Project Description

Maunalua Boat Ramp Maintenance Dredging and Facility Improvements

Submitted to
State of Hawaii Department of Land and Natural Resources (DLNR)
Office of Conservation and Coastal Lands (OCCL)

Prepared for
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ACRONYMS AND ABBREVIATIONS

BMP	best management practice
CRM	cement rubble masonry
DLNR	State of Hawaii Department of Land and Natural Resources
Facility	Maunalua Bay Launch Ramp Facility
MHHW	mean higher high water
MHW	mean high water
MLLW	mean lower low water

1 INTRODUCTION

The Maunalua Boat Ramp Maintenance Dredging and Facility Improvements project is proposed by the State of Hawaii Department of Land and Natural Resources (DLNR) to provide needed maintenance to the Maunalua Bay navigation channel ("the navigation channel") and at the Maunalua Bay Launch Ramp Facility (Facility). Sedimentation within the navigation channel since original construction poses obstructions to navigation and vessel launching, with adverse impacts to the local community. This project proposes to perform maintenance dredging to improve navigation, and beneficially reuse dredged material to improve the Facility. Ongoing shoreline erosion occurring at the site would be mitigated by stabilizing shorelines and rehabilitating the failing seawalls that exist throughout most of the site.

1.1 SITE DESCRIPTION

The Facility exists along the shoreline of Maunalua Bay, southwest of the Hawaii Kai Marina, and is made up of dredged fill material placed between the 1940s–1970s. Much of the current site is paved with asphalt concrete to provide parking for vehicles and boat trailers. A concrete boat launch ramp exists at the shoreline of the Facility, with two lanes separated by a fixed-pier loading dock. A concrete paved boat washdown area exists along the mauka edge of the parking area. Areas of the site that are not paved consist primarily of the dredged fill material of which the landmass is made, made up of coral rubble, sand, and silt. Basalt gravel is also present in many unpaved areas, particularly in the vicinity of the existing seawalls where it was placed during their original construction. Vertical cement rubble masonry (CRM) seawalls ("Type A Wall") exist flanking both sides the boat ramp, which transition to sloped CRM walls ("Type B Wall") extending further east and west along the shoreline. Another taller section of Type B wall exists along the shoreline at the eastern end of the Facility. Sandy beach areas exist along unarmored portions of the shoreline, with the "Canoe Launch" beach towards the west end of the facility and "East Beach" towards the east end of the facility.

The west side of the Facility is host to several canoe clubs who practice the traditional Hawaiian sport of outrigger canoe paddling from the site. Canoes are stored within a modern hale structure as well as in the upland area in the westernmost portion of the Facility, and are launched into the bay via the shoreline along the western edge of the Facility. A satellite photo showing an overview of the Facility is provided in Figure 1, below.

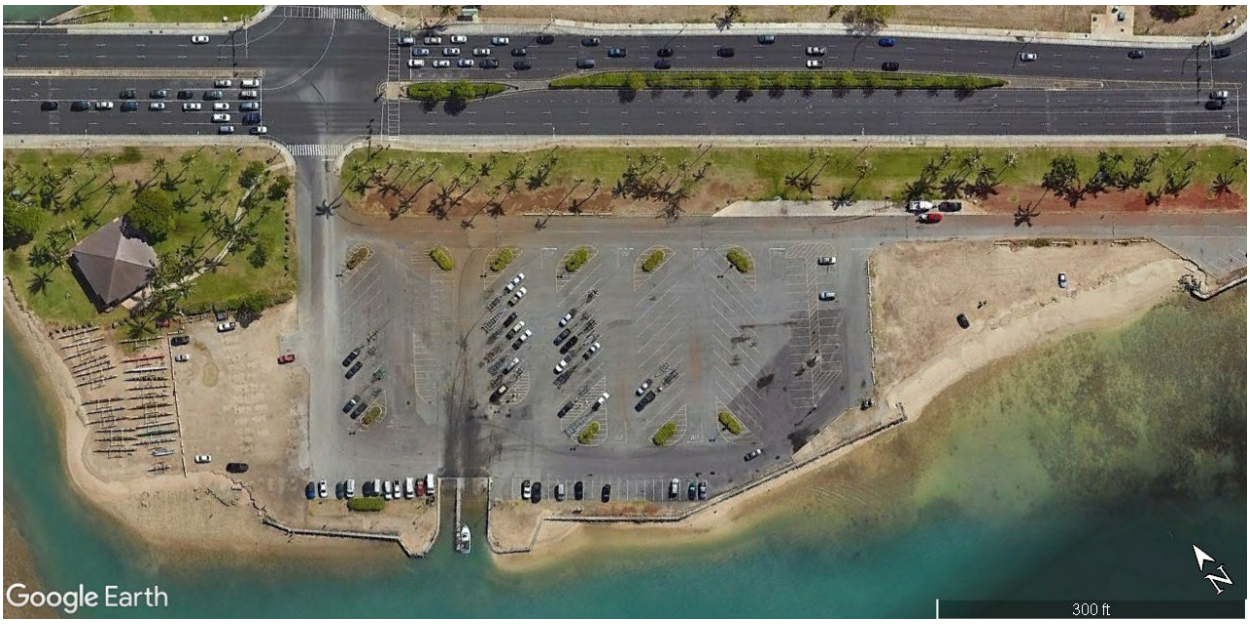


Figure 1. Satellite Photo of the Facility, Captured on May 21, 2015 (Photo: NASA)

A dredged navigation channel, nominally 100 ft wide with depths ranging between 6 to 9 ft relative to mean lower low water (MLLW), provides access for vessels to transit between the Facility and the deeper waters of the bay to the southeast. Channel markers #8–#21, made of concrete-filled galvanized steel pipes with reflective signage, are located along the edges of the navigation channels spaced at roughly 300-ft intervals. A dredged channel also exists at the outer edge of the fringing reef, roughly 1,300 ft long and 130 ft wide, to provide safe passage between the bay and the Pacific Ocean. The navigation channel is illustrated in Figure 2, below. A single channel marker (#1) identifies the beginning of the channel as vessels approach from the ocean (not shown).

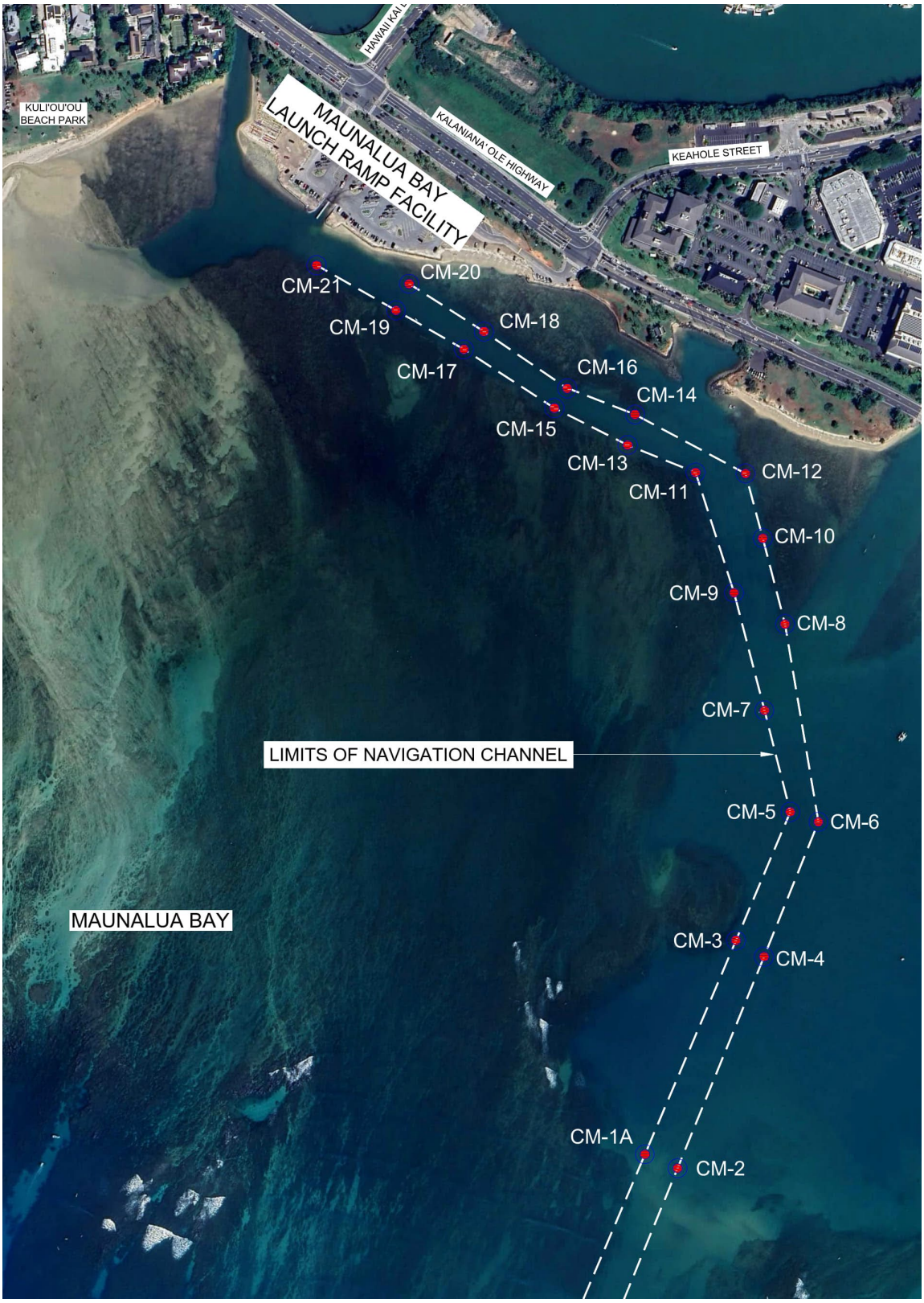


Figure 2. Site Map of the Maunalua Bay Navigation Channel

1.2 HISTORY OF MAINTENANCE DREDGING ACTIVITIES

Figure 1 provides a 1928 photograph of the narrow ribbon of land located between Maunalua Bay and "Kuapa Pond," a brackish fishpond, which stretched inland, northeast of the site. The location of the present-day Facility is shown with a red star. The shoreline of Maunalua Bay consisted of carbonate sand beaches with a narrow, vegetated backshore/dune system. As evidenced in the photograph, no navigation channel connecting the present-day Facility location to Maunalua Bay existed at this time.

Figure 3. Aerial Photograph of the Project Site in Maunalua Bay with a Red Star Showing the Location of the Existing Maunalua Bay Boat Ramp Facility (Center Left) and Kuapa Pond in the Foreground, as It Existed in 1928.

Maunalua Bay and its vicinity underwent significant changes between the 1940s–1960s, with the creation of navigation channels as well as large-scale dredging and filling operations associated with the development of the Hawaii Kai Marina. Figure 3 presents an aerial photograph of the project site in 1967. The dredged navigation channel can be clearly seen running from the bottom right of the photograph towards the upper left at the site of the present-day boat launch ramp. Figure 4 provides a more recent satellite photograph from 2016. A white dashed line has been added to identify the location of the dredged navigation channel that provides vessel access to the Maunalua Bay Boat Ramp Facility from the Pacific Ocean.

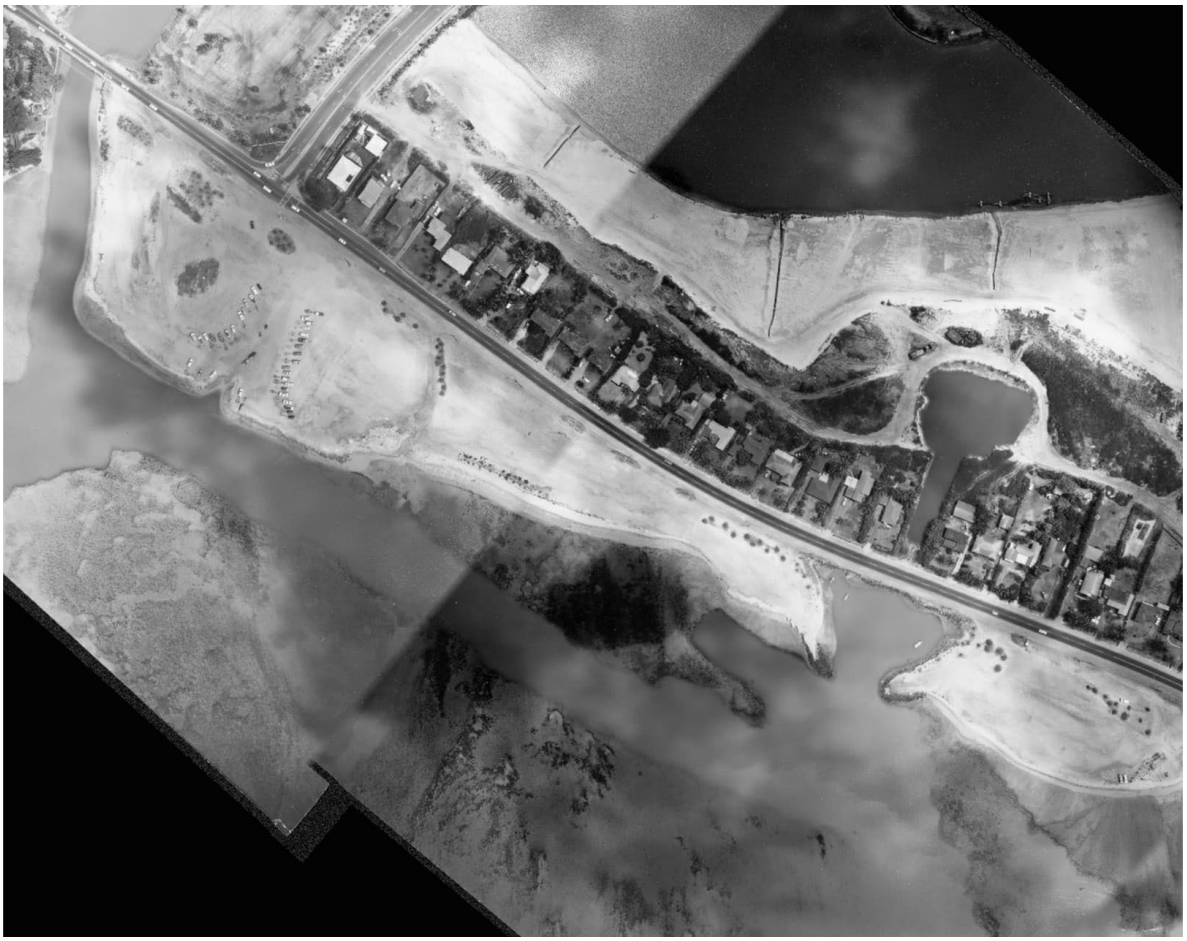


Figure 4. Historical Aerial Photograph of the Project Site in 1967.

Figure 5. Satellite photograph of the project Site in 2016.

Additional historical documentation of maintenance dredging performed within the navigation channel along the Facility is provided by archive files showing the limits of maintenance dredging in 1990. Figure 4 presents a snapshot of the 1990 dredge plan, where maintenance dredging was performed at the boat launch ramp, with the area makai of the ramp dredged to a depth of -6 feet MLLW. Dredged material was placed along the shoreline west of the ramp.

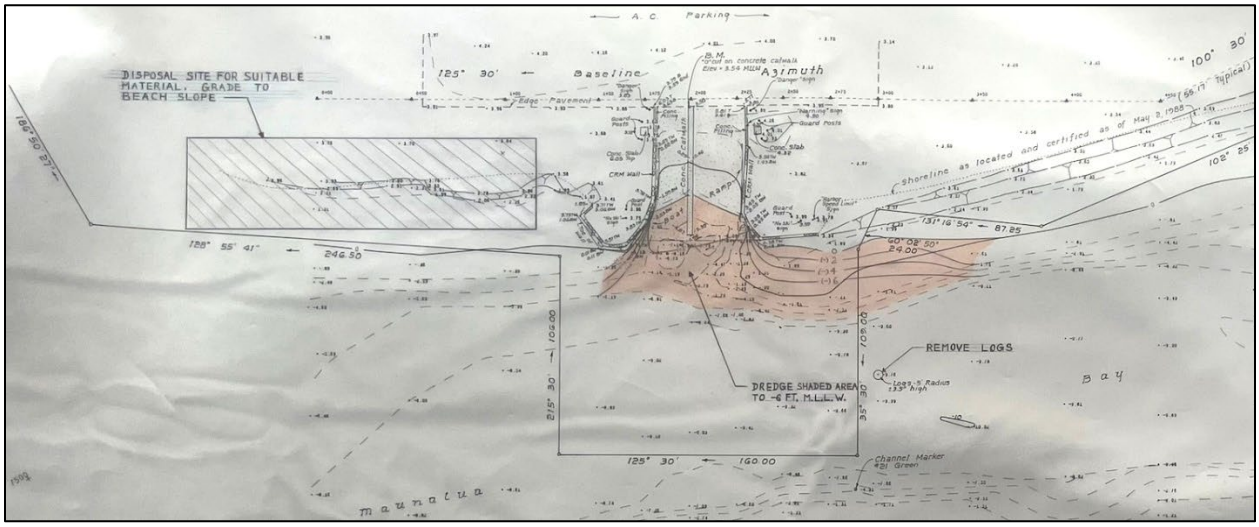


Figure 6. 1990 dredge plan showing maintenance dredging activities within the area proposed for maintenance dredging.

Similar to the constructed navigation channel adjacent to the Facility, historical aerial photographs also provide documentation that the outer reach of the navigation channel towards the mouth of Maunalua Bay is a constructed/maintained channel. Figure 5 (left image) represents the condition of the bay in 1928, with a yellow circle indicating the approximate location of the present-day channel. The 1928 photograph clearly shows a lack of navigable passage through this area at the time. Figure 5 (right image) is a satellite image from 2016, where it is evident this area has been dredged for navigation. A search of available historical photographs indicates initial construction of the outer channel occurred between 1940 and 1958.

Figure 7. Left: Aerial photograph of Maunalua Bay from 1928. Right: Satellite image of Maunalua Bay in 2016. The yellow circle indicates the approximate location of proposed maintenance dredging in the location of original channel construction.

1.3 HISTORY OF FACILITY CONSTRUCTION AND IMPROVEMENTS

The Maunalua Bay Boat Launch Facility was originally constructed in the late 1950s through the early 1960s. It is understood the landmass of the present-day Facility was constructed using material dredged from within Kuapa Pond to create the Hawaii Kai Marina, as well as coral rubble from construction of the navigation channel through limestone reef. Figure 4 provides an aerial photograph of the navigation channel and Facility area as it existed in 1975.

Between 1967 and 1975, a concrete boat ramp bordered by cement rubble masonry walls was constructed at the facility to prevent erosion and provide a safe launch facility for boaters. Shoreline hardening structures also began to be installed, starting with a rock revetment installed along the shoreline of the C&C Parks and Recreation-owned lot east of the site, makai of the restroom structure. Elsewhere the shoreline was not protected by shoreline armoring and subsequently experienced chronic erosion.

Figure 8. Historical Aerial Photograph of the Facility area 1975.

Further hardening was installed between 1975 and 1988, consisting of a seawall extending west from the west end of the existing revetment, and terminating at the current east end of east beach. The seawall can be seen in Figure 5, below.

Figure 9. Historical Aerial Photograph of the Facility Area in 1988.

Finally, in 1993, the current extents of shoreline hardening were competed, with the installation of short, sloped walls extending east and west from the boat ramp, as can be seen in Figure 7, below. A cross-section from the project drawings is also provided in Figure 8, below.

Figure 10. Historical Aerial Photograph of the Facility Area in 1996.

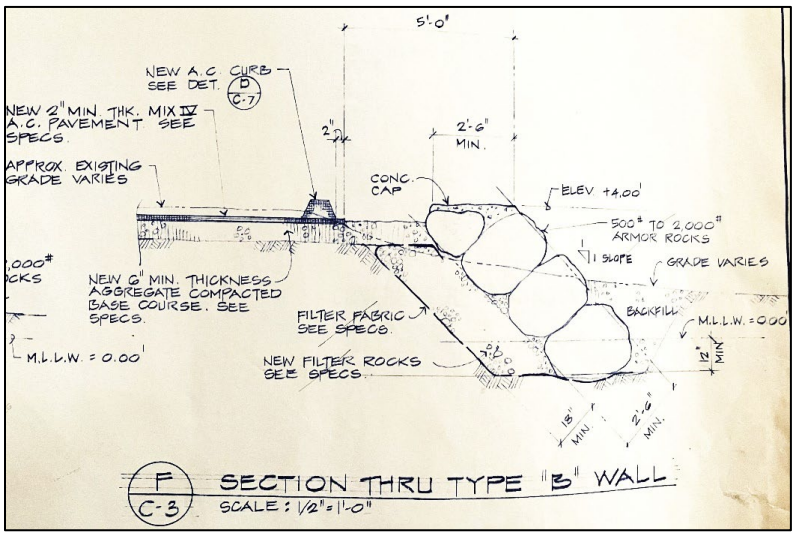


Figure 11. Cross section of the "Type B" wall installed in 1993.

Areas without shoreline hardening have continued to erode since 1993. An aerial photograph of the project site collected in July 2023 is provided in Figure 9, below, showing severe erosion at the west end of the site, and moderate erosion at east beach.

Figure 12. Orthomosaic Aerial Image of the Project Site as It Existed on July 14, 2023 (Shoreline Science & Engineering, LLC).

2 PROPOSED WORK

2.1 MAINTENANCE DREDGING AND NAVIGATION IMPROVEMENTS

2.1.1 Maintenance Dredging

Seven areas in the navigation channel require dredging to remove hazards or otherwise restore design depths. In total, approximately 5,850 cubic yards of material are proposed to be dredged from within the Maunalua Bay navigation channel. DLNR seeks to restore safe vessel navigation by performing maintenance dredging to a depth of -6 ft MLLW, with up to 1 ft of payable overdepth. These areas are presented in the project plans as dredge areas 1, 2, 3, 4, 5, 6, and 7.

Sediment within the proposed dredge areas has been characterized in a separate report, "Sediment and Geotechnical Investigations" (Integral 2024). Dredging will be performed mechanically, with material transported to the Facility via barge for offload, dewatering, sorting, and reuse. Dredged material will be used as fill material for beach nourishment, filling of eroded areas, and in conjunction with repairs to the existing seawall structures.

2.1.1.1 Dredge Area 1

West of the boat ramp, a shoal has accreted within the navigation channel. Continued accretion threatens to further constrict or even cut off access for paddlers and boaters, and restrict the flow of water in and out of the Hawaii Kai Marina. Following construction of the dredged material containment structure (discussed in section 2.2.1) a portion of this shoal will be dredged to restore navigable depths and improve access.

2.1.1.2 Dredge Area 2

A significant shoal has developed makai of the eastern edge of the boat ramp, presenting a hazard for larger vessels while launching or hauling out. Sediment has also accumulated on top of the existing concrete boat launch ramp along its eastern edge. The shoal will be dredged, and sediment removed from the boat ramp with careful attention so as to not damage the existing ramp and wall structures.

2.1.1.3 Dredge Areas 3, 4, 5, and 6

Several small shoals exist along the edges on the inner navigation channel, roughly between channel markers #8 and #15, which will be dredged to restore safe navigation.

2.1.1.4 Dredge Area 7

A large sand shoal has developed just makai of Channel Marker #2, presenting a hazard to boaters with multiple prop strikes reported in recent years.

2.1.2 Channel Marker Replacement

The original Channel Markers #16 and #1A no longer exist, however, temporary buoys are in place to mark their locations. This project includes the replacement of these two channel markers and their pertinent signage. Channel Marker 1A will consist of a 16.5" pre-stressed concrete pile, and Channel Marker #16 will consist of a concrete-filled galvanized steel pipe pile.

2.2 PROPOSED FACILITY IMPROVEMENTS

In addition to performing maintenance dredging, the proposed project involves several Facility improvements, including repairing damaged shoreline structures, shoreline erosion mitigation efforts, and beach nourishment. A recommended sequence of work and construction methodologies are offered in Section 3.

2.2.1 Dredged Material Containment Structure and Backfilling

A 415 linear foot dredged material containment structure will be constructed to permanently contain fill material within a roughly 5,500 square foot area that has eroded in the southwest portion of the site, and mitigate ongoing erosion. Approximately 130 linear feet of existing Type B Wall will be demolished and removed in preparation for the new sheet pile structure.

The layout of the proposed containment structure is intended to restore the Facility to its originally constructed extents. The structure will consist of driven steel sheet pile topped with a reinforced concrete cap. Steel tie-back anchors will be installed below grade near the western terminus of the structure, to provide anchoring to the portion of the sheet pile near Dredge Area 1. The eroded area behind the containment structure will be filled with dredged material in lifts of specific gradations, separated by non-woven geotextile fabric. The bottom layer of material below mean higher high water (MHHW) will primarily consist of dredged coral rubble material. The thickness and layout of subsequent lifts will be influenced by the volume

and characteristics of the surplus dredge material that is available after fill and beach nourishment have been completed elsewhere on site.

2.2.2 Seawall Repairs

Small, un-grouted rock walls (Type B wall) located along the shoreline of the Facility have developed voids and have partially collapsed in some areas. This wall type is shown in Figure 3, below. Grouted CRM walls (Type A wall) adjacent to the boat ramp have also degraded and developed voids. This wall type is shown in Figure 4, below. The existing Type A walls will be repaired via filling of voids, repointing existing mortar, and forming and tremie pouring voids per the project plans and specifications.

The existing Type A and B walls may be partially re-built (as needed), by removing the existing un-reinforced concrete cap and all loose stones above grade, and re-constructing per the project plans and specifications. All voids will be fully grouted, and the walls will be topped with a reinforced concrete cap added as a part of this repair. Repairs to both wall types will include increasing the height of the walls (including the new reinforced concrete cap) by approximately 10 percent to a final post-construction top of wall elevation of +4.7 ft MLLW. The existing Type B wall at the east end of the site is taller, and consequently be repaired to a corresponding 10 percent increase in height to +5.2 ft MLLW.

Figure 13. Photo of the Type B Wall East of the Boat Ramp, Looking West, on February 28, 2024 (Photo: Integral Consulting Inc.).

Figure 14. Photo of the Dilapidated Type A Wall along the East Edge of the Boat Ramp, Looking East, on February 28, 2024 (Photo: Integral Consulting Inc.).

2.2.3 Type B Wall Extension and New Revetment

Toward the east end of the site is a small beach area, approximately 300 feet in length (referred to as "East Beach"). Erosion at both ends of the beach has damaged existing shoreline structures and resulted in the collapse of a portion of the asphalt parking lot on the east end of the beach. This project includes extending the length of the existing Type B wall at the west end of the beach (after it turns towards the mauka direction) by 25 linear feet. A photo of the end of the existing Type B wall is shown in Figure 5 below.

Figure 15. Photo of the Terminal End of the Type B Wall Located at the East End of East Beach.

At the eastern end of the beach, shoreline erosion has undermined the existing parking area and threatens the adjacent drive aisle. A new revetment will be constructed at this location, extending the length of the existing shoreline armoring in this area by roughly 45 feet. This area is shown in figure 6, below.

Figure 16. Photo of the Dilapidated Wall/Revetment Structure and Shoreline Erosion Area Located at the East End of East Beach.

2.2.4 Alternative 1 – New Sheet Pile Wall in lieu of Seawall Repairs

Competitive bids for construction were obtained earlier this year and DLNR has awarded the project to a local marine contractor. Bid prices were considerably higher than expected; review of bid line-item cost elements and subsequent discussions with the selected marine contractor indicate that repairing the existing seawalls will be just as expensive, or even more expensive, than installing new sheet pile walls. Recognizing that new sheet pile walls will provide the State with a longer-lasting product and a more resilient facility when compared to repairing and rehabilitating the old, dilapidated seawalls, DLNR is presently evaluating an alternative that involves installing new sheet pile walls just mauka of the existing seawalls. This alternate approach is being referred to as “Alternate 1”.

In addition to providing robust protection against coastal erosion, Alternative 1 raises the seawall crest elevation to better protect against future sea level rise threats. Therefore, Alternative 1 better aligns with the sea level rise planning benchmark of 3.2 feet recommended by the City and County of Honolulu Climate Change Commission (2018). For these reasons, Alternative 1 is expected to provide the State with additional benefits at an equivalent or lower cost.

2.2.5 Beach Nourishment

Sediment samples were collected from proposed dredge areas and beach nourishment sites. Grain size analysis results indicate that sediment within Dredge Area #7 meets beach fill compatibility criteria for both the Canoe Launch and East Beach nourishment sites. Although sediment from other dredge areas does not meet beach fill compatibility criteria for the proposed nourishment sites, it is suitable to use as fill for upland improvements. The methods, analyses, results, and discussion to support these compatibility determinations are detailed in the report “Sediment Compatibility Analysis for Small-Scale Beach Restoration”.

Beach-quality dredged sediment from Dredge Area #7 will be placed along two shoreline locations at the Facility, the “Canoe Launch” area at the west end of the site and “East Beach” located toward the east end of the site. Figure 7 presents the approximate location of these beach fill areas. Segregating material dredged from dredge area #7 will be a requirement of the project, to allow for post-dredge confirmatory sampling and to ensure only suitable material is used for beach nourishment, with material from other dredge areas utilized elsewhere on site.

Figure 17. Locations of the Two Beach Areas Being Considered for the Placement of Beach Quality Sand from Dredging Operations.

Beach nourishment of the Canoe Launch area will involve placement of beach-quality dredged sand between roughly the -0.5 ft and +4.3 ft contours along approximately 130 linear feet of the existing shoreline. Nourishment of this area is intended primarily to enhance the area being used by traditional Hawaiian canoe paddlers to launch and store canoes, by restoring a carbonate sand beach similar to what historically existed along the Maunalua Bay shoreline.

At the East Beach area, the existing parking stops (concrete piles laid on their side to prevent the seaward advancement of vehicles) will be adjusted to increase the width of the beach while maintaining the existing parking capacity. Prior to the placement of suitable beach-quality sand along East Beach, coral rubble that has accumulated above the existing natural slope of the beach in this area will be "bladed" toward the mauka edge of the proposed fill template to serve as inner "core" material for the proposed berm/dune feature designed to protect the adjacent parking area from storm surge and wave overwash during high wave and/or water level events. Sand will then be placed along approximately 300 linear ft of shoreline, in accordance with the fill template provided in the project plans and specifications.

2.3 SUMMARY OF ACTION AREA FILL AND IMPACTS

Table 3. Summary of Action Area Fill and Impact Acreages.

Fill Type	Volume (Cubic Yards)		Area (Acres)		Length of shoreline (Linear Feet)
	Above MHW	**Below MHW**	**Above MHW**	**Below MHW**	
Shoreline Stabilization[a]*:*	1,255	770	0.51	0.11	1,151
Canoe Launch Beach Fill:	150	20.8	0.16	0.03	128
East Beach Fill:	827	5.58	0.36	0.03	300

[a] Shoreline Stabilization summary includes all shoreline stabilization activities including construction of the Dredged Material Containment Structure, the new revetment extension, and repairs to existing seawalls.

Table 4. Summary of Action Area Dredging and Impact Acreages.

Dredge Area	Volume (Cubic Yards)	Area (Acres)
1	500	0.06
2	800	0.21
2A	250	0.03
3	900	0.17
4	125	0.03
5	150	0.03
6	125	0.03
7	3,000	1.10

3 PROPOSED PROJECT SEQUENCE AND METHODOLOGIES

The following subsections summarize recommended methodologies and a sequence of work intended to efficiently manage the various project activities.

3.1 INSTALLATION OF BMPS

The first task to be completed will be the installation of required best management practices (BMPs). This will include all necessary upland erosion and sediment control devices, such as silt fences and filter socks, to prevent sediment-laden runoff from escaping disturbed areas.

A floating turbidity curtain will be deployed between the boat ramp and accreted shoal to the west, to contain any turbidity that may be generated during the installation of the dredged material containment structure. Floating turbidity curtains will also be deployed around active work areas during wall repair work throughout the site. Construction fences shall be installed as necessary to separate areas of active construction from the public.

3.2 DREDGED MATERIAL CONTAINMENT STRUCTURE AND BACKFILLING

Once BMPs are in place and the laydown area has been prepared, construction of the dredged material containment structure may proceed. This feature must be constructed prior to dredging so that it is prepared to accept dredged material. The structure will be installed by driving steel sheet piles into the ground using a vibratory hammer. The Type B wall west of the boat ramp that exists within the footprint of the proposed sheet pile wall will be demolished/removed to facilitate the installation of sheet pile in its place, with rocks from the original Type B wall retained and made available for use in wall repair work throughout the rest of the site. Once the Dredged Material Containment Structure is installed, the eroded area landward of the structure will serve as a natural dewatering basin and sediment trap during dredged material offload and staging operations. Some grading may be done within the footprint of the proposed fill area to prepare for the arrival of dredged material.

The placement of dredged material behind the Dredged Material Containment Structure shall be conducted as follows:

- Bottom Layer (below Elevation +1.9 feet MLLW): For areas behind the sheet pile wall that are below the elevation of Mean Higher High Water (+1.9 feet MLLW), fill material shall consist of coral rubble or other material generally larger than ¾-inch diameter. A non-woven geotextile fabric (Mirafi 180N or approved equal) shall be placed above the (bottom) coral rubble layer, prior to the placement of additional (fine) dredged material above it.

- Middle Layer (between elevation +1.9 feet MLLW to (approximately) +4 feet MLLW): After placement of the non-woven geotextile fabric above the bottom coral rubble layer, the Contractor shall place dredged material containing greater than 10% fines. A second non-woven geotextile fabric (Mirafi 180N or approved equal) shall be placed above this layer, prior to the placement of the top layer of dredged material.

- Top Layer (above approximately +4 feet MLLW): After placement of non-woven geotextile fabric atop the Middle Layer, the Contractor shall fill the area to the fill template provided in the plans and specifications, which ranges from +4 feet to +5.5 feet MLLW, with dredged material containing less than 10% fines.

Surplus coral rubble material shall be prioritized for use as the top layer of finished grade directly behind (mauka) of the Type A and Type B wall repairs throughout the rest of the site, with any remaining coral rubble placed on the top (finished ground) surface of the area south of the canoe storage on the west end of the Facility.

3.3 WALL REPAIRS

The existing Type B walls east of the boat ramp will be partially re-built, by first removing the existing un-reinforced concrete camp and all loose stones above grade, followed by preparation of the subgrade behind the wall, placement of geotextile fabric, placement of underlayer stones, and placement and grouting of the armor stone. Finally, a steel-reinforced concrete cap will be formed and poured on top of the re-built wall. The end of the Type B wall that turns mauka at the west end of East Beach will be extended by roughly 25 linear feet, maintaining the same cross-section as the rest of the wall. All walls will be repaired to achieve a final Top of Wall elevation of +4.7 ft MLLW, approximately 10% taller than the existing wall. This work will be done primarily by hand with the assistance of an excavator. Ideally, Type B wall repairs would begin concurrently with the installation of the dredged material containment structure. This would help to ensure that the repairs can quickly utilize stones provided by the demolition of the west-most type B wall, and that sufficient areas behind the repaired walls are ready to receive fill as soon as it becomes available from dredging operations.

The existing Type A walls will be repaired per the project plans and specifications. Type A wall repairs will include careful excavation of the soil mauka of the walls to allow the installation of Mirafi FW700 woven geotextile (or approved equal) along the mauka face of the wall, extending down to the foundation and then encircling all fill placed behind the wall as shown on the Plans. Following repair of the walls, the area behind the walls will be backfilled and compacted in lifts. For fills placed within the woven geotextile fabric (Mirafi FW700) wrap behind the wall, material placed below the elevation of MHHW (+1.9 feet MLLW) shall consist of coral rubble or other material generally larger than ¾-inch diameter, and shall be separated from other fills

placed above MHHW with a non-woven geotextile fabric (Mirafi 180N or approved equal). Finally, a steel-reinforced concrete cap will be formed and poured on top of the re-built wall.

3.4 MAINTENANCE DREDGING

All dredging will be mechanical dredging, performed via an excavator atop a floating barge. Dredged material will be loaded into a bin on the dredge barge, or into a separate scow. A floating turbidity curtain will be deployed to isolate and fully surround the dredge area whenever active work is occurring. Once full, the barge or scow will be transported to an offload area at the Facility. Dredged material will then be offloaded into a truck or directly placed into the fill area behind the dredged material containment structure, where it will be allowed to dewater and screened and segregated into material stockpiles as necessary (see below).

Dredged Material Stockpiles:

1. Dredge Area 7 Material Stockpile: The Contractor shall stockpile dredged material recovered from Dredge Area 7, expected to be beach-quality sand, in a separate stockpile, to allow additional evaluation and testing prior to placement along the shoreline at the Canoe Launch beach and East Beach areas.

2. Coral Rubble Stockpile: Coral rubble and other sediment larger than ¾-inch in diameter shall be screened using a grizzly screen, a mechanical screener, or an alternative method as accepted by the Engineer, to separate out the larger (coral rubble) material from the rest of the dredged material (e.g., silts, sands). The Coral Rubble Stockpile will be used within specific fill lifts at various locations throughout the Facility as described in sections 3.2 and 3.3.

3. Fine Material Stockpile: To the extent feasible, finer dredged material (dredged material containing MORE than 10% fines) shall be stockpiled separately from dredged material containing higher concentrations of sand. The Fine Material Stockpile will be used within specific fill lifts at various locations throughout the Facility as described in sections 3.2 and 3.3.

4. Coarser Material Stockpile: To the extent feasible, coarser dredged material (dredged material containing LESS than 10% fines) shall be stockpiled separately from dredged material containing higher concentrations of fines. The Coarser Material Stockpile will be used for prioritizing the use of this material type in Facility improvements throughout the site.

3.5 BEACH NOURISHMENT

Beach nourishment activities at the Canoe Area and East Beach will be achieved using excavators and/or loaders. At both beach nourishment locations, suitable dredged material will be placed initially toward the top of the beach profile and pushed toward the water. Mechanized equipment will not be permitted to enter the water at any time during the process.

At East Beach, coral rubble that has accumulated above the existing natural slope of the shoreline (approximately 10:1) will be "bladed" toward the mauka edge of the proposed fill template, to serve as an inner core to the proposed berm/dune feature. The berm/dune feature will begin at the edge of the parking stops and continue up on a 3:1 (horizontal:vertical) slope up to a maximum dune crest elevation of +8 ft MLLW, with a crest width of 5 ft. The slope of fill will then proceed in the seaward direction following a slope of 6:1 (horizontal:vertical). The eastern end of the proposed fill template is intended to overlap with/bury the landward end of the proposed new revetment. As such, the revetment must be completed prior to placing beach fill in that area.

3.6 NEW REVETMENT AND PARKING LOT REPAIR

At the east end of East Beach, a new revetment structure is proposed to stabilize an eroding area and prevent further damage to the paved parking lot. Erosion control BMPs will be installed as required by the project plans and specifications. Loose stones and debris in the vicinity of the proposed revetment will be removed, followed by preparation of the subgrade behind the revetment, placement of geotextile fabric, placement of underlayer stones, and placement and grouting of the armor stone. This work will be done primarily by hand with the assistance of an excavator. Once complete, the area behind the new revetment will be filled using dredged material, and the subgrade for the parking area repair will be prepared. The parking area will be repaired to its original extents using asphalt. The eastern end of the proposed East Beach fill is intended to overlap with/bury the landward end of the proposed new revetment. As such, the revetment must be completed prior to placing beach fill in that area.

3.7 CHANNEL MARKER INSTALLATION

Channel marker installation will be achieved using an excavator, crane, or similar equipment atop a floating barge. Channel Marker 16, which will consist of a galvanized steel pipe, will be driven into the substrate using an APE 200T vibratory hammer. The pipe will be filled with concrete after driving is complete. Channel Marker 1A, which will consist of a 16.5" octagonal pre-stressed concrete pile, will be installed by first pre-drilling the installation location to its designed penetration depth, and then placing the pile into the drilled hole. The annulus around the pile will then be filled with sand and navigation signage will be affixed to the new piles using stainless-steel hardware.

4 AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

The following Best Management Practice (BMPs) and Avoidance and Minimization Measures (AMMs) would be followed to avoid, mitigate, and minimize effects on listed species, designated critical habitat, EFH, and the aquatic resource.

4.1 BEST MANAGEMENT PRACTICES

Standard industry construction BMPs will be followed during implementation of the Project. Specifications and construction notes will be called out on final drawings and be implemented by the construction contractor. At minimum it is expected that upland erosion and sediment control devices, such as silt fences and filter socks, shall be placed along the MHHW line in the western fill area/contractor laydown area. Construction fences shall also be installed as necessary to separate the area from the public. Turbidity curtains will be deployed offshore for shoreline work and will be used to fully encircle all dredging operations. Additional BMPs will be implemented as per final requirements by the City and County of Honolulu for the Grading Permit, as needed to meet sediment and erosion control requirements.

4.2 SEAGRASS TRANSPLANTATION

Efforts to minimize impacts to seagrass, specifically the species of *Halophila hawaiian* and *H. decipiens*, would include attempts to relocate seagrass encountered during dredging. The project team plans to work with the local non-profit organization Malama Maunalua and the selected dredging contractor to incorporate use of the contractor's equipment (e.g., the dredge bucket) to carefully remove the top 6 inches of sediment within areas occupied by sea grass. The sediment and attached seagrass would be placed on an adjacent platform or barge (or similar) where salvageable seagrass would be retrieved for transplant. The seagrass would be kept moist until it can be transplanted. The project team would then attempt to transplant sea grass within a nearby suitable location with similar depth and environmental characteristics as the donor site (as identified by a qualified biologist).

4.3 AVOIDANCE AND MINIMIZATION TO CORAL RESOURCES

Several live corals were identified within areas that may be impacted by proposed dredging operations. Prior to initiating construction activities, these corals would be removed and delivered to Malama Maunalua for their use in ongoing coral restoration research under the purview of their existing permit with the State of Hawaii Division of Aquatic Resources.

4.4 APPLICABLE PAC-SLOPES MEASURES

Relevant measures would be implemented from the Effects of Implementing Standard Local Operation Procures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES) on ESA-listed Sea turtles and Marine Mammals, dated July 2010 (NMFS, 2010). Only measures relevant to the project are included below.

4.4.1 GENERAL CONDITIONS

The DLNR and construction contractor would apply the following set of general conditions during implementation of the Project.

1. Each applicable condition, BMP, and conservation measure would be included as an enforceable part of the permit document.
2. The Corps will retain the right of reasonable access to projects authorized under Pac-SLOPES to monitor the compliance with and effectiveness of permit conditions.
3. Each permit will contain the requirement that the permittee document and report to the Corps and NMFS, all interactions with listed species, including the disposition of any listed species that are injured or killed. Should an ESA-listed species be adversely affected, all work must stop pending reinitiation of consultation between the Corps and NMFS PRD for that action.
4. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of a proposed action.
    a. A responsible party, i.e., permittee/site manager/project supervisor, shall designate a competent observer to survey work sites and the areas adjacent to the proposed action for ESA-listed marine species;
    b. Surveys shall be made prior to the start of work each day, including prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the workday are strongly recommended;
    c. All in-water work will be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and will only begin/resume after the animals have voluntarily departed the area, with the following exception: if ESA-listed marine species are noticed within 50 yards after work has already begun, that work may continue only if, in the best judgment of the responsible party, the activity is unlikely disturb or harm the animal(s), for example, divers performing surveys or underwater work (excluding the use of toxic chemicals) is likely safe, the use of heavy machinery is not; and
    d. No one shall attempt to feed, touch, ride, or otherwise intentionally interact with any protected species.

5. Project footprints must be limited to the minimum area necessary to complete the project.
6. The project area must be flagged to identify sensitive resource areas, such as seagrass beds, listed terrestrial plants, and turtle nests.
7. Work located waterward of the Mean Higher High Tide Line of a navigable water or waterward of the upward limits of adjacent wetlands must be timed to minimize effects on ESA-listed species and their habitats.
8. Project operations must cease under unusual conditions, such as large tidal events and high surf conditions, except for efforts to avoid or minimize resource damage.
9. A storm water management plan, commensurate to the size of the project, must be prepared and carried out for any project that will produce any new impervious surface or a land cover conversion that will slow the entry of water into the soil to ensure that effects to water quality and hydrology are minimized.
10. A pollution and erosion control plan for the project site and adjacent areas must be prepared and carried out. As a minimum, this plan shall include:
    a. Proper installation and maintenance of silt fences, sausages, equipment diapers, and/or drip pans;
    b. A contingency plan to control and clean spilled petroleum products and other toxic materials.
    c. Appropriate materials to contain and clean potential spills will be stored at the work site, and be readily available;
    d. All project-related materials and equipment placed in the water will be free of pollutants;
    e. Daily pre-work inspections of heavy equipment for cleanliness and leaks, with all heavy equipment operations postponed or halted until leaks are repaired and equipment is cleaned;
    f. Fueling of project-related vehicles and equipment will take place at least 50 feet away from the water, preferably over an impervious surface;
    g. A plan will be developed to prevent trash and debris from entering the marine environment during the project; and
    h. All construction discharge water (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated before discharge.
11. Erosion controls must be properly installed before any alteration of the area may take place.
12. Temporary access roads and drilling pads must avoid steep slopes, where grade, soil types, or other features suggest a likelihood of excessive erosion or failure; existing

access routes must be utilized or improved whenever possible, in lieu of construction of new access routes.

13. All disturbed areas must be immediately stabilized following cessation of activities for any break in work longer than 4 days.
14. Drilling and sampling are restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of in an upland location.
15. Authorized work must comply with all applicable NWP General and Regional Conditions.

4.4.2 SPECIAL CONDITIONS:

The Pac-SLOPES Biological Evaluation also evaluates impacts from specific activities that can be reasonably expected to interact directly or indirectly with ESA-listed species. The following Activity Specific Best Management Practices (BMPs) may apply to the Project:

Pac Slopes BMP 5.1. Collision with vessels:

1. Vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.
2. Vessel operators shall reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals, and to 5 knots or less when piloting vessels in areas of known or suspected turtle activity.
3. If approached by a marine mammal or turtle, the vessel operator shall put the engine in neutral and allow the animal to pass.
4. Vessel operators shall not encircle or trap marine mammals or sea turtles between multiple vessels or between vessels and the shore.

Pac Slopes BMP 5.2. Direct physical impact:

1. Before any equipment, anchor(s), or material enters the water, a responsible party, i.e., permittee/site manager/project supervisor, shall verify that no ESA-listed species are in the area where the equipment, anchor(s), or materials are expected to contact the substrate. If practicable, the use of divers to visually confirm that the area is clear is preferred.
2. Equipment operators shall employ “soft starts” when initiating work that directly impacts the bottom. Buckets and other equipment shall be sent to the bottom in a slow and controlled manner for the first several cycles before achieving full operational impact strength or tempo.
3. All objects lowered to the bottom shall be lowered in a controlled manner. This can be achieved by the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.

4. Equipment, anchor(s), or materials shall not be deployed in areas containing live corals, sea grass beds, or other significant resources.

Pac Slopes BMP 5.3. Entanglement:

1. Mooring systems shall employ the minimum line length necessary to account for expected fluctuations in water depth due to tides and waves.
2. Mooring systems shall be designed to keep the line as tight as possible, with the intent to eliminate the potential for loops to form.
3. Mooring lines shall consist of a single line. No additional lines or material capable of entangling marine life may be attached to the mooring line or to any other part of the deployed system.
4. Mooring systems shall be designed to keep the gear off the bottom, by use of a mid-line float when appropriate, with the intent to eliminate scouring of corals or entanglement of the line on the substrate.
5. Any permanent or long-term deployments shall include an inspection and maintenance program to reduce the likelihood of failures that may result in loose mooring lines lying on the substrate or hanging below a drifting buoy.
6. Mooring systems, including those used for temporary markers, scientific sensor buoys, or vessel moorings, shall be completely removed from the marine environment immediately at the completion of the authorized work or the end of the mooring's service life. The only exceptions to this rule shall be mooring anchors such as eyebolts that are epoxied into the substrate and which pose little or no risk to marine life.

Pac Slopes BMP 5.5. Exposure to elevated noise levels:

1. For any equipment used in undertaking the authorized work, the 160 dB and 120 dB isopleths shall not exceed the 50-yard shut-down range for impulsive and continuous sound sources, respectively.
2. Maintenance dredging, in-water excavation, movement of large armor stones, and benthic core sampling shall not be undertaken if any ESA-listed species is within 50 yards of the authorized work, and those operations shall immediately shut-down if an ESA-listed species enters within 50 yards of the authorized work.

4.5 BLANKET SECTION 401 WATER QUALITY CERTIFICATION

The proposed project will follow all relevant conditions of the Blanket Section 401 Water Quality Certification (April 2022).

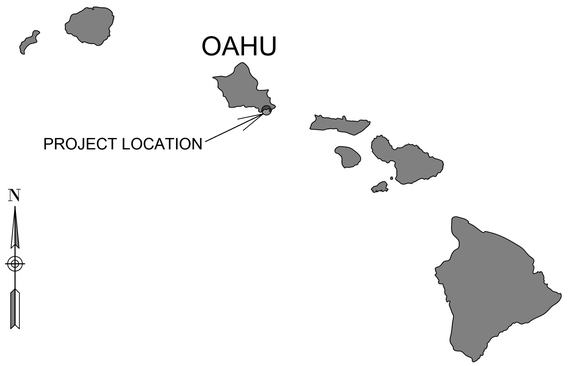
STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF BOATING AND OCEAN RECREATION

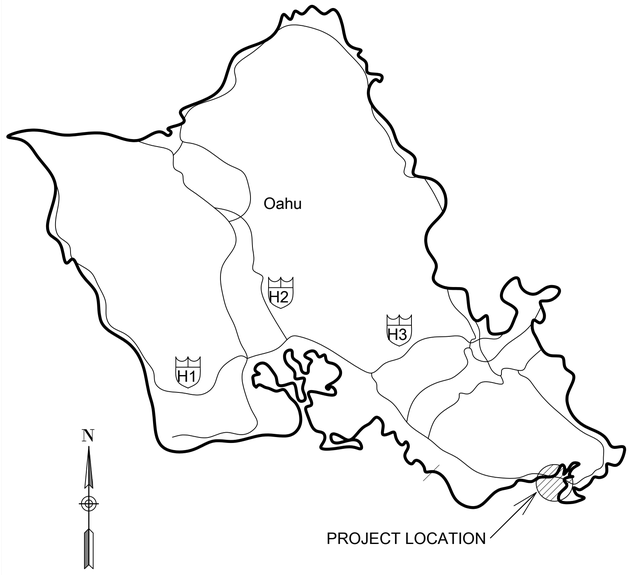
JOB NO. B08CO79A

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS

HONOLULU, OAHU, HAWAII

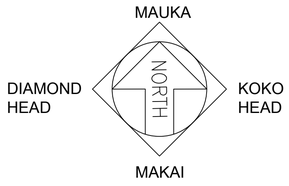


REGIONAL MAP



LOCATION MAP

VICINITY MAP



FOR PERMITTING
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SHEET INDEX		
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CONSULTANT:

integral consulting inc.

APPROVED:

_____ DATE:_____

EDWARD UNDERWOOD
ADMINISTRATOR
DIVISION OF BOATING AND OCEAN RECREATION
DEPARTMENT OF LAND AND NATURAL RESOURCES

July 24, 2024

GENERAL NOTES

1. ALL APPLICABLE CONSTRUCTION WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISION OF THE STATE OF HAWAII DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" DATED 2005, AND THE 1984 "STANDARD DETAILS" FOR PUBLIC WORKS CONSTRUCTION OF THE DEPARTMENT OF PUBLIC WORKS, CITY AND COUNTY OF HONOLULU, AS AMENDED.

2. ALL WORK SHALL BE INCLUDED IN THE BASE BID UNLESS OTHERWISE INDICATED. WORK CALLED FOR ON THE PLANS AND NOT ITEMIZED IN THE PROPOSAL, AND ALL WORK NOT CALLED FOR BUT REQUIRED FOR THE CONSTRUCTION OF THE PROJECT SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.

3. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT, AND SHALL BE RESPONSIBLE FOR THE REPAIR, RELOCATION OR REPLACEMENT OF SAME IN THE EVENT OF DAMAGES DUE TO HIS CONSTRUCTION PRACTICES, OR INTERFERENCES WITH CONSTRUCTION WORK, THE CONTRACTOR SHALL COORDINATE HIS WORK WITH THE RESPECTIVE UTILITY COMPANIES AND THE STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES DIVISION OF BOATING AND OCEAN RECREATION (DLNR-DOBOR).

4. THE CONTRACTOR SHALL VERIFY AND CHECK ALL DIMENSIONS AND DETAILS SHOWN ON THE DRAWINGS PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION.

5. FIELD ADJUSTMENTS SHALL BE MADE AS APPROVED BY THE ENGINEER.

6. CONTRACTOR SHALL COORDINATE HIS OPERATIONS WITH THOSE OF OTHER CONTRACTORS WHO MAY BE EMPLOYED ON ADJACENT OR RELATED STATE PROJECTS AND AVOID UNNECESSARY DELAY OR HINDRANCE IN THE PERFORMANCE OF THEIR RESPECTIVE CONTRACTS.

7. NO CONTRACTOR SHALL PERFORM ANY CONSTRUCTION OPERATION SO AS TO CAUSE FALLING ROCKS, SOIL OR DEBRIS IN ANY FORM TO FALL, SLIDE OR FLOW INTO EXISTING DRAINAGE SYSTEMS OR ADJOINING PROPERTIES, STREETS OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATIONS OCCUR, THE CONTRACTOR MAY BE CITED AND THE CONTRACTOR SHALL IMMEDIATELY TAKE ALL REMEDIAL ACTIONS NECESSARY.

8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE WATER QUALITY AND WATER POLLUTION CONTROL STANDARDS IN HAWAII ADMINISTRATIVE RULES, TITLE 11, CHAPTER 54, "WATER QUALITY STANDARDS" AND TITLE 11, CHAPTER 55, "WATER POLLUTION CONTROL", AS WELL AS CHAPTER 14 OF THE REVISED ORDINANCES OF HONOLULU, AS AMENDED. BEST MANAGEMENT PRACTICES SHALL BE EMPLOYED AT ALL TIMES DURING CONSTRUCTION.

9. THE CONTRACTOR SHALL BE RESPONSIBLE TO PLAN AND CONSTRUCT BEST MANAGEMENT PRACTICES (BMP) AS REQUIRED BY HIS OPERATIONS TO COMPLY WITH THE LAWS, STANDARDS, RULES, AND/OR POLICIES OF THE COUNTY, STATE OR FEDERAL REGULATORY AGENCIES. PRIOR TO ACCEPTANCE OF THE PROJECT BY THE STATE, THE CONTRACTOR SHALL BE REQUIRED TO REMOVE ALL BEST MANAGEMENT PRACTICES AND RESTORE THE PROJECT SITE TO ITS ORIGINAL CONDITION OR BETTER.

10. THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH THE ADMINISTRATIVE RULES IN THE STATE OF HAWAII DEPARTMENT OF HEALTH REGARDING NOISE CONTROL.

11. ALL EXISTING TREES TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.

12. PURSUANT TO CHAPTER 6E OF THE HAWAII REVISED STATUTES (HRS), IN THE EVENT ANY ARTIFACTS OR HUMAN REMAINS ARE UNCOVERED DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY SUSPEND WORK AND NOTIFY THE HONOLULU POLICE DEPARTMENT, THE STATE DEPARTMENT OF LAND AND NATURAL RESOURCES-HISTORIC PRESERVATION DIVISION (PH. 808-692-8015).

13. IN PERFORMING ALL WORK, THE CONTRACTOR SHALL EXERCISE DUE CARE AND CAUTION NECESSARY TO AVOID ANY DAMAGE INFLICTED TO AND IMPAIRMENT IN THE USE OF ANY EXISTING UTILITY LINE. ANY DAMAGE INFLICTED ON EXISTING UTILITY LINES RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE IMMEDIATELY REPAIRED OR RESTORED AS DIRECTED BY THE ENGINEER AT THE CONTRACTOR'S EXPENSE.

14. THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY; AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE STATE AND ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF THE WORK ON THIS PROJECT, EXCEPT FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE STATE OR ENGINEER.

15. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AREA AND SURROUNDING AREA FREE FROM RUBBISH, DUST, NOISE, EROSION, ETC. THE WORK SHALL BE DONE IN CONFORMANCE WITH THE AIR AND WATER POLLUTION CONTROL STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH.

16. THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS, LIGHTS, FLARES, BARRICADES, MARKERS, CONED AND OTHER PROTECTIVE MEASURES AND SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION, CONVENIENCE AND SAFETY OF THE PUBLIC. THE CONTRACTOR SHALL ENSURE TEMPORARY SAFE PEDESTRIAN PASSAGEWAYS AROUND THE CONSTRUCTION SITE AS PER THE AMERICAN WITH DISABILITIES ACT CCESSIBILITY GUIDELINES (ADAAG) 206.1 & 402.1.

17. THE CONTRACTOR SHALL RESTORE TO ORIGINAL OR BETTER CONDITION, ALL IMPROVEMENTS DAMAGED AS A RESULT OF THE CONSTRUCTION, INCLUDING PAVEMENTS, EMBANKMENTS, CURBS, SIGNS, LANDSCAPING, STRUCTURES, UTILITIES, WALLS, FENCES, ETC. UNLESS PROVIDED FOR SPECIFICALLY IN THE PROPOSAL. DEMOLITION AND RESTORATION OF EXISTING ITEMS SHALL BE INCIDENTAL AND INCLUDED WITHIN THE AMOUNT PAID FOR INSTALLATION OF NEW ITEMS.

GENERAL NOTES (CONT.)

18. ALL EXISTING UTILITIES TO REMAIN IN USE, WHETHER OR NOT SHOWN ON THE PLANS, SHALL BE PROTECTED AT ALL TIMES BY THE CONTRACTOR DURING CONSTRUCTION UNLESS SPECIFIED ON THE PLANS TO BE ABANDONED. ANY DAMAGES TO EXISTING UTILITIES SHALL BE REPAIRED AND PAID FOR BY THE CONTRACTOR.

19. CONTRACTOR SHALL MAKE ARRANGEMENTS FOR TEMPORARY UTILITIES SUCH AS ELECTRICITY, WATER, ETC. REQUIRED FOR THEIR OPERATIONS. ALL COSTS FOR TEMPORARY UTILITIES SHALL BE BORNE BY THE CONTRACTOR.

20. DIMENSIONS SHALL BE TAKE PRECEDENCE OVER SCALE. IF DIMENSIONAL ERRORS OR CONFLICTS ARISE, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND SHALL WAIT FOR CLARIFICATION BEFORE RESUMING OR COMMENCING WORK ON THE DISCREPANCY ITEM.

21. THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS REQUIRED FOR THE PROTECTION OF PUBLIC HEALTH, SAFETY, AND ENVIRONMENTAL QUALITY.

22. DUE TO LIMITED SPACE AT THE JOB SITE THE STATE RECOGNIZES THE NEED FOR A CONSTRUCTION STAGING AREA FOR TEMPORARY STORAGE OF CONTRACTOR'S EQUIPMENT AND MATERIALS. LOCATIONS OF POSSIBLE CONSTRUCTION STAGING AREAS ARE SHOWN ON SHEET D11.

23. THE CONTRACTOR SHALL INSTALL ADEQUATE TEMPORARY BARRICADES AND WARNING SIGNS TO PROTECT THE PUBLIC DURING THE CONSTRUCTION PERIOD. PROVIDE AND MAINTAIN A SAFE PEDESTRIAN ACCESS AND VEHICLE ACCESS TO THE FACILITY THROUGHOUT THE CONSTRUCTION PERIOD.

24. WITH THE EXCEPTION OF THE IMMEDIATE AREA OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE ACCESS TO AND FROM PARKING AREAS, HARBOR FACILITIES, AND PUBLIC STREETS AT ALL TIMES

25. CONTRACTOR SHALL ERECT AND MAINTAIN A CONTINUOUS TURBIDITY CURTAIN TO ENCLOSE AREAS OF CONSTRUCTION ACTIVITIES. LIMITS OF TURBIDITY CURTAIN SHALL BE ADJUSTED TO MINIMIZE THE AREA OF CONTAINMENT REQUIRED

PUBLIC HEALTH SAFETY & CONVENIENCE NOTES

1. THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS REQUIRED FOR THE PROTECTION OF PUBLIC HEALTH, SAFETY AND ENVIRONMENTAL QUALITY.

2. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AND ITS SURROUNDING AREAS FREE FROM DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH.

3. THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS, LIGHTS, FLARES, BARRICADES, MARKERS, CONES AND OTHER PROTECTIVE FACILITIES AND SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION, CONVENIENCE AND SAFETY OF THE PUBLIC.

4. THE CONTRACTOR'S ATTENTION IS DIRECTED TO TITLE 11, DEPARTMENT OF HEALTH, CHAPTER 46, COMMUNITY NOISE CONTROL, IN WHICH MAXIMUM ALLOWABLE NOISE LEVELS HAVE BEEN SET. IF THE CONSTRUCTION WILL BE REQUIRED TO OBTAIN A PERMIT FROM THE DIRECTOR OF THE DEPARTMENT OF HEALTH, THE CONTRACTOR SHALL OBTAIN A COPY OF CHAPTER 46 AND BECOME FAMILIAR WITH THE NOISE LEVEL RESTRICTIONS AND THE PROCEDURES FOR OBTAINING A PERMIT FOR CONSTRUCTION ACTIVITIES. APPLICATION AND INFORMATION ON VARIANCES FROM THE ENVIRONMENTAL HEALTH SERVICES DIVISION, 591 ALA MOANA BLVD., RM. 125, HONOLULU, HAWAII OR BY TELEPHONE 586-4576.

5. WHERE PEDESTRIAN WALKWAYS EXIST, THEY SHALL BE MAINTAINED IN PASSABLE CONDITION OR OTHER FACILITIES FOR PEDESTRIANS SHALL BE PROVIDED. TEMPORARY PASSAGE WAYS SHALL BE ACCESSIBLE AND COMPLY PER ADAAG 206.1 & 402.1.

ABBREVIATIONS:

AC	ASPHALTIC CONCRETE	GV	GATE VALVE	ST	STREET
ADA	AMERICANS WITH DISABILITIES ACT	HORIZ	HORIZONTAL	STA	STATION
ADAAG	AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES	ID	INSIDE DIAMETER	STD	STANDARD
AFF	ABOVE FINISH FLOOR ELEVATION	INV	INVERT	SY	SQUARE YARD
&	AND	ISA	INTERNATIONAL SYMBOL OF ACCESSIBILITY	T	TOP
APPROX	APPROXIMATE, APPROXIMATELY	LAT	LATERAL	TB	TOP OF BANK
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS	LC	LENGTH OF CURVE	THK	THICK
@	AT	LF	LINEAR FOOT	TOF	TOP OF FOOTING
B, BOT	BOTTOM	LIN	LINEAR	TW	TOP OF WALL
BLDG	BUILDING	LB(S)	POUND(S)	TC	TOP OF CURB
BW	BOTTOM OF WALL	MAX	MAXIMUM	TS	TOP OF STAIR
BWS	BOARD OF WATER SUPPLY	MECH	MECHANICAL	TYP	TYPICAL
BC	BOTTOM OF CURB	MH	MANHOLE	VB	VALVE BOX
BF	BEGIN CURVE BOTTOM OF FILTER MATERIAL	MISC	MISCELLANEOUS	VCP	VITRIFIED CLAY PIPE
CIP	CAST IN PLACE	MIN	MINIMUM	VERT	VERTICAL
CB	CATCH BASIN	MON	MONUMENT	W	WATER
CFS	CUBIC FT PER SECOND	N	NEW	W/ WL	WITH/WATERLINE
CO	CLEAN OUT	NTS	NOT TO SCALE	WMH	WATER MANHOLE
CONN.	CONNECT, CONNECTION CENTERLINE	NO	NUMBER	WM	WATER METER
C	CONCRETE	OC	ON CENTER	WV	WATER VALVE
CONC.	CONTINUE	OD	OUTSIDE DIAMETER	WWF	WELDED WIRE FABRIC
CONT.	CONTINUOUS	O/S	OFFSET	W	WEST
COTG	CLEAN OUT TO GRADE	PCC	PORTLAND CEMENT CONCRETE		
CY	CUBIC YARD	PAV'T	PAVEMENT		
DET.	DETAIL	PSF PI	POUNDS PER SQUARE FOOT POINT OF INTERSECTION		
DIA	DIAMETER	PL	PROPERTY LINE, PLACE		
DI	DRAIN INLET	PVC	POLYVINYL CHLORIDE		
DMH	DRAIN MANHOLE	PP	POWER POLE		
DPP	DEPARTMENT OF PLANNING &PERMITING	PSI	POUNDS PER SQUARE INCH		
DPW	DEPARTMENT OF PUBLIC WORKS DOWN	POC	POINT ON CURVE		
DS	SPOUT	PORT	PORTABLE BUILDING		
DWG	DRAWING	R	RADIUS		
E	EXISTING	REQ'D	REQUIRED		
EA	EACH	REINF	REINFORCEMENT		
EC	END CURVE	REV	REVISION/REVISED		
EJ	EXPANSION JOINT	ROW	RIGHT OF WAY		
ELEC	ELECTRIC, ELECTRICAL	RP	RADIAL POINT		
EP	EDGE OF PAVEMENT	RPM	RAISED PAVEMENT MARKER		
ELEV, EL	ELEVATION	S	SOUTH, SLOPE, SEWER		
EQ	EQUAL	SCH	SCHEDULE		
EW	EACH WAY	SF	SQUARE FOOT		
EXIST	EXISTING	SHT	SHEET		
EX.TC	EXISTING TOP OF CURB	SIGMH	SIGNAL MANHOLE		
EX.BC	EXISTING BOTTOM OF CURB	SL	SEWER LINE		
FT	FOOT, FEET	S/N	SERIAL NUMBER		
FH	FIRE HYDRANT	SMH	SEWER MANHOLE		
FFE	FINISH FLOOR ELEVATION	SPEC	SPECIFICATION		
FG	FINISH GRADE	SQ	SQUARE		
GALV	GALVANIZED	SST	STAINLESS STEEL		

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

GENERAL NOTES

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED

APPROVED: _____ CHIEF ENGINEER _____ DATE

DRAWING NO. C-0

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
5. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023

KULI'OU'OU BEACH PARK
HAWAII KAI DRIVE
KALANIANA'OLE HIGHWAY
KEAHOLE STREET
MAUNALUA BAY LAUNCH RAMP FACILITY
HAWAII KAI MARINA
PORTLOCK BEACH
MAUNALUA BAY
LIMITS OF NAVIGATION CHANNEL
0+00
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
45+00
50+00
55+00
CM-1A
CM-2
CM-3
CM-4
CM-5
CM-6
CM-7
CM-8
CM-9
CM-10
CM-11
CM-12
CM-13
CM-14
CM-15
CM-16
CM-17
CM-18
CM-19
CM-20
CM-21

ELEVATIONS TABLE (FT, MLLW)

Number	Minimum Elevation	Maximum Elevation	Color
1	-22.00	-15.00	
2	-15.00	-10.00	
3	-10.00	-8.00	
4	-8.00	-6.00	
5	-6.00	-3.00	
6	-3.00	4.98	

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:
NAVIGATION CHANNEL BOUNDARIES
NAVIGATION CHANNEL MARKER – CM#

MAUKA
DIAMOND HEAD
KOKO HEAD
MAKAI
NORTH
0 250 500 Feet

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

NAVIGATION CHANNEL EXISTING CONDITIONS

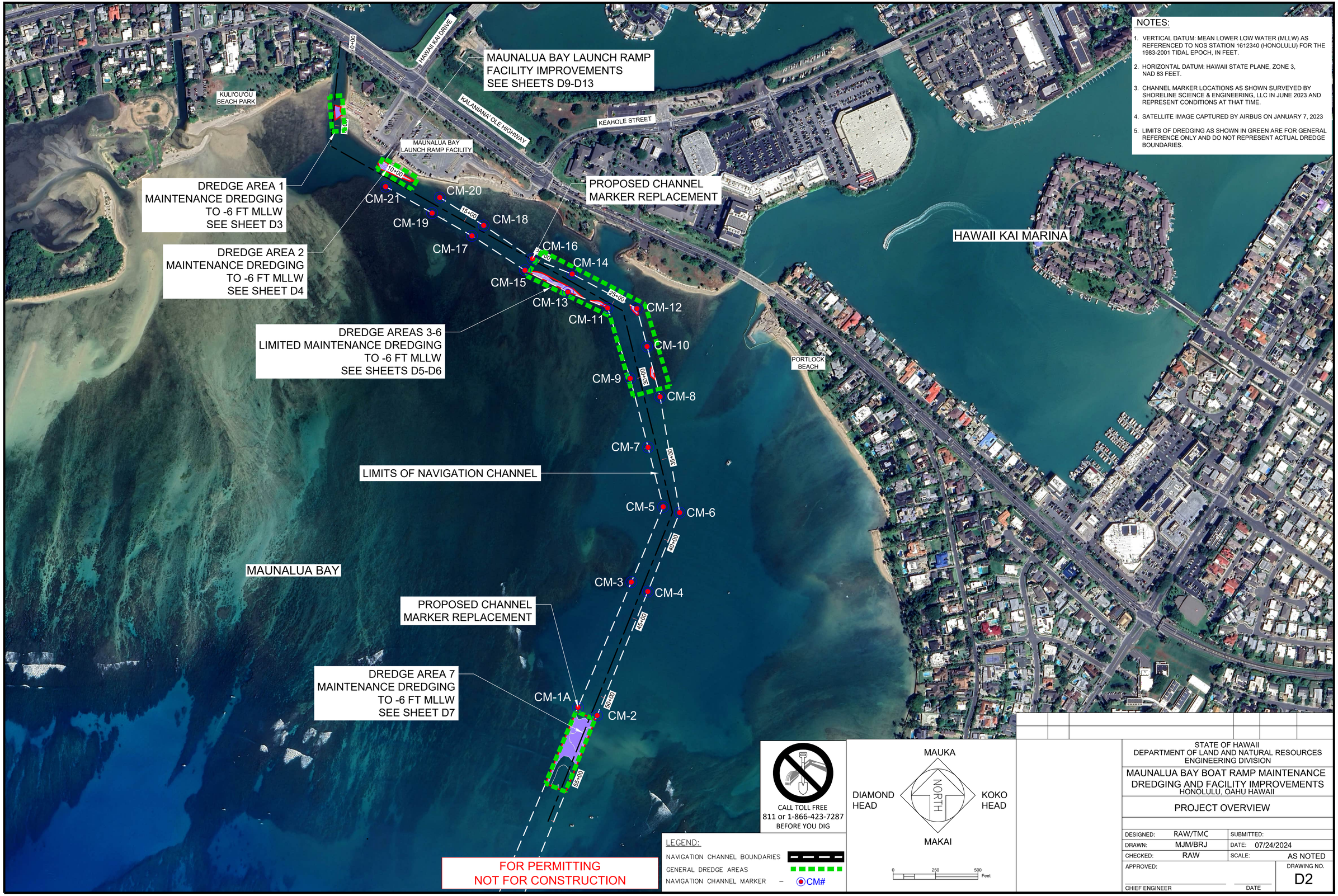
DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D1

CHIEF ENGINEER DATE

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 03 OF 26 SHEETS



ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 04 OF 26 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
5. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
6. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
7. APPROXIMATE SEAGRASS AND CORAL LOCATIONS AS SHOWN SURVEYED BY MARINE RESEARCH CONSULTANTS, LLC ON OCTOBER 6, 2023 AND MARCH 5, 2024.

MAUNALUA BAY
LAUNCH RAMP FACILITY

BM1
1736429.02
42636.79
4.49

MATCH LINE -1
AT STATION - 8+00
NEXT SHEET NUMBER: D4

SEAGRASS

CM-21

DREDGE AREA 2
SEE SHEET D4

CANOE STORAGE AREA

CANOE LAUNCH AREA

ERODED SHORELINE AREA

TO HAWAII KAI MARINA

D1-3
D1-4
D1-5
D1-1
D1-2

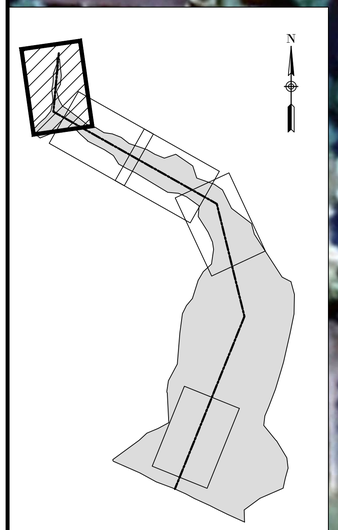
PROPOSED DREDGED MATERIAL
CONTAINMENT STRUCTURE

DREDGE AREA 1
DREDGE TO -6 FT MLLW

SECTION A
SEE SHEET D8

SEAGRASS
AS OF MARCH 5, 2024

SHALLOW (REEF) AREA



KEY PLAN

DREDGE AREA BOUNDARY COORDINATES		
POINT NAME	EASTING	NORTHING
D1-1	1736133.11	42717.84
D1-2	1736126.58	42806.48
D1-3	1736167.36	42795.08
D1-4	1736161.44	42774.78
D1-5	1736175.97	42749.61

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- CROSS-SECTION LOCATION
- LIMITS OF NAVIGATION CHANNEL
- NAVIGATION CHANNEL MARKER — CM#
- EXISTING CONTOURS (JUNE-AUGUST, 2023), IN FEET — -4
- SEAGRASS
- DREDGE AREA BOUNDARY POINTS — D#
- DREDGE MATERIAL CONTAINMENT STRUCTURE

KOKO HEAD
MAUKA
NORTH
MAKAI
DIAMOND HEAD

0 30 60 Feet

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

DREDGE AREA 1 PLAN

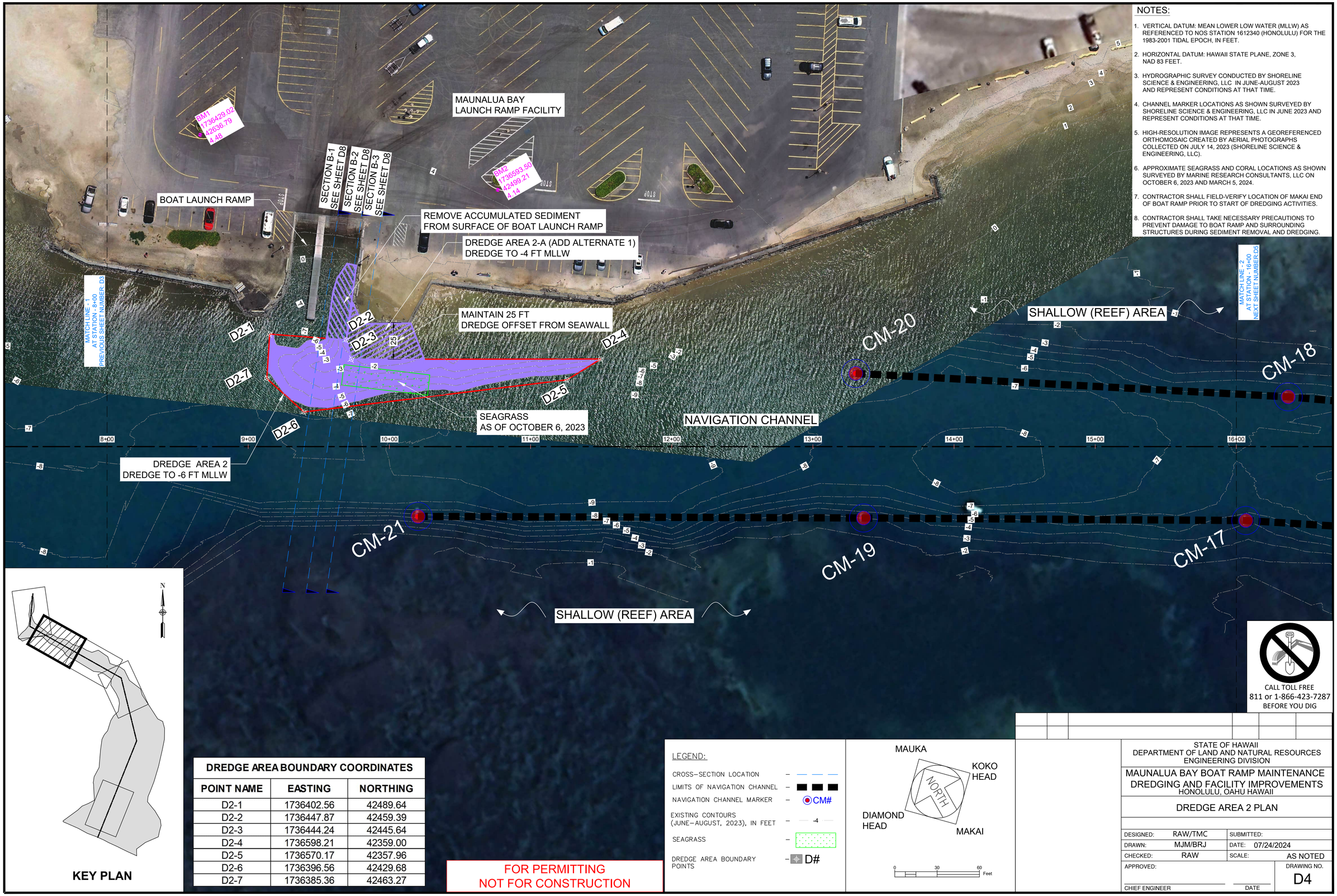
DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D3

CHIEF ENGINEER _____ DATE _____

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 05 OF 26 SHEETS



NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
5. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
6. APPROXIMATE SEAGRASS AND CORAL LOCATIONS AS SHOWN SURVEYED BY MARINE RESEARCH CONSULTANTS, LLC ON OCTOBER 6, 2023 AND MARCH 5, 2024.
7. CONTRACTOR SHALL FIELD-VERIFY LOCATION OF MAKAI END OF BOAT RAMP PRIOR TO START OF DREDGING ACTIVITIES.
8. CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT DAMAGE TO BOAT RAMP AND SURROUNDING STRUCTURES DURING SEDIMENT REMOVAL AND DREDGING.

KEY PLAN

DREDGE AREA BOUNDARY COORDINATES

POINT NAME	EASTING	NORTHING
D2-1	1736402.56	42489.64
D2-2	1736447.87	42459.39
D2-3	1736444.24	42445.64
D2-4	1736598.21	42359.00
D2-5	1736570.17	42357.96
D2-6	1736396.56	42429.68
D2-7	1736385.36	42463.27

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- CROSS-SECTION LOCATION
- LIMITS OF NAVIGATION CHANNEL
- NAVIGATION CHANNEL MARKER – CM#
- EXISTING CONTOURS (JUNE-AUGUST, 2023), IN FEET – -4
- SEAGRASS
- DREDGE AREA BOUNDARY POINTS – D#

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

DREDGE AREA 2 PLAN

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D4
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 06 OF 26 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
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4. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
5. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
6. APPROXIMATE SEAGRASS AND CORAL LOCATIONS AS SHOWN SURVEYED BY MARINE RESEARCH CONSULTANTS, LLC ON OCTOBER 6, 2023 AND MARCH 5, 2024.
7. CORAL COLONY LOCATIONS ARE FOR GENERAL REFERENCE ONLY – NOT TO SCALE.

MATCH LINE - 2
AT STATION - 16+00
PREVIOUS SHEET NUMBER: D4

MATCH LINE - 3
AT STATION - 24+00
NEXT SHEET NUMBER: D6

SHALLOW (REEF) AREA

PROPOSED CHANNEL MARKER REPLACEMENT
SEE SHEET S-3

SECTION C
SEE SHEET D8

SECTION D
SEE SHEET D8

CM-18 CM-17 CM-16 CM-15 CM-14 CM-13

16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00

DREDGE AREA 3
DREDGE TO -6 FT MLLW

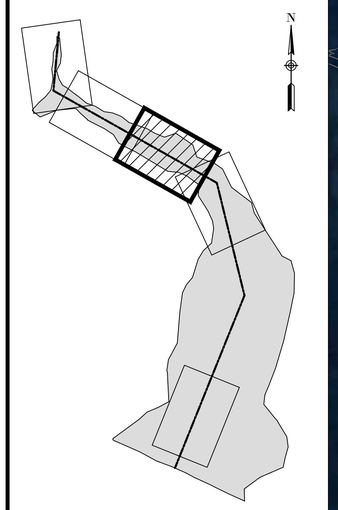
DREDGE AREA 4
SEE SHEET D6

D3-1 D3-2 D3-3 D3-4 D3-5 D4-2 D4-3 D4-4 D4-5

CORAL COLONY
AS OF OCTOBER 6, 2023

CORAL COLONY
AS OF OCTOBER 6, 2023

SHALLOW (REEF) AREA



KEY PLAN

DREDGE AREA BOUNDARY COORDINATES		
POINT NAME	EASTING	NORTHING
D3-1	1737252.70	41831.78
D3-2	1737506.00	41704.05
D3-3	1737598.71	41666.66
D3-4	1737538.18	41721.84
D3-5	1737347.49	41818.89

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- CROSS-SECTIONS
- LIMITS OF NAVIGATION CHANNEL
- NAVIGATION CHANNEL MARKER – CM#
- EXISTING CONTOURS (JUNE-AUGUST, 2023), IN FEET – -4
- DREDGE AREA BOUNDARY POINTS – D#

MAUKA
KOKO HEAD
DIAMOND HEAD
MAKAI
NORTH

0 30 60 Feet

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

DREDGE AREA 3 PLAN

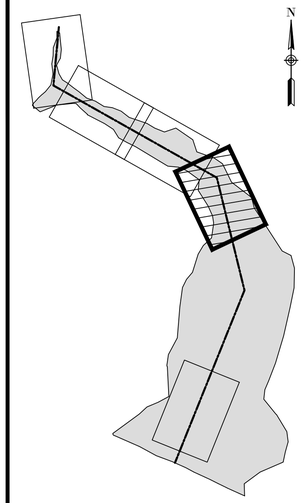
DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D5

CHIEF ENGINEER DATE

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 07 OF 26 SHEETS



KEY PLAN

DREDGE AREA BOUNDARY COORDINATES		
POINT NAME	EASTING	NORTHING
D4-1	1737740.35	41609.53
D4-2	1737637.70	41650.93
D4-3	1737638.53	41653.23
D4-4	1737678.50	41652.69
D4-5	1737699.89	41646.81
D4-6	1737744.05	41617.43
D5-1	1737913.19	41605.63
D5-2	1737872.64	41627.84
D5-3	1737877.31	41605.33
D5-4	1737912.29	41568.26
D5-5	1737922.59	41570.46
D6-1	1738003.18	41263.73
D6-2	1738024.21	41183.89
D6-3	1737993.62	41207.20
D6-4	1737992.70	41251.64

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
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3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
5. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
6. APPROXIMATE SEAGRASS AND CORAL LOCATIONS AS SHOWN SURVEYED BY MARINE RESEARCH CONSULTANTS, LLC ON OCTOBER 6, 2023 AND MARCH 5, 2024.
7. CORAL COLONY LOCATIONS ARE FOR GENERAL REFERENCE ONLY – NOT TO SCALE.

SHALLOW (REEF) AREA

CM-12

SECTION E SEE SHEET D8

D5-1 D5-2 D5-3 D5-4 D5-5

DREDGE AREA 5
DREDGE TO -6 FT MLLW

CM-10

SECTION F SEE SHEET D8

D6-1 D6-2 D6-3 D6-4

SEAGRASS
AS OF MARCH 5, 2024

CM-8

NAVIGATION CHANNEL

DREDGE AREA 4
DREDGE TO -6 FT MLLW

DREDGE AREA 6
DREDGE TO -6 FT MLLW

SECTION D SEE SHEET D8

D4-1 D4-2 D4-3 D4-4 D4-5 D4-6

CM-11

TO LAUNCH RAMP FACILITY

TO PACIFIC OCEAN

CM-9

CORAL COLONY
AS OF OCTOBER 6, 2023

SHALLOW (REEF) AREA

D3-3 D3-4

DREDGE AREA 3
SEE SHEET D5

CM-13

MATCHLINE 3
AT STATION 24+00
PREVIOUS SHEET NUMBER D5

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

LEGEND:

- CROSS-SECTION LOCATION
- LIMITS OF NAVIGATION CHANNEL
- NAVIGATION CHANNEL MARKER – CM#
- EXISTING CONTOURS (JUNE-AUGUST, 2023), IN FEET
- SEAGRASS
- DREDGE AREA BOUNDARY POINTS – D#

KOKO HEAD
MAUKA
NORTH
MAKAI
DIAMOND HEAD

0 30 60 Feet

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

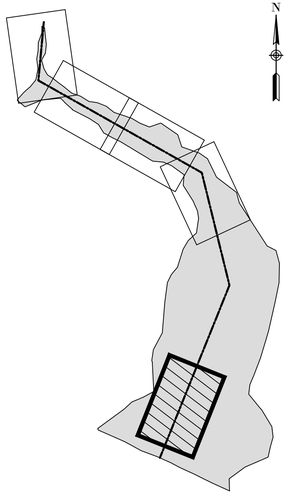
DREDGE AREAS 4, 5, AND 6 PLAN

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D6
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 08 OF 26 SHEETS



KEY PLAN

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
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4. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
5. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023

SECTION G
SEE SHEET D8

CM-2

D7-2

D7-3

48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00

TO LAUNCH RAMP FACILITY

TO PACIFIC OCEAN (DEEP WATER)

DREDGE AREA 7
DREDGE TO -6 FT MLLW

CM-1A

D7-1

D7-4

PROPOSED CHANNEL
MARKER REPLACEMENT
SEE SHEET S-3

FOR PERMITTING
NOT FOR CONSTRUCTION

DREDGE AREA BOUNDARY COORDINATES

POINT NAME	EASTING	NORTHING
D7-1	1737554.91	39228.68
D7-2	1737668.48	39181.61
D7-3	1737493.48	38754.05
D7-4	1737374.32	38804.60

LEGEND:

- CROSS-SECTIONS
- LIMITS OF NAVIGATION CHANNEL
- NAVIGATION CHANNEL MARKER – CM#
- EXISTING CONTOURS (JUNE-AUGUST, 2023), IN FEET – -4
- DREDGE AREA BOUNDARY POINTS – D#

KOKO HEAD
MAKAI
MAUKA
NORTH
DIAMOND HEAD

0 30 60 Feet

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

DREDGE AREA 7 PLAN

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			

CHIEF ENGINEER DATE

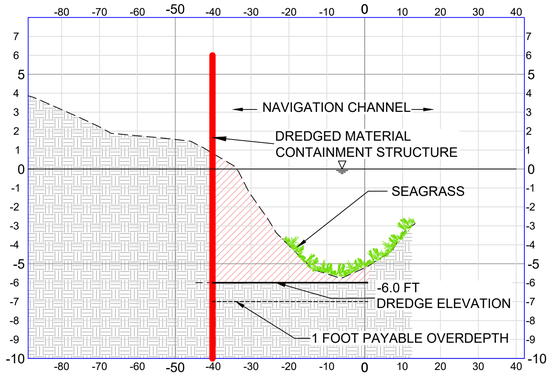
DRAWING NO. D7

ANSI D 34.00" x 22.00"

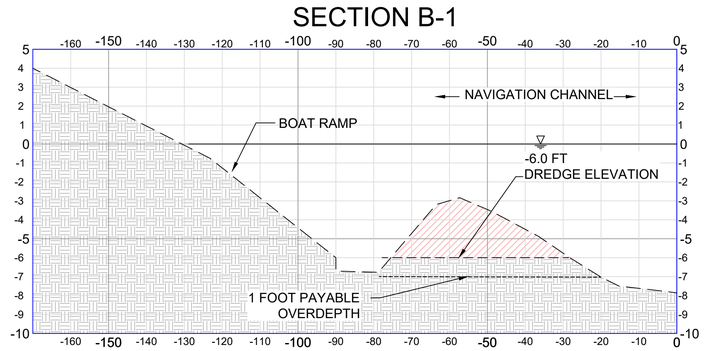
JOB NO. B08CO79A

SHEET NO. 09 OF 26 SHEETS

SECTION A



SECTION B-1



NOTES:

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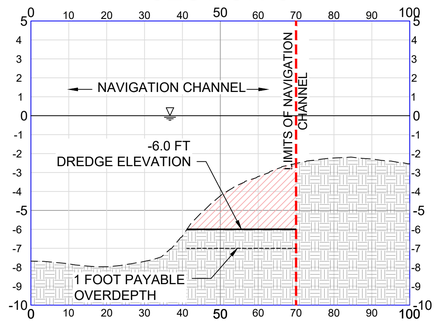
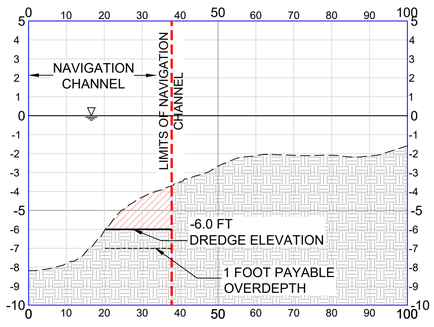
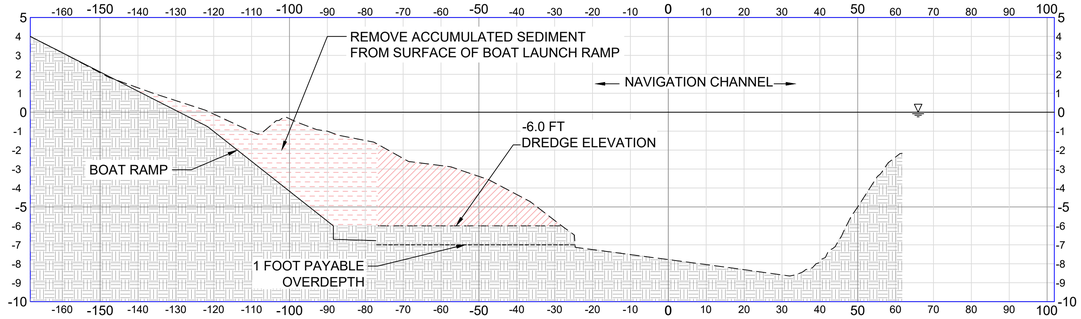
SECTION C



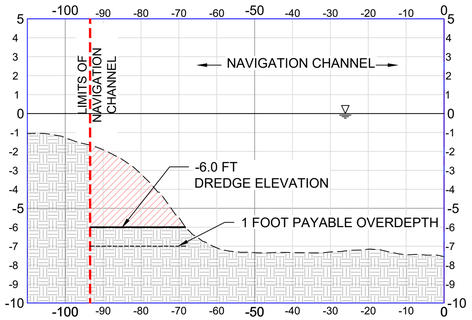
SECTION D



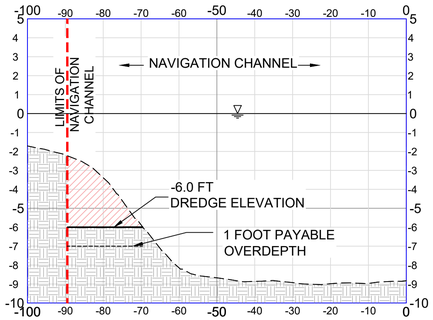
SECTION B-2



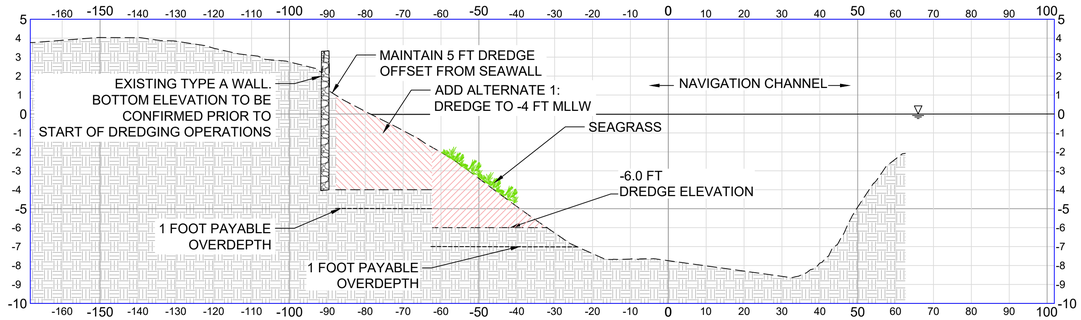
SECTION E



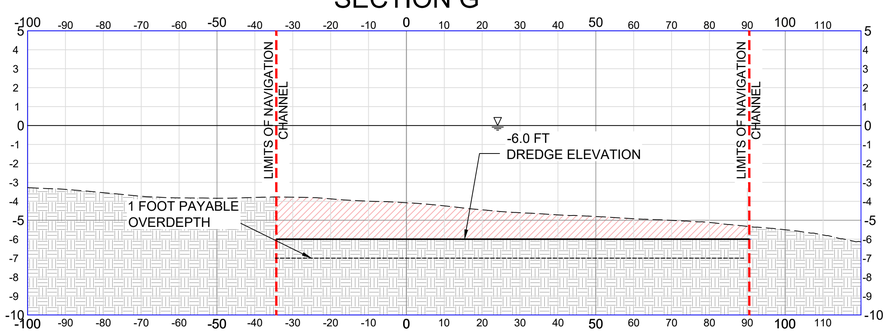
SECTION F



SECTION B-3



SECTION G



FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

DREDGE AREA CROSS-SECTIONS

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D8
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
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4. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
5. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).

KALANIANA'OLE HWY

PROPOSED PAVED PARKING AREA REPAIR

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED BEACH-QUALITY SAND BENEFICIAL REUSE

MAUNALUA BAY LAUNCH RAMP FACILITY

PROPOSED DREDGED BEACH-QUALITY SAND BENEFICIAL REUSE

PROPOSED WALL EXTENSION (TYPE B)

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

CRM WALL

PROPOSED WALL REPAIR (TYPE B)

PROPOSED ROCK REVETMENT

PROPOSED WALL REPAIR (TYPE B)

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED MATERIAL CONTAINMENT STRUCTURE

PROPOSED WALL REPAIR (TYPE A)

STA:1+00 STA:2+00 STA:3+00 STA:4+00 STA:5+00 STA:6+00 STA:7+00 STA:8+00 STA:9+00 STA:10+00 STA:11+00 STA:12+00 STA:13+ STA:14+00 STA:15+00 STA:15+97

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- DREDGED MATERIAL CONTAINMENT STRUCTURE
- TYPE A WALL REPAIR
- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET -4
- MHW
- 6" CONCRETE CURB

MAUKA KOKO HEAD DIAMOND HEAD MAKAI NORTH

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

FACILITY IMPROVEMENTS OVERVIEW

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D9
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 11 OF 26 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME.
5. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
6. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023

LEGEND:

EXIST. TYPE B WALL (TO BE REMOVED)

EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET -4

MHW

FOR PERMITTING
NOT FOR CONSTRUCTION

MAUKA
KOKO HEAD
NORTH
DIAMOND HEAD
MAKAI

0 15 30 Feet

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EXISTING CONDITIONS AND DEMOLITION PLAN: WEST-END FACILITY IMPROVEMENTS

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D10
CHIEF ENGINEER		DATE	

JOB NO. B08CO79A

SHEET NO. 12 OF 26 SHEETS

ANSI D 34.00" x 22.00"

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME.
5. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
6. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
7. CONTRACTOR SHALL STAKEOUT SHEET PILE WALL ALIGNMENT WITH FLAGS OR SIMILAR PRIOR TO START OF SHEET PILE INSTALLATION, FOR APPROVAL BY THE ENGINEER.
8. CLEAN ALL SEDIMENT OFF PAVEMENT. SAW CUT MAKAI EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR INSTALLATION OF CRM WALL

BASELINE CONTROL COORDINATES

POINT NAME	STATION	NORTH	EAST
B-1	0+00.0	42770.55	1736209.63
B-2	0+18.0	42786.14	1736200.64
B-3	0+51.0	42794.70	1736168.77
B-4	0+72.0	42774.42	1736163.32
B-5	1+83.0	42678.26	1736218.77
B-6	4+11.2	42532.11	1736393.78
B-7	4+38.2	42553.00	1736411.00

TIE-BACK ANCHOR CONTROL POINTS

POINT NAME	STATION
TB-1	0+04.58
TB-2	0+93.70
TB-3	0+13.58
TB-4	0+84.40
TB-5	0+24.42
TB-6	0+75.40
TB-7	0+36.42
TB-8	0+65.79
TB-9	0+45.32
TB-10	0+56.80

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:
- DREDGED MATERIAL CONTAINMENT STRUCTURE
- TYPE A WALL REPAIR
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET -4
- MHW

MAUKA · KOKO HEAD · DIAMOND HEAD · MAKAI · NORTH

0 15 30 Feet

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

WEST-END FACILITY IMPROVEMENTS

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D11
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 13 OF 26 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME.
5. CHANNEL MARKER LOCATIONS AS SHOWN SURVEYED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE 2023 AND REPRESENT CONDITIONS AT THAT TIME.
6. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
7. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
8. CLEAN ALL SEDIMENT OFF PAVEMENT. SAW CUT MAKAI EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR INSTALLATION OF 6" CONCRETE CURB. PROVIDE 12" CURB CUTS AT 25 FT O.C. FOR DRAINAGE. BURY PROWADDLE OR DRAINAGE MESH ALONG MAKAI SIDE OF CURB CUTS TO RETAIN FILL.

PROPOSED BENEFICIAL RE-USE OF SUITABLE BEACH-QUALITY SAND

PROPOSED WALL (TYPE B) EXTENSION 25LF
SEE DETAIL 1 ON SHEET S-4

PROPOSED DREDGED MATERIAL FILL

PROPOSED 6" CONCRETE CURB

PROPOSED WALL REPAIR (TYPE B) 387 LF
SEE DETAIL 3 ON SHEET S-4

PROPOSED DREDGED MATERIAL FILL

PROPOSED WALL REPAIR (TYPE A) 120 LF
SEE DETAIL 2 ON SHEET S-4

BMZ-1736593.50 42499.21 4.14

STOP

STOP

B-8 B-9 B-10 B-11 B-12 B-13 B-14

STA:5+00 STA:5+50 STA:6+00 STA:6+50 STA:7+00 STA:7+50 STA:8+00 STA:8+50 STA:9+00 STA:9+50 STA:10+00 STA:10+50 STA:11+00

BASELINE CONTROL COORDINATES			
POINT NAME	STATION	NORTH	EAST
B-8	5+43.7	42504.46	1736493.76
B-9	5+83.1	42473.31	1736469.68
B-10	6+11.7	42457.32	1736493.35
B-11	6+44.0	42474.29	1736520.86
B-12	7+78.2	42396.49	1736630.16
B-13	10+09.4	42351.43	1736856.91
B-14	10+51.9	42392.79	1736866.72

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- TYPE A WALL REPAIR
- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET -4
- MHW
- 6" CONCRETE CURB

MAUKA KOKO HEAD DIAMOND HEAD MAKAI NORTH

0 15 30 Feet

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EAST-END FACILITY IMPROVEMENTS 1

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D12
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 14 OF 26 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME.
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6. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023

BASELINE CONTROL COORDINATES			
POINT NAME	STATION	NORTH	EAST
B-13	10+51.86	42392.79	1736866.72
B-14	11+26.03	42393.30	1736940.89
B-15	12+18.58	42374.99	1737031.62
B-16	12+43.02	42369.16	1737055.35
B-17	13+56.29	42334.32	1737163.12
B-18	14+22.65	42271.71	1737185.13
B-19	15+94.8	42238.80	1737356.44

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET
- MHW
- CURB
- PILE BARRIER

MAUKA
KOKO HEAD
NORTH
DIAMOND HEAD
MAKAI

0 15 30 Feet

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EAST-END FACILITY IMPROVEMENTS 2

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D13

CHIEF ENGINEER DATE

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 15 OF 26 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME.
4. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME.
5. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
6. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
7. CLEAN ALL SEDIMENT OFF PAVEMENT. SAW CUT MAKAI EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR INSTALLATION OF 6" CONCRETE CURB. PROVIDE 12" CURB CUTS AT 25 FT O.C. FOR DRAINAGE. BURY PROWADDLE OR DRAINAGE MESH ALONG MAKAI SIDE OF CURB CUTS TO RETAIN FILL

PROPOSED 6" CONCRETE CURB

PROPOSED ASPHALT REPAIR

B-18

B-19

B-20

STA 13+50

STA 13+70

STA 14+00

STA 14+50

STA 15+00

STA 15+50

STA 15+97

TYPE B WALL REPAIR
180 LF
SEE DETAIL 3 ON SHEET S-4

PROPOSED DREDGED MATERIAL FILL

PROPOSED REVETMENT STRUCTURE
SEE DETAIL 1 ON SHEET S-4

BASELINE CONTROL COORDINATES			
POINT NAME	STATION	NORTH	EAST
B-18	13+56.29	42334.32	1737163.12
B-19	14+22.65	42271.71	1737185.13
B-20	15+97.09	42238.80	1737356.44

CALL TOLL FREE
811 or 1-866-423-7287
BEFORE YOU DIG

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET -4
- MHW
- CONCRETE CURB

MAUKA
KOKO HEAD
DIAMOND HEAD
MAKAI
NORTH

0 15 30 Feet

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EAST-END FACILITY IMPROVEMENTS 3

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D14

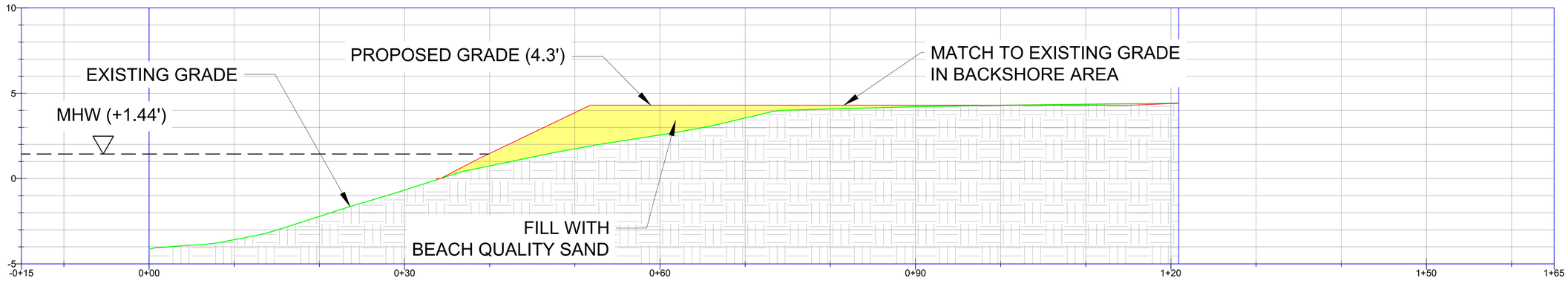
CHIEF ENGINEER DATE

ANSI D 34.00" x 22.00"

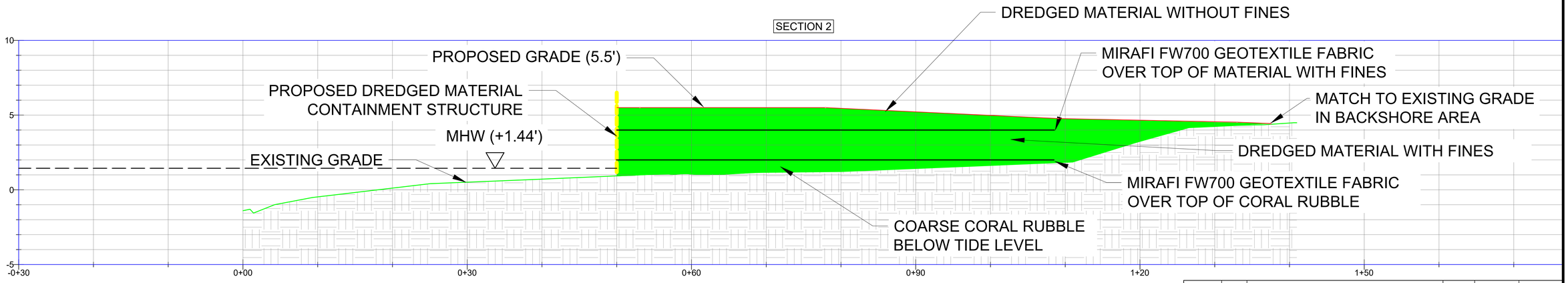
JOB NO. B08CO79A

SHEET NO. 16 OF 26 SHEETS

SECTION 1



SECTION 2



FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

FACILITY IMPROVEMENTS
CROSS-SECTIONS

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D15
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

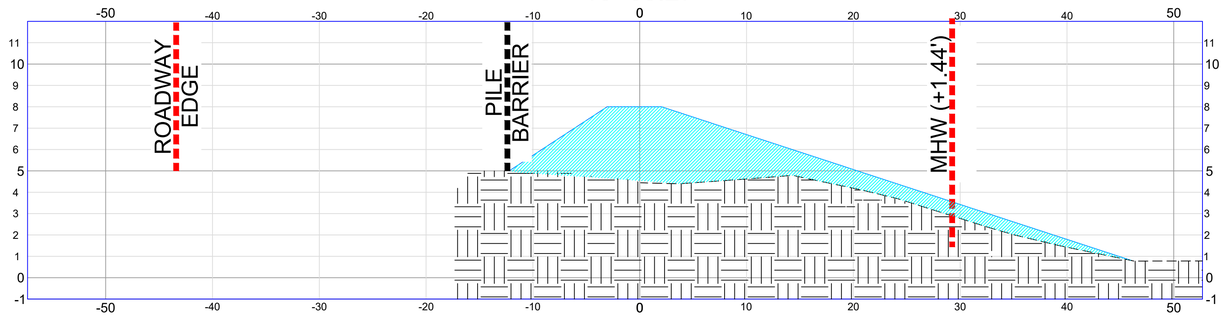
JOB NO. B08CO79A

SHEET NO. 17 OF 26 SHEETS

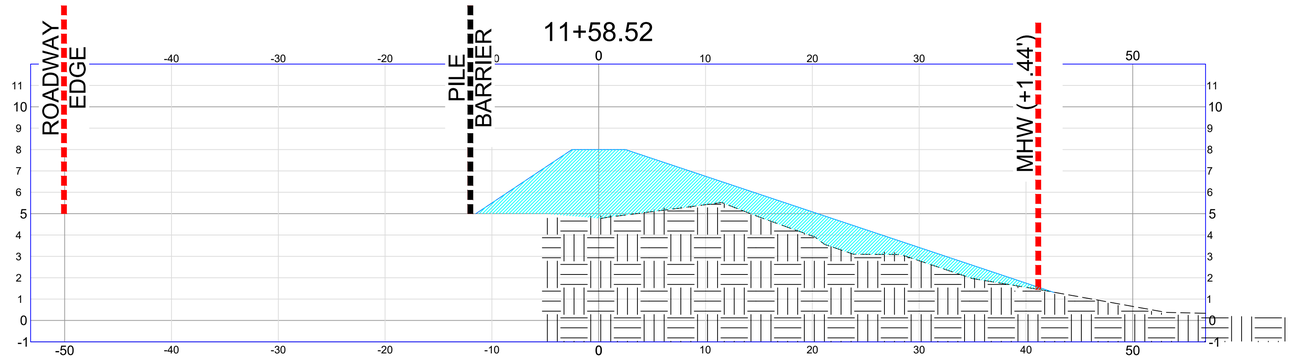
NOTES:

1. 2X VERTICAL EXAGGERATION ON ALL SECTIONS.

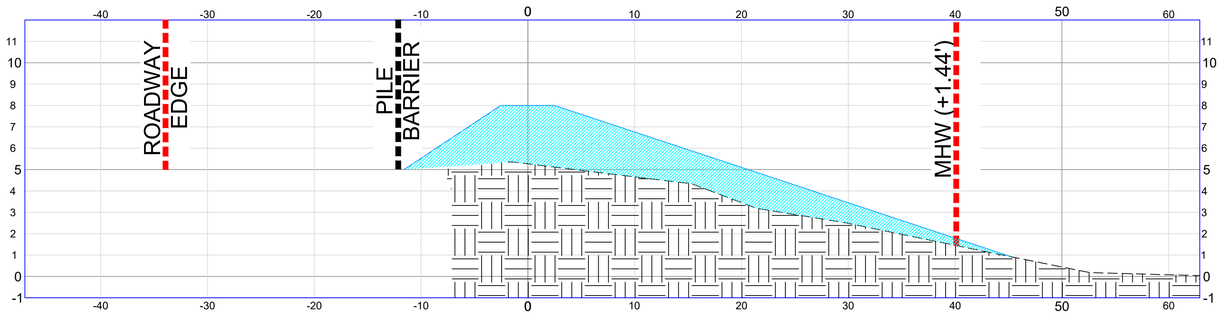
10+65.27



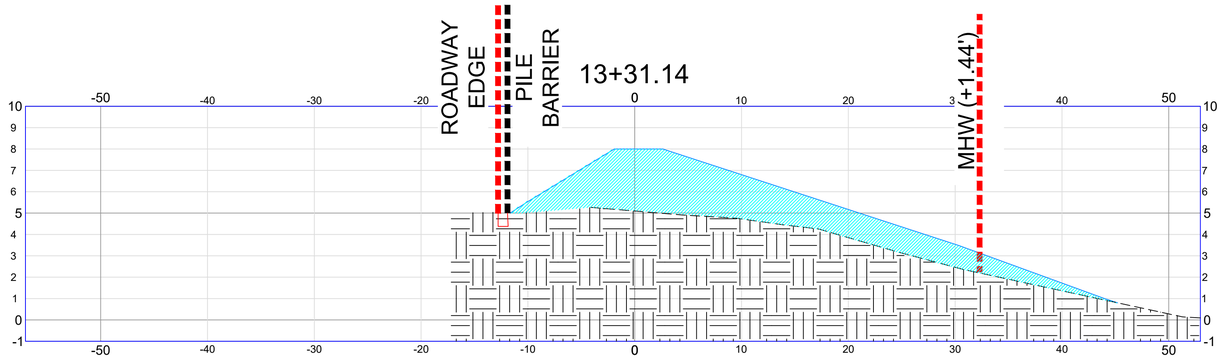
11+58.52



12+46.56



13+31.14



FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EAST BEACH CROSS-SECTIONS

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. D16

CHIEF ENGINEER _____ DATE _____

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

STRUCTURAL DESIGN CRITERIA

1. THE DESIGN WAS DEVELOPED USING THE RESULTS OF THE FOLLOWING: 1) GEOTECHNICAL EXPLORATION CONDUCTED BY GEOTEK HAWAII, INC. ON APRIL 15, 2024.
2. DESIGN CODES ADHERED TO INCLUDE THE FOLLOWING:
   a. HAWAII BUILDING CODE 2021
   b. AMERICAN CONCRETE INSTITUTE, ACI 318–19
   c. AMERICAN INSTITUTE OF STEEL CONSTRUCTION, AISC 15TH EDITION
   d. AMERICAN SOCIETY OF CIVIL ENGINEERS, ASCE 7–16
   e. UNITED STATES ARMY CORPS OF ENGINEERS, USACE EM 110–2–1614, DESIGN OF COASTAL REVETMENTS, SEAWALLS AND BULKHEADS
   f. UNITED STATES ARMY CORPS OF ENGINEERS, USACE EM 1110–2–2504, DESIGN OF SHEET PILE WALLS
3. DESIGN LOADS ADHERED TO INCLUDE THE FOLLOWING:
   a. RISK CATEGORY: 1
   b. DEAD LOAD: 150 PSF
   c. LIVE LOAD: 300 PSF
   d. SOIL LOAD: CALCULATED USING SOIL UNIT WEIGHTS AND SOIL FRICTION ANGLES DESCRIBED IN THE GEOTECHNICAL REPORT

STRUCTURAL NOTES

1. ALL DETAILS AND SECTION DRAWINGS ARE INTENDED TO BE TYPICAL AND SHALL BE CONSTRUCTED TO APPLY TO WORK ASSIGNMENTS EXCEPT WHERE A SEPARATE DETAIL IS SHOWN.
2. CONTRACTOR IS TO COORDINATE STRUCTURAL AND OTHER DRAWINGS THAT ARE PART OF THE CONTRACT DOCUMENTS FOR ANCHORED, EMBEDDED, OR SUPPORTED ITEMS WHICH MAY AFFECT THE STRUCTURAL DRAWINGS.
3. USE OF THESE DRAWINGS REPRODUCED IN WHOLE OR ANY PART IN SHOP DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR NOR SUBCONTRACTORS FROM THEIR RESPONSIBILITY TO ACCURATELY LAYOUT, COORDINATE, DETAIL, FABRICATE, AND INSTALL A COMPLETE STRUCTURE.
4. THE ENGINEER SHALL REVIEW ALL SHOP DRAWINGS FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS AND FOR COMPLETENESS. ALL SHEETS SHALL BE SIGNED AND SEALED PRIOR TO SUBMITTING TO THE ENGINEER FOR REVIEW. NONCOMPLIANCE WITH THIS REQUEST WILL RESULT IN REJECTION OF THE SUBMITTAL.

MATERIAL NOTES

1. REINFORCED CONCRETE. FIBER REINFORCED CONCRETE SHALL BE 5000 PSI COMPRESSIVE STRENGTH AT 28 DAYS. WATER CONTENT RATIO SHALL BE LESS THAN OR EQUAL TO 0.4. TWENTY PERCENT (20%) OF THE CEMENT SHALL BE REPLACED WITH TYPE F FLY ASH. POLYPROPYLENE FIBER CONTENT SHALL BE 2 LBS/CY OF CONCRETE. FIBERS SHALL BE 100% VIRGIN POLYPROPYLENE, FIBRILLATED FIBERS CONTAINING NO REPROCESSED OLEFIN MATERIALS AND SPECIFICALLY MANUFACTURED FOR USE AS CONCRETE REINFORCEMENT. INCLUDE SUFFICIENT CHEMICAL ADMIXTURES TO PRODUCE 4% AIR WITHIN CONCRETE. CONTRACTOR SHALL PROVIDE MIX DESIGN TO THE ENGINEER FOR APPROVAL 10 DAYS PRIOR TO CONCRETE PLACEMENT.
2. REINFORCED CONCRETE MATERIALS TESTING. ONE RANDOMLY SELECTED PIECE OF REINFORCING STEEL SHALL BE TESTED FOR TENSILE YIELD STRENGTH BY AN INDEPENDENT TESTING LAB. IN LIEU OF INDEPENDENT TESTING, COPIES OF TESTING FROM THE STEEL MILL FOR THE SPECIFIC STEEL BATCH INCORPORATED INTO THE PROJECT WILL BE ACCEPTED. THE RESULTS SHALL BE SUPPLIED TO THE ENGINEER. THE CONTRACTOR SHALL HAVE AN INDEPENDENT TESTING LABORATORY TEST THE CONCRETE AT A RATE OF 1 TEST PER 20 CY OF CONCRETE USED. THE TEST SHALL INCLUDE 7, 14, AND 28 DAY COMPRESSIVE STRENGTH TESTS. THE RESULTS SHALL BE SUPPLIED TO THE ENGINEER. TESTS SHALL BE IN ACCORDANCE WITH ASTM C31, C39, AND C617. COPIES OF ALL CONCRETE DELIVERIES TO THE PROJECT SHALL BE PROVIDED TO THE ENGINEER.
3. EXPANSION JOINT FILLER. EXPANSION JOINT FILLER SHALL BE 0.5 INCH THICK EXPANSION JOINT MATERIAL MEETING HDOT STANDARD SPECIFICATION 705.
4. TIEBACKS. TIE ROD SHALL BE NEW, COLD ROLLED ASTM A615 GRADE 80 KSI STEEL 2.25" THREADED BAR WITH 16 MILS OF COAL TAR EPOXY APPLIED TO EXPOSED SECTIONS.
5. ANCHOR HARDWARE. ANCHOR HARDWARE SHALL BE NEW, COLD ROLLED ASTM A576 GRADE 80 (FULL LOAD HEX NUT), ASTM F436 GRADE 80 (HARDENED WASHER AND BEVELED WASHER), AND ASTM A572 GRADE 80 (BEARING PLATE).
6. STEEL SHEET PILE. STEEL SHEET PILE SHALL BE NEW, HOT ROLLED, A572 GRADE 50 STEEL OF THE SECTIONS SPECIFIED ON THE PLANS. COAT ALL STEEL WITH 16 MILS OF COAL TAR EPOXY TO ELEVATIONS SPECIFIED ON THE PLANS.
7. HARDWARE. ALL HARDWARE SHALL BE 316 STAINLESS STEEL. CONTRACTOR SHALL SUPPLY THE ENGINEER COPIES OF LABELS, DELIVERY TICKETS, ETC. TO VERIFY STEEL GRADE.

EXECUTION NOTES

1. PROJECT LOGISTICS. CONTRACTOR MAY UTILIZE STAGING AND PARKING AREAS FOR MATERIAL LAYDOWN AND EMPLOYEE PARKING, RESPECTIVELY, AS DIRECTED BY THE ENGINEER. ALL STORED MATERIALS SHALL BE FENCED OFF FROM THE PUBLIC USING SECURE FENCING.
2. ENVIRONMENTAL PROTECTION. CONTRACTOR SHALL PROTECT THE ENVIRONMENT AT ALL TIMES. THIS SHALL INCLUDE BUT NOT BE LIMITED TO ADHERENCE TO STATE AND FEDERAL PERMITS, PROTECTION OF UPLANDS, PREVENTION OF SPILLS, AND IMPLEMENTATION OF A SAFETY PLAN.
3. PROJECT LAYOUT. CONTRACTOR SHALL LAYOUT AND STAKE THE LOCATION OF STRUCTURES AND ANCHORING SYSTEMS PRIOR TO NEW CONSTRUCTION. CONFLICTS SHALL BE REPORTED TO THE ENGINEER. THE ENGINEER WILL OBSERVE THE LAYOUT PRIOR TO COMMENCING CONSTRUCTION.
4. DEBRIS REMOVAL. ANY DEBRIS LOCATED IN THE WATER ADJACENT TO THE WORK DURING CONSTRUCTION SHALL BE REMOVED AND LEGALLY DISPOSED OF.
5. DELIVERY AND REMOVAL OF MATERIALS. DELIVERY AND REMOVAL OF MATERIALS CAN BE ACCOMPLISHED BY BARGE OR FROM THE UPLANDS.
6. CONCRETE SHALL NOT BE POURED WHEN THE AMBIENT TEMPERATURE EXCEEDS 85 DEGREES. STEEL REINFORCING SHALL BE SPRAYED WITH FRESHWATER TO REDUCE THE STEEL TEMPERATURE TO LESS THAN 100 DEGREES PRIOR TO CONCRETE PLACEMENT. IF POURING IS REQUIRED WHEN THE AMBIENT TEMPERATURE EXCEEDS 85 DEGREES, CONTRACTOR SHALL WORK WITH THE READY MIX PLANT TO IMPLEMENT HOT WEATHER CONCRETE MANAGEMENT PRACTICES, WHICH WILL REQUIRE RESUBMISSION OF CONCRETE MIX DESIGNS AND PROCEDURES 5 DAYS PRIOR TO CONCRETE POURING.
7. CONCRETE EXPANSION JOINTS. CONTRACTOR SHALL INSTALL AN EXPANSION JOINT MATERIAL EVERY 20 FEET. NO EXPANSION JOINTS SHALL BE WITHIN 5 FEET OF A CORNER OR CHANGE IN DESIGN SECTION OR ALIGNMENT. EXPANSION JOINTS SHALL BE FILLED WITH 0.5 INCH THICK PRE–MOLDED JOINT FILLER CONFORMING TO THE REQUIREMENTS OF SECTION 705.01 OF THE HDOT STANDARD SPECIFICATIONS. THE JOINT FILLER SHALL BE SHAPED TO THE OUTER EDGES OF THE SECTION AND THE INNER SHAPE OF THE ADJOINING FEATURE. ALL REINFORCING STEEL SHALL STOP AT THE EXPANSION JOINTS. NO CHAMFERED EDGE SHALL BE FORMED IN THE CONCRETE CAP AT THE EXPANSION JOINTS. UPON REMOVING FORMWORK, CONTRACTOR SHALL CAULK THE REMAINDER OF THE JOINT AS NEEDED TO BE FLUSH WITH THE CONCRETE SURFACE.
8. CONCRETE FORMWORKERS AND FINISHERS. CONTRACTOR SHALL SUPPLY A SUFFICIENT NUMBER OF EXPERIENCED CONCRETE FORMWORKERS AND FINISHERS IN ORDER TO COMPLETE THE WORK. ALL FORMWORKERS AND FINISHERS SHALL BE SUPERVISED BY A CONCRETE FOREMAN WHO HAS A THOROUGH UNDERSTANDING OF THE CONSTRUCTION PLANS, SPECIFICATIONS, AND REFERENCED SPECIFICATIONS. NO SUBSTANDARD WORKMANSHIP WILL BE ACCEPTED.
9. CONCRETE TRANSPORTATION. CONCRETE DELIVERED FROM A READY MIX PLANT SHALL BE TRANSPORTED AND PLACED IN THE FORM WITHIN THE SPECIFIED TIME LIMITS OF THE MIX DESIGN. SUPPLIED MIX DESIGN SHALL INCLUDE PLACEMENT TIME LIMITS. CONCRETE NOT PLACED WITHIN THE TIME LIMITS WILL BE REJECTED AND NOT INCLUDED IN THE WORK. CONTRACTOR SHALL BEAR ALL COSTS FOR REJECTED CONCRETE. CONCRETE SHALL NOT BE PLACED IN THE FORMS UNTIL THE REINFORCING STEEL PLACEMENT HAS BEEN APPROVED BY THE ENGINEER.
10. CONCRETE WASTE MANAGEMENT. CONTRACTOR SHALL ERECT AND MANAGE A TEMPORARY WASTE PIT FOR EXCESS FRESH CONCRETE DELIVERED TO THE SITE OR FOR TRUCK WASH OUT. ALL CONCRETE WASTE SHALL BE ALLOWED TO CURE AND THEN DISPOSED OF PROPERLY. A WASTE PIT SHALL BE CONSTRUCTED PRIOR TO CONCRETE DELIVERY AND WILL BE INSPECTED AS PART OF ANY CONCRETE FORM WORK INSPECTIONS. THE WASTE PIT SHALL BE LINED WITH VISQUEEN OR EQUAL TO FACILITATE WASTE REMOVAL.
11. COAL TAR EPOXY. ALL STEEL BULKHEAD COMPONENTS SHALL BE COATED WITH 16 MILS OF COAL TAR EPOXY AS INDICATED ON THE PLANS. STEEL SHALL BE COATED UNDER QUALITY CONDITIONS TO ACHIEVE UNIFORM APPLICATION OF THE COAL TAR EPOXY. ANY ITEM COATED PRIOR TO CONSTRUCTION SHALL BE RECOATED AS NECESSARY AFTER INSTALLATION. STEEL WITHIN CONCRETE MEMBERS SHALL NOT BE COATED. CONTRACTOR SHALL SUPPLY A CLEAN COPY OF THE PRODUCT LABEL TO THE COUNTY AND ENGINEER.
12. STEEL BULKHEAD INSTALLATION. DUE TO THE CLOSE PROXIMITY TO ADJACENT STRUCTURES, STEEL SHEET PILE SHALL BE INSTALLED WITH A VARIABLE MOMENT VIBRATORY HAMMER OR EQUIVALENT.

SUBMITTALS

CONTRACTOR TO SUBMIT THE FOLLOWING INFORMATION TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION:

1. SCHEDULE FOR COMPLETION OF WORK WITH TASKS AND DURATION DEFINED.
2. PILE DRIVING MEANS AND METHODS INCLUDING PILE HAMMER DATA.
3. HARDWARE INCLUDING BOLTS, SCREWS, CONNECTORS, AND CLEATS.

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

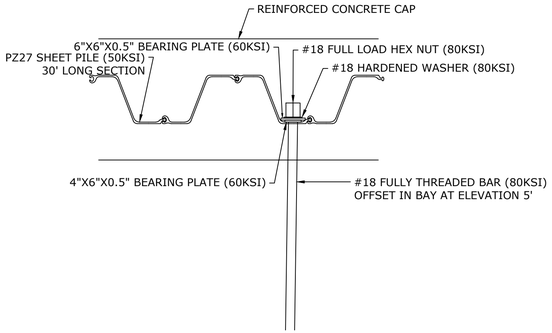
STRUCTURAL NOTES

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. S-1
CHIEF ENGINEER		DATE	

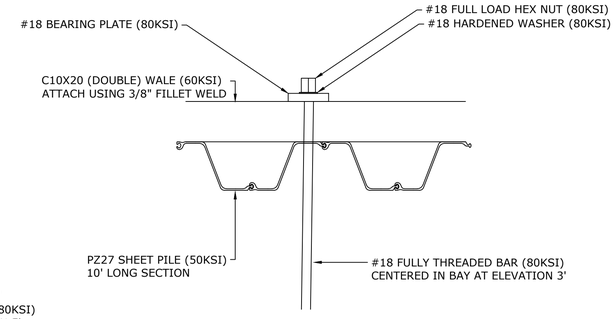
JOB NO. B08CO79A

SHEET NO. 19 OF 26 SHEETS

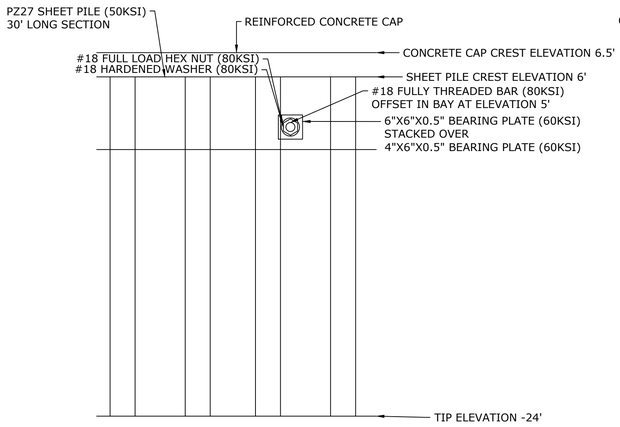
ANSI D 34.00" x 22.00"

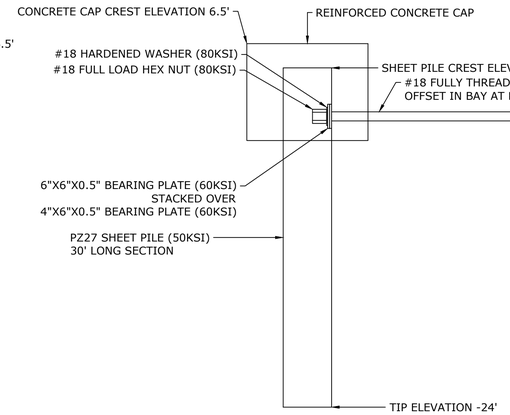


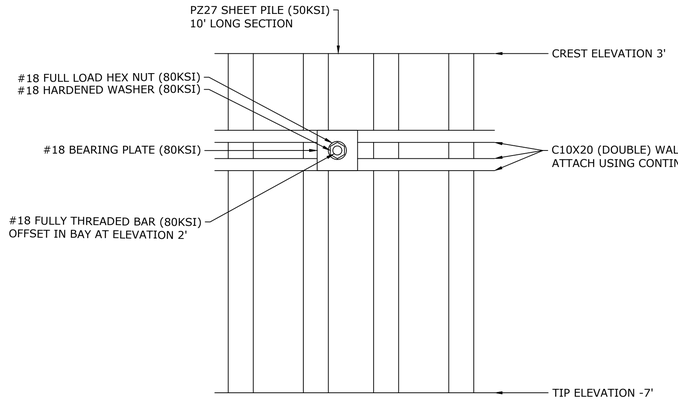
NOTES:
1. ALL STEEL SHEET PILE SECTIONS SHALL BE ASTM A572 GRADE 50.
3. ALL STEEL HARDWARE SHALL BE ASTM A576 GRADE 80.
4. ALL FABRICATED BEARING PLATES SHALL BE ASTM A572 GRADE 50 WITH 2.75" HOLE CENTERED IN PLATE.
5. BEARING PLATES INSTALLED AT ANGLE NOT FLUSH WITH BAY SURFACE SHALL BE APPROPRIATELY SHIMMED. BEVELED WASHERS WITH SINGLE 6"X6"X0.5" BEARING PLATE MAY BE USED IN LIEAU OF SHIMS WHERE APPROPRIATE.
5. APPLY COAL TAR EPOXY FROM 10' BELOW MUDLINE TO TOP OF EXPOSED STEEL. RECOAT COAL TAR EPOXY AFTER INSTALLATION AS NEEDED.

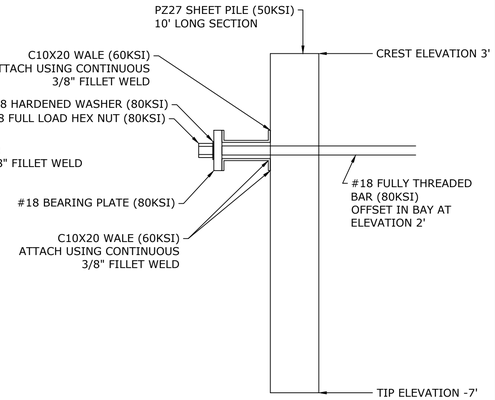


NOTES:
1. ALL STEEL SHEET PILE SECTIONS SHALL BE ASTM A572 GRADE 50.
2. ALL STEEL C-CHANNELS SHALL BE ASTM A572 GRADE 60.
3. ALL STEEL HARDWARE SHALL BE ASTM A576 GRADE 80.
4. APPLY COAL TAR EPOXY FROM 10' BELOW MUDLINE TO TOP OF EXPOSED STEEL. RECOAT COAL TAR EPOXY AFTER INSTALLATION AS NEEDED.



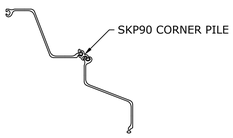






1 S-2 SHEET PILE BULKHEAD DETAIL
NOT TO SCALE

2 S-2 SHEET PILE ANCHOR DETAIL (TB-1 & TB-3 ONLY)
NOT TO SCALE



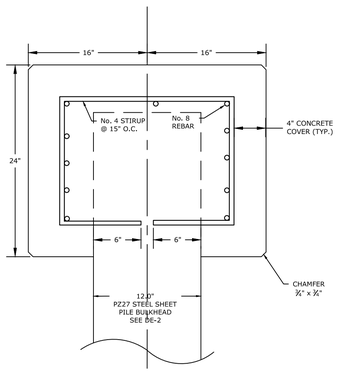
NOTES:
1. SKP90 CORNER PILE SECTION SHALL BE ASTM A572 GRADE 60 STEEL.
2. SKP90 CORNER PILE CORNER PILE SECTION SHALL RUN FULL LENGTH OF ADJOINING SHEET PILES.
3. APPLY COAL TAR EPOXY FROM 10' BELOW MUDLINE TO TOP OF EXPOSED STEEL.

NORMAL CORNER

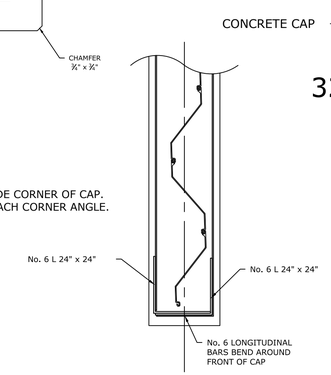
NOTES:
1. SKP45 CORNER PILE SECTIONS SHALL BE ASTM A572 GRADE 60 STEEL.
2. SKP45 CORNER PILE SECTION SHALL RUN FULL LENGTH OF ADJOINING SHEET PILES.
3. APPLY COAL TAR EPOXY FROM 10' BELOW MUDLINE TO TOP OF EXPOSED STEEL.

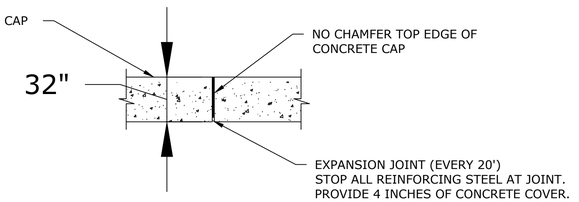
OBTUSE CORNER

3 S-2 CORNER DETAILS
NOT TO SCALE



NOTE:
1. CAP EXPANSION JOINTS AT 40' O.C.
2. ADD 5 30" x 30" No 6L AT EACH OUTSIDE CORNER OF CAP. BEND L PER FIELD MEASUREMENT OF EACH CORNER ANGLE.





NOTES:
1. STOP ALL REINFORCING STEEL AT JOINT. PROVIDE 4 INCHES OF CONCRETE COVER.
2. INSTALL 0.75" EXPANSION JOINT MATERIAL FDOT SECTION 9.32, OR EQUAL, FULL SECTION OF CAP.
3. CAULK REMAINING JOINT AFTER CONCRETE CURE AND FORM REMOVAL.
4. NO EXPANSION JOINT WITHIN 2 FEET OF TIE ROD.

4 S-2 REINFORCED CONCRETE CAP DETAIL
NOT TO SCALE

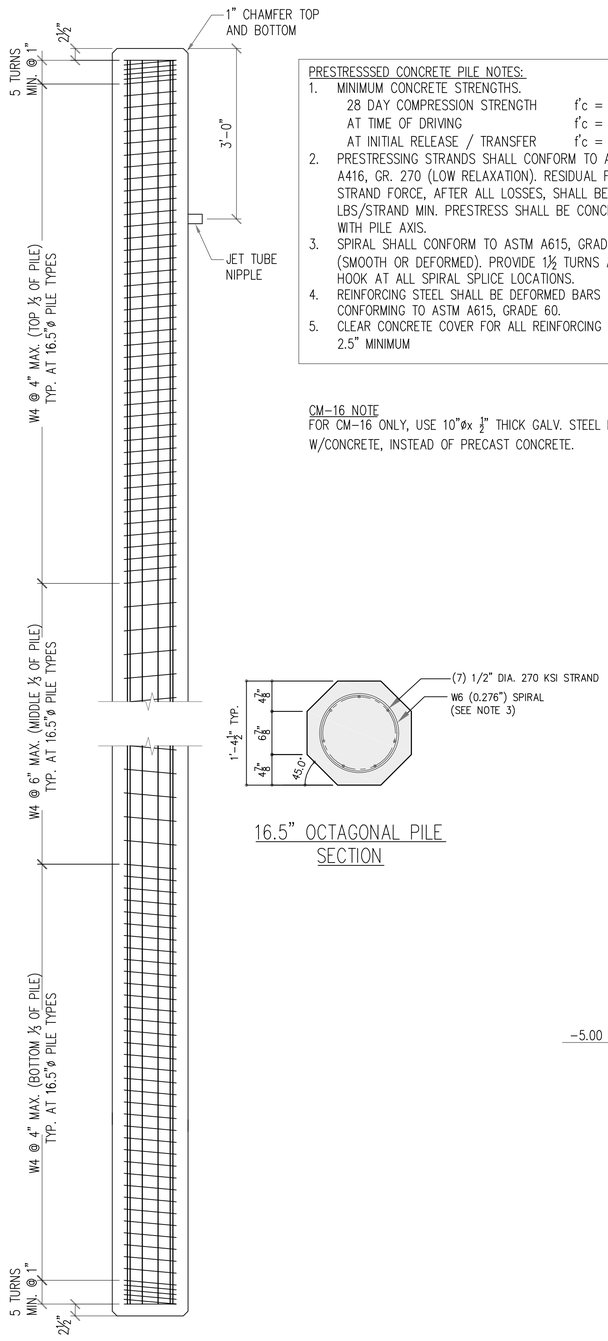
FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

STRUCTURAL DETAILS 1

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. S-2
CHIEF ENGINEER		DATE	



PILE DETAILS

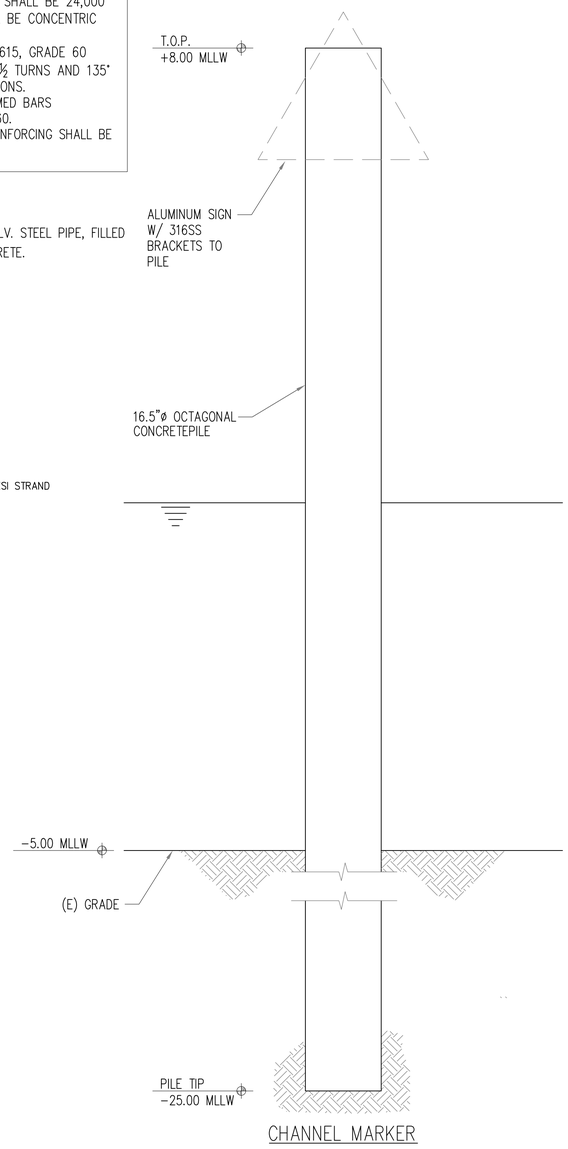
PRESTRESSSED CONCRETE PILE NOTES:

1. MINIMUM CONCRETE STRENGTHS.
   - 28 DAY COMPRESSION STRENGTH f'c = 7,000 psi
   - AT TIME OF DRIVING f'c = 7,000 psi
   - AT INITIAL RELEASE / TRANSFER f'c = 4,000 psi
2. PRESTRESSING STRANDS SHALL CONFORM TO ASTM A416, GR. 270 (LOW RELAXATION). RESIDUAL FINAL STRAND FORCE, AFTER ALL LOSSES, SHALL BE 24,000 LBS/STRAND MIN. PRESTRESS SHALL BE CONCENTRIC WITH PILE AXIS.
3. SPIRAL SHALL CONFORM TO ASTM A615, GRADE 60 (SMOOTH OR DEFORMED). PROVIDE 1½ TURNS AND 135° HOOK AT ALL SPIRAL SPLICE LOCATIONS.
4. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.
5. CLEAR CONCRETE COVER FOR ALL REINFORCING SHALL BE 2.5" MINIMUM

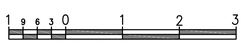
CM-16 NOTE
FOR CM-16 ONLY, USE 10"øx ¼" THICK GALV. STEEL PIPE, FILLED W/CONCRETE, INSTEAD OF PRECAST CONCRETE.

16.5" OCTAGONAL PILE SECTION

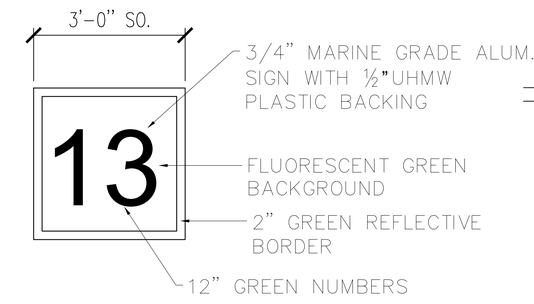
1 S-3 CHANNEL MARKER
SCALE: 3/4" = 1'-0"



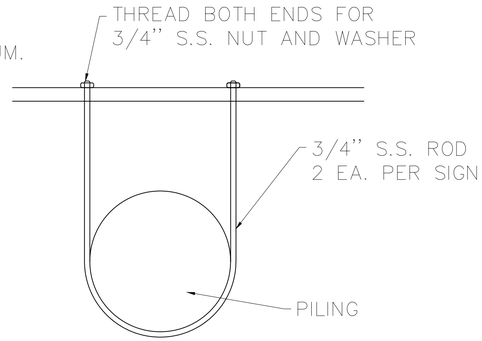
CHANNEL MARKER



SCALE:: ¾"=1'-0"

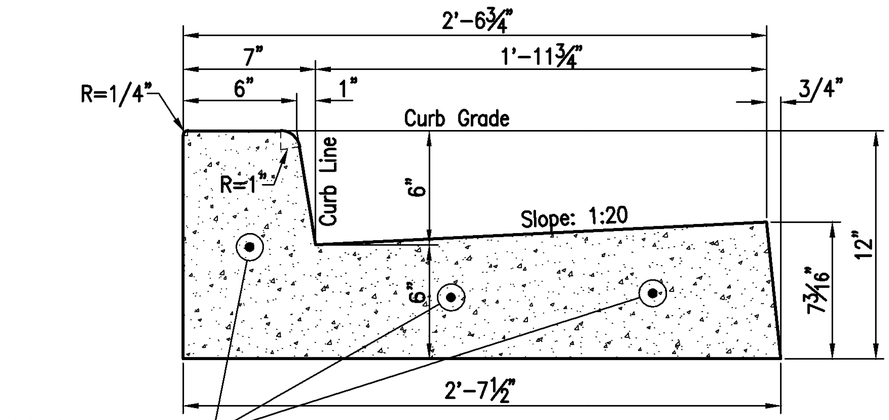


DAY MARKER SIGN BOARD



BRACKET DETAIL

2 S-3 CHANNEL MARKER DETAIL
N.T.S.



Class "A" Concrete quantity = 0.0618 cu. yd./lin. ft.

3 S-3 CAST IN PLACE INTEGRAL CURB AND GUTTER DETAIL
N.T.S.

FOR PERMITTING
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ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

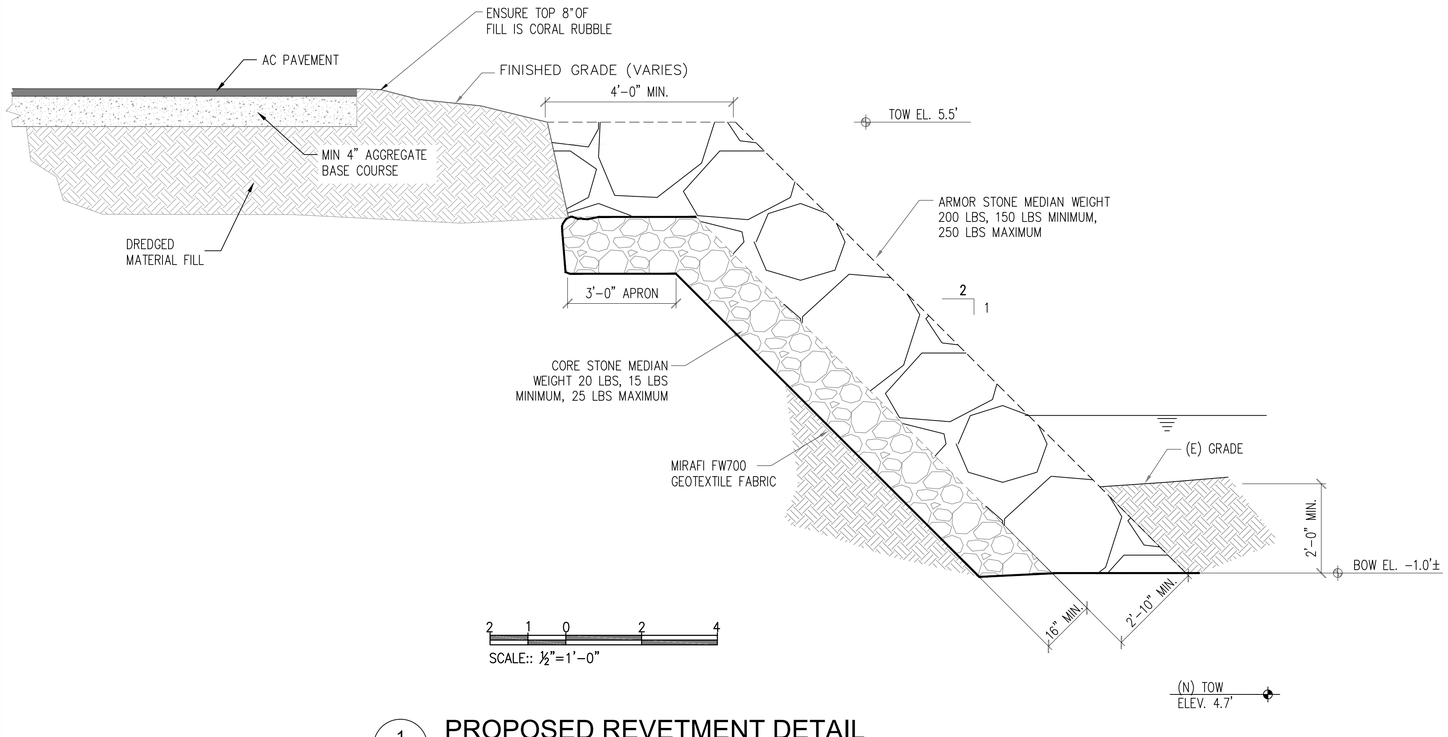
STRUCTURAL DETAILS 2

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. S-3
CHIEF ENGINEER		DATE	

JOB NO. B08CO79A

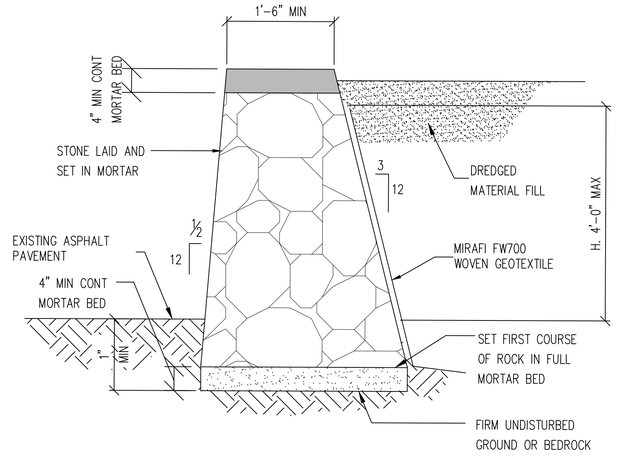
SHEET NO. 21 OF 26 SHEETS

ANSI D 34.00" x 22.00"



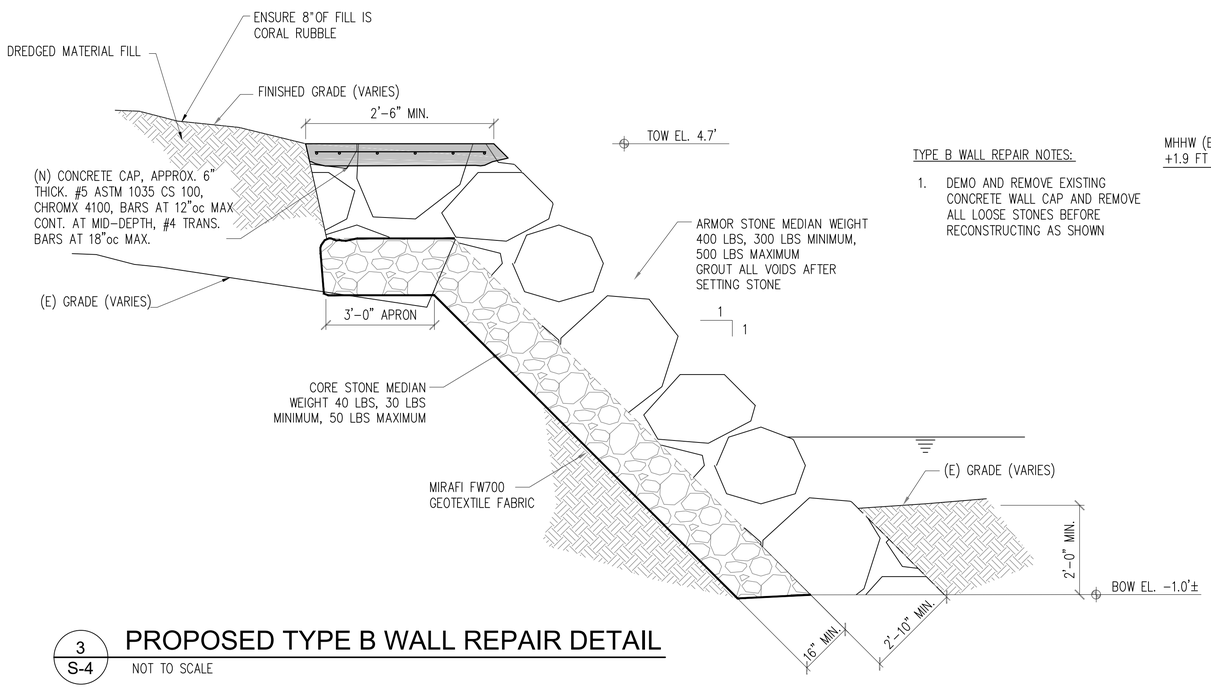
1 S-4 PROPOSED REVETMENT DETAIL

SCALE: 1/2" = 1'-0"



4 S-4 NEW CRM WALL DETAIL

NOT TO SCALE

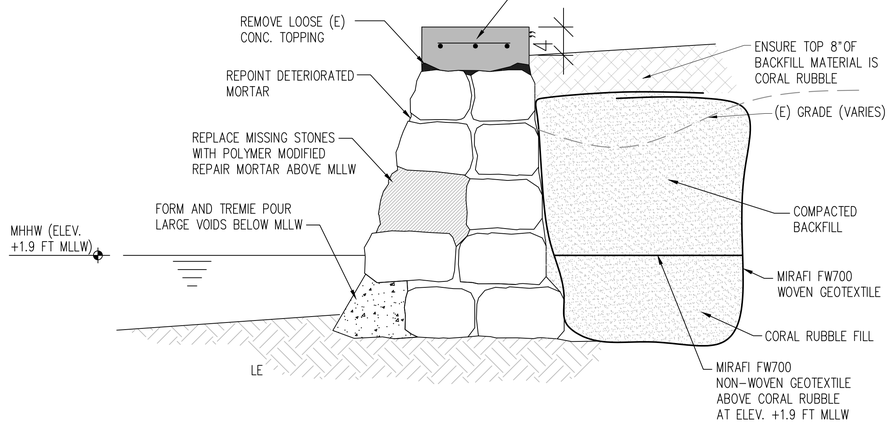


TYPE B WALL REPAIR NOTES:

1. DEMO AND REMOVE EXISTING CONCRETE WALL CAP AND REMOVE ALL LOOSE STONES BEFORE RECONSTRUCTING AS SHOWN

3 S-4 PROPOSED TYPE B WALL REPAIR DETAIL

NOT TO SCALE



TYPE A WALL REPAIR NOTES:

1. EXCAVATE DOWN TO BASE OF WALL, PLACE FILTER FABRIC AND BACKFILL WITH COMPACTED BACKFILL/DREDGED MATERIAL. OVERLAP GEOTEXTILE AS SHOWN.
2. DETERIORATED AND LOOSE MORTAR AND DEBRIS SHALL BE REMOVED PRIOR TO PLACEMENT OF NEW MORTAR, AND DISPOSED OF AT AN APPROVED LOCATION.
3. LOOSE OR DISPLACED STONES AND VOIDS IN WALL SHALL BE REPLACED WITH POLYMER MODIFIED CONCRETE ABOVE MLLW, AND FORMED AND TREMIE POURED CONCRETE BELOW MLLW.
4. REPAIR MORTAR FOR REPOINTING DETERIORATED MORTAR BETWEEN STONES AND FILLING SMALL VERTICAL VOIDS SHALL BE MAPEI PLANITOP X (ABOVE WATER) AND MASTERSEAL 590 (BELOW WATER), OR APPROVED EQUAL. INSTALL PERMANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS.
5. SLURRY COAT SHALL BE SCRUBBED INTO THE SUBSTRATE AND THE VOID FILLED WITH REPAIR MORTAR IN LIFTS.
6. MORTAR SHALL BE BUILT OUT TO THE OUTER FACE AT THE EDGE OF STONES.

2 S-4 PROPOSED TYPE A WALL REPAIR DETAIL

NOT TO SCALE

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

STRUCTURAL DETAILS 3

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. S-4
CHIEF ENGINEER		DATE	

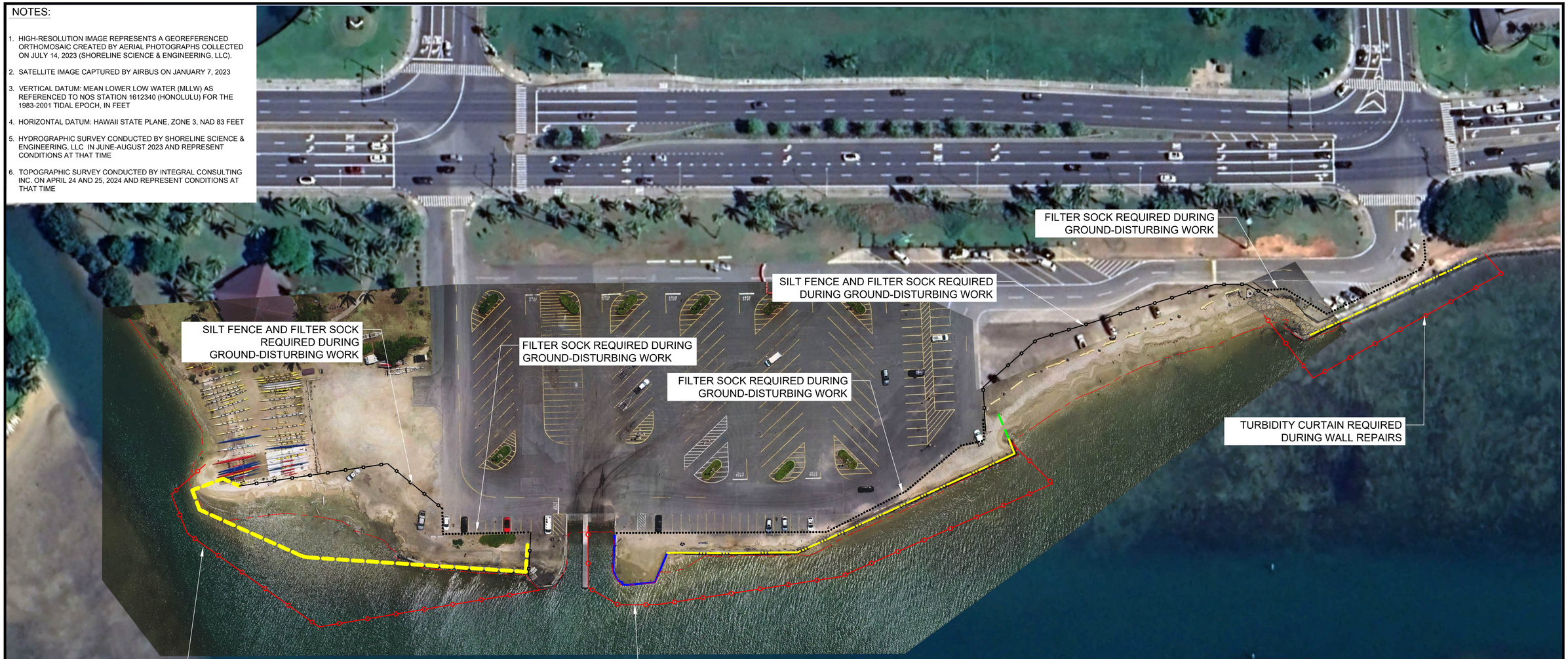
ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 22 OF 26 SHEETS

NOTES:

1. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
2. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
3. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET
4. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET
5. HYDROGRAPHIC SURVEY CONDUCTED BY SHORELINE SCIENCE & ENGINEERING, LLC IN JUNE-AUGUST 2023 AND REPRESENT CONDITIONS AT THAT TIME
6. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME



LEGEND:

- DREDGED MATERIAL CONTAINMENT STRUCTURE
- TYPE A WALL REPAIR
- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- MHW
- FILTER SOCK
- SILT FENCE AND FILTER SOCK
- TURBIDITY CURTAIN

MAUKA
KOKO HEAD
NORTH
DIAMOND HEAD
MAKAI

0 50 100 Feet

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EROSION AND SEDIMENT CONTROL PLAN

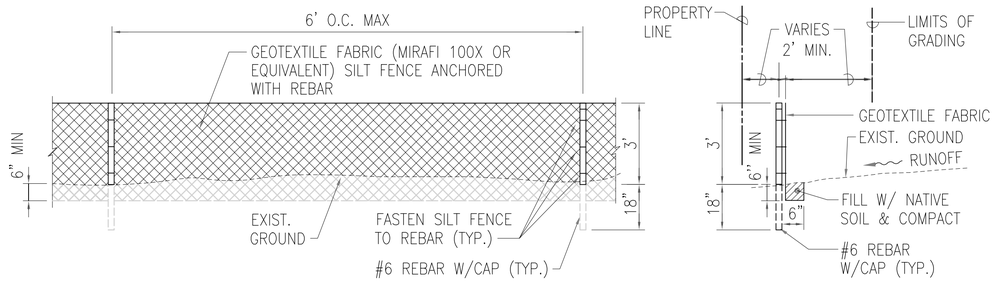
DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. C-1

CHIEF ENGINEER DATE

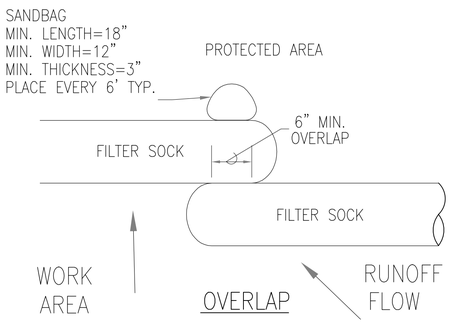
ANSI D 34.00" x 22.00"

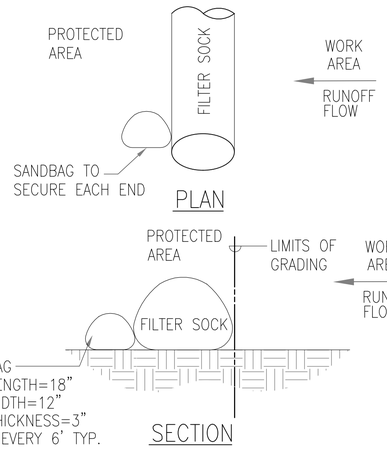
JOB NO. B08CO79A

SHEET NO. 23 OF 26 SHEETS

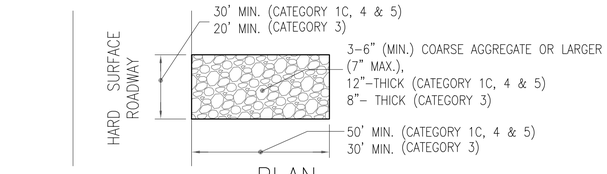


1 SILT FENCE DETAIL





2 FILTER SOCK DETAIL



NOTE:
8" COARSE AGGREGATE LAYER SHALL BE REMOVED IMMEDIATELY PRIOR TO INSTALLATION OF ROADWAY BASE COURSE.

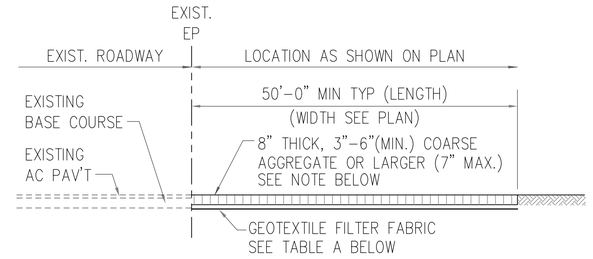
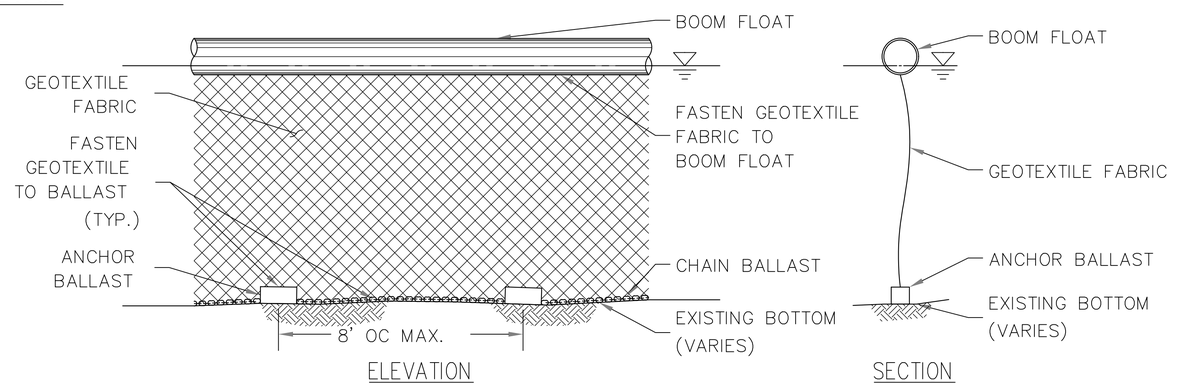


TABLE A GEOTEXTILE REQUIREMENTS

PHYSICAL PROPERTY	REQUIREMENTS
GRAB TENSILE STRENGTH	220 LB (ASTM D1682)
ELONGATION FAILURE	60% (ASTM D1682)
MULLEN BURST STRENGTH	430 LB (ASTM D3768)
PUNCTURE STRENGTH	125 LB (ASTM D751, MODIFIED)
EQUIVALENT OPENING	SIZE 40-80 (U.S. STD SIEVE, CW-02215)

3 CONSTRUCTION INGRESS/EGRESS DETAILS



4 TURBIDITY CURTAIN DETAIL

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EROSION AND SEDIMENT CONTROL DETAILS

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:	CHIEF ENGINEER	DATE	DRAWING NO. C-2

EROSION PREVENTION/ SEDIMENT CONTROL NOTES:

1. THE CONTRACTOR SHALL FOLLOW THE GUIDELINES IN THE CITY AND COUNTY OF HONOLULU'S "RULES RELATING TO WATER QUALITY".

2. MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE ANY EARTHWORK IS INITIATED.

3. MINIMIZE SOIL COMPACTION
   AREAS WHERE FINAL STABILIZATION OR INFILTRATION PRACTICES WILL BE INSTALLED SHALL BE PROTECTED FROM EXCESSIVE COMPACTION DURING CONSTRUCTION. VEHICLE AND EQUIPMENT USE SHALL BE RESTRICTED OR TECHNIQUES TO CONDITION THE SOILS TO SUPPORT VEGETATION SHALL BE IMPLEMENTED IN THE AREAS THAT HAVE BEEN COMPACTED AND ARE DESIGNATED TO REMAIN VEGETATIVE OR POST-CONSTRUCTION INFILTRATION AREAS. CLEARLY MARK THE AREAS TO BE AVOIDED WITH FLAGS OR TEMPORARY FENCING. WHERE TEMPORARY FENCING IS USED, FENCING MUST BE ADEQUATELY SUPPORTED BY POSTS AND MAINTAINED IN AN, UPRIGHT POSITION.

4. PERIMETER CONTROLS
   PERIMETER CONTROLS ARE REQUIRED DOWN SLOPE OF ALL DISTURBED AREAS. MAINTAIN DOWNSTREAM VEGETATE BUFFER AREA

5. SEDIMENT BARRIERS AND FENCES
   SEDIMENT FENCES OR BARRIERS SHALL BE USED DOWNSLOPE OF ALL DISTURBED AREAS. UNTIL SLOPES ARE STABILIZED A SEDIMENT FENCE OR BARRIERS SHALL BE INSTALLED AT THE TOE OF THE SLOPE AND ON CONTOURS AT THE FOLLOWING SPACING:
   SLOPE ≥ 2:1 10 FEET SPACING
   SLOPE ≥ 4:1 AND < 2 1 15 FEET SPACING
   SLOPE < 4:1 20 FEET SPACING

6. TRACKING CONTROL
   • MINIMIZE SEDIMENT TRACK-OUT ONTO OFF-SITE STREETS, OTHER PAVED AIREAS, AIND SIDEWALKS FROM VEHICLES EXITING THE CONSTRUCTION SITE BY RESTRICTING VEHICLE TRAFFIC TO PROPERLY DESIGNATED AREAS AND USING ADDITIONAL CONTROLS TO REMOVE SEDIMENT FROM VEHICLE TIRES PRIOR TO EXITING THE SITE.
   • VEHICULAR PARKING AND MOVEMENTS ON PROJECT SITES MUST BE CONFINED TO PAVED SURFACES OR PREDEFINED PARKING AREAS AND VEHICLE PATHS, WHICH SHALL BE MARKED WITH FLAGS OR BOUNDARY FENCING.
   • ALL POLLUTANTS AND MATERIALS THAT ARE DROPPED, WASHED, TRACKED, SPILLED, OR OTHERWISE DISCHARGED FROM A PROJECT SITE TO OFF-SITE STREETS, OTHER PAVED AREAS, SIDEWALKS OR THE MS4 MUST BE CLEANED USING DRY METHODS SUCH AS SWEEPING OR VACUUMING
   • WASHING POLLUTANTS AND MATERIALS THAT ARE DISCHARGED FROM THE PROJECT SITE TO THE MS4 INTO DRAIN INLETS OR CATCH BASINS IS PROHIBITED UNLESS THE MATERIAL IS SEDIMENT AND THE INLETS ARE DIRECTED TO A SEDIMENT BASIN OR SEDIMENT TRAP.

7. BEST MANAGEMENT PRACTICES (BMPS) SHALL NOT BE REMOVED UNTIL FINAL STABILIZATION IS COMPLETE FOR THAT PHASE.

8. REFER TO CITY AND COUNTY OF HONOLULU BEST MANAGEMENT PRACTICES MANUAL-CONSTRUCTION, FOR MORE INFORMATION ON BMPS.

EROSION AND SEDIMENT CONTROL PLAN SCHEDULE AND RAIN RESPONSE PLAN:

PROJECT SEQUENCE:

1. INSTALL STABILIZED CONSTRUCTION ENTRANCE, PERIMETER CONTROLS, INLET PROTECTION, AND TEMPORARY FENCING FOR PROTECTED AREAS, CLEARING AND GRUBBING AS NECESSARY FOR THE INSTALLATION OF THESE BMPS.

2. CLEAR, GRUB, AND GRADE THE SITE, REFER TO THE SITE PLAN. RELOCATE, RECONSTRUCT AND MAINTAIN BMPS AS NEEDED TO KEEP THEM EFFECTIVE AT ALL TIMES. INITIATE TEMPORARY STABILIZATION IMMEDIATELY ONCE GRADING IS COMPLETED IN EACH PHASE.

3. PROCEED WITH CONSTRUCTION WITH LEAST POSSIBLE DISTURBANCE OF VEGETATIVE AREAS AND TEMPORARY STRUCTURES.

4. REMOVE OR DISMANTLE TEMPORARY EROSION CONTROL STRUCTURES AFTER FULL ESTABLISHMENT OF PERMANENT VEGETATIVE COVER.

5. PRACTICE GOOD HOUSEKEEPING MEASURES THROUGHOUT THE DURATION OF CONSTRUCTION

6. INSPECTIONS WILL BE PERFORMED WEEKLY.

RAIN RESPONSE PLAN:

1. THE FOLLOWING WILL BE PERFORMED WHEN HEAVY RAINS, TROPICAL STORM OR HURRICANE IS IMMINENT OR IS FORECASTED IN THE NEXT 48 HOURS:

- TEMPORARY SUSPENSION OF ACTIVE GRADING, GRUBBING AND TRENCHING.
- INSPECT ALL PERIMETER CONTROLS, AND MAINTAIN AS NEEDED. REINSTALL ANY PERIMETER CONTROLS THAT WERE REMOVED DUE TO ACTIVE WORK IN THE AREA. IF A SEVERE STORM IS EXPECTED,
- COVER OR RELOCATE MATERIAL STOCKPILES AND LIQUID MATERIAL CONTAINERS TO AVOID CONTACT WITH RAINWATER.
- PLACE SPILL PANS OR OIL-ONLY SPILL PADS UNDER CONSTRUCTION VEHICLES TO PREVENT RUNOFF FROM CONTACTING ANY SPILLED PETROLEUM PRODUCTS. PROPERLY DISPOSE OF ANY ACCUMULATED OILY WATER AFTER THE RAIN EVENT.
- RE-INSPECT AFTER THE APPROACHING HEAVY RAINS, TROPICAL STORM OR HURRICANE AND REPLACE OR MAINTAIN BMPS AS NEEDED.

GOOD HOUSEKEEPING BMPs:

1. INSPECT BMPS AND SITE WEEKLY MAINTAIN BMPS AND SITE AS REQUIRED TO ENSURE CONTINUED PERFORMANCE.

2. DUST CONTROL DUST FROM THE PROJECT SITE SHALL NOT BE TRANSPORTED OR DISCHARGED TO OFFSITE AREAS. WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION STANDARDS CONTAINED IN THE "HAWAII ADMINISTRATIVE RULES TITLE 11, CHAPTER 60.1 AIR QUALITY CONTROL.

3. STREET SWEEPING AND VACUUMING. ALL POLLUTANTS DISCHARGED FROM CONSTRUCTION SITE TO OFF-SITE AREAS MUST BE SWEPT OR VACUUMED EACH DAY BEFORE LEAVING THE JOB SITE.

4. MATERIALS DELIVERY, STORAGE AND USE MANAGEMENT. PREVENT, REDUCE, OR ELIMINATE THE DISCHARGE OF POLLUTANTS FROM MATERIAL DELIVERY, STORAGE, AND USE TO THE STORM WATER SYSTEM OR WATERCOURSES BY MINIMIZING THE STORAGE OF HAZARDOUS MATERIALS ONSITE, STORING MATERIALS IN A DESIGNATED AREA, INSTALLING SECONDARY CONTAINMENT. CONSTRUCTION MATERIALS, WASTE, TOXIC AND HAZARDOUS SUBSTANCES, STOCKPILES AND OTHER SOURCES OF POLLUTION SHALL NOT BE STORED IN BUFFER AREAS, NEAR AREAS OF CONCENTRATED FLOW, OR AREAS ABUTTING THE MS4, RECEIVING WATERS, OR DRAINAGE IMPROVEMENTS THAT DISCHARGE OFF-SITE. PRIMARY AND SECONDARY CONTAINMENT CONTROLS AND COVERS SHALL BE IMPLEMENTED TO THE MEP.

5. SPILL PREVENTION AND CONTROL. CREATE AND IMPLEMENT SPILL PREVENTION AND RESPONSE PLANS TO ELIMINATE AND MINIMIZE THE DISCHARGE OF POLLUTANTS TO THE MS4 AND RECEIVING WATERS FROM LEAKS AND SPILLS BY REDUCING THE CHANCE FOR SPILLS, ABSORBING, CONTAINING, AND CLEANING UP SPILLS AND PROPERLY DISPOSING OF SPILL MATERIALS. AT A MINIMUM, ALL PROJECTS SHALL CLEANUP ALL LEAKS AND SPILLS IMMEDIATELY.

6. HAZARDOUS MATERIALS. PREVENT OR REDUCE THE DISCHARGE OF POLLUTANTS TO STORM WATER FROM HAZARDOUS WASTE THROUGH PROPER MATERIAL USE AND WASTE DISPOSAL. IN THE EVENT THAT HAZARDOUS MATERIALS ARE DISCHARGED TO THE MS4, THE PROPERTY OWNER OR ESCP COORDINATOR SHALL IMMEDIATELY NOTIFY THE DEPARTMENT OF FACILITIES MAINTENANCE, HONOLULU FIRE DEPARTMENT, AND HONOLULU POLICE DEPARTMENT OF THE DISCHARGE BY TELEPHONE. A WRITTEN REPORT DESCRIBING THE POLLUTANTS THAT WERE DISCHARGED, THE REASONS FOR THE DISCHARGE, AND THE MEASURES THAT HAVE BEEN TAKEN OR WILL BE TAKEN TO PREVENT A REOCCURRENCE OF THE DISCHARGE SHALL BE SUBMITTED TO THE DIRECTOR NO LESS THAN 3 DAYS AFTER NOTIFICATION BY PHONE.

7. NONHAZARDOUS MATERIALS. IN THE EVENT THAT NONHAZARDOUS MATERIALS ARE DISCHARGED TO THE MS4, THE PROPERTY OWNER OR ESCP COORDINATOR SHALL NOTIFY THE CITY DEPARTMENT OF FACILITIES MAINTENANCE BY TELEPHONE NO LATER THAN THE NEXT BUSINESS DAY. A WRITTEN REPORT DESCRIBING THE POLLUTANTS THAT WERE DISCHARGED, THE REASONS FOR THE DISCHARGE, AND THE MEASURES THAT HAVE BEEN TAKEN OR WILL BE TAKEN TO PREVENT A REOCCURRENCE OF THE DISCHARGE SHALL BE SUBMITTED TO THE DIRECTOR NO LESS THAN 3 DAYS AFTER NOTIFICATION BY PHONE.

8. VEHICLE AND EQUIPMENT CLEANING. ELIMINATE AND MINIMIZE THE DISCHARGE OF POLLUTANTS TO STORM WATER FROM VEHICLE AND EQUIPMENT CLEANING OPERATIONS BY USING OFF-SITE FACILITIES WHEN FEASIBLE, WASHING IN DESIGNATED, CONTAINED AREAS ONLY, AND ELIMINATING DISCHARGES TO THE STORM DRAIN SYSTEM BY EVAPORATING AND/OR TREATING WASH WATER, AS APPROPRIATE OR INFILTRATING WASH WATER FOR EXTERIOR CLEANING ACTIVITIES THAT USE WATER ONLY.

9. VEHICLE AND EQUIPMENT FUELING. PREVENT FUEL SPILLS AND LEAKS BY USING OFF-SITE FACILITIES, FUELING ONLY IN DESIGNATED AREAS, ENCLOSING OR COVERING STORED FUEL, AND IMPLEMENTING SPILL CONTROLS SUCH AS SECONDARY CONTAINMENT AND ACTIVE MEASURES USING SPILL RESPONSE KITS.

10. VEHICLE AND EQUIPMENT MAINTENANCE. ELIMINATE AND MINIMIZE THE DISCHARGE OF POLLUTANTS TO STORM WATER FROM VEHICLE AND EQUIPMENT MAINTENANCE OPERATIONS BY USING OFF-SITE FACILITIES WHEN FEASIBLE, PERFORMING WORK IN DESIGNATED AREAS ONLY, USING SPILL PADS UNDER VEHICLES AND EQUIPMENT, CHECKING FOR LEAKS AND SPILLS, AND CONTAINING AND CLEANING UP SPILLS IMMEDIATELY.

11. SOLID WASTE MANAGEMENT. PREVENT OR REDUCE DISCHARGE OF POLLUTANTS TO THE LAND, GROUNDWATER, AND IN STORM WATER FROM SOLID WASTE OR CONSTRUCTION AND DEMOLITION WASTE BY PROVIDING DESIGNATED WASTE COLLECTION AREAS, COLLECT SITE TRASH DAILY, AND ENSURING THAT CONSTRUCTION WASTE IS COLLECTED, REMOVED, AND DISPOSED OF ONLY AT AUTHORIZED DISPOSAL AREAS.

12. SANITARY/SEPTIC WASTE MANAGEMENT. TEMPORARY AND PORTABLE SANITARY AND SEPTIC WASTE SYSTEMS SHALL BE MOUNTED OR STAKED IN, WELL-MAINTAINED AND SCHEDULED FOR REGULAR WASTE DISPOSAL AND SERVICING. SOURCES OF SANITARY AND/DR SEPTIC WASTE SHALL NOT BE STORED NEAR THE MS4 OR RECEIVING WATERS.

13. STOCKPILE MANAGEMENT. STOCKPILES SHALL NOT BE LOCATED IN DRAINAGE WAYS, WITHIN 50 FEET FROM AREAS OF CONCENTRATED FLOWS, AND ARE NOT ALLOWED IN THE CITY RIGHT-OF-WAY. SEDIMENT BARRIERS OR SILT FENCES SHALL BE USED AROUND THE BASE OF ALL STOCKPILES. STOCKPILES SHALL NOT EXCEED 15 FEET IN HEIGHT. STOCKPILES GREATER THAN 15 FEET IN HEIGHT SHALL REQUIRE 8 FOOT WIDE BENCHING IN ACCORDANCE WITH ROH CHAPTER 14, ARTICLE 15. STOCKPILES MUST BE COVERED WITH PLASTIC SHEETING DR A COMPARABLE MATERIAL IF THEY WILL NOT BE ACTIVELY USED WITHIN 7 DAYS.

14. LIQUID WASTE MANAGEMENT. LIQUID WASTE SHALL BE CONTAINED IN A CONTROLLED AREA SUCH AS A HOLDING PIT, SEDIMENT BASIN, ROLL-OFF BIN, OR PORTABLE TANK OF SUFFICIENT VOLUME AND TO CONTAIN THE LIQUID WASTES GENERATED. CONTAINMENT AREAS DR DEVICES MUST BE IMPERMEABLE AND LEAK FREE AND SHOULD NOT BE LOCATED WHERE ACCIDENTAL RELEASE OF THE CONTAINED LIQUID CAN DISCHARGE TO WATER BODIES, CHANNELS, OR STORM DRAINS.

15. CONCRETE WASTE MANAGEMENT. PREVENT OR REDUCE THE DISCHARGE OF POLLUTANTS TO STORM WATER FROM CONCRETE WASTE BY CONDUCTING WASHOUT OFFSITE OR PERFORMING ONSITE WASHOUT IN A DESIGNATED AREA CONSTRUCTED AND MAINTAINED IN SUFFICIENT QUANTITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS. PLASTIC LINING MATERIAL SHOULD BE A MINIMUM OF 10 MILLIMETER POLYETHYLENE SHEETING AND SHOULD BE FREE OF HOLES, TEARS, OR OTHER DEFECTS THAT COMPROMISE THE IMPERMEABILITY OF THE MATERIAL. CONTAINMENT AREAS OR DEVICES SHOULD NOT BE LOCATED WHERE ACCIDENTAL RELEASE OF THE CONTAINED LIQUID CAN DISCHARGE TO WATER BODIES, CHANNELS, OR STORM DRAINS. WASHOUT FACILITIES MUST BE CLEANED, OR NEW FACILITIES MUST BE CONSTRUCTED AND READY FOR USE ONCE THE WASHOUT IS 75 PERCENT FULL. ONCE CONCRETE WASTES ARE WASHED INTO THE DESIGNATED AREA AND ALLOWED TO HARDEN, THE CONCRETE SHOULD BE BROKEN UP, REMOVED, AND DISPOSED OF AS SOLID WASTES.

16. CONTAMINATED SOIL MANAGEMENT. AT MINIMUM CONTAIN CONTAMINATED MATERIAL SOIL BY SURROUNDING WITH IMPERMEABLE LINED BERMS OR COVER EXPOSED CONTAMINATED MATERIAL WITH PLASTIC SHEETING. CONTAMINATED SOIL SHOULD BE DISPOSED OF PROPERLY IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS.

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

EROSION & SEDIMENT CONTROL NOTES

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED

APPROVED: _____ CHIEF ENGINEER _____ DATE

DRAWING NO. C-3

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

GRADING NOTES:

1. ALL GRADING WORK SHALL BE DONE IN ACCORDANCE WITH CHAPTER 14, ARTICLES 13, 14, 15 AND 16, AS RELATED TO GRADING, SOIL EROSION AND SEDIMENT CONTROL OF THE REVISED ORDINANCES OF HONOLULU, 1990, AS AMENDED, AND SOILS REPORT BY SHORELINE SCIENCE & ENGINEERING DATED MAY 2019.

2. NO CONTRACTOR SHALL PERFORM ANY GRADING OPERATION SO AS TO CAUSE FALLING ROCKS, SOIL OR DEBRIS IN ANY FORM TO FALL, SLIDE OR FLOW ONTO ADJOINING PROPERTIES, STREETS OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATIONS OCCUR, THE CONTRACTOR MAY BE CITED AND THE CONTRACTOR SHALL IMMEDIATELY MAKE ALL REMEDIAL ACTIONS NECESSARY.

3. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AREA AND SURROUNDING AREA FREE FROM DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION CONTROL STANDARDS CONTAINED IN THE HAWAII ADMINISTRATIVE RULES, TITLE 11, CHAPTER 60.1, “AIR POLLUTION CONTRO”.

4. WITH EXCEPTION OF IRRIGATION LINES, THE UNDERGROUND PIPES, CABLES OR DUCTLINES KNOWN TO EXIST BY THE ENGINEER FROM THIS SEARCH OF RECORDS ARE INDICATED ON THE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS AND DEPTHS OF THE FACILITIES AND EXERCISE PROPER CARE IN EXCAVATING IN THE AREA. WHEREVER CONNECTIONS OF NEW UTILITIES ARE SHOWN ON THE PLANS, THE CONTRACTOR SHALL EXPOSE THE EXISTING LINES AT THE PROPOSED CONNECTIONS TO VERIFY THEIR LOCATIONS AND DEPTHS PRIOR TO EXCAVATION FOR THE NEW LINES.

5. ADEQUATE PROVISIONS SHALL BE MADE TO PREVENT SURFACE WATERS FROM DAMAGING THE CUT FACE OF AN EXCAVATION OR THE SLOPED SURFACES OF A FILL. FURTHERMORE, ADEQUATE PROVISIONS SHALL BE MADE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE SITE.

6. NO GRADING WORK SHALL BE DONE ON SATURDAYS, SUNDAYS AND HOLIDAYS AT ANY TIME WITHOUT PRIOR NOTICE TO THE DIRECTOR, D.P.P., PROVIDED SUCH GRADING WORK IS ALSO IN CONFORMANCE WITH THE COMMUNITY NOISE CONTROL STANDARDS CONTAINED IN THE HAWAII ADMINISTRATIVE RULES, TITLE 11, CHAPTER 46, “COMMUNITY NOISE CONTROL".

7. THE LIMITS OF THE AREA TO BE GRADED SHALL BE FLAGGED BEFORE THE COMMENCEMENT OF THE GRADING WORK.

8. THE GENERAL CONTRACTOR/DEVELOPER/OWNER OF THE PROJECT SHALL BE RESPONSIBLE FOR ALL GRADING OPERATIONS TO BE PERFORMED IN CONFORMANCE WITH APPLICABLE PROVISIONS OF THE HAWAII ADMINISTRATIVE RULES, TITLE 11, CHAPTER 54, "WATER QUALITY STANDARDS," AND TITLE 11, CHAPTER 55, "WATER POLLUTION CONTROL", AS WELL AS CHAPTER 14 OF THE REVISED ORDINANCES OF HONOLULU, AS AMENDED. BEST MANAGEMENT PRACTICES SHALL BE EMPLOYED AT ALL TIMES DURING CONSTRUCTION.

9. IN ACCORDANCE WITH STATE LAW, ALL DISCHARGES RELATED TO PROJECT CONSTRUCTION OR OPERATIONS ARE REQUIRED TO COMPLY WITH STATE WATER QUALITY STANDARDS (HAWAII ADMINISTRATIVE RULES, CHAPTER 11-54). BEST MANAGEMENT PRACTICES SHALL BE USED TO MINIMIZE OR PREVENT THE DISCHARGE OF SEDIMENT, DEBRIS, AND OTHER POLLUTANTS TO STATE WATERS. PERMIT COVERAGE IS AVAILABLE FROM THE DEPARTMENT OF HEALTH, CLEAN WATER BRANCH AT HTTP://HEALTH.HAWAII.GOV/CWB. THE OWNER/DEVELOPER/CONTRACTOR IS RESPONSIBLE FOR OBTAINING OTHER FEDERAL, STATE, OR LOCAL AUTHORIZATIONS AS REQUIRED BY LAW.

10. WHERE APPLICABLE AND FEASIBLE THE MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE ANY EARTH MOVING PHASE OF THE GRADING IS INITIATED.

11. TEMPORARY EROSION CONTROLS SHALL NOT BE REMOVED BEFORE PERMANENT EROSION CONTROLS ARE IN-PLACE AND ESTABLISHED.

12. IF THE GRADING WORK INVOLVES CONTAMINATED SOIL, THEN ALL GRADING WORK SHALL BE DONE IN CONFORMANCE WITH APPLICABLE STATE AND FEDERAL REQUIREMENTS.

13. PURSUANT TO CHAPTER 6E, HRS, IN THE EVENT ANY ARTIFACTS OR HUMAN REMAINS ARE UNCOVERED DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY SUSPEND WORK AND NOTIFY THE HONOLULU POLICE DEPARTMENT, THE STATE DEPARTMENT OF LAND AND NATURAL RESOURCES-HISTORIC PRESERVATION DIVISION (692-8015). IN ADDITION, FOR NON-CITY PROJECTS, THE CONTRACTOR SHALL INFORM THE CIVIL ENGINEERING BRANCH, D.P.P. (768-8084); AND FOR CITY PROJECTS, NOTIFY THE RESPONSIBLE CITY AGENCY.

14. ALL GRADING AND CONSTRUCTION WORK SHALL IMPLEMENT MEASURES TO ENSURE THAT THE DISCHARGE OF POLLUTANTS FROM THE CONSTRUCTION SITE WILL BE REDUCED TO THE MAXIMUM EXTENT PRACTICABLE AND WILL NOT CAUSE OR CONTRIBUTE TO AN EXCEEDANCE OF WATER QUALITY STANDARDS.

15. NON-COMPLIANCE TO ANY OF THE ABOVE REQUIREMENTS SHALL MEAN IMMEDIATE SUSPENSION OF ALL WORK, AND REMEDIAL WORK SHALL COMMENCE IMMEDIATELY. ALL COSTS INCURRED SHALL BE BILLED TO THE VIOLATOR. FURTHERMORE, VIOLATORS SHALL BE SUBJECTED TO ADMINISTRATIVE, CIVIL AND/OR CRIMINAL PENALTIES.

16. FOR BENCH MARK, SEE SHEET D10, D11, D12, AND D13.

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE
DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

GRADING NOTES

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/24/2024
CHECKED:	RAW	SCALE:	AS NOTED

APPROVED: _____ _____
CHIEF ENGINEER DATE

DRAWING NO. C-4

JOB NO. B08CO79A SHEET NO. 26 OF 26 SHEETS

ANSI D 34.00" x 22.00"

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
3. TOPOGRAPHIC SURVEY CONDUCTED BY INTEGRAL CONSULTING INC. ON APRIL 24 AND 25, 2024 AND REPRESENT CONDITIONS AT THAT TIME.
4. HIGH-RESOLUTION IMAGE REPRESENTS A GEOREFERENCED ORTHOMOSAIC CREATED BY AERIAL PHOTOGRAPHS COLLECTED ON JULY 14, 2023 (SHORELINE SCIENCE & ENGINEERING, LLC).
5. SATELLITE IMAGE CAPTURED BY AIRBUS ON JANUARY 7, 2023
6. APPROXIMATE SHORELINE LOCATION AS OBSERVED ON MAY 9 AND JUNE 10, 2024 DURING HIGH TIDE AND SWELL CONDITIONS.

KALANIANA'OLE HWY

PROPOSED PAVED PARKING AREA REPAIR

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED BEACH-QUALITY SAND BENEFICIAL REUSE

MAUNALUA BAY LAUNCH RAMP FACILITY

PROPOSED WALL EXTENSION (TYPE B)

PROPOSED DREDGED BEACH-QUALITY SAND BENEFICIAL REUSE

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

CRM WALL

PROPOSED WALL REPAIR (TYPE B)

PROPOSED ROCK REVETMENT

PROPOSED WALL REPAIR (TYPE B)

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED MATERIAL CONTAINMENT STRUCTURE

PROPOSED WALL REPAIR (TYPE A)

STA:0+00 STA:1+00 STA:2+00 STA:3+00 STA:4+00 STA:5+00 STA:7+00 STA:8+00 STA:10+00 STA:11+00 STA:12+00 STA:13+87 STA:14+00 STA:15+00 STA:15+87

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

FOR PERMITTING
NOT FOR CONSTRUCTION

LEGEND:

- DREDGED MATERIAL CONTAINMENT STRUCTURE
- TYPE A WALL REPAIR
- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET
- APPROX. SHORELINE
- 6" CONCRETE CURB

MAUKA KOKO HEAD NORTH DIAMOND HEAD MAKAI

0 40 80 Feet

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

SHORELINE SURVEY EXHIBIT 1

DESIGNED:	RAW/TMC	SUBMITTED:	
DRAWN:	MJM/BRJ	DATE:	07/05/2024
CHECKED:	RAW	SCALE:	AS NOTED
APPROVED:			DRAWING NO. X1
CHIEF ENGINEER		DATE	

ANSI D 34.00" x 22.00"

JOB NO. B08CO79A

SHEET NO. 1 OF 1 SHEETS

NOTES:

1. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) AS REFERENCED TO NOS STATION 1612340 (HONOLULU) FOR THE 1983-2001 TIDAL EPOCH, IN FEET.
2. HORIZONTAL DATUM: HAWAII STATE PLANE, ZONE 3, NAD 83 FEET.
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KALANIANAOLE

(Proj. No. 740A-01-71)

MAUNALUA BAY BOAT LAUNCHING RAMP FACILITY

PROPOSED PAVED PARKING AREA REPAIR

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED BEACH-QUALITY SAND BENEFICIAL REUSE

PROPOSED WALL EXTENSION (TYPE B)

PROPOSED ROCK REVETMENT

PROPOSED WALL REPAIR (TYPE B)

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

CRM WALL

PROPOSED DREDGED MATERIAL BENEFICIAL REUSE

PROPOSED DREDGED MATERIAL CONTAINMENT STRUCTURE

PROPOSED WALL REPAIR (TYPE A)

MAUNALUA

LEGEND:

- DREDGED MATERIAL CONTAINMENT STRUCTURE
- TYPE A WALL REPAIR
- TYPE B WALL REPAIR
- TYPE B WALL EXTENSION
- EXISTING CONTOURS (JUNE–AUGUST, 2023), IN FEET
- APPROX. SHORELINE
- 6" CONCRETE CURB

MAUKA · KOKO HEAD · DIAMOND HEAD · MAKAI · NORTH

0 40 80 Feet

FOR PERMITTING
NOT FOR CONSTRUCTION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

MAUNALUA BAY BOAT RAMP MAINTENANCE DREDGING AND FACILITY IMPROVEMENTS
HONOLULU, OAHU HAWAII

SHORELINE SURVEY EXHIBIT 2

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SHEET NO. 1 OF 1 SHEETS

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Biological Evaluation

Maunalua Bay Boat Ramp Maintenance Dredging and Facility Improvements

Maunalua Bay, Honolulu, Hawai'i

On Behalf of

State of Hawaii Department of Land and Natural Resources (DLNR)
Division of Boating and Ocean Recreation (DOBOR)
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ACRONYMS AND ABBREVIATIONS

AMM	avoidance and minimization measures
BE	Biological Evaluation
Bay	Maunalua Bay
BMP	best management practice
CFR	Code of Federal Regulations
CM-1A	Channel Marker #1A
CRM	Cement Rubble Masonry
CWA	Clean Water Act
DLNR	Department of Land and Natural Resources
DOBOR	Division of Boating and Ocean Recreation
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
facility	Maunalua Bay Launch Ramp Facility
FEP	Fishery Ecosystem Plan
FESA	Federal Endangered Species Act
FMP	Fishery Management Plan
GST	Green sea turtle
HAPCs	Habitat Areas of Particular Concern
HMS	Hawaiian monk seal
HST	Hawksbill sea turtle
MHHW	mean high high water
MLLW	mean lower low water
MSA	Magnuson-Stevens Fishery Conservation and Management Act
navigation channel	Maunalua Bay Navigation Channel
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA Marine Fisheries Service
NWHI	Northwestern Hawai'ian Islands
PBF	Physical or Biological Feature
RHA	Rivers and Harbors Act
Services	NOAA Fisheries and U.S. Fish and Wildlife Service
SSE	Shoreline Science & Engineering
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WOTUS	waters of the U.S./State

EXECUTIVE SUMMARY

The State of Hawai'i Department of Land and Natural Resources (DLNR) Division of Boating and Ocean Recreation (DOBOR) has submitted a request for a U.S. Army Corps of Engineers (USACE) for authorization of the Maunalua Bay Boat Ramp Maintenance Dredging and Facility Improvements project (the Project).

Location

The Maunalua Bay Boat Ramp and Facility is located on the southeast coast of the island of Oahu, south of the Hawai'i Kai Marina, directly southwest of the intersection of Kalaniana'ole Highway and Hawai'i Kai Drive and adjacent to the Hui Nalu O Hawai'i canoe club. Improvements to the Site would occur along the shoreline of the facility and along and within the boat channel adjacent to the facility (Enclosure A. Site and Vicinity Map).

Proposed Project

The Project would complete needed maintenance dredge to the Maunalua Bay navigation channel ("the navigation channel") and at the Maunalua Bay Launch Ramp Facility ("the facility"). All proposed actions would occur within the identified Action Area (Enclosure B. Action Area Map). Project activities would include dredging specific locations within the navigation channel (the limits of which would not extend beyond the originally constructed footprint and dredge depths), repair of existing seawall structures along the shoreline, installation of a short wall extension and new revetment at the east end of the site, construction of a Dredged Material Containment Structure (DMCS) at the west end of the site, replacement of two navigational aids (piling with signage) within the navigation channel, and implementation of beach nourishment.

Habitat Disturbance

Project implementation would require removal of approximately 5,850 cubic yards of sediment (across 72,802 square feet (ft) (1.67 acres)). Project implementation would require channel marker removal and reinstallation. Fill placement is proposed to restore the eroded shoreline at the west end of the Facility that would result in a permanent loss of waters of the United States (U.S.) totaling 0.11 acre. No new in-water infrastructure is proposed other than construction of the DMCS and reinstallation of channel markers. Work would result in temporary disturbance of ocean substrate associated with dredging, placement of sand to rebuild beaches, and removal/placement of channel markers.

Protected Species and Habitats Considered

Waters of the U.S., the Ocean, within the Action Area provide suitable habitat to support species under the regulatory protections of the National Oceanic and Atmospheric

Administration's National Marine Fisheries Service (NOAA Fisheries). The species listed below were initially identified as having the potential to occur in the vicinity of the Action Area, and therefore, potential effects of the proposed action on these species were further considered.

- Green sea turtle (GST, *Chelonia mydas*), designated population segment (DPS), Central North Pacific;
- Hawksbill sea turtle (HST, *Eretmochelys imbricata)*;
- Humpback whale (*Megaptera novaeangliae*); and
- Hawai'ian monk seal (HMS, *Neomonachus schauinslandi*).

Designated critical habitat is proposed for the Central North Pacific DPS green sea turtle in the Action Area, as of July 19, 2023 (88 FR 46376). The Action Area also occurs within designated marine critical habitat for Hawai'ian monk seal, however the Action Area does not occur within designated terrestrial critical habitat for monk seal (80 FR 50925). There is no critical habitat designated for humpback whale, however, the Action Area lies within State waters of the Hawai'ian Islands Humpback Whale National Marine Sanctuary. See Enclosure D. Critical Habitat Map which depicts critical habitat throughout the project site and vicinity.

The Action Area falls within Essential Fish Habitat (EFH), as defined in the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Specifically, the Action Area is managed under two Fishery Management Plans (FMPs): the Fishery Ecosystem Plan (FEP) for Pacific Pelagic Fisheries and the FMP for Bottomfish and Seamount Groundfish by the Western Pacific Regional Fishery Management Council. See Enclosure C. Essential Fish Habitat Map for a depiction of EFH throughout project site and vicinity.

Effects Determination

Green sea turtle, Hawksbill sea turtle, humpback whale, and Hawai'ian monk seal could be present year-round, but are expected to occur in low abundance within the Action Area. Given the nature of the proposed work and avoidance and minimization measures, the action ***may affect, but is not likely to adversely affect*** green sea turtles, hawksbill sea turtles, humpback whales, and Hawai'ian monk seals.

The Project ***may affect, but is not likely to adversely affect*** marine critical habitat for green sea turtle or Hawaiian monk seal. Changes to critical habitat are expected to be discountable (extremely unlikely to occur) and insignificant (too small to detect or measure) for all species considered.

The Project has the potential to affect EFH for species managed under multiple FMPs. The Project ***may adversely effect*** EFH, but the adverse effect would not be substantial and is expected to be temporary. These effects would be minimized through on-site habitat restoration and other measures to avoid, minimize, and offset adverse effects to EFH caused by the Project's in-water activities.

1 INTRODUCTION

1.1 PURPOSE OF DOCUMENT

Dredging and facility improvements proposed to support the Project have the potential to affect listed species under the jurisdiction of the NOAA Fisheries. The purpose of this BE is to provide technical information and to review the Project in sufficient detail to determine the extent to which the Project may affect threatened or endangered, or candidate species, designated species proposed for listing as threatened or endangered, critical habitat, and EFH within the jurisdiction of NOAA Fisheries. The USACE is the federal lead and action agency. As the action agency, USACE is expected to request Federal Endangered Species Act (FESA) section 7 consultation with NOAA Fisheries regarding these effects.

This BE discusses the Project, potential impacts on biological resources resulting from the implementation of the Project, and proposed measures that would be implemented to avoid these potential impacts. The information provided herein should be sufficient for NOAA Fisheries to evaluate potential Project effects on humpback whale, Hawai'ian monk seal, green sea turtle, and hawksbill sea turtle in addition to designated critical habitat for listed species. An EFH assessment is also included.

1.2 RELEVANT LAWS

Protected species considered within this document include species considered to be threatened or endangered, or candidate species and designated species proposed for listing as threatened or endangered by NOAA Fisheries. These species are legally protected pursuant to the federal laws include:

- **Federal Endangered Species Act (FESA)**: The FESA prohibits the "take" of any wildlife species listed by the NOAA Fisheries or the U.S. Fish and Wildlife Service (USFWS) (collectively referred to as "Services") as threatened or endangered, including the destruction of habitat that could hinder species recovery. The Services oversee the implementation of FESA (50 Code of Federal Regulations [CFR] § 402.7, Section 305(b)(4)(B)) and have regulatory authority over listed plants, wildlife, and fish. To remain compliant with the FESA, federal agencies, such as USACE, are required to consult with the Services prior to issuance of a permit if a project may adversely affect a federally listed species. As a part of the consultation, the Services must confirm that a project is not likely to destroy or adversely modify critical habitat.

- **Magnuson-Stevens Fishery Conservation and Management Act (MSA)**: The MSA (16 United States Code [USC] §§ 1801–1884) was passed in 1976 to conserve and manage U.S. fishery resources, prevent overfishing, rebuild overfished stocks, and facilitate

long-term protection of EFH. The MSA (Section 3) defines EFH as "*those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity*." Under the MSA, EFH includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10), and "adverse effect" means any impact that reduces either the quality or quantity of EFH (50 CFR 600.910(a)). The MSA is implemented by regional Fishery Management Councils that work with NOAA Fisheries to develop and implement FMPs. In the US Pacific Islands, the Western Pacific Regional Fishery Management Council has jurisdiction and is responsible for identifying the EFH for each fishery under their oversight. Section 305(b) of the MSA directs federal agencies to consult with NOAA Fisheries on all actions or proposed actions that may adversely affect EFH to obtain avoidance and minimization consultation as well as conservation and enhancement recommendations.

2 ACTION AREA

2.1 PROJECT LOCATION

The Maunalua Bay Boat Ramp and Facility is located on the southeast coast of the island of O'ahu, south of the Hawai'i Kai Marina, directly southwest of the intersection of Kalaniana'ole Highway and Hawai'i Kai Drive and adjacent to the Hui Nalu O Hawai'i canoe club. Improvements to the Site would occur along the shoreline of the facility and along and within the boat channel adjacent to the Facility (Enclosure A. Site and Vicinity Map). The boat ramp and facility are currently owned and operated by the DLNR DOBOR.

2.2 ACTION AREA DESCRIPTION

The Action Area (AA) includes "*all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action*." [50 CFR 402.02]. The 21.41-acre Action Area consists of the Maunalua Bay Boat Ramp and Boating Facility, adjacent eastern beach to be nourished, and along with the navigational channels directly adjacent to the facility. The Action Area extends to the natural boundaries, as encompassed by structures, to account for construction-related disturbances that may affect listed species and protected habitats (Enclosure B. Action Area Map).

3 ENVIRONMENTAL BASELINE

3.1 JURISDICTIONAL WATERS

The Action Area is largely within jurisdictional waters of the U.S./State, under the jurisdiction of the USACE pursuant to the Clean Water Act, Section 404 and the Rivers and Harbors Act, Section 10.

3.2 HISTORIC USES

The Facility exists along the shoreline of Maunalua Bay, southwest of the Hawaii Kai Marina, and is made up of dredged fill material placed between the 1940s–1970s. The fill was placed atop the fringe reef that originally existed just makai of Kalanianaole highway. The site as it existed prior to fill being placed to create the facility is shown in Photograph 1, below.

Photograph 1, the aerial photograph of the shoreline in the project area as it existed in 1949.

The navigation channels that connect the Maunalua Bay Launch Ramp Facility to deeper waters within Maunalua Bay and to the Pacific Ocean were originally dredged in the late 1950s and early 1960s, with several maintenance dredging efforts occurring since. The outer extents of the navigation channel makai of channel maker #8 follows a natural gap in the reef.

Photograph 2, the facility as it existed shortly after its original construction as shown in an aerial photograph captured in 1967.

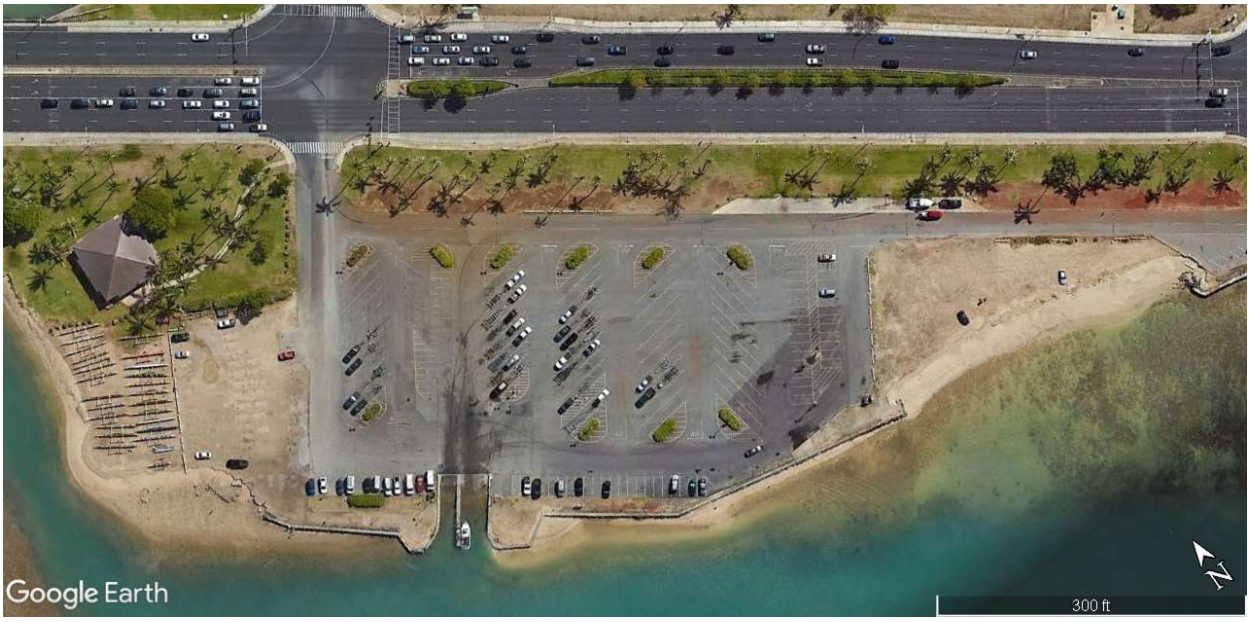
The facility has undergone several improvements since it was originally constructed using dredged fill. Improvements include construction of a concrete boat ramp and finger pier, installation of cement rubble masonry (CRM) seawalls flanking the ramp, additional small revetments along the shoreline of the facility extending away from both sides of the boat ramp, and paved parking and boat washdown areas.

Photograph 3, the facility as it existed shortly following improvements constructed in 1993.

3.3 CURRENT SITE AND ADJACENT LAND USES

Much of the current site is paved with asphalt concrete to provide parking for vehicles and boat trailers. A concrete boat launch ramp exists at the shoreline of the Facility, with two lanes separated by a fixed-pier loading dock. A concrete paved boat washdown area exists along the mauka edge of the parking area. Areas of the site that are not paved are made primarily of the dredged fill material (coral rubble, sand, and silt). Basalt gravel is also present in many unpaved areas, particularly in the vicinity of the existing seawalls where it was placed during their original construction. Vertical CRM seawalls ("Type A Wall") exist flanking both sides the boat ramp, which transition to sloped CRM walls ("Type B Wall") extending further east and west along the shoreline. Another section of Type B wall exists along the shoreline at the eastern end of the Facility. Unarmored portions of the shoreline, which exist at the west end and toward the east end of the Facility, consist of a mixture of eroding dredged material fill and naturally accreted carbonate sand.

The west side of the Facility is host to several canoe clubs who practice the traditional Hawaiian sport of outrigger canoe paddling from the site. Canoes are stored within a modern hale structure as well as in the upland area in the westernmost portion of the Facility and are launched into the bay via the shoreline along the western edge of the Facility. A satellite photo showing an overview of the Facility is provided in Photograph 4, below.



Photograph 4, Satellite Photo of the Facility, Captured on May 21, 2015 (Photo: NASA)

A dredged navigation channel, nominally 100 ft wide with depths ranging between 6 to 9 ft relative to mean lower low water (MLLW), provides access for vessels to transit between the Facility and the deeper waters of the bay to the southeast. Channel markers #8–#21, made of

concrete-filled galvanized steel pipes with reflective signage, are located along the edges of the navigation channels spaced at roughly 300-ft intervals. A dredged channel also exists at the outer edge of the fringing reef, roughly 1,300 ft long and 130 ft wide, to provide safe passage between the bay and the Pacific Ocean. The navigation channel is illustrated in Photograph 5, below. A single channel marker (#1) identifies the beginning of the channel as vessels approach from the ocean (not shown).

Photograph 5, Site Map of the Maunalua Bay Navigation Channel

In recent years, isolated areas within the navigation channels have experienced significant shoaling, creating hazards to navigation. A broken channel marker (CM #16) which has been temporarily replaced by a buoy, presents another hazard to boaters. In addition, shoreline structures at the facility have deteriorated.

The Action Area is primarily subtidal habitat characterized by open water and a soft sediment seafloor. The largest tidal fluctuations along the northern waterfront are from approximately −1.4 to +2.7 ft MLLW, but the mean tidal variation is about 1.3 ft. The offshore area exhibits varying elevations depending on currents, sedimentation rates, and vessel activities. Maintenance dredging has been performed previously in portions of the Action Area and was last dredged in the mid-1990s.

The further-most offshore part of the Action Area is characterized by large spans of sandy bottom with hard-substrate composed of limestone fossil reef and *Pocillopora meandrina* skeletons lining some sides of the navigation channel. Much of the biological resources existing at this outermost portion consist of patches of cyanobacteria and macroalgae. Moving closer inshore, running parallel to the boat facility and neighboring beach (East Beach), the submerged environment consists of fine-grained sand and silt towards the middle of the channel and of large-grained sand, coral rubble, gravel, and rocks towards the edges of the channel. Here macroalgae tends to exist in a larger presence, and isolated patches of Halophila seagrasses can be found throughout. Occasional, isolated instances of corals exist within this portion of the channel, however only three roughly fist-sized *Pocillopora damicornis colonies* were found within the proposed dredge areas.

4 PROJECT DESCRIPTION

4.1 PROJECT PURPOSE

The Project is proposed by DLNR to provide needed maintenance to the Maunalua Bay navigation channel Facility. Sedimentation within the navigation channel since original construction poses obstructions to navigation and vessel launching, with adverse impacts to the local community. This project proposes to perform maintenance dredging to improve navigation, and beneficially reuse dredged material to improve the Facility. Ongoing shoreline erosion occurring at the site would be mitigated by stabilizing shorelines and rehabilitating the failing seawalls that exist throughout most of the site.

4.2 MAINTENANCE DREDGING AND NAVIGATION IMPROVEMENTS

4.2.1 Maintenance Dredging

Seven areas in the navigation channel require dredging to remove hazards or otherwise restore design depths. In total, approximately 5,850 cubic yards of material are proposed to be dredged from within the Maunalua Bay navigation channel. DLNR seeks to restore safe vessel navigation by performing maintenance dredging to a depth of -6 ft MLLW, with up to 1 ft of payable overdepth. These areas are presented in the project plans as dredge areas 1, 2, 3, 4, 5, 6, and 7.

Dredging will be performed mechanically, with dredged material transported to the Facility via barge for offload, dewatering, sorting, and reuse. Dredged material will be used as fill material for beach nourishment, filling of eroded areas, and in conjunction with repairs to the existing seawall structures.

4.2.1.1 Dredge Area 1

West of the boat ramp, a shoal has accreted within the navigation channel. Continued accretion threatens to further constrict or even cut off access for paddlers and boaters, and restrict the flow of water in and out of the Hawaii Kai Marina. Following construction of the Dredged Material Containment Structure (discussed in section 2.2.1) a portion of this shoal will be dredged to restore navigable depths and improve access.

4.2.1.2 Dredge Area 2

A significant shoal has developed makai of the eastern edge of the boat ramp, presenting a hazard for larger vessels while launching or hauling out. Sediment has also accumulated on top of the existing concrete boat launch ramp along the eastern edge. The shoal will be dredged,

and sediment removed from the boat ramp with careful attention to not damage the existing ramp and wall structures.

4.2.1.3 Dredge Areas 3, 4, 5, and 6

Several small shoals exist along the edges on the inner navigation channel, roughly between channel markers #8 and #15, which will be dredged to restore safe navigation.

4.2.1.4 Dredge Area 7

A large sand shoal has developed just makai of Channel Marker #2, presenting a hazard to boaters with multiple prop strikes reported in recent years.

4.2.2 Channel Marker Replacement

The original Channel Markers #16 and #1A no longer exist, however, temporary buoys are in place to mark their locations. This project includes the replacement of these two channel markers and their pertinent signage. Channel Marker 1A will consist of a 16.5" pre-stressed concrete pile, and Channel Marker #16 will consist of a concrete-filled galvanized steel pipe pile.

4.3 PROPOSED FACILITY IMPROVEMENTS

In addition to performing maintenance dredging, the proposed project involves several Facility improvements, including repairing damaged shoreline structures, shoreline erosion mitigation efforts, and beach nourishment. A recommended sequence of work and construction methodologies are offered in Section 3.

4.3.1 Dredged Material Containment Structure and Backfilling

A 415 linear foot DMCS will be constructed to permanently contain fill material within a roughly 5,500 square foot area that has eroded in the southwest portion of the site, and mitigate ongoing erosion. Approximately 130 linear ft of existing Type B Wall will be demolished and removed in preparation for the new sheet pile structure.

The layout of the proposed containment structure is intended to restore the Facility to its originally constructed extents. The structure will consist of driven steel sheet pile topped with a reinforced concrete cap. Steel tie-back anchors will be installed below grade near the western terminus of the structure, to provide anchoring to the portion of the sheet pile near Dredge Area 1. The eroded area behind the containment structure will be filled with dredged material in lifts of specific gradations, separated by non-woven geotextile fabric. The bottom layer of material below mean higher high water (MHHW) will primarily consist of dredged coral

rubble material. The thickness and layout of subsequent lifts will be influenced by the volume and characteristics of the surplus dredge material that is available after fill and beach nourishment have been completed elsewhere on site.

4.3.2 Seawall Repairs

Small, un-grouted rock walls (Type B wall) located along the shoreline of the Facility have developed voids and have partially collapsed in some areas. This wall type is shown in Photograph 6, below. Grouted CRM walls (Type A wall) adjacent to the boat ramp have also degraded and developed voids. This wall type is shown in Photograph 7, below. The existing Type A walls will be repaired via filling of voids, repointing existing mortar, and forming and tremie pouring voids per the project plans and specifications.

The existing Type A and B walls may be partially re-built (as needed), by removing the existing un-reinforced concrete cap and all loose stones above grade, and re-constructing per the project plans and specifications. All voids will be fully grouted, and the walls will be topped with a reinforced concrete cap added as a part of this repair. Repairs to both wall types will include increasing the height of the walls (including the new reinforced concrete cap) by approximately 10 percent to a final post-construction top of wall elevation of +4.7 ft MLLW. The existing Type B wall at the east end of the site is taller, and consequently will be repaired to a corresponding 10 percent increase in height to +5.2 ft MLLW.

Photograph 6, Photo of the Type B Wall East of the Boat Ramp, Looking West, on February 28, 2024 (Photo: Integral Consulting Inc.)

Photograph 7, Photo of the Dilapidated Type A Wall along the East Edge of the Boat Ramp, Looking East, on February 28, 2024 (Photo: Integral Consulting Inc.)

4.3.3 Type B Wall Extension and New Revetment

Toward the east end of the site is a small beach area, approximately 300 ft in length (referred to as "East Beach"). Erosion at both ends of the beach has damaged existing shoreline structures and resulted in the collapse of a portion of the asphalt parking lot on the east end of the beach. This project includes extending the length of the existing Type B wall at the west end of the beach (after it turns towards the mauka direction) by 25 linear ft. Photograph 8, below is of the end of the existing Type B wall.

Photograph 8, Photo of the Terminal End of the Type B Wall Located at the East End of East Beach

At the eastern end of the beach, shoreline erosion has undermined the existing parking area and threatens the adjacent drive aisle. A new revetment will be constructed at this location, extending the length of the existing shoreline armoring in this area by roughly 45 ft. This area is shown in Photograph 9, below.

Photograph 9, Photo of the Dilapidated Wall/Revetment Structure and Shoreline Erosion Area Located at the East End of East Beach

4.3.4 Beach Nourishment

Beach-quality dredged sediment from Dredge Area 7 will be placed along two shoreline locations at the Facility, the "Canoe Launch" area at the west end of the site and "East Beach" located toward the east end of the site. Figure 1 presents the approximate location of these beach fill areas.

Figure 1. Locations of the Two Beach Areas Being Considered for the Placement of Beach Quality Sand from Dredging Operations

Beach nourishment of the canoe launch area will involve placement of beach-quality dredged sand between roughly the -0.5 ft and +4.3 ft contours along approximately 130 linear ft of the existing shoreline. Nourishment of this area is intended primarily to enhance the area being used by traditional Hawaiian canoe paddlers to launch and store canoes, by restoring a carbonate sand beach like what historically existed along the Maunalua Bay shoreline.

At the East Beach area, the existing parking stops (concrete piles laid on their side to prevent the seaward advancement of vehicles) will be adjusted to increase the width of the beach while maintaining the existing parking capacity. Prior to the placement of suitable beach-quality sand along East Beach, coral rubble that has accumulated above the existing natural slope of the beach in this area will be "bladed" toward the mauka edge of the proposed fill template to serve as inner "core" material for the proposed berm/dune feature designed to protect the adjacent parking area from storm surge and wave overwash during high wave and/or water level events. Sand will then be placed along approximately 300 linear ft of shoreline, in accordance with the fill template provided in the project plans and specifications.

4.4 SUMMARY OF ACTION AREA FILL AND IMPACTS

Table 1. Summary of Action Area Fill and Impact Acreages

Fill Type	Volume (Cubic Yards)		Area (Acre)		Length of shoreline (Linear Feet)
	Above MHW	**Below MHW**	**Above MHW**	**Below MHW**	
Shoreline Stabilization[a]*:*	1255	770	0.51	0.11	1151
Canoe Launch Beach Fill:	150	21	0.16	0.03	128
East Beach Fill:	827	6	0.36	0.03	300

[a] Shoreline Stabilization summary includes all shoreline stabilization activities including construction of the DMCS, the new revetment extension, and repairs to existing seawalls.

Table 2. Summary of Action Area Dredging and Impact Acreages

Dredge Area	Volume (Cubic Yards)	Area (Acres)
1	500	0.06
2	800	0.21
2A	250	0.03
3	900	0.17
4	125	0.03
5	150	0.03
6	125	0.03
7	3000	1.10

5 PROPOSED PROJECT SEQUENCE AND METHODOLOGIES

The following subsections summarize recommended methodologies and a sequence of work intended to efficiently manage the various project activities.

5.1 INSTALLATION OF BMPS

The first task to be completed will be the installation of required best management practices (BMPs) including all necessary upland erosion and sediment control devices (e.g., silt fences and filter socks) to prevent sediment-laden runoff from escaping disturbed areas.

A floating turbidity curtain will be deployed between the boat ramp and accreted shoal to the west, to contain any turbidity that may be generated during the installation of the dredged material containment structure. Floating turbidity curtains will also be deployed around active work areas during wall repair work throughout the site. Construction fences shall be installed as necessary to separate areas of active construction from the public.

5.2 DREDGED MATERIAL CONTAINMENT STRUCTURE AND BACKFILLING

Once BMPs are in place and the laydown area has been prepared, construction of the DMCS will proceed. This feature must be constructed prior to dredging so that it is prepared to accept dredged material. The structure will be installed by driving steel sheet piles into the substrate using a vibratory hammer. The Type B wall west of the boat ramp that exists within the footprint of the proposed sheet pile wall will be demolished/removed to facilitate the installation of sheet pile in its place, with rocks from the original Type B wall retained and made available for use in wall repair work throughout the rest of the site. Once the DMCS is installed, the eroded area landward of the structure will serve as a natural dewatering basin and sediment trap during dredged material offload and staging operations. Some grading may be required within the footprint of the proposed fill area to prepare for the arrival of dredged material.

The placement of dredged material behind the DMCS shall be conducted as follows:

- Bottom Layer (below Elevation +1.9 ft MLLW): For areas behind the sheet pile wall that are below the elevation of MHHW (+1.9 ft MLLW), fill material shall consist of coral rubble or other material generally larger than ¾-inch diameter. A non-woven geotextile fabric (Mirafi 180N or approved equal) shall be placed above the (bottom) coral rubble layer, prior to the placement of additional (fine) dredged material above it.

- Middle Layer (between elevation +1.9 ft MLLW to (approximately) +4 ft MLLW): After placement of the non-woven geotextile fabric above the bottom coral rubble layer, the Contractor shall place dredged material containing greater than 10% fines. A second non-woven geotextile fabric (Mirafi 180N or approved equal) shall be placed above this layer, prior to the placement of the top layer of dredged material.

- Top Layer (above approximately +4 ft MLLW): After placement of non-woven geotextile fabric atop the middle layer, the Contractor shall fill the area to the fill template provided in the plans and specifications, which ranges from +4 ft to +5.5 ft MLLW, with dredged material containing less than 10% fines.

Surplus coral rubble material shall be prioritized for use as the top layer of finished grade directly behind (mauka) of the Type A and Type B wall repairs throughout the rest of the site, with any remaining coral rubble placed on the top (finished ground) surface of the area south of the canoe storage on the west end of the Facility.

5.3 WALL REPAIRS

The existing Type B walls east of the boat ramp will be partially re-built, by first removing the existing un-reinforced concrete cap and all loose stones above grade, followed by preparation of the subgrade behind the wall, placement of geotextile fabric, placement of underlayer stones, and placement and grouting of the armor stone. Finally, a steel-reinforced concrete cap will be formed and poured on top of the re-built wall. The end of the Type B wall that turns mauka at the west end of East Beach will be extended by roughly 25 linear ft, maintaining the same cross-section as the rest of the wall. All walls will be repaired to achieve a final top of wall elevation of +4.7 ft MLLW, approximately 10% taller than the existing wall. This work will be completed primarily by hand with the assistance of an excavator. Ideally, Type B wall repairs would begin concurrently with the installation of the DMCS. This would help to ensure that the repairs can quickly utilize stones provided by the demolition of the western-most type B wall, and that sufficient areas behind the repaired walls are ready to receive fill as soon as it becomes available from dredging operations.

The existing Type A walls will be repaired per the project plans and specifications. It may be necessary to complete dredging and sediment removal from the surface of the boat launch ramp at Dredge Area 2 prior to completing Type A wall repairs parallel to the ramp, to expose lower portions of the wall that are currently buried by sediment. Type A wall repairs will include careful excavation of the soil mauka of the walls to allow the installation of Mirafi FW700 woven geotextile (or approved equal) along the mauka face of the wall, extending down to the foundation and then encircling all fill placed behind the wall as shown on the Plans. Following repair of the walls, the area behind the walls will be backfilled and compacted in lifts. For fills

placed within the woven geotextile fabric (Mirafi FW700) wrap behind the wall, material placed below the elevation of MHHW (+1.9 ft MLLW) shall consist of coral rubble or other material generally larger than ¾-inch diameter, and shall be separated from other fills placed above MHHW with a non-woven geotextile fabric (Mirafi 180N or approved equal). Finally, a steel-reinforced concrete cap will be formed and poured on top of the re-built wall.

5.4 MAINTENANCE DREDGING

All dredging will be mechanical dredging, performed via an excavator atop a floating barge. Dredged material will be loaded into a bin on the dredge barge, or into a separate scow. A floating turbidity curtain will be deployed to isolate and fully surround the dredge area whenever active work is occurring. Once full, the barge or scow will be transported to an offload area at the Facility. Dredged material will then be offloaded into a truck or directly placed into the fill area behind the dredged material containment structure, where it will be allowed to dewater and screened and segregated into material stockpiles as necessary (see below).

Dredged Material Stockpiles:

1. Dredge Area 7 Material Stockpile: The Contractor shall stockpile dredged material recovered from Dredge Area 7, expected to be beach-quality sand, in a separate stockpile, to allow additional evaluation and testing prior to placement along the shoreline at the Canoe Launch beach and East Beach areas.

2. Coral Rubble Stockpile: Coral rubble and other sediment larger than ¾-inch in diameter shall be screened using a grizzly screen, a mechanical screener, or an alternative method as accepted by the Engineer, to separate out the larger (coral rubble) material from the rest of the dredged material (e.g., silts, sands). The Coral Rubble Stockpile will be used within specific fill lifts at various locations throughout the Facility as described in sections 3.2 and 3.3.

3. Fine Material Stockpile: To the extent feasible, finer dredged material (dredged material containing MORE than 10% fines) shall be stockpiled separately from dredged material containing higher concentrations of sand. The Fine Material Stockpile will be used within specific fill lifts at various locations throughout the Facility as described in sections 3.2 and 3.3.

4. Coarser Material Stockpile: To the extent feasible, coarser dredged material (dredged material containing LESS than 10% fines) shall be stockpiled separately from dredged material containing higher concentrations of fines. The Coarser Material Stockpile will be used for prioritizing the use of this material type in Facility improvements throughout the site.

5.5 BEACH NOURISHMENT

Beach nourishment activities at the Canoe Area and East Beach will be achieved using excavators and/or loaders. At both beach nourishment locations, suitable dredged material will be placed initially toward the top of the beach profile and pushed toward the water. Mechanized equipment will not be permitted to enter the water at any time during the process.

At East Beach, coral rubble that has accumulated above the existing natural slope of the shoreline (approximately 10:1) will be "bladed" toward the mauka edge of the proposed fill template, to serve as an inner core to the proposed berm/dune feature. The berm/dune feature will begin at the edge of the parking stops and continue up on a 3:1 (horizontal:vertical) slope up to a maximum dune crest elevation of +8 ft MLLW, with a crest width of 5 ft. The slope of fill will then proceed in the seaward direction following a slope of 6:1 (horizontal:vertical).

5.6 NEW REVETMENT AND PARKING LOT REPAIR

At the east end of East Beach, a new revetment structure is proposed to stabilize an eroding area and prevent further damage to the paved parking lot. Erosion control BMPs will be installed as required by the project plans and specifications. Loose stones and debris in the vicinity of the proposed revetment will be removed, followed by preparation of the subgrade behind the revetment, placement of geotextile fabric, placement of underlayer stones, and placement and grouting of the armor stone. This work will be done primarily by hand with the assistance of an excavator. Once complete, the area behind the new revetment will be filled using dredged material, and the subgrade for the parking area repair will be prepared. The parking area will be repaired to its original extents using asphalt. The eastern end of the proposed East Beach fill is intended to overlap with and bury the landward end of the proposed new revetment. As such, the revetment must be completed prior to placing beach fill in that area.

5.7 CHANNEL MARKER INSTALLATION

Channel marker installation will be achieved using an excavator, crane, or similar equipment atop a floating barge. Channel Marker 16, which will consist of a galvanized steel pipe, will be driven into the substrate using an APE 200T vibratory hammer. The pipe will be filled with concrete after driving is complete. Channel Marker 1A, which will consist of a 16.5-inch octagonal pre-stressed concrete pile, will be installed by first pre-drilling the installation location to its designed penetration depth, and then placing the pile into the drilled hole. The annulus around the pile will then be filled with sand and navigation signage will be affixed to the new piles using stainless-steel hardware.

6 AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

The following Best Management Practice (BMPs) and Avoidance and Minimization Measures (AMMs) would be followed to avoid, mitigate, and minimize effects on listed species, designated critical habitat, EFH, and the aquatic resource.

6.1 BEST MANAGEMENT PRACTICES

Standard industry construction BMPs will be followed during implementation of the Project. Specifications and construction notes will be called out on final drawings and be implemented by the construction contractor. At minimum it is expected that upland erosion and sediment control devices, such as silt fences and filter socks, shall be placed along the MHHW line in the western fill area/contractor laydown area. Construction fences shall also be installed as necessary to separate the area from the public. Turbidity curtains will be deployed offshore for shoreline work and will be used to fully encircle all dredging operations. Additional BMPs will be implemented as per final requirements by the City and County of Honolulu for the Grading Permit, as needed to meet sediment and erosion control requirements.

6.2 SEAGRASS TRANSPLANTATION

Efforts to minimize impacts to seagrass, specifically the species of *Halophila hawaiian* and *H. decipiens*, would include attempts to relocate seagrass encountered during dredging. The project team plans to work with the local non-profit organization Malama Maunalua and the selected dredging contractor to incorporate use of the contractor's equipment (e.g., the dredge bucket) to carefully remove the top 6 inches of sediment within areas occupied by sea grass. The sediment and attached seagrass would be placed on an adjacent platform or barge (or similar) where salvageable seagrass would be retrieved for transplant. The seagrass would be kept moist until it can be transplanted. The project team would then attempt to transplant sea grass within a nearby suitable location with similar depth and environmental characteristics as the donor site (as identified by a qualified biologist).

6.3 AVOIDANCE AND MINIMIZATION TO CORAL RESOURCES

Several live corals were identified within areas that may be impacted by proposed dredging operations. Prior to initiating construction activities, these corals would be removed and delivered to Malama Maunalua for their use in ongoing coral restoration research under the purview of their existing permit with the State of Hawaii Division of Aquatic Resources.

6.4 APPLICABLE PAC-SLOPES MEASURES

Relevant measures would be implemented from the Effects of Implementing Standard Local Operation Procures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES) on ESA-listed Sea turtles and Marine Mammals, dated July 2010 (NMFS, 2010). Only measures relevant to the project are included below.

6.4.1 GENERAL CONDITIONS

The DLNR and construction contractor would apply the following set of general conditions during implementation of the Project.

1. Each applicable condition, BMP, and conservation measure would be included as an enforceable part of the permit document.
2. The Corps will retain the right of reasonable access to projects authorized under Pac-SLOPES to monitor the compliance with and effectiveness of permit conditions.
3. Each permit will contain the requirement that the permittee document and report to the Corps and NMFS, all interactions with listed species, including the disposition of any listed species that are injured or killed. Should an ESA-listed species be adversely affected, all work must stop pending reinitiation of consultation between the Corps and NMFS PRD for that action.
4. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of a proposed action.
    a. A responsible party, i.e., permittee/site manager/project supervisor, shall designate a competent observer to survey work sites and the areas adjacent to the proposed action for ESA-listed marine species;
    b. Surveys shall be made prior to the start of work each day, including prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the workday are strongly recommended;
    c. All in-water work will be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and will only begin/resume after the animals have voluntarily departed the area, with the following exception: if ESA-listed marine species are noticed within 50 yards after work has already begun, that work may continue only if, in the best judgment of the responsible party, the activity is unlikely disturb or harm the animal(s), for example, divers performing surveys or underwater work (excluding the use of toxic chemicals) is likely safe, the use of heavy machinery is not; and
    d. No one shall attempt to feed, touch, ride, or otherwise intentionally interact with any protected species.

5. Project footprints must be limited to the minimum area necessary to complete the project.
6. The project area must be flagged to identify sensitive resource areas, such as seagrass beds, listed terrestrial plants, and turtle nests.
7. Work located waterward of the Mean Higher High Tide Line of a navigable water or waterward of the upward limits of adjacent wetlands must be timed to minimize effects on ESA-listed species and their habitats.
8. Project operations must cease under unusual conditions, such as large tidal events and high surf conditions, except for efforts to avoid or minimize resource damage.
9. A storm water management plan, commensurate to the size of the project, must be prepared and carried out for any project that will produce any new impervious surface or a land cover conversion that will slow the entry of water into the soil to ensure that effects to water quality and hydrology are minimized.
10. A pollution and erosion control plan for the project site and adjacent areas must be prepared and carried out. As a minimum, this plan shall include:
    a. Proper installation and maintenance of silt fences, sausages, equipment diapers, and/or drip pans;
    b. A contingency plan to control and clean spilled petroleum products and other toxic materials.
    c. Appropriate materials to contain and clean potential spills will be stored at the work site, and be readily available;
    d. All project-related materials and equipment placed in the water will be free of pollutants;
    e. Daily pre-work inspections of heavy equipment for cleanliness and leaks, with all heavy equipment operations postponed or halted until leaks are repaired and equipment is cleaned;
    f. Fueling of project-related vehicles and equipment will take place at least 50 feet away from the water, preferably over an impervious surface;
    g. A plan will be developed to prevent trash and debris from entering the marine environment during the project; and
    h. All construction discharge water (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated before discharge.
11. Erosion controls must be properly installed before any alteration of the area may take place.
12. Temporary access roads and drilling pads must avoid steep slopes, where grade, soil types, or other features suggest a likelihood of excessive erosion or failure; existing

access routes must be utilized or improved whenever possible, in lieu of construction of new access routes.

13. All disturbed areas must be immediately stabilized following cessation of activities for any break in work longer than 4 days.
14. Drilling and sampling are restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of in an upland location.
15. Authorized work must comply with all applicable NWP General and Regional Conditions.

6.4.2 SPECIAL CONDITIONS:

The Pac-SLOPES Biological Evaluation also evaluates impacts from specific activities that can be reasonably expected to interact directly or indirectly with ESA-listed species. The following Activity Specific Best Management Practices (BMPs) may apply to the Project:

Pac Slopes BMP 5.1. Collision with vessels:

1. Vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.
2. Vessel operators shall reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals, and to 5 knots or less when piloting vessels in areas of known or suspected turtle activity.
3. If approached by a marine mammal or turtle, the vessel operator shall put the engine in neutral and allow the animal to pass.
4. Vessel operators shall not encircle or trap marine mammals or sea turtles between multiple vessels or between vessels and the shore.

Pac Slopes BMP 5.2. Direct physical impact:

1. Before any equipment, anchor(s), or material enters the water, a responsible party, i.e., permittee/site manager/project supervisor, shall verify that no ESA-listed species are in the area where the equipment, anchor(s), or materials are expected to contact the substrate. If practicable, the use of divers to visually confirm that the area is clear is preferred.
2. Equipment operators shall employ “soft starts” when initiating work that directly impacts the bottom. Buckets and other equipment shall be sent to the bottom in a slow and controlled manner for the first several cycles before achieving full operational impact strength or tempo.
3. All objects lowered to the bottom shall be lowered in a controlled manner. This can be achieved by the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.

4. Equipment, anchor(s), or materials shall not be deployed in areas containing live corals, sea grass beds, or other significant resources.

Pac Slopes BMP 5.3. Entanglement:

1. Mooring systems shall employ the minimum line length necessary to account for expected fluctuations in water depth due to tides and waves.
2. Mooring systems shall be designed to keep the line as tight as possible, with the intent to eliminate the potential for loops to form.
3. Mooring lines shall consist of a single line. No additional lines or material capable of entangling marine life may be attached to the mooring line or to any other part of the deployed system.
4. Mooring systems shall be designed to keep the gear off the bottom, by use of a mid-line float when appropriate, with the intent to eliminate scouring of corals or entanglement of the line on the substrate.
5. Any permanent or long-term deployments shall include an inspection and maintenance program to reduce the likelihood of failures that may result in loose mooring lines lying on the substrate or hanging below a drifting buoy.
6. Mooring systems, including those used for temporary markers, scientific sensor buoys, or vessel moorings, shall be completely removed from the marine environment immediately at the completion of the authorized work or the end of the mooring's service life. The only exceptions to this rule shall be mooring anchors such as eyebolts that are epoxied into the substrate and which pose little or no risk to marine life.

Pac Slopes BMP 5.5. Exposure to elevated noise levels:

1. For any equipment used in undertaking the authorized work, the 160 dB and 120 dB isopleths shall not exceed the 50-yard shut-down range for impulsive and continuous sound sources, respectively.
2. Maintenance dredging, in-water excavation, movement of large armor stones, and benthic core sampling shall not be undertaken if any ESA-listed species is within 50 yards of the authorized work, and those operations shall immediately shut-down if an ESA-listed species enters within 50 yards of the authorized work.

6.5 BLANKET SECTION 401 WATER QUALITY CERTIFICATION

The proposed project will follow all relevant conditions of the Blanket Section 401 Water Quality Certification (April 2022).

7 ANALYSIS METHODS

7.1 BIOLOGICAL RESOURCES INVENTORY METHODS

Information about biological resources that could occur within the Action Area was obtained from the following sources:

- NOAA Fisheries Listed Species, Critical Habitat, EFH, and Marine Mammal Protection Act (MMPA) species lists (NOAA Fisheries 2016)
- NOAA Fisheries Critical Habitat shapefiles
- NOAA Fisheries EFH shapefiles
- NOAA Fisheries EFH Mapper (NOAA Fisheries 2020a)
- NOAA Fisheries Environmental Consultation Organizer
- Marine Biological Surveys (2023 and 2024)
- Existing literature as cited in the text.

The above-listed resources were queried to identify all federally and state-listed endangered, threatened, and candidate species and species proposed for listing, as well as designated critical habitat (defined as habitats determined to be essential for the survival of that species) and EFH.

NOAA Fisheries shapefiles were used to map EFH (Enclosure C. Essential Fish Habitat Map) and critical habitat (Enclosure D. Critical Habitat Map) within the Action Area. As these large shapefiles are not accurate on the small scale of the Action Area, the limit of NOAA Fisheries jurisdiction was mapped as the high tide line along the shoreline.

Marine biological surveys within the Action Area were conducted in 2023 and 2024 to document the existing marine resources that may be directly or indirectly impacted by proposed project activities. These surveys were completed by Marine Research Consultants, Inc. Surveying methods, results, and further details on biological resources within or in proximity to the dredging Action Area are included within Enclosure F.

7.2 SEDIMENT INVESTIGATIONS FOR PROPOSED BEACH NOURISHMENT

In support of proposed beach nourishment activities that would involve the placement of suitable dredged material along the existing beaches at the Canoe Launch Area and East Beach, sediment samples from areas proposed for dredging were compared against sediment samples collected from the proposed beach nourishment locations. Sediment samples obtained from each site were sent to Geolabs, Inc. for analysis of grain-size distribution

analyses per ASTM D-1140-92 “wet sieve” technique, and further evaluated for compatibility in accordance with the State of Hawaii guidelines.

After reviewing the results of the grain size analyses, it was determined that only the material sampled from Dredge Area #7 appeared to be appropriate for consideration for beach placement based on the requirements set forth in the “Instructions for General Application, Category II, Small-Scale Beach Nourishment Projects (SSBN)” provided by the State of Hawaii Office of Conservation and Coastal Lands (OCCL).

As a requirement of the project during construction, material dredged from Dredge Area #7 will be segregated and stockpiled separately from other dredged material. Dredged material from Area #7 will then undergo additional testing to ensure compatibility with the proposed receiving beach areas, in consultation with DLNR-OCCL.

8 SPECIES OCCURRENCE, ACCOUNTS, AND PROTECTED HABITATS

8.1 PROTECTED SPECIES WITH NO POTENTIAL FOR OCCURRENCE

Due to lack of suitable habitat and/or lack of range overlap, some of the known regionally occurring special-status are not expected to occur within the Action Area. The Action Area is limited to the near-shore and shallow environment; many regionally occurring species are pelagic and are rarely found in proximity of Hawai'ian shoreline (Table 2).

North Pacific right whales calve and mate in coastal waters, however, its presence in Hawaii is uncommon and generally understood to be the southern extreme of its typical distribution (Rowntree, et al., 1980; Salden and Micklesen, 1999; Brownell et al., 2001). Giant manta rays have been documented at shallow depths, however occurrence in shallow areas is limited to cleaning stations in offshore reefs (O'Shea et al., 2010; Marshall et al., 2011; Rohner et al., 2013). Leatherback, olive Ridley, and loggerhead sea turtles are not known to nest on the Hawai'ian Islands and are rarely observed within Hawai'ian waters (Balazs, 1978).

The coral, *Acropora globiceps,* is known to occur in shallow waters. The Action Area has been surveyed for corals. *A. globiceps*, were not observed within dredge extent during pre-dredge surveys.

Table 3. Special-Status Wildlife Species with No Potential to Occur in Action Area

Species Common Name	FESA Listing	Listing Citation and Date	Habitat Designation	Potential to Occur in the Action Area
Blue Whale *Balaenoptera musculus*	Endangered	35 FR 8491; June 2, 1970	N/A	Not anticipated; pelagic
False Killer Whale – Hawai'ian Insular *Pseudorca crassidens*	Endangered	79 FR 42687; July 23, 2014	None within the AA	Unlikely; Prefer ≥25 fathom depth
Fin Whale *Balaenoptera physalus*	Endangered	35 FR 8491; June 2, 1970	N/A	Not anticipated; pelagic
Sei Whale *Balaenoptera borealis*	Endangered	35 FR 8491; June 2, 1970	N/A	Not anticipated; pelagic
North Pacific Right Whale *Eubalaena japonica*	Endangered	35 FR 8491; June 2, 1970	N/A	Rare in Hawai'ian waters
Sperm Whale *Physeter macrocephalus*	Endangered	35 FR 8491; June 2, 1970	N/A	Not anticipated; pelagic
Leatherback Turtle *Demochelys coriacea*	Endangered	35 FR 8491; June 2, 1970	N/A	Not anticipated; pelagic
North Pacific DPS Loggerhead Turtle *Caretta caretta*	Endangered	76 FR 58868; September 22, 2011	N/A	Not anticipated; pelagic

Species Common Name	FESA Listing	Listing Citation and Date	Habitat Designation	Potential to Occur in the Action Area
Olive Ridley Turtle Pacific DPS *Lepidochelys olivacea*	Threatened	79 FR 42687; July 23, 2014	N/A	Not anticipated; pelagic
Giant Manta Ray *Manta birostris*	Threatened	82 FR 2916; January 22, 2018	N/A	Not anticipated; pelagic
Oceanic Whitetip Shark *Carcharhinus longimanus*	Threatened	83 FR 4153; January 30, 2018	N/A	Not anticipated; pelagic
Coral *Acropora globiceps*	Threatened	79 FR 53852; September 10, 2014	N/A	Not found in previous surveys

Similarly, due to a lack of suitable habitat and/or lack of range overlap, some of the known regionally occurring special-status terrestrial species are not expected to occur within the Action Area (Table 3).

Table 4. Upland Special-Status Wildlife Species with no Potential to Occur in Action Area

Species Common Name	FESA Listing	Listing Citation and Date	Habitat Designation
Hawai'ian Hoary Bat *Lasiurus cinereus semotus*	Endangered	35 FR 16047; October 13, 1970	No Critical Habitat
Band-rumped Storm-petrel, Hawai'ian DPS *Hydrobates castro*	Endangered	81 FR 67786; September 30, 2016	No Critical Habitat

Species Common Name	FESA Listing	Listing Citation and Date	Habitat Designation
Hawai'ian Common Gallinule *Gallinula galeata sandwicensis*	Endangered	32 FR 4001; March 11, 1967	No Critical Habitat
Alae ke'oke'o, Hawai'ian Coot *Fulica alai*	Endangered	35 FR 16047; October 13, 1970	No Critical Habitat
Hawai'ian duck *Anas wyvilliana*	Endangered	32 FR 4001; March 11, 1967	No Critical Habitat
Hawai'ian Petrel *Pterodroma sandwichensis*	Endangered	32 FR 4001; March 11, 1967	No Critical Habitat
Hawai'ian Stilt *Himantopus mexicanus knudseni*	Endangered	35 FR 16047; October 13, 1970	No Critical Habitat
Newell's Shearwater *Puffinus newelli*	Threatened	40 FR 44149; September 25, 1975	No Critical Habitat
Short-tailed Albatross *Phoebastria albatrus*	Endangered	65 FR 46643; July 31, 2000	No Critical Habitat
Ihi *Portulaca villosa*	Endangered	81 FR 67786; September 30, 2016	No Critical Habitat

8.2 PROTECTED SPECIES WITH POTENTIAL TO OCCUR WITHIN ACTION AREA

The remaining four (4) regionally known special-status species with protected status addressed within this document have the potential to occur within the Action Area. These species are further discussed in the following sections (Table 4).

Table 5. Special-Status Wildlife Species with Potential to Occur in Action Area

Species Common Name	FESA Listing	Listing Citation and Date	Habitat Designation
Honu, Green Sea Turtle *Chelonia mydas*	Endangered	81 FR 20057; April 6, 2016	N/A
Honu'ea, Hawksbill Sea Turtle *Eretmochelys imbricata*	Endangered	35 FR 8491; June 2, 1970	N/A
Koholā, Humpback Whale *Megaptera novaeangliae*	Protected under MMPA	N/A	National Marine Sanctuary (NOAA Fisheries)
ʻĪlio holo i ka uaua, Hawai'ian Monk Seal *Neomonachus schauinslandi*	Endangered	41 FR 51611; November 23, 1976	Critical (Marine, not Terrestrial)

8.2.1 Honu, Green Sea Turtle

Honu, GST (*Chelonia mydas*), grow up to about 1 meter in shell length and up to 200kg in total weight. The term "green" can be misleading, as the external appearance of GST is closer to colors of light to dark brown, with hints of olive. The "green" is in reference to its green fat, which is a result of its vegetative diet. As for juvenile GST, their appearance consists of black dorsal and white ventral surfaces (Carr, 1952).

GST seem to navigate far distances as they have documented nesting sites globally, though their actual pelagic behavior is not fully understood (Groombridge and Luxmoore, 1989). GST are known to inhabit largely in shallow coastal waters. GST are coastal foragers, primarily preying on a broad variety of algae and seagrasses; however, some populations forage heavily on invertebrates (Carballo et al., 2002). Though GST reproduction is not fully understood, the conditions pertaining to GST coastal foraging areas have been reported to affect GST reproduction timing (Limpus and Nicholls, 1988; Solow et al., 2002). GST prefer sandy beaches with intact dunes and native vegetation for nesting and egg development (Hirth, 1997; Ackerman, 1997).

Occurrence in the Action Area

The GST is the most common sea turtle to be observed throughout the Hawai'ian Islands, though approximately 90% of GST mating and breeding occurs in Northwestern Hawai'ian Islands (NWHI) (Aki et al., 1994). As such, there is a low potential for occurrence within the Action Area.

8.2.2 Honu'ea, Hawksbill Sea Turtle

Honu'ea, the HST (*Eretmochelys imbricata*) are notable for their hawk-like beak and their "tortoiseshell" patterned shell. HST tend to inhabit coral reef ecosystems, though have been documented to utilize estuaries and seagrass beds when peripheral to corals (Witzell 1983; Musick and Limpus 1997; Bjorndal and Bolten 2010). In the Indo-Pacific, HST are notably omnivorous, foraging on algae, soft corals, sponges, and invertebrates (Bjorndal 1997; Whiting and Guinea 1998).; Bell 2012).

HST are found globally, inhabiting up to 108 countries. The migratory behavior of HST is not fully understood, as in some cases HST are known to migrate up to 2,000 km, while in some instances HST travel is limited locally, particularly those which happen to be tagged in more geographically isolated island chains such as Hawaii or Seychelles (van Dam et al. 2008; Moncada et al. 2012; Parker et al. 2009; Mortimer and Balazs 2000). An HST tagged in Samoa had been documented to travel up to 4,500 km, until transmission had ceased (SPREP 2007). It is suspected that distance traveled for HST is likely reflective to availability for foraging grounds, those in isolated areas would be put to risk to find new foraging sites (Marcovaldi et al. 2012).

Occurrence in the Action Area

HST tend to favor the main Hawai'i over the northwestern Hawai'i Islands, primarily on Molokai and Hawai'i (main island) (Hawai'ian Sea Turtle Recovery Team, 1992). As such, there is a low potential for occurrence within the Action Area.

8.2.3 Koholā, Humpback Whale

Koholā or humpback whales are large baleen whales (~14-15 m length), typically identified by their dark dorsal and while ventral coloration, large pectoral flippers, and distinctive flukes (Bettridge et al. 2015). Moreover, they emit distinctive songs which can be heard up to twenty miles in distance and for as long as 20 minutes in length (Clapham and Mattila 1990; Cato 1991).

Humpback whales have defined feeding and breeding seasons, traveling towards colder, temperate waters for feeding and to tropical waters for breeding, as well as calving. At wintering grounds, humpbacks are notable for aggressive competition between males for mating. This competition for mating largely attributes to high instances of physical contact, thrashing, chasing, song display, and bubble display (Bettridge et al., 2015).

Humpback whales have a broad geographical range, spanning all oceans and ranging from tropical to waters close to freezing point (Bettridge et al., 2015). Although humpback whales are monotypic, there are many genetically distinct breeding populations that follow predictable migration patterns; Currently NMFS identifies 14 DPS for humpback whales, one specific to Hawai'i. Genetic analyses attribute the Hawai'i DPS to be highly distinct from others.

This DPS can be found to migrate to most parts of the North Pacific, however they show a particular preference to the Northeast Pacific (Alaska to British Columbia). It is estimated for Hawai'i to winter up to 10,000 humpbacks each year, comprising slightly over half of all North Pacific humpbacks (Calambokidis, et al. 2008). All of the Hawai'ian islands are utilized by humpbacks for breeding, hence the creation of the Hawai'ian Islands Humpback Whale National Marine Sanctuary in 1992 by the U.S. Congress. The Hawai'ian DPS inhabit the Hawai'ian Islands generally from fall into spring, with a particular peak in the winter (Baker & Herman, 1981; Herman & Antinoja, 1977). It is during this period when the Hawai'ian DPS is known to mate and calve near-shore (Dawbin, 1966). The wintering Hawai'ian DPS are often inhabiting near-shore environments shallower than 183 m (Herman et al., 1980; Baker and Herman 1981).

Occurrence in the Action Area

Should a rare individual approach or enter the Action Area, outlined AMMs (section 6.4) will protect against take of humpback whales.

8.2.4 'īlio holo i ka uaua, Hawai'ian Monk Seal

'Īlio Holo I Ka Uaua, the HMS, are endemic to the Hawai'ian Islands, with majority residing in the Northwestern Hawai'ian Islands, though HMS are found and known to birth on the main Hawai'ian islands as well (Baker and Johanos, 2004). HMS, like many seal species, require both terrestrial and marine habitat. Isolated, sandy shorelines protected by near-shore reefs are preferred for birthing and nursing early young, however HMS have been known to utilize all varieties of Hawai'ian coastal environments for landing (Westlake and Gilmartin, 1990). HMS birthing occurs year-round, though there is a peak in occurrence during March to April (Johnson and Johnson, 1980; Johanos et al., 1994).

Much more of life for HMS occurs within the ocean, where they are known to rest, forage, travel, and interact socially (Parrish et al., 2000). The HMS diet is broad and sourced from the sea floor, preying upon primarily fishes, though also considerable amounts of cephalopods and crustaceans (Goodman-Lowe, 1998). HMS are also notably solitary in nature and tend to only gather in small groups of other HMS.

Occurrence in the Action Area

The majority of HMS (approximately 1200 individuals) are based in the Northwestern Hawai'ian Islands, while approximately 400 individuals are known to inhabit the main islands (NOAA Fisheries website).

8.3 DESIGNATED CRITICAL HABITAT WITHIN ACTION AREA

The Action Area exists within designated critical habitat for the Hawai'ian Monk Seal. Hawaiian monk seal critical habitat areas surrounding Kauai, Oahu, Maui Nui (including Kahoolawe, Lanai, Maui, Molokai), and Hawaii are defined in the marine environment from the water's edge (MLLW) seaward to a 200-meter depth boundary, including the seafloor and all subsurface waters and marine habitat within 10 meters of the seafloor. Seven islets (near Oahu and Maui Nui) and numerous coastal locations (identified as lines in a separate dataset) around the MHIs have critical habitat designated from the water's edge into the terrestrial environment where the boundary extends inland 5 meters (in length) past the shoreline. The shoreline is described by the upper reaches of the wash of the waves, other than storm or seismic waves, at high tide during the season in which the highest wash of the waves occurs, usually evidenced by the edge of vegetation growth or the upper limit of debris. In locations where critical habitat does not extend inland to the terrestrial environment, the designation boundary is the MLLW line.

9 EFFECTS OF THE ACTION

As required by Section 7(a)(2) of the FESA, when a federal agency's action "may affect" a listed resource under the jurisdiction of the Services, that agency is required to consult with the Services. If the action agency concludes that the project is "not likely to adversely affect" listed species and critical habitat, then it submits a request for informal consultation with the Services for concurrence. Further, Section 9 of the FESA and federal regulation, pursuant to Section 4(d) of the FESA, prohibit the take of federally listed species, without special exemption.

Within the federal regulations, "take", as defined under the federal ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC §1538; endangered species: 50 CFR §17.21 (c); threatened species: 50 CFR §17.31 (a)). Harm is further defined by NOAA Fisheries as an act that kills or injures fish or wildlife. Such an act may include *significant* habitat modification or degradation that kills or injures fish or wildlife by *significantly* impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR §222.102).

Potential direct and indirect habitat loss (including consideration of duration) from the proposed action (i.e., the Project) are discussed below by type of ecological effect expected and the activity causing the potential effect. Effects are considered for each species with the potential to occur within the Action Area. In-water construction activities and how avoidance and minimization measures (e.g., best management practices [BMPs]) minimize these effects are included as a part of the project description (see Section 6).

9.1 BENEFICIAL EFFECTS

Much of the anticipated dredge path is populated with highly invasive algae species, *Gracilaria salicornia* and *Avrainvillea lacerata.* Dredging areas where these algae are present, while simultaneously avoiding or relocating *Halophila* sp. should enable *Halophila* to begin to outcompete invasive algae locally.

Transplantation methods for *Halophila sp*. are highly understudied, largely due to lack in funding and resources dedicated to native seagrass transplantation. As a part of the project, it is proposed that *Halophila* within the dredge path be relocated approximately 5-10 ft away (see Section 6.2) from impact locations. The Project team would work in association with local groups with seagrass transplantation experience, such as Malama Maunalua and the State of Hawaii DLNR Division of Aquatic Resources, to devise a method of transplanting native seagrass with the use of a modified excavator. Techniques using a modified excavator are not yet tested, however, this project provides an opportunity to test a novel transplantation technique using mechanical equipment.

Successful replanting of *Halophila* would provide long-term benefits, as impacts to *Halophila* would be minimized for the current project and a potential new method of seagrass transplantation would be tested for future dredging efforts across Hawai'i.

Beach nourishment project components are expected to create larger, more accessible space for beach recreation. Both beach nourishment and improvements to the existing seawall would also buffer against adverse effects from sea level rise and would reduce dredge frequency in the future.

9.2 EFFECTS ASSOCIATED WITH DREDGING

Dredging activities could result in both direct and indirect effects within the Action Area. Potential indirect effects associated with dredging could include degradation of water quality (e.g., turbidity) and disturbance of fish habitat.

9.2.1 Water Quality

Dredging equipment can result in temporary increases of suspended sediment within the water column which has the potential to impact water quality in the immediate vicinity of the activity. Bottom sediments become suspended as the bucket contacts the sediment surface and when material washes from the top and sides of the bucket as it passes up through the water column. Additional sediment is introduced into the water column as the bucket breaks the water surface or materials spill during barge loading.

Increased turbidity, which would only occur during active dredging and channel marker replacement, would be minor, short-term, and localized to the immediate work area. Effects of increased turbidity on listed species would be minimized through implementation of avoidance measures that prescribe suspended sediment containment, such as use of a turbidity curtain. Within the turbidity curtain, suspended sediments disturbed through dredging are expected to settle quickly and return to ambient levels.

9.2.2 Habitat Disturbance

Disturbance of Maunalua Bay floor substrate, largely that which is foraging habitat, is expected to be minor, relatively short-term, and limited within focused dredging areas. Moreover, *Halophila* ssp. contributing to this habitat is anticipated to be relocated within 5-10 ft from its original location. As the listed species are anticipated to occur in low abundance and use habitat for foraging only, disturbance within the Action Area is expected to only result in temporary displacement of species during construction and is not anticipated to result in long-term habitat disturbance.

Dredging would disturb and remove benthic invertebrates and the substrate they use, temporarily reducing the diversity and productivity of benthic habitat within the Action Area. Recolonization of benthic habitat following dredging is controlled by many physical and ecological factors including site-specific bathymetry, hydrodynamics, depth of deposited sediment, the spatial scale of the disturbance, substrate type, and the timing and frequency of the disturbance (Wilber and Clarke 2001). The proposed dredging and channel marker replacement design is not expected to change factors that affect benthic recolonization (i.e., primarily sedimentation rates) within the Action Area. Additionally, large areas of undisturbed substrate would surround the dredged area, and therefore colonization through adult immigration from surrounding undisturbed areas would facilitate habitat recolonization.

The proposed project will cause minor impacts to biological resources in the project areas. Specifically, two small, roughly fist-sized coral colonies (*P. damicornis*) exist in dredge areas #2 and #3, and five small (< 10cm) coral colonies (*P. damicornis*) exist attached to the existing damaged channel marker #16. The coral colonies within the dredge areas will be removed prior to dredging and provided to the local non-profit organization Malama Maunalua for their ongoing coral restoration and research activities within Maunalua Bay. The coral colonies attached to the submerged damaged channel marker cannot be transplanted due to their secure attachment to the pile, and likelihood of damage if removal were attempted. The project intends to not disturb the corals on the damaged channel marker by leaving the existing channel marker in place along the seafloor in its current location. However, if it is determined that leaving the old pile will pose a navigational hazard to boaters, it will be removed.

There are also three dredge areas within which native seagrass (*Halophila spp.*) is present (dredge areas #1, #5, and #7). The cumulative expected impacts to seagrass due to dredging within these areas is 1,324 square ft (0.03 acres). Given the Action Area already experiences repeat routine disturbance associated with vessel use, and natural sediment transport, the current benthic community is expected to be well adapted to frequent disruption and is therefore expected to return to pre-dredge condition quickly.

9.3 HYDROACOUSTIC EFFECTS

9.3.1 Pile Driving

Pile driving would be required for two purposes: installation of sheet pile wall for the DMCS and installation of new channel markers. Pile driving has the potential to result in the incidental take of both marine mammals and fish. Different methods of pile driving (vibratory versus impact hammer) produce different types of sound. Further, the material and size of the pile being installed affects the noise generated. Pile driving can produce high-intensity noise resulting in damage to soft tissues, such as swim (gas) bladders or eyes (barotraumas), and/or result in harassment of fish and marine mammals such that they alter swimming, sleeping, or foraging behavior or temporarily abandon forage habitat.

The striking of a pile by a pile-driving hammer creates a pulse of sound that propagates through the pile, radiating out through the water column, seafloor, and air. Vibratory pile drivers work on a different principle from pile-driving hammers and produce a different sound profile. A vibratory method of installation induces particle motion to the substrate immediately below and around the pile, causing liquefaction of the immediately adjacent sediment and allowing the pile to be pushed downward. Sound levels are typically 10 to 20 dB lower in intensity relative to the higher, pulse-type noise produced by an impact hammer (Caltrans 2015, Caltrans 2020).

The only pile driving operations proposed with this project involve the use of the vibratory method in conjunction with the installation of the DMCS. General Condition 4 would ensure no listed marine mammals are within the work area during installation of piles (see Section 6.4.1). This, in addition to other AMMs, and restricted vibratory installation methods, would minimize the effects of pile installation on the species within the Action Area.

9.3.2 Dredging

Underwater noise generated by dredging activities originates primarily from the bucket, dredge equipment mechanisms, and sounds generated by the engine and propeller of the vessel. The active waterfront within the Action Area supports extensive vessel traffic including frequent recreational use. Typically, dredging does not generate noise that would rise to levels that would result in hearing loss, physical injury, or mortality of fish. Noise generated by dredging operations may result in behavioral changes including startle, avoidance of the area in which dredging is occurring, or the departure of fish from the immediate vicinity of the activity. As such, it is not expected that dredging would generate noise levels that would result in injury or mortality or would produce higher than typical background noise within the Action Area.

9.4 EFFECTS ASSOCIATED WITH FACILITY IMPROVEMENTS

The proposed project includes measures to stabilize eroding shorelines of the Facility and beneficially reuse dredged material from maintenance dredging activities. At the western end of the Facility, the unprotected south-facing shoreline has experienced erosion resulting in the loss of public recreation area. The proposed DMCS would restore the site to previous extents and stabilize the shoreline from future erosion. Existing seawalls throughout the remainder of the Facility would be repaired to prevent ongoing shoreline erosion occurring behind the structures and prevent eroded soil and sediment from entering and potentially depositing in the adjacent navigation channel. Structures at each end of East Beach would be extended to prevent the continued shoreline erosion at these locations, and minimize impacts associated with future sea level rise. Sand from dredging activities deemed suitable for beach placement will be deposited at the Canoe Launch beach and East Beach to restore these beach areas, help to preserve the beach under the impacts of future sea level rise, and support recreational activities.

An assessment was completed to evaluate the effects of these proposed shoreline stabilization activities on the hydrology and geomorphology characteristics of the Action Area, including the surrounding sediments, intertidal and subtidal areas, and adjacent and nearby shorelines. The sections below provide an overview of the analysis and present the findings for each proposed action.

9.4.1 Hydrodynamic Modeling and Observational Data

In support of the effects evaluation, a coupled hydrodynamic and wave model was developed for the site to evaluate tidal, wind, and wave conditions that drive flow within the bay and harbor system. The model was developed using the open-source suite of modeling tools maintained by Deltares, Inc. The hydrodynamic model was developed using DFlow-FM, an unstructured hydrodynamic modeling software that resolves the changes in water levels, current velocities, and bed forces due to local tidal circulation. The hydrodynamic model was coupled with the third-generation wave model Simulating Waves Nearshore (SWAN). The model grid for the hydrodynamic model extends into the interior waters of the Hawaii Kai Marina to ensure appropriate representation of the tidal prism, while the wave model encompasses only the outer Maunalua Bay. Bathymetric data used included surveys conducted by Shoreline Science & Engineering, LLC between 2017 to 2023, and was supplemented by 2013 LiDAR. The model grid elevations and modeling domain are presented in Figure 2.

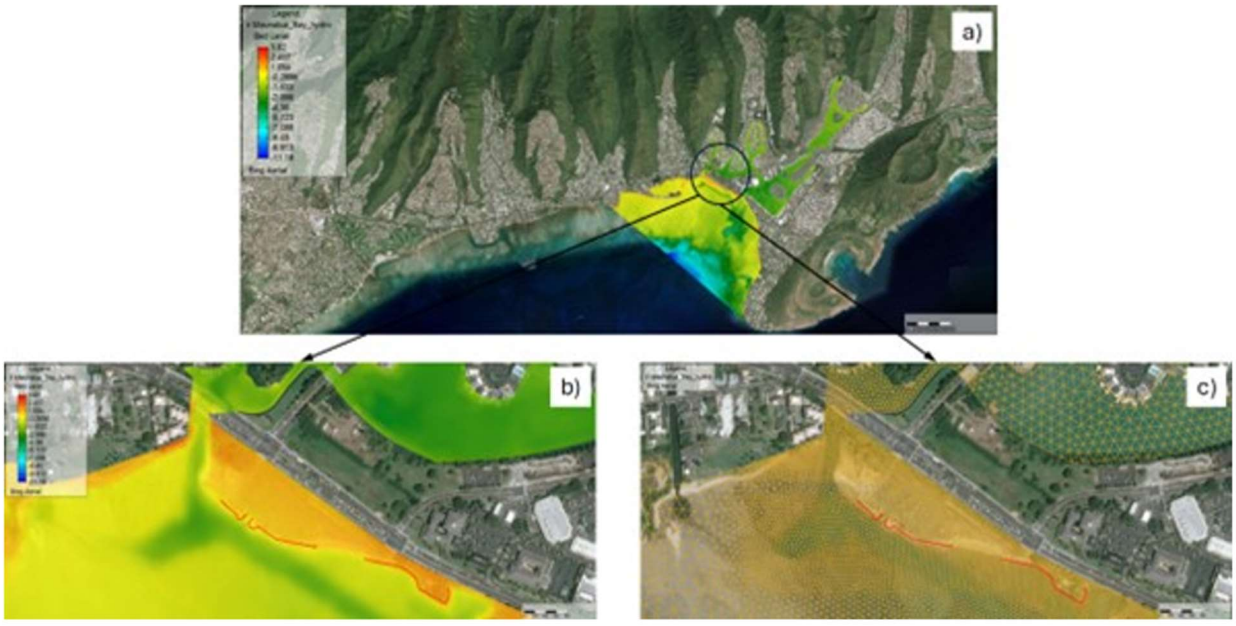


Figure 2. Hydrodynamic model grid extents (A) bathymetry around the Facility (b), and grid resolution and existing shoreline structures in red (c).

Boundary conditions for water levels were derived from the NOAA tidal gage at Honolulu (station ID 1612340) and wave measurements were obtained from the USACE's Wave Information Studies, Station 83354. Model calibration and validation were provided by a Nortek 2 MHz Acoustic Doppler Profiler that was deployed in March 2024 just offshore of the Facility's western end, and a Hohonu water level sensor within the project vicinity previously installed in support of the project. Model evaluation and interpretation were conducted relative to a conceptual site model informed by local knowledge and observations within the system. Modeling did not take into consideration permeability of existing structures or stormwater runoff due to local rainfall.

Two different modeling scenarios were selected to represent a range of remotely forced and locally generated wave conditions that could potentially impact the project area. Scenario 1 included typical day-to-day conditions where easterly tradewinds are the driving force of coastal hydrodynamics. Scenario 2 represented conditions that may be expected during a large south swell wave event. Hurricane Iniki (1992) was selected as the boundary conditions for the extreme swell event with maximum wave heights of 5.17 meters, a period of 11.75 seconds, and a direction of 193 degrees, or south-southwest. The SWAN model was applied using the propagation and generation mode to enable both ocean waves and locally generated waves to transform over the bathymetry within Maunalua Bay.

Outcomes from the model included a range of wave heights, current velocities and circulation patterns. The interaction of waves and currents on bed shear stress was also computed. Model results demonstrated that very little of the offshore wave energy reaches the project shoreline at the Facility. The fringing reef and shallow depths are effective at dissipating the energetic waves propagating from the Pacific Ocean.

9.4.2 Hydrologic and Gemorphologic Effects

Due to the complex and dynamic nature of coastal environments, it is essential to conduct a detailed assessment of environmental impacts when proposing any type of construction within the shoreline zone. Shorelines are characterized by complex interactions between land, sea, and atmospheric processes – and these interactions shape coastal geomorphology and hydrodynamics and influence ecosystems, coastal habitat, built infrastructure, and human activities.

Construction projects that involve shoreline armoring (e.g., seawalls or rock revetments) can alter natural coastal processes and, without a thorough analysis, can lead to unforeseen consequences on both the immediate and surrounding areas. For example, shoreline armoring can lead to increased erosion of nearby shorelines by altering circulation patterns and transport mechanisms, or cause changes to coastal ecosystems by altering current flows or bed shear stress. The process of beach nourishment can also adversely impact the surrounding environment if the physical characteristics of the source material and receiving beach are not

carefully evaluated and beach fill designs are informed by site-specific conditions and hydrodynamic processes.

The following sections apply the results of the hydrodynamic modeling and site analysis to provide an overview of anticipated effects for each element of the proposed Facility Improvements.

9.4.2.1 Dredged Material Containment Structure

Most of the exposed shoreline along the Facility is protected from shoreline erosion by a series of seawalls originally constructed in the 1990s. A notable exception is along the south-western corner of the Facility, where the lack of shore protection measures has resulted in chronic erosion of the shoreline and resulted in the loss of approximately 0.25 acre of public recreation area. The proposed DMCS is intended to stop future erosion of this area and restore the eroded area to a usable condition.

Evaluation of the coupled hydrodynamic and wave models described above indicate that construction of the DMCS would have a minimal impact to hydrodynamic and geomorphologic processes. The broad fringing reef and shallow depths offshore of the site are effective at dissipating the energetic waves forced in the Pacific Ocean. Modeling also showed that local wind generated waves that develop within the bay are not effective at producing large waves at the Action Area.

To assess the maximum potential impact after construction of the DMCS, the hydrodynamic model was used to compare wave heights, current velocities, and bed shear stress for existing and post-construction conditions during a historic Category 4 hurricane (Hurricane Iniki, 1992). This high wave height storm event produced offshore significant wave heights of over 5 meters, and modeling results showed these peak wave heights translated to wave heights just offshore of the DMCS of 0.5 meters without the structure, with a 0.10-meter increase (for a total significant wave height of 0.6 meters) after construction of the DMCS. Figure 3 presents the change in wave height between the existing and proposed conditions under the extreme storm event scenario. As can be seen in the figure, the zone of influence where wave heights are increased are limited to the immediate area just offshore of the structure.

The limited effects of the DMCS on local wave forcing combined with the shallow depths existing just offshore of Kuli'ou'ou Beach Park and adjacent shoreline result in no anticipated effects to that shoreline. Similarly, based on the modeling results Canoe Launch beach directly to the north of the DMCS is not anticipated to see an increase in wave heights due to wave refraction or diffraction. The western end of the DMCS would however be expected to "anchor" in place the Canoe Launch beach and aid in beach preservation under scenarios of future sea level rise. Adjacent shoreline areas to the east of the DMCS are already armored with existing seawalls and would not be impacted by the proposed structure.

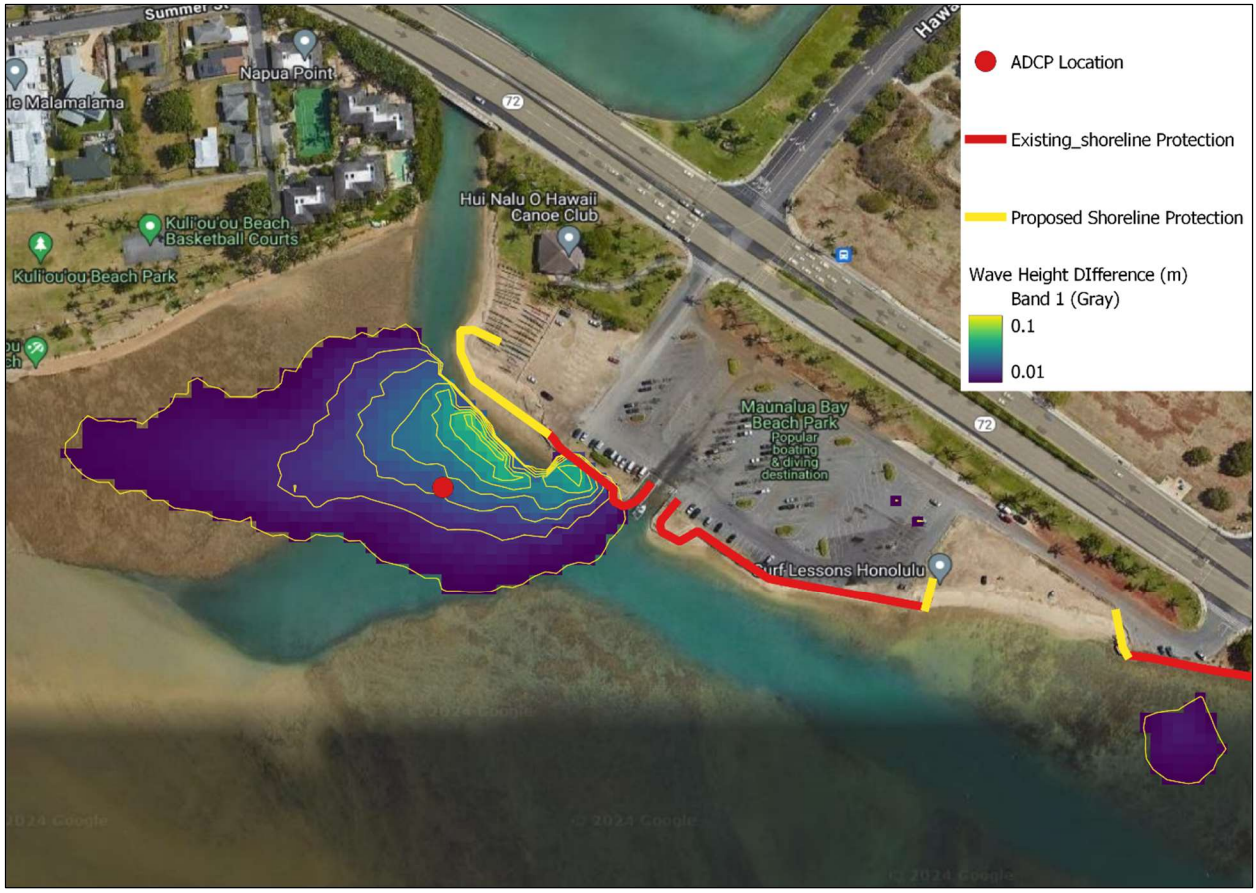


Figure 3. Changes in wave height due to proposed Dredged Material Containment Structure.

To evaluate the potential effects of the DMCS on coastal habitat and ecosystems, the hydrodynamic model was used to assess the project effects on current velocities and bed shear stress. Model results showed negligible impact during typical site conditions where ocean forcing is dominated by trade wind waves. For the extreme condition using the historic Hurricane Iniki as boundary conditions, model results demonstrated that changes in velocities and bed shear stress would be primarily limited to the areas of very shallow depths on either side of the navigation channel, with minimal impacts to the seafloor within the navigation channel where depths support seagrass habitat. Figure 4 presents the shear stress difference during the extreme storm scenario for with and without the proposed DMCS.

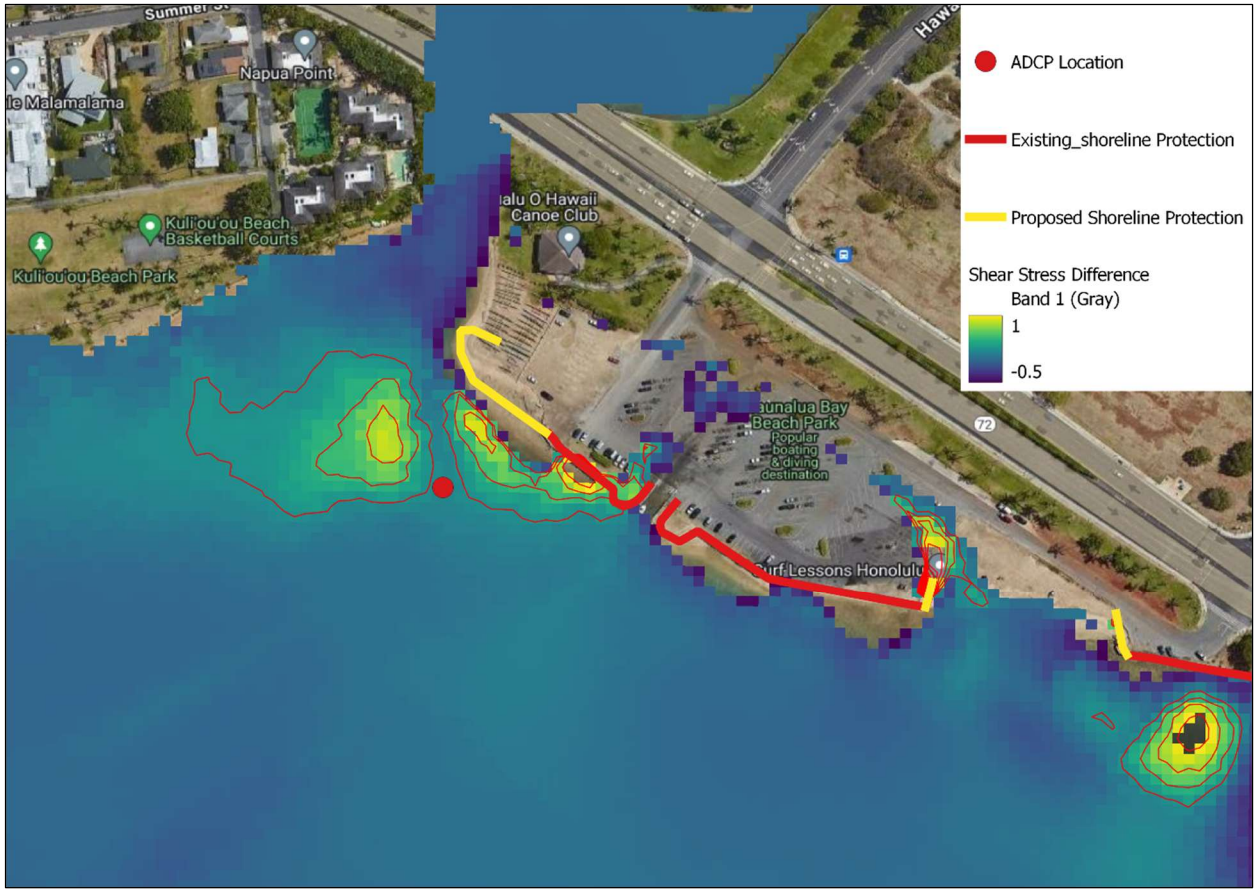


Figure 4. Difference in bed shear stress during Hurricane Iniki due to the proposed Dredged Material Containment Structure.

9.4.2.2 Seawall Repairs

Under existing conditions waves frequently pass through voids in the dilapidated seawalls, exacerbating shoreline erosion behind the walls. During high wave or water level events, overtopping of the seawall further contributes to scour at these structures. As water recedes, soil and sediment that is eroded from behind the walls is carried by natural processes into the adjacent navigation channel, where it has the possibility of adversely impacting seagrass habitat and worsening navigation conditions within the channel. Additionally, sediment-laden stormwater runoff from the rest of the Facility (which all slopes down to the shoreline) is also allowed to pass through the existing walls into Maunalua Bay under existing conditions.

The proposed repairs to existing seawalls that line the majority of the Facility's shoreline are designed to rehabilitate damaged portions of the wall while staying within the original footprint of the original structures. The repairs to the existing structures will not affect coastal hydrodynamic and sediment transport processes in the channel or have the potential to affect the geomorphology of adjacent or nearby shorelines. However, the repairs will alleviate chronic

issues of sediment erosion and scour behind the structures during high wave and water level events. Failing to implement wall repairs has the potential to adversely affect existing seagrass habitat that may be otherwise smothered by the continued deposition of sediment within the channel.

9.4.2.3 Type B Wall Extension and New Revetment

"East Beach" consists of an unnatural headland-bay shoreline where rock seawalls on either side of the beach serve as artificial headlands connected by a concave-shaped beach of sand and coral rubble. On both ends of the beach, shore-parallel seawall structures turn 90 degrees towards the shoreline and continue for several feet, however, terminate within the active shore zone. The length of these "turn-back" features have proved to be inadequate, leaving adjacent shoreline areas vulnerable to scour and increased erosion through a process commonly referred to as "end-effects". At the east end of the beach, the shoreline has been severely eroded resulting in the loss of several vehicle parking stalls. At the west end of the beach, erosion has been less severe, however, scour around the end of the seawall structure has caused its terminal end to fail. Without further intervention, erosion at both the east and west ends of East Beach would be expected to worsen with sea level rise and the continued degradation of the dilapidated structures.

To stabilize the shoreline at the east end, the proposed project includes construction of a rock revetment that would tie into the existing seawall structure and continue landward in a direction perpendicular to the beach for approximately 45 ft. Dredged material would serve as fill material behind the revetment, and the parking area would be restored to its original configuration. At the west end of the beach, the project includes extending the existing Type B seawall approximately 20 ft in the landward direction. The landward end of both the wall extension and new revetment would be buried beneath the berm crest of the existing beach, and topped with additional fill from beach nourishment activities.

Given that the locations of the proposed wall extension and new rock revetment lie within the interior of the East Beach headland-bay shoreline and would not change the controlling (seaward) points of the existing artificial headland features, the hydrological and gemorphological effects are anticipated to be limited to within the immediate East Beach shoreline area. The new rock revetment at the east end will stabilize an otherwise eroding shoreline, which in recent years has been a supply of sand and coral rubble to the rest of the beach. The direction of net sediment transport from east to west in this area has resulted in the buildup of material along the west end of the beach. After construction of the rock revetment, some minor changes in sand distribution along the East Beach shoreline can be expected until a new state of equilibrium has been achieved.

9.4.2.4 Beach Nourishment

Approximately 171 and 833 cubic yards of beach quality sand are to be placed at Canoe Launch beach and East Beach, respectively. Due to the sheltered location and orientation of Canoe Launch beach, the offsite transport of sediment following the completion of beach fill activities is expected to be minimal. This area will be even more sheltered after construction of the DMCS immediately to the south. For East Beach, which has a more exposed orientation and is subject to wave action during storm events, a variety of beach nourishment design profiles were evaluated considering the sediment characteristics of the receiving beach and proposed beach fill material. The equilibrium beach profile theory (Dean, 1977) was applied to site conditions to model the anticipated transformation from post-construction to the final equilibrium shoreline slope. Results showed that beach slopes of the post-construction equilibrium shoreline are nearly identical to existing beach slopes, with the final toe of fill falling within the limits of natural beach variability. The proposed dune/berm feature would provide a buffer between the beach and the parking area, and can provide a source of sand for natural recovery following high wave energy events.

9.5 ANALYSIS OF POTENTIAL FOR INCIDENTAL TAKE

GST, HST, and HMS may be present, in very low densities within the Action Area. However take is not expected to occur as a result of the nature of the work (e.g., use of vibratory pile installation methods) and implementation of avoidance measures (Section 6). The Action Area is not used by sensitive species for spawning and rearing.

9.6 EFFECTS ON PROTECTED HABITATS

9.6.1 Critical Habitat Effects

While the Action Area is located within designated marine critical habitat for HMS, as defined in Section 8.3, the physical or biological features (PBFs) that are essential to the conservation of these species (e.g., abundant prey items, high water and sediment quality, aquatic vegetation, and nearshore marine areas free of obstruction) are impacted by the recreational use of the area. Adverse effects on critical habitat could occur due to substrate disturbance associated with dredging. Increased shading would not occur, as no new overwater structures are proposed. Further as demonstrated by hydrodynamic and wave model Project effects on critical habitat would be minimal. No permanent changes within the marine Action Area are expected over the long term, once the Maunalua Bay substrates accrete and recolonize. Water quality, although impacted in the short term, would restore to original quality shortly after dredging is complete. As such, implementation of the project would not reduce identified PBFs for HMS within the Action Area.

Based on the very small area of the Action Area affected through dredging compared to available critical habitat within Maunalua Bay, the temporary time period during which the habitat would be unavailable for use by sensitive species, and the overall temporary nature of the effects on substrate, the potential loss of critical habitat from the action is expected to be undetectable.

Project activities ***may affect, but is not likely to adversely affect*** critical habitat designated for species considered within this BE. The Action Area contains approximately 1.67 acres of estuarine or marine environment that is consistent with that described in the critical habitat designation for these species. Changes to critical habitat are expected to be discountable (extremely unlikely to occur) and insignificant (too small to detect or measure) for all species considered.

9.6.2 Seagrass (*Halophila hawaiiana & H. decipiens*)

The seagrass species that occurs in Maunalua bay is a mixture of *Halophila hawaiiana* and *H. dicipiens*. Previous benthic surveys (Enclosure F) have identified Halophila populations within the action area. Though removal of these communities would be minimal, proposed transplantation efforts would minimize the potential adverse effects on this species.

9.7 CUMULATIVE EFFECTS

Cumulative effects under the FESA are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the Action Area (50 CFR 402.02). As discussed in this BE, in-water dredging and construction activities have the potential to result in temporary impacts on FESA protected species and habitat due to water quality impacts, increases in underwater noise, and disturbance and alteration of intertidal and subtidal habitats.

No future projects occurring within the vicinity of the Action Area are known at this time. Thus, the Project in combination with other past, present, and reasonably foreseeable projects would not contribute to cumulative effects on resources considered in this BE.

10 ESSENTIAL FISH HABITAT ASSESSMENT

The MSA (Public Law 104-297) was passed in 1976 for the conservation and management of fishery resources of the United States to prevent overfishing, to rebuild overfished stocks, to ensure conservation, and to facilitate long-term protection of EFH. Within the regulations, EFH is defined as "*those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.*" Section 305(b) of the MSA directs federal agencies to consult with NOAA Fisheries on all actions or proposed actions that may adversely affect EFH to obtain avoidance and minimization consultation as well as conservation and enhancement recommendations. Generally, EFH consultation consists of a federal agency notifying NOAA Fisheries regarding an action that may adversely affect EFH (50 CFR 600.920(a)(3)) and providing NOAA Fisheries with an EFH Assessment (50 CFR 600.920(e)). NOAA Fisheries provides EFH conservation recommendations to avoid and/or minimize adverse effects on EFH (MSA § 305(b)(4)(A)), and the federal agency responds to the NOAA Fisheries EFH conservation recommendations (50 CFR 600.920(k)(1)).

The purpose of this section is to provide information necessary to complete an EFH assessment and to determine suitable EFH recommendations to protect the resource.

10.1 EFH WITHIN ACTION AREA

The Action Area for this Project falls within EFH, as defined in the Magnuson-Stevens Fishery Conservation and Management Act (MSA), is managed under two Fishery Management Plans (FMPs): the Fishery Ecosystem Plan (FEP) for Pacific Pelagic Fisheries and the FMP for Bottomfish and Seamount Groundfish by the Western Pacific Regional Fishery Management Council.

Table 6. Essential Fish Habitat Species Within Action Area

Common Name	Life Stage	FMP
Kona Crab	Eggs/Larval; Juvenile/Adult	Bottomfish and Seamount Groundfish
MHI Coral Reef Ecosystem	All	
Amberjack/ Black Jack/ Sea Bass	Eggs; Post-Hatch	Bottomfish and Seamount Groundfish
Blue Stripe Snapper/ Gray Jobfish	Eggs; Post-Hatch; Post-Settlement/ Sub-Adult/ Adult	Bottomfish and Seamount Groundfish
Giant Trevally	Eggs; Post-Hatch; Post-Settlement/ Sub-Adult/ Adult	Bottomfish and Seamount Groundfish
Pink Snapper	Eggs; Post-Hatch	Bottomfish and Seamount Groundfish
Red Snapper / Longtail Snapper / Yellowtail Snapper / Pink Snapper / Snapper	Eggs; Post-Hatch	Bottomfish and Seamount Groundfish
Silver Jaw Jobfish / Thicklip Trevally	Eggs; Post-Hatch	Bottomfish and Seamount Groundfish
All pelagic fisheries	Eggs/Larval; Juvenile/Adult	FEP for Pacific Pelagic Fisheries

10.2 EFH SENSITIVE HABITATS

The Action Area supports seagrass beds (*Halophila hawaiiana, H. dicipiens*), which are known to establish in low-wave energy, sandy bottoms with adequate flow. Maunalua Bay tends to promote these conditions within its navigational channels. Multiple biological surveys have been conducted to identify presence of seagrass throughout the Action Area. Seagrass was identified in survey areas 2-4 (Enclosure F), however, it should be noted that at survey areas 3-4, seagrasses are currently being encroached heavily by alien invasive species (AIS) *G. salicornia*. Corals (primarily stony coral) were identified during surveying as well, however, with only a few isolated coral colonies existing within the proposed Action Area.

10.3 EXISTING CONDITIONS

10.3.1 Sediment Investigation

On October 3, 2023, sediment samples were collected throughout the Action Area to characterize the variation of material characteristics and to determine if the prospective locations were suitable for dredging. The investigation concluded that sediment throughout the Action Area can be feasibly dredged and is suitable for beneficial re-use at upland locations within Action Area in support of Facility improvements.

10.3.2 Benthic Habitat

The benthic habitat pertinent to the Action Area was investigated twice, once in 2023 and once 2024, and details of these surveys can be found in Enclosure F. The 2023 survey found *Halophila* seagrasses (*H. hawaiiana* and *H. decipiens*) were limited to survey areas 2-4. Densities of seagrasses in these survey areas were variable. Survey areas 3 and 4 consisted of seagrasses which coexisted with AIS *G. salicornia*. *G. salicornia* was the dominant covering species of survey areas 3 and 4. Sparse instances of corals (*P. damicornis* and *L. purpurea*) were found in isolated instances throughout survey area 2. Survey areas 1 and 5 were devoid of seagrasses and corals.

The 2024 surveys investigated the Action Area for marine resources, with particular attention to *Halophila* and stony corals. *Halophila* existed within survey areas A and E (corresponding to Dredge Areas 1 and 2). Singular instances of stony coral (*P. damicornis*) were found in survey areas C and D.

10.4 POTENTIAL EFFECTS ON EFH AND FEDERALLY MANAGED SPECIES

Dredging would result in habitat alteration. Dredging of sediment within approximately 1.7 acres of the existing navigation channel is required to remove approximately 5,850 cubic yards of sediment.

10.4.1 Beneficial Effects on EFH and Federally Managed Species

The project anticipates an improved environment for *Halophila* regrowth as the species would largely be preserved or avoided, while invasive algae species are intended to be removed.

10.4.2 Adverse Effects on EFH and Federally Managed Species

Adverse effect means any impact that reduces quality or quantity of EFH and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem

components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH, or outside of it, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Adverse effects are anticipated to be negligible and short term. Similar to anticipated effects on FESA protected species (summarized in Section 9), FMP management species may experience turbidity, hydroacoustic effects, and temporary disturbance of habitat. These effects are expected to be temporary and outweighed by the beneficial effects described in Sections 9.1 and 10.4.1.

10.5 EFH ASSESSMENT CONCLUSION

The proposed project includes measures to avoid, mitigate, or offset adverse effects to EFH caused by the in-water activities. These measures, in addition to measures specific to avoiding and preserving *Halophila*, are outlined in Section 6.2. These actions would serve to protect and minimize effects on EFH.

11 DETERMINATIONS

Based on the analysis in this BE, determinations are as follows:

The Project ***may affect, but is not likely to adversely affect*** humpback whale, green sea turtle, hawksbill sea turtle, and Hawai'ian monk seal. Abundance of these species are estimated to be low within the Action Area, the nature of the work would have discountable effects on the species, and avoidance measures would preclude potential for take.

The Project ***may affect, but is not likely to adversely affect*** designated marine critical habitat for Hawai'ian monk seal. Changes to critical habitat are expected to be discountable (extremely unlikely to occur) and insignificant (too small to detect or measure) for species considered.

Habitat disturbance ***may affect*** EFH, but these effects would not be substantial and potential effects would be minimized through the implementation of coral relocation, and EFH mitigation actions. Potential effects would be limited to temporary disturbance of Action Area substrate.

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Sediment and Geotechnical Investigations

In Support of the Maunalua Bay Boat Launch Ramp Maintenance Dredging and Facility Improvements Project

Prepared for

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ACRONYMS AND ABBREVIATIONS

DLNR	State of Hawaii Department of Land and Natural Resources
DOBOR	Division of Boating and Ocean Resources
Facility	Maunalua Bay Boat Launch Ramp Facility
GPS	global positioning system
SPT	Standard Penetration Test

1 INTRODUCTION

The State of Hawaii Department of Land and Natural Resources (DLNR) intends to perform maintenance dredging within the Maunalua Bay navigation channel to restore navigable depths between the Pacific Ocean and the Maunalua Bay Boat Launch Ramp Facility (Facility). Site improvements are also proposed for the Facility, to restore land that has been lost to coastal erosion and stabilize shorelines where existing seawalls have failed. This project is being administered by the Division of Boating and Ocean Resources (DOBOR). Integral Consulting Inc. (Integral) has been contracted to provide planning, permitting, and engineering services for this project.

1.1 PROJECT DESCRIPTION

A total of seven areas have been identified for maintenance dredging to remove hazards to navigation within the channel. Dredged material is to be beneficially reused to support Facility improvements. To characterize the material proposed for removal, sediment samples from dredge areas were collected and analyzed. Additional samples were collected from the Facility's shoreline areas to allow for an evaluation of sediment compatibility for the placement of appropriate dredged material (i.e., sand) to be placed directly on the shorelines. Additional geotechnical investigations were conducted to inform the feasibility of dredging and construction activities at the site. This report details the methods, analyses, and results for the sediment and geotechnical investigations that were conducted in support of this project. This information is intended to support the structural engineering design of proposed facility improvements and to inform prospective contractors as to the site conditions.

1.2 HISTORICAL BACKGROUND AND GEOLOGICAL SITE CONDITIONS

Figure 1 provides a 1928 photograph of the narrow ribbon of land located between Maunalua Bay and "Kuapa Pond," a brackish fishpond, which stretched inland, northeast of the site. The location of the present-day Facility is shown with a red star. The shoreline of Maunalua Bay consisted of carbonate sand beaches with a narrow, vegetated backshore/dune system. Sediment types, which would be typically found in this type of environment, would include sand near the bay's shoreline, transitioning to mostly silt in the furthest landward reaches of the pond. Further offshore, coastal sediment material would consist of coral rubble and ancient limestone reef.

Figure 1. Aerial Photograph of the Project Site in Maunalua Bay with a Red Star Showing the Location of the Existing Maunalua Bay Boat Ramp Facility (Center Left) and Kuapa Pond in the Foreground, as It Existed in 1928

Maunalua Bay and its vicinity underwent significant changes between the 1940s–1960s, with the creation of the navigation channel as well as large-scale dredging and filling operations associated with the development of the Hawaii Kai Marina. The Maunalua Bay Boat Launch Facility was originally constructed in the late 1950s through the early 1960s. It is understood the landmass of the present-day Facility was constructed using material dredged from within Kuapa Pond to create the Hawaii Kai Marina, as well as coral rubble from construction of the navigation channel through limestone reef. Figure 2 provides an aerial photograph of the Facility as it existed in 1968.

Figure 2. Aerial Photograph of the Project Site (Left) and Similarly Filled Areas, as It Existed in 1968

Today, shoreline structures have been installed along most of the Facility area to stabilize the shoreline. At the launch ramp facility, a concrete boat ramp and roughly 750 linear ft of cement rubble masonry walls were constructed to prevent erosion and provide a safe launch facility for boaters. Beyond the end of these walls on the east and west ends of the Facility are areas where the Facility was not protected by shoreline armoring; these areas have subsequently experienced chronic shoreline erosion over the years. An aerial photograph of the project site collected in July 2023 today is provided in Figure 3, below.

Figure 3. Orthomosaic Aerial Image of the Project Site as It Existed on July 14, 2023 (Shoreline Science & Engineering, LLC)

On the west end of the Facility, an area of the original Facility consisting of approximately 5,500 ft^2 has been eroded, resulting in the loss of usable space for recreational activities at the site. An oblique aerial photograph of this area is provided in Figure 4, below. This project proposes to restore this eroded shoreline by constructing a dredged material containment structure consisting of a steel sheet pile wall and filling the area behind with dredged sediment.

Figure 4. Oblique Aerial Photograph of the West End of the Facility as It Existed on April 13, 2022 (Photo: Shoreline Science & Engineering, LLC)

2 METHODS

2.1 GEOTECHNICAL BORINGS

To determine the geotechnical design parameters of the proposed sheet pile wall, Integral retained Geotek Hawaii to drill two geotechnical borings along the proposed alignment with a tracked Geoprobe 6620DT rig with 6-in. diameter hollow-stem auger and auto-hammer. The borings, B-1 and B-2, extended to depths of 41.5 and 36.5 ft below ground surface, respectively. Boring B-1 was located at the west end of the Facility adjacent to the navigation channel, and Boring B-2 was located between the boat launch ramp and the west end of the Facility. The approximate boring locations are illustrated on Figure 5.

The drillers performed Standard Penetration Test (SPT) sampling in general accordance with ASTM D 1586 roughly at 5-ft intervals in both borings, which consisted of the 140-lb auto-hammer driving a 2-in. OD / 1.4-in. ID split-barrel sampler into the soil profile 18 in. Each hammer blow consists of the hammer falling 30 in., representing approximately 350 ft-lb of force. The number of blows per foot, adding the second and third 6-in. increments, is referred to as the N-value. The N-values reported herein are raw "field blows" and are not corrected for depth or hammer energy. N-values can be correlated with various soil properties, particularly density and strength.

Soil samples recovered from the field exploration were visually classified in the field roughly consistent with the Unified Soil Classification System (ASTM D2488). To refine and verify our field classification, we delivered four of the SPT samples to Geolabs, Inc., for laboratory Unified Soil Classification System classification (ASTM 2487, including sieve analysis and Atterberg Limits).

Boring locations were initially estimated using a handheld global positioning system (GPS) device and were later located with survey-grade equipment.

Figure 5. Approximate Locations of Geotechnical Borings Conducted at the West End of the Maunalua Bay Boat Ramp Facility

2.2 DREDGE AREA SEDIMENT SAMPLING

On June 8, 2023, sediment samples were collected from the surface at various locations proposed for dredging, based on an evaluation of site conditions and substrate/sediment types. Collected samples were placed within labeled gallon resealable bags, described, and photographed. A GPS point was also recorded at each sampling location, using a handheld Garmin GPS 73. The samples generally contained material from within the top 4 in. of the existing channel bottom. The samples were then delivered to Geolabs, Inc., for analysis of grain-size distributions per ASTM C117, C136, and D1140. The sample locations are shown on the map on Figure 6, below.

Figure 6. Locations Where Sediment Samples Were Collected on June 8, 2023, throughout the Maunalua Bay Navigation Channel

2.3 BEACH AREA SEDIMENT SAMPLING

On February 28, 2024, two Integral scientists conducted investigations of the proposed beach nourishment areas (Figure 7), including collecting sediment samples. The samples were collected by hand along multiple transects, placed within labeled gallon resealable bags, and photographed. The samples were collected from three transects of each of the two beach nourishment areas.

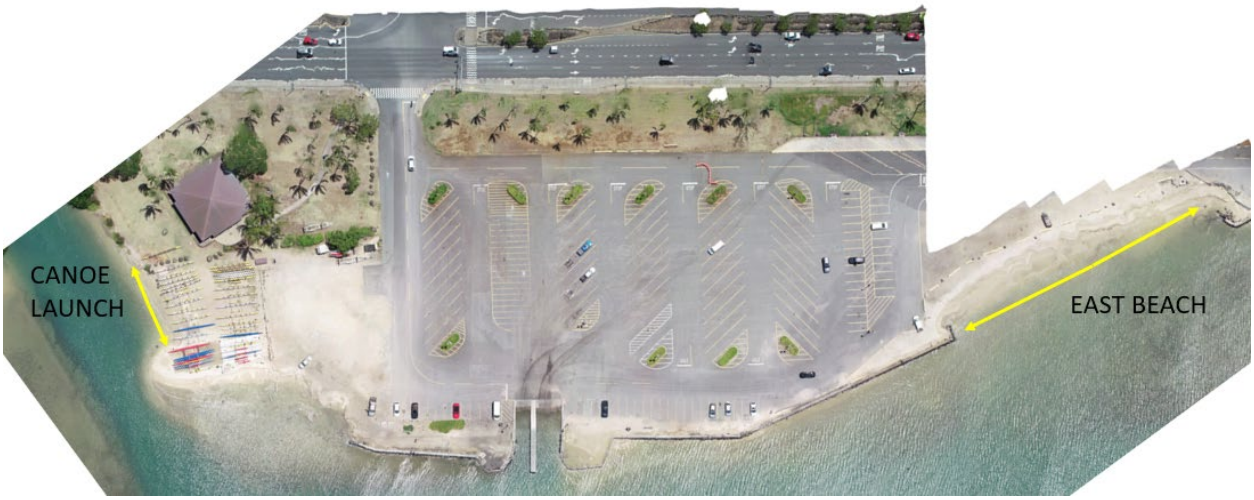

Figure 7. Locations of the Two Beach Areas Being Considered for the Placement of Beach Quality Sand from Dredging Operations

The material from Transects C1-1 through C3-1 at the western nourishment site (i.e., the "canoe launch area") were combined into three composite samples for testing. Similarly, material from Transects B1-1 through B3-1 at the eastern nourishment site "east beach" were combined into three composite samples for testing. The material from the center cross section (B2-1) was submitted for testing, while the remaining two were archived to allow for future analysis, as needed. The locations from which these samples were collected are shown in Figures 8 and 9, below. The samples generally contained material from within the top 4 in. of the beach surface. The samples were then delivered to Geolabs, Inc., for analysis of grain-size distributions per ASTM C117, C136, and D1140.

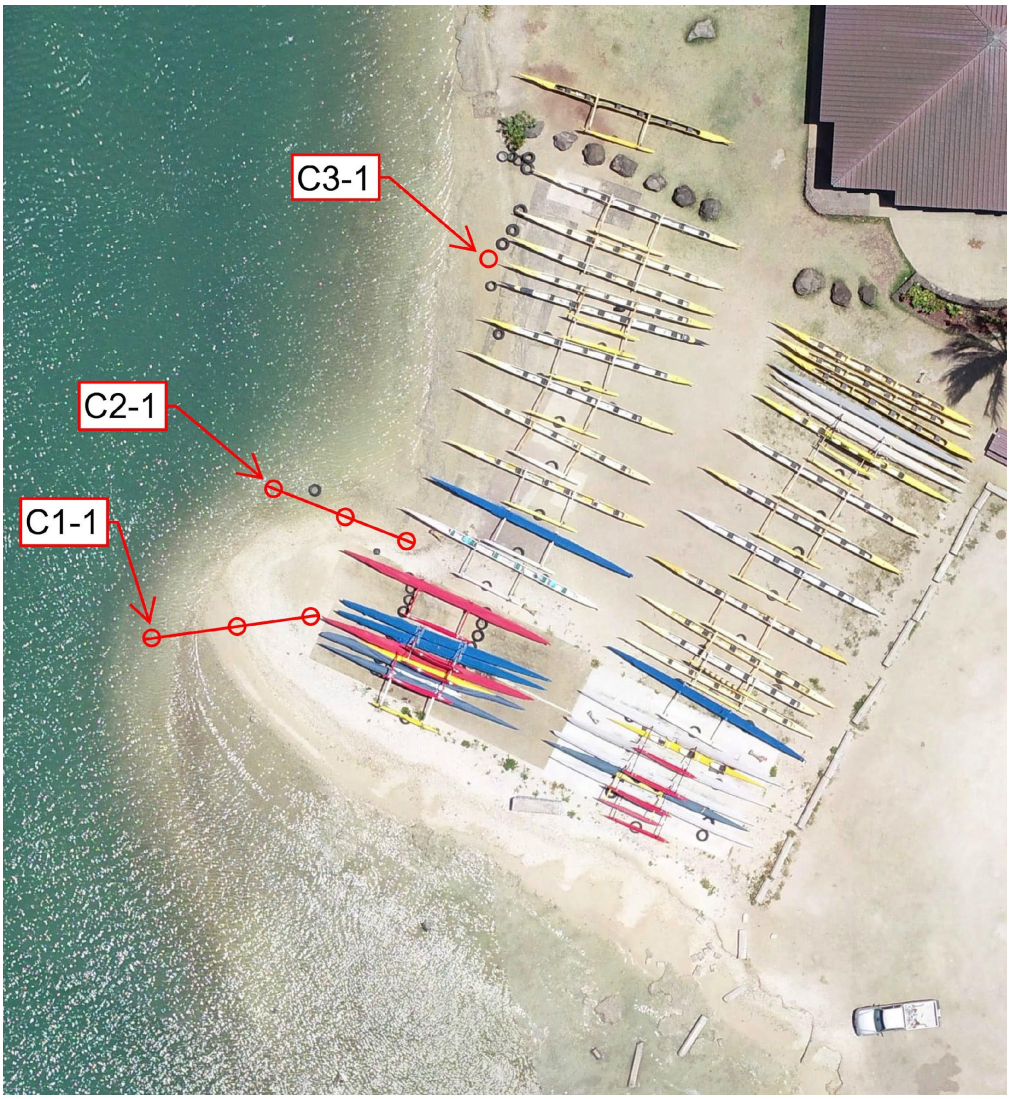

Figure 8. Locations of Sediment Samples Collected at the "Canoe Launch" Beach

Figure 9. Locations of Sediment Samples Collected at "East Beach"

2.4 SEDIMENT PROBING

On October 3, 2023, two scientists from Shoreline Science & Engineering, LLC conducted sediment probing tests, to roughly characterize any variations in the density of the material below the layer sampled in June. The probing was performed using a 10-ft-long piece of ⅝-in. rebar, which was driven into the channel bottom by hand using a manual post driver. At each probing location, the rebar was driven to a depth beyond the proposed dredge elevation, to determine if the full extent of material was suitable for maintenance dredging. The scientists recorded the water depth at the probe location and the depth to which the rebar was driven. A GPS point was also recorded at each probing location using a handheld Garmin GPS 73. The probing locations are shown on the map in Figure 10, below.

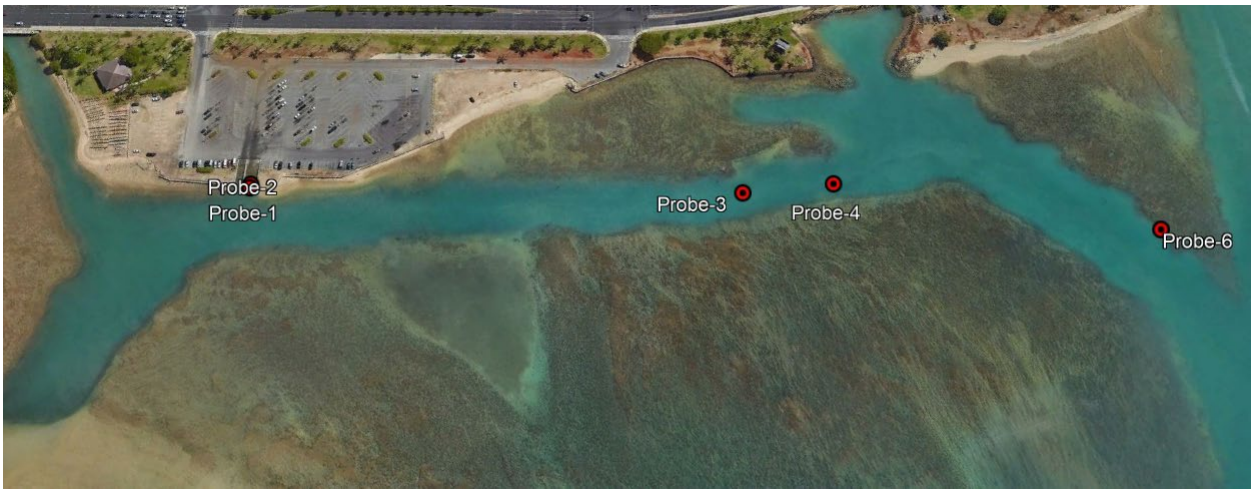

Figure 10. Locations Where Sediment Probing Was Performed on October 3, 2023, throughout the Maunalua Bay Navigation Channel

3 RESULTS

3.1 GEOTECHNICAL BORINGS

Boring logs resulting from our field exploration are presented in Appendix A. The logs contain the soil descriptions, SPT blows, and N-values logged during the drilling and sampling activities. The logs contain information from the specific boring locations only, and the soil conditions may vary between the strata interfaces indicated on the logs. The soil classifications and descriptions shown on the logs are generally based upon visual characterizations of the recovered samples using the Unified Soil Classification System. Laboratory analysis of grain size and Atterberg limits was performed on four samples, which are provided in Appendix B.

The subsurface soil conditions encountered in the borings generally consisted of wet and very loose clayey sand with gravel (SC) to the termination depths.

On the date of our field exploration, groundwater was encountered in the borings at an approximate depth of 2 ft below the existing ground surface.

3.1.1 Engineering Evaluation and Recommendations

3.1.1.1 General

Our geotechnical engineering evaluation of the site and subsurface conditions at the property, with respect to the planned construction, and our recommendations for driven pile design and installation and seawall design parameters, are based upon 1) our site observations, 2) the field data obtained, and 3) our understanding of the project information and structural conditions as presented in this report. We note that the applicability of geotechnical recommendations is very dependent upon project characteristics, specifically 1) improvement locations, 2) grade alterations, and 3) actual applied structural loads. If the stated conditions are incorrect or if the project scope is revised, we will review our recommendations with respect to any modifications.

3.1.1.2 Soil Parameters for Sheet Pile Wall Design

The sediment containment structure sheet piles and associated horizontal anchors to be installed by a contractor should be based on the following recommended soil parameters determined from our boring data and geotechnical analysis. For design purposes, we recommend that the groundwater table be assumed at the ground surface (submerged) because of the tidally controlled shallow static water table and the wet condition of the dredged material to be placed within/landward of the structure. In addition, appropriate factors of safety should be included in the final design.

Table 1. Boring B-1

Depth[a] (feet)	Soil Description	Avg. N-Value	Wet Unit Weight γ_t (pcf)	Sub. Unit Weight γ_{sub} (pcf)	Friction Angle (deg)	K_a	K_p	K_o	Cohesion (psf)	Horiz. Subgrade Modulus k (pci)[b]
0–5	Poorly graded sand (SP)	0	105	40	28	0.4	2.8	0.5	0	10
5–41.5	Clayey sand with gravel (SC)	1	110	50	28	0.4	2.8	0.5	0	12

Notes:

[a] Indicated depth is depth below grade at the respective boring location.

[b] Submerged condition

Table 2. Boring B-2

Depth[a] (feet)	Soil Description	Avg. N-Value	Wet Unit Weight γt (pcf)	Sub. Unit Weight γsub (pcf)	Friction Angle (deg)	K_a	K_p	K_o	Cohesion (psf)	Horiz. Subgrade Modulus k (pci)[b]
0–54	Clayey sand / sandy clay with gravel (SC/CL)	-	120	58	28	0.4	2.8	0.5	100	15
4–536.5	Clayey sand with gravel (SC) / Clayey gravel with sand (GC)	1	110	50	28	0.4	2.8	0.5	0	12

Notes:

[a] Indicated depth is depth below grade at the respective boring location.

[b] Submerged condition

3.2 DREDGE AREAS SEDIMENT SAMPLING

Description of sediment conditions classified by dredge area are presented in Table 3. Laboratory reports of the grain size analyses are included in Appendix C.

Table 3. Dredge Areas Sediment Sampling Results

Sample No.	Location/CM #	Dredge Area	Analytical Description[a]
S-1A/1B	West end	1	Brown sandy silt (ML) with traces of gravel
S-2	20	N/A	Brown sandy silt (ML) with traces of gravel
S-3	18	N/A	Tan silty sand (SM) with traces of gravel
S-4	12	4	Tan silty sand (SM) with some gravel
S-5	8	5	Tan poorly graded gravel (GP-GM) with silt and sand
S-6	2	7	Tan sand (SP) with traces of silt
S-7	2	7	Tan sand (SP) with traces of silt
S-8	Boat Ramp	2	Tan poorly graded sand (SP) with gravel and traces of silt
S-9	Boat Ramp	1	Tan silty sand (SM) with traces of gravel

Notes:

N/A = not applicable

[a] Analytical descriptions from Geolabs, Inc.

3.3 BEACH AREAS SEDIMENT SAMPLING

Description of sediment conditions from the two beach areas are presented in Table 4. Laboratory reports of the grain size analyses are included in Appendix D. All material analyzed is fine- to coarse-grained poorly graded sand (SP) (also with gravel in C3-1).

Table 4. Nourishment Areas Sediment Sampling Results

Sample No.	Location	Analytical Description[a]
B2-1	East Beach	Tannish brown poorly graded sand (SP)
C1-1	Canoe Launch South	Tannish brown poorly graded sand (SP)
C2-1	Canoe Launch Middle	Tannish brown poorly graded sand (SP)
C3-1	Canoe Launch North	Tannish brown poorly graded sand (SP) with some gravel

Notes:

[a] Analytical descriptions from Geolabs, Inc.

3.4 DREDGE AREA SEDIMENT PROBING

The results of the sediment probing work are summarized in Table 5, below. The sediment probing achieved depths beyond the proposed dredge depth at all probe locations.

Table 5. Dredge Areas Sediment Probing Results

Probe #	Location/CM #	Corresponding Dredge Area	Probe Depth Below MLLW (ft)	Notes
1	Boat Ramp Shoal	1	>8	
2	Boat Ramp Shoal	1	>8	
3	CM-15	2	11.5	Koko head of CM-15
4	CM-13	2	11.7	11.5 ft off CM-13
5	CM-12	4	9.5	Near CM-12
6	CM-8/10	5	7.3	Between CM 8 and 10. Cemented coral rubble

4 CONCLUSIONS

The results of these sediment investigations suggest that all proposed dredge areas are feasible to dredge and contain material that will be suitable for upland reuse at the Facility. It is not anticipated that the dredging contractor will encounter hard material (e.g., fossil limestone reef) that cannot be easily removed by conventional dredging methods.

Based on the comparison of sediment characteristics between proposed dredge areas and existing conditions at the Canoe Launch beach and East Beach, only sediment from Dredge Area 7 is proposed for direct placement on the beach.

Dredged material from Dredge Areas 1, 2, 3, 4, 5, and 6 are expected to contain a mix of sandy silt/silty sand with traces of gravel, poorly graded gravel with silt and sand, and gravelly sand with traces of silt and gravel. Material from these dredge areas can be used as fill material for proposed facility improvements in accordance with the project plans.

Appendix A

Log of Boring Records

integral engineering p.c.
4704 N. Harlan Street, Suite 690
Denver, CO 80212
(303) 404-2944

Log of Boring: B-1

Project Name: Maunalua Bay Maintenance Dredging and Facility Improvements
Project Number: 3972
Logged by: Taylor Caster
Date: 4/15/2024

Location (State Plane, meters): 5103 529190.972E, 13041.842N

Drilling Method: 6-inch Hollow-Stem Auger

Depth (Feet)	Symbol	Soil Classification (USCS)	Sample No., Blows / ft	Soil Description
		SP		(Loose to very loose) very light yellowish brown poorly graded sand with gravel and trace fines (SP), moist to wet, gravel consists of coral rubble (recent beach deposit).
--5		SC		(Very loose) gray clayey sand with gravel (SC), wet, gravel consists of coral rubble.
--10			1 ?	
--15			2 P,P,1 Nf=1	Very loose very light gray clayey sand with gravel (SC), wet, gravel consists of coral rubble.
--20		SC	3 P,P,1 Nf=1	
--25			4 P,P,1 Nf=1	
--30			5 WT, Nf=0	Laboratory soil classification performed on material from sample 5. Sieve: 35% sand, 34% fines, 31% gravel. Atterberg Limits: LL=26, PL=16, PI=10. USCS=SC
--35		SC	6 1,1,1 Nf=2	Very loose gray to black clayey sand with gravel (SC), wet, gravel consists of coral rubble, black material in sample 7 appears to contain organics
--40			7 2,1,1 Nf=2	
--45				41.5 ft total depth of boring. Water level in boring roughly 2ft depth (consistent with sea-level). Boring backfilled with drill cuttings and bentonite chips. All samples from standard penetration test (SPT) per ASTM D1586; Nf is the "field" or uncorrected N-value based on addition of the hammer blows from the bottom two of three 6-inch intervals. P represents the sampler being pushed by the hammer without any blows. WT represents the sampler and sampling rods pushing the sampler without the weight of the hammer. Drilling performed by Geotek Hawaii operating a tracked Geoprobe 6620DT rig with an autohammer. See attached "abbreviated soil classification system" sheet. .
--50				
--55				

integral engineering p.c.
4704 N. Harlan Street, Suite 690
Denver, CO 80212
(303) 404-2944

Log of Boring: B-2
Project Name: Maunalua Bay Maintenance Dredging and Facility Improvements
Project Number: 3972
Logged by: Taylor Caster
Date: 4/15/2024

Location (State Plane, meters): 5103 529218.347E 13015.801N

Drilling Method: 6-inch Hollow-Stem Auger

Depth (Feet)	Symbol	Soil Classification (USCS)	Sample No., Blows / ft	Soil Description
		SC/ CL		(Medium dense) yellowish brown and gray clayey sand / sandy clay with gravel (SC/CL), moist to wet, gravel consists of coral rubble (eroding existing land)
--5		SC	1 P,P,1	Very loose gray clayey sand with gravel (SC), wet, gravel consists of coral rubble. Laboratory soil classification performed on material from sample 1. Sieve: 50% sand, 29% gravel, 21% fines. Atterberg Limits: LL=27, PL=18, PI=9. USCS=SC
--10		SC-SM	2 P,P,1 Nf=1	Very loose light gray silty clayey sand with gravel (SC-SM), wet, gravel consists of coral rubble.
--15			3 P,P,1 Nf=1	
--20			4 P,P,1 Nf=1	Laboratory soil classification performed on material from sample 4. Sieve: 43% sand, 35% gravel, 22% fines. Atterberg Limits: LL=25, PL=20, PI=5. USCS=SC-SM
--25		SC	5 P,1,1 Nf=2	Very loose gray clayey sand (SC), wet, gravel consists of coral rubble.
--30		GC	6 P,P,1 Nf=1	Laboratory soil classification performed on material from sample 6. Sieve: 38% fines, 38% gravel, 24% sand. Atterberg Limits: LL=31, PL=19, PI=12. USCS=GC.
--35			7 P,P,1 Nf=1	Very loose very light gray clayey gravel with sand (GC), wet, gravel consists of coral rubble.
--40				36.5 ft total depth of boring. Water level in boring roughly 2ft depth (consistent with sea-level). Boring backfilled with drill cuttings and bentonite chips.
--45				All samples from standard penetration test (SPT) per ASTM D1586; Nf is the "field" or uncorrected N-value based on addition of the hammer blows from the bottom two of three 6-inch intervals. P represents the sampler being pushed by the hammer without any blows. WT represents the sampler and sampling rods pushing the sampler without the weight of the hammer. Drilling performed by Geotek Hawaii operating a tracked Geoprobe 6620DT rig with an autohammer.
--50				See attached "abbreviated soil classification system" sheet.
--55				

Abbreviated Soil Classification System

Major Divisions			Symbol	Name
Coarse-Grained Soils More Than 50% Retained on No. 200 Sieve	GRAVEL More than 50% of coarse fraction retained on No. 4 Sieve	CLEAN GRAVEL	GW	well-graded gravel
			GP	poorly graded gravel
		GRAVEL WITH FINES	GM	silty gravel
			GC	clayey gravel
	SAND More than 50% of coarse fraction passes No. 4 Sieve	CLEAN SAND	SW	well-graded sand
			SP	poorly graded sand
		SAND WITH FINES	SM	silty sand
			SC	clayey sand
Fine-Grained Soils More than 50% passes No. 200 Sieve	Silt and Clay Liquid Limit Less than 50%	Inorganic	ML	silt
			CL	lean clay
		Organic	OL	organic soil
	Silt and Clay Liquid Limit greater than 50%	Inorganic	MH	elastic silt
			CH	fat clay
		Organic	OH	organic soil
Highly Organic Soils			PT	peat

Field Soil Density and Consistency

Granular Soils		Cohesive Soils		
Relative Density	Standard Penetration Resistance	Relative Consistency	Standard Penetration Resistance	Pocket Penetrometer ≈ Unconfined Compressive Strength (tons / foot^2)
Very Loose	0-4	Very Soft	Less than 2	Less than .25
Loose	5-10	Soft	2-4	.25-.50
Medium Dense	11-24	Medium Stiff	5-8	.50-1.0
Dense	25-50	Stiff	9-15	1.0-2.0
Very Dense	More than 50	Very Stiff	16-30	2.0-4.0
		Hard	More than 30	More than 4.0

Grain Sizes

		Approximate Proportional Descriptors (%)	
Boulders	>12 Inches		
Cobbles	3-12 Inches		
Gravel	3/4 - 3 Inches (coarse)	Trace	0 - 5
	1/4 - 3/4 Inches (fine)	Few	5 - 10
Sand	No. 10-No. 4 Sieve (Coarse)	Little	15 - 25
	No. 10-No. 40 Sieve (medium)	Some	30 - 45
	No. 40 - No. 200 Sieve (fine)	Mostly	50-100
Silt and Clay	Passing No. 200 Sieve		

Dry = very low moisture, dry to the touch; Moist = damp, without visible moisture; Wet = saturated, with visible free water.

integral engineering pc

SOIL CLASSIFICATION SYSTEM
AND GUIDELINES

Appendix B

Sieve Analysis / Atterberg Limits for Boring Samples

GEOLABS, INC.
94-429 Koaki Street, Suite 200
Waipahu, Hawaii 96797
Phone: (808)841-5064

LETTER OF TRANSMITTAL

DATE: April 26, 2024	**JOB NO:** 8647-10
ATTENTION: Mr. Robert Walker	
RE: Laboratory Testing Services	
Maunalua Bay Boat Launch Facility	
Makapuu, Oahu, Hawaii	

TO: Integral
98-820 Moanalua Road, Space 5 #706
Aiea, HI 96701

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

NO.	DATE	PAGES	DESCRIPTION
1	4/23/2024	4	Sieve Analysis Test Results (ASTM C117 & C136) for 4 bag samples
2	4/25/2023	1	Atterberg Limits Test Results (ASTM D4318) for 4 bag samples

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ___ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit ___ copies for distribution
☒ As requested ☐ Returned for corrections ☐ Return ___ corrected prints
☐ For review & comment ☐ Returning for Further Processing and Return
☐ FOR BIDS DUE _____ ☐ SIGNED AND RETURNED

REMARKS: Transmitting results of the revised laboratory analysis for ASTM D2487 of 4 bag samples (delived to our laboratory on 4/22/2024), to determine the USCS classifications.

COPY TO _____

SIGNED: _____
Taylor Onizuka, P.E.
Project Engineer

JC:TO

If enclosures are not as noted, kindly notify us at once.

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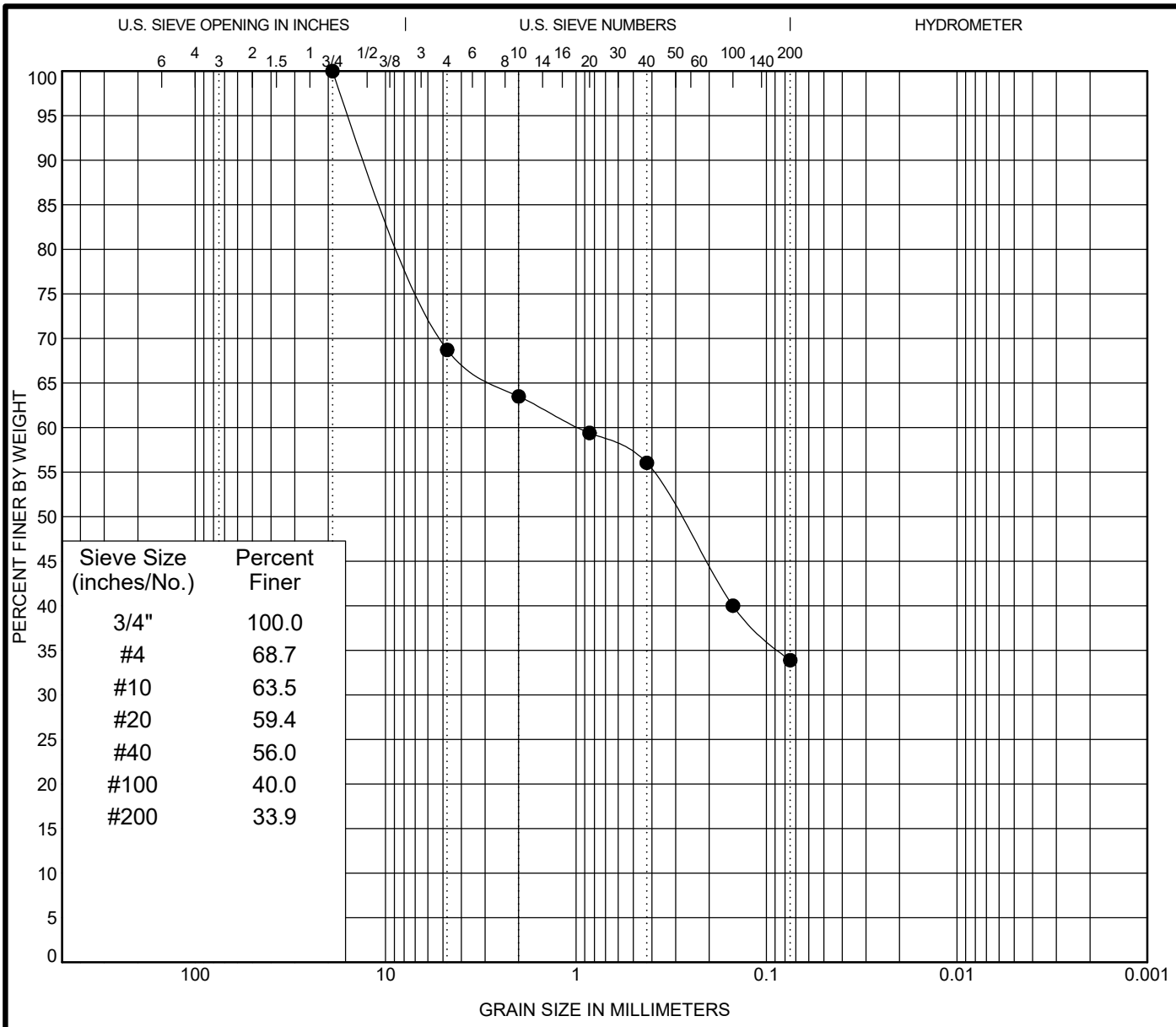


Sample: B-1

Depth (ft): 30.0 - 31.5

Description: Gray clayey sand (SC) with some gravel (coralline)

Test Date: April 23, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
26	16	10			19	0.964			31.3	34.8	33.9

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

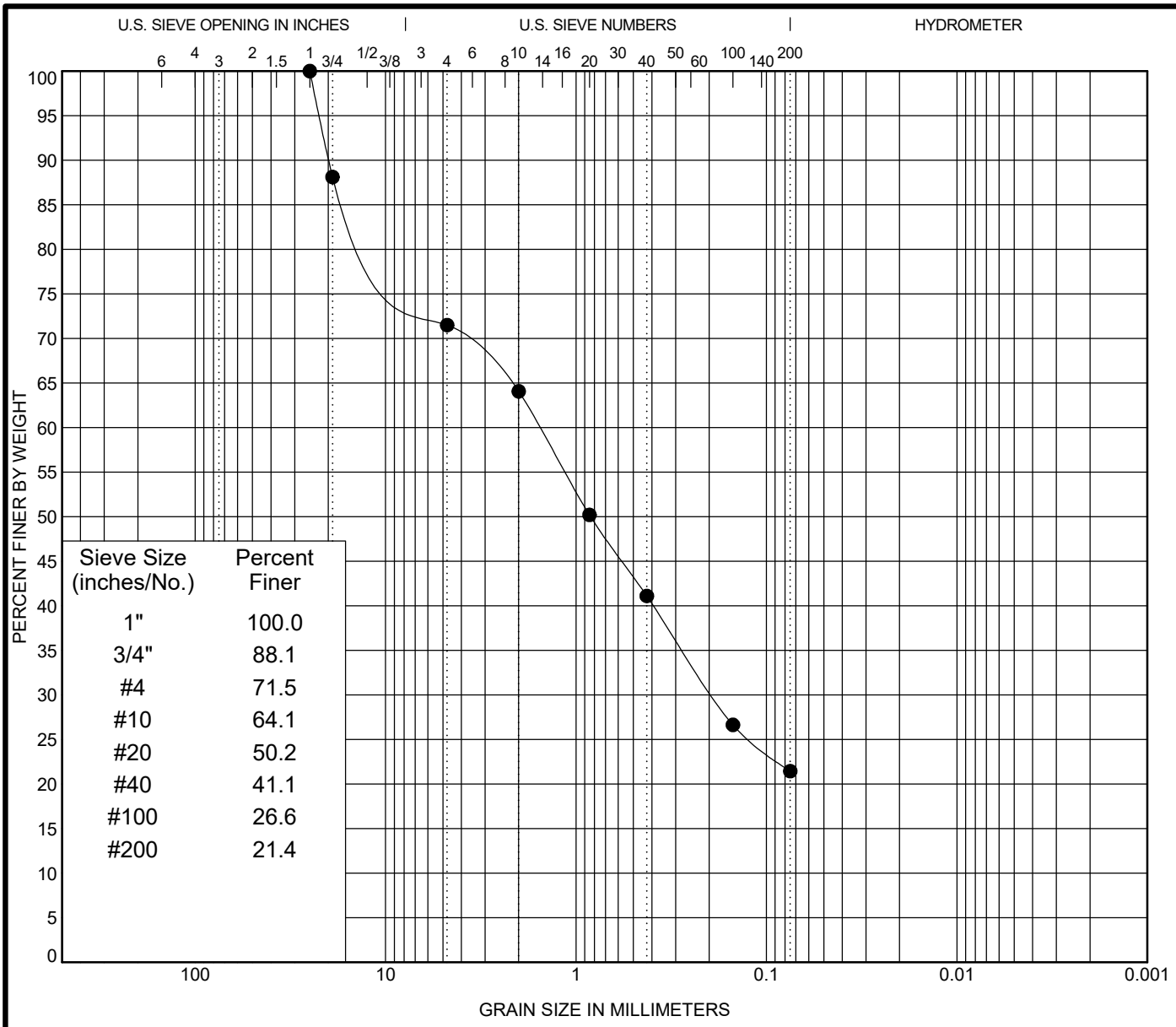
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 0

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 4/25/24



Sieve Size (inches/No.)	Percent Finer
1"	100.0
3/4"	88.1
#4	71.5
#10	64.1
#20	50.2
#40	41.1
#100	26.6
#200	21.4

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: B-2

Depth (ft): 5.0 - 6.5

Description: Gray clayey sand (SC) with some gravel (coralline)

Test Date: April 23, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
27	18	9			25	1.556	0.191		28.5	50.1	21.4

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GEOTECHNICAL ENGINEERING

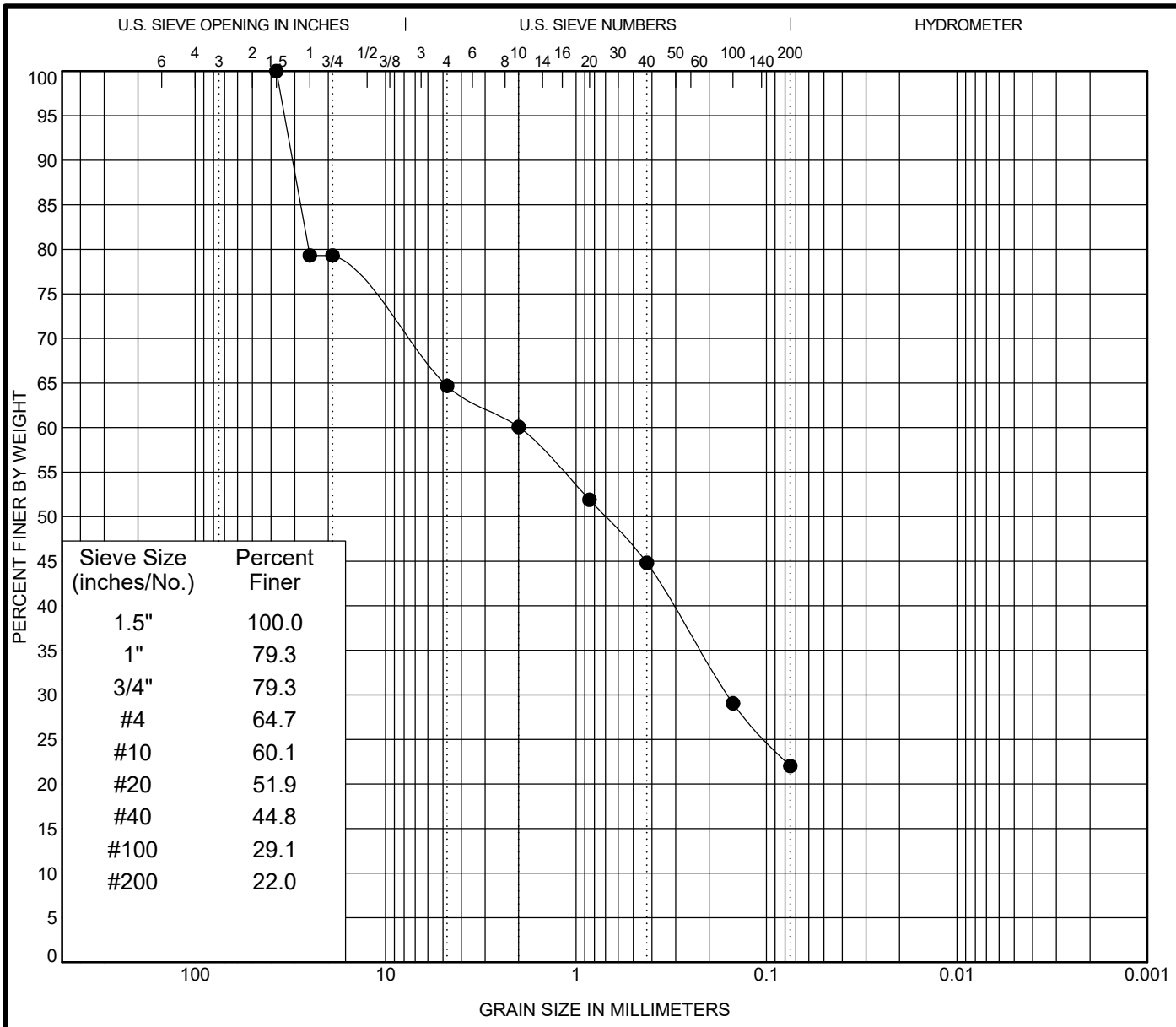
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 1

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 4/25/24



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: B-2

Depth (ft): 20.0 - 21.5

Description: Gray silty clayey sand (SC-SM) with some gravel (coralline)

Test Date: April 23, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
25	20	5			37.5	1.987	0.16		35.3	42.7	22.0

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GEOTECHNICAL ENGINEERING

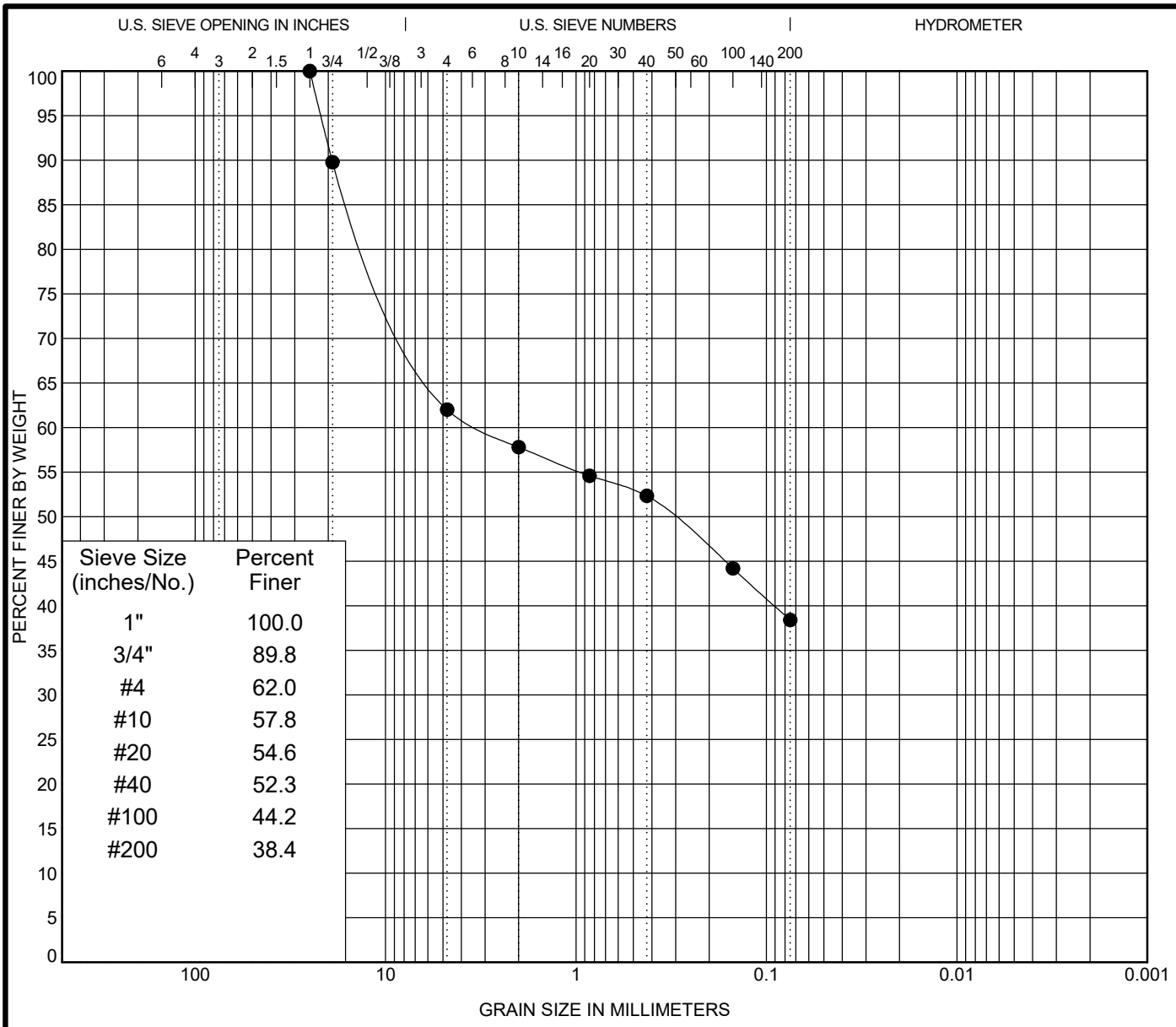
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 2

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 4/25/24



Sieve Size (inches/No.)	Percent Finer
1"	100.0
3/4"	89.8
#4	62.0
#10	57.8
#20	54.6
#40	52.3
#100	44.2
#200	38.4

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: B-2

Depth (ft): 30.0 - 31.5

Description: Gray clayey gravel (GC) with a little sand (coralline)

Test Date: April 23, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
31	19	12			25	3.144			38.0	23.6	38.4

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

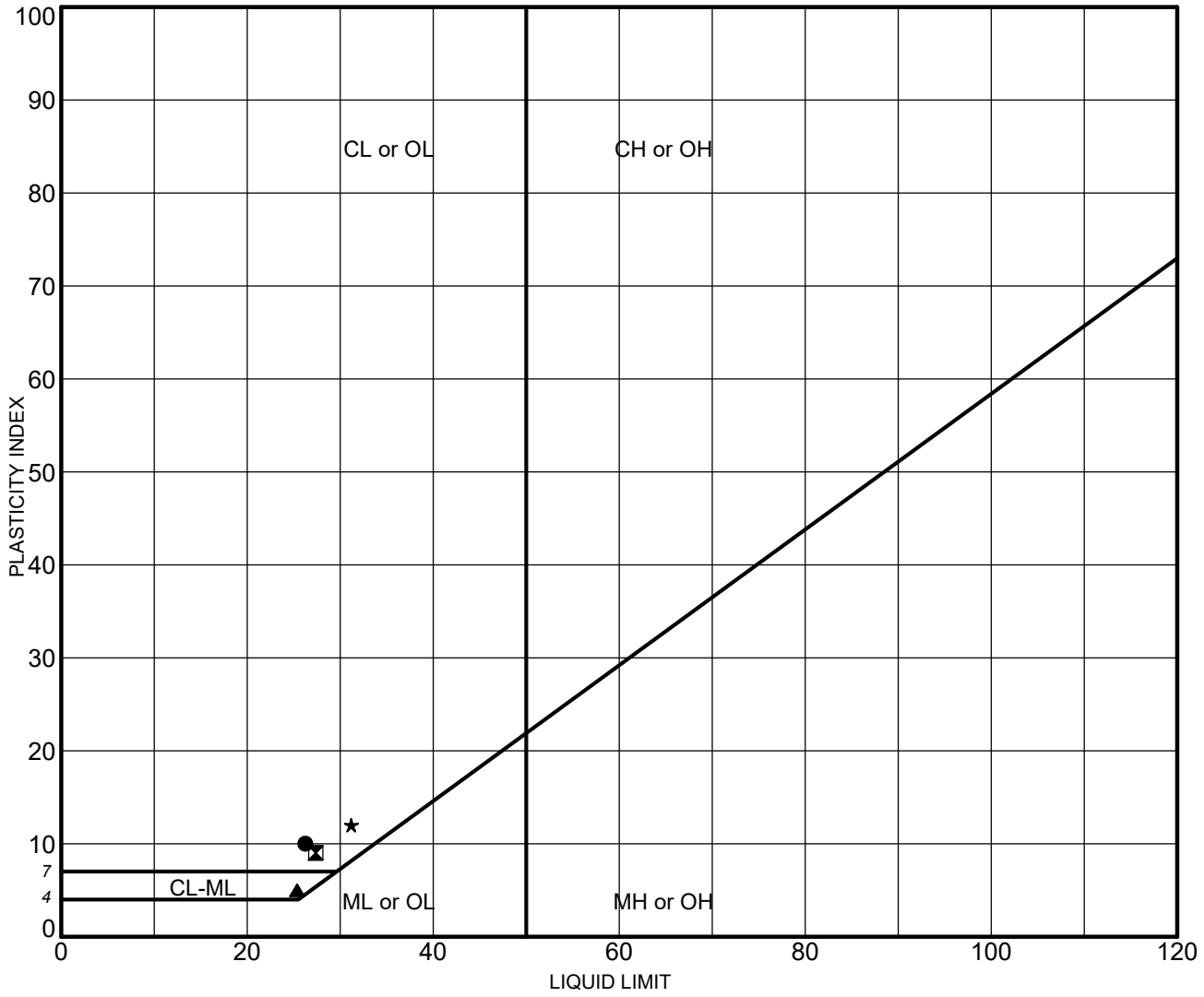
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 3

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 4/25/24



	Sample	Depth (ft)	LL	PL	PI	Description
●	B-1	30.0-31.5	26	16	10	Gray clayey sand (SC) with some gravel (coralline)
⊠	B-2	5.0-6.5	27	18	9	Gray clayey sand (SC) with some gravel (coralline)
▲	B-2	20.0-21.5	25	20	5	Gray silty clayey sand (SC-SM) w/ some gravel (coralline)
★	B-2	30.0-31.5	31	19	12	Gray clayey gravel (GC) with a little sand (coralline)

NP = NON-PLASTIC

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

W.O. 8647-10

ATTERBERG LIMITS TEST RESULTS - ASTM D4318

MAUNALUA BAY BOAT RAMP

Plate

B - 0

G_ATTERBERG_CONSTRUCTION_PHASE_8647-10.GPJ GEOLABS.GDT 4/25/24

Appendix C

Grain Size Distribution for
Dredge Area Sediment Samples

GEOLABS, INC.
94-429 Koaki Street, Suite 200
Waipahu, Hawaii 96797
Phone: (808)841-5064

LETTER OF TRANSMITTAL

DATE: July 5, 2023	**JOB NO:** 8647-00
ATTENTION: Mr. Robert Walker	
RE: Laboratory Testing Services	
Maunalua Bay Dredging Sediment	
Hawaii Kai, Oahu, Hawaii	

TO: Shoreline Science & Engineering, LLC
P.O. Box 756
Haleiwa, HI 96712

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

NO.	DATE	PAGES	DESCRIPTION
1	7/5/2023	2	Grain Size Distribution for 9 grab samples

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☒ As requested ☐ Returned for corrections ☐ Return ___ corrected prints
☐ For review & comment ☐ Returning for Further Processing and Return
☐ FOR BIDS DUE _____ 20____ ☐ SIGNED AND RETURNED

REMARKS: Transmitting results of the laboratory sieve analysis for the grain size distribution of 9 grab samples (delived to our laboratory on 6/1482023), to determine the amount of material finer than 75-µm (No. 200) sieve in soils by washing.

COPY TO _____

SIGNED: _____
John Y.L. Chen, P.E.
Vice President

JC:

If enclosures are not as noted, kindly notify us at once.

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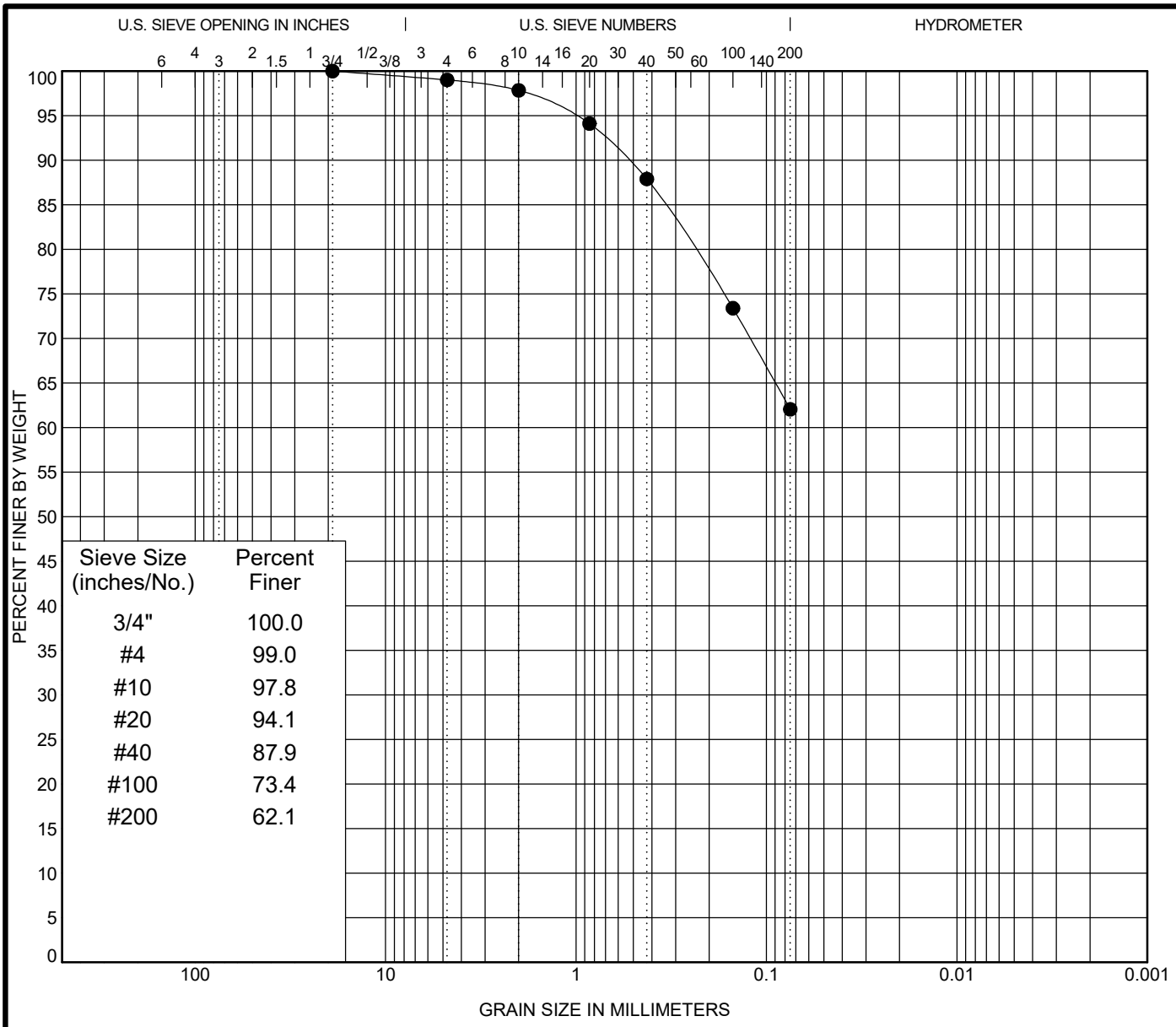


Sieve Size (inches/No.)	Percent Finer
3/4"	100.0
#4	99.0
#10	97.8
#20	94.1
#40	87.9
#100	73.4
#200	62.1

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S1A/1B

Depth (ft): 0.0 - 1.0

Description: Brown sandy silt (ML) with traces of gravel

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
					19				1.0	37.0	62.1

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

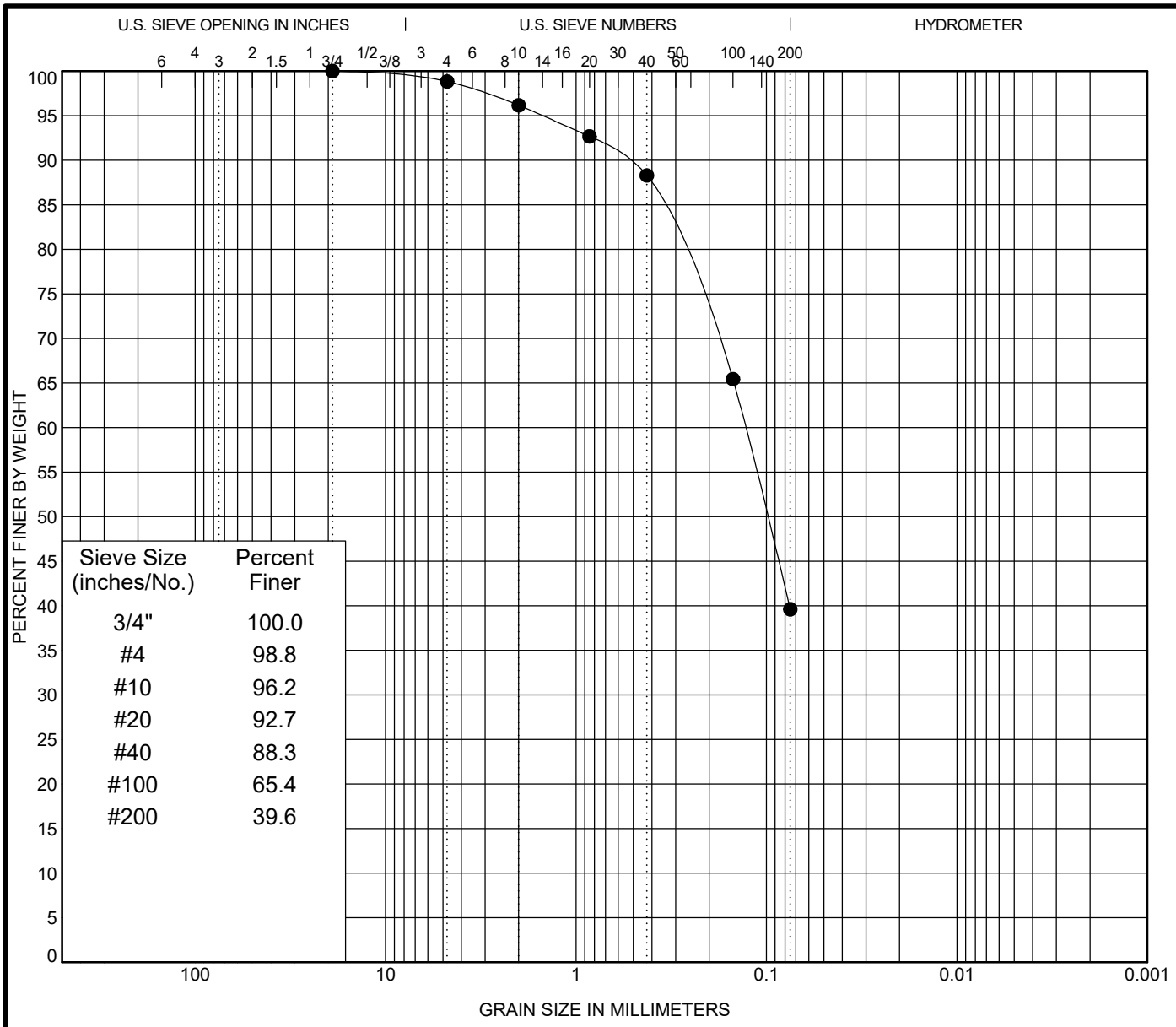
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 1

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S2

Depth (ft): 0.0 - 1.0

Description: Brown silty sand (SM) with traces of gravel

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
					19	0.13			1.2	59.2	39.6

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

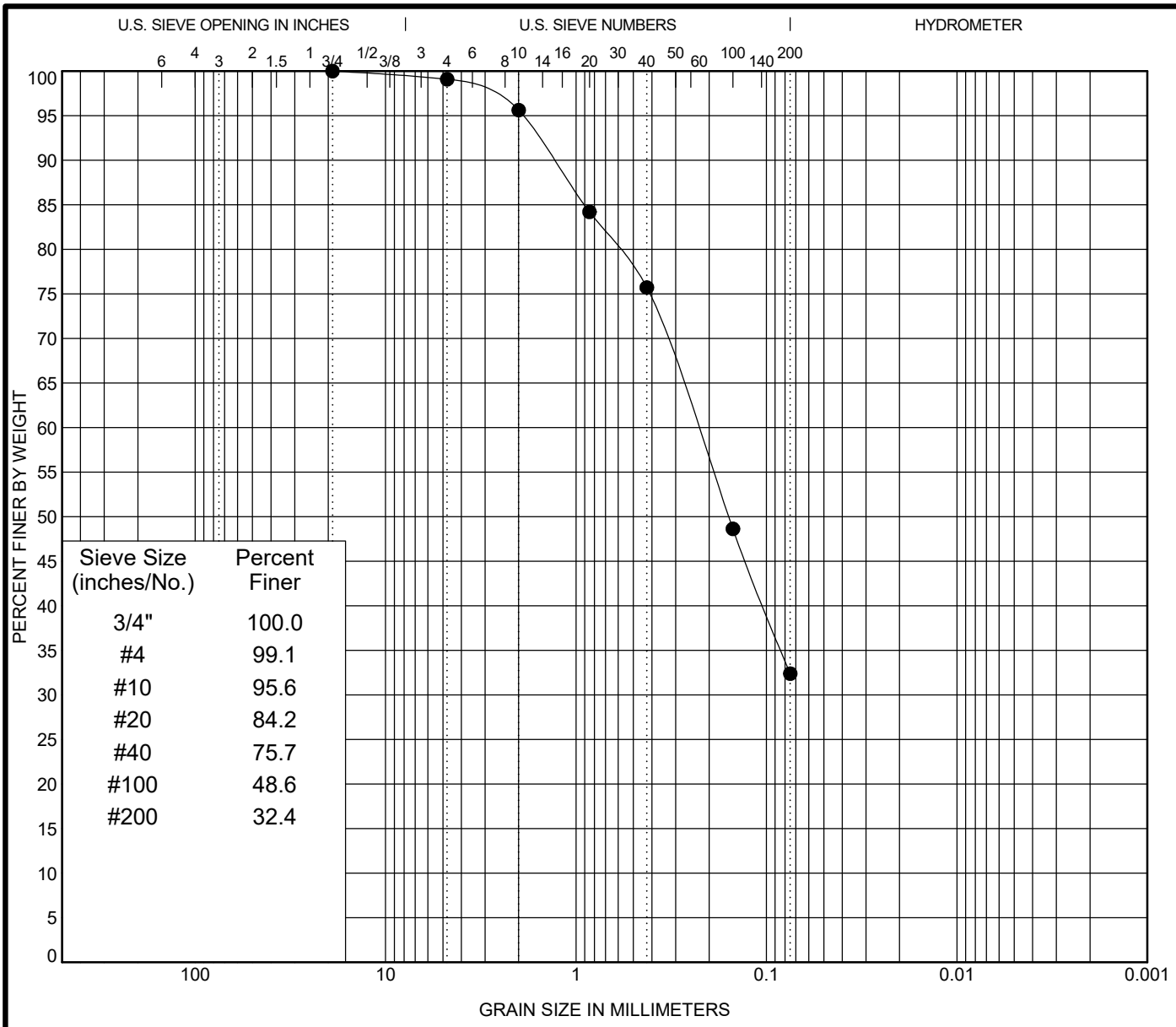
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 2

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



Sieve Size (inches/No.)	Percent Finer
3/4"	100.0
#4	99.1
#10	95.6
#20	84.2
#40	75.7
#100	48.6
#200	32.4

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S3

Depth (ft): 0.0 - 1.0

Description: Tan silty sand (SM) with traces of gravel

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
					19	0.232			0.9	66.7	32.4

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

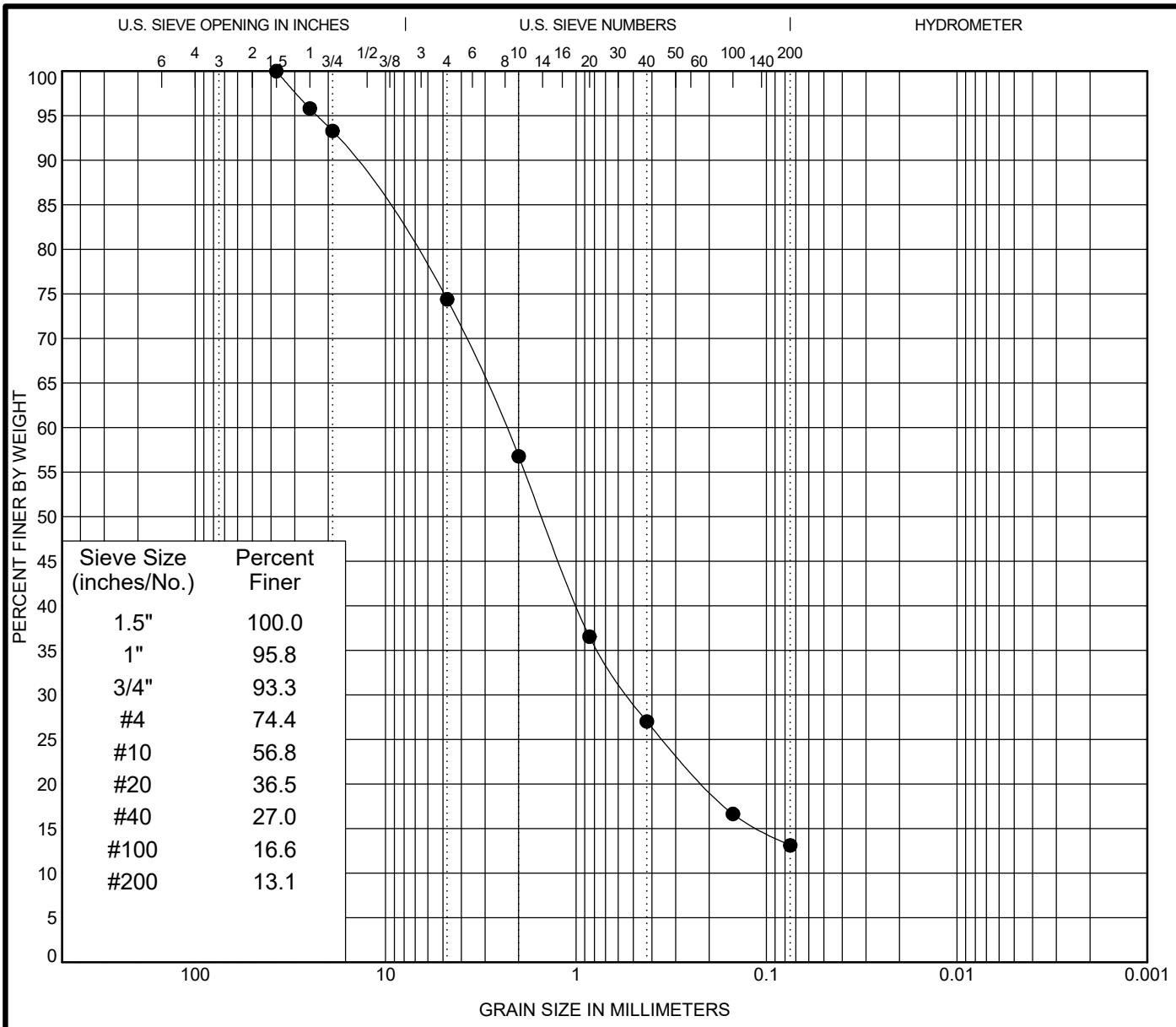
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 3

LAB GRAIN SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



Sieve Size (inches/No.)	Percent Finer
1.5"	100.0
1"	95.8
3/4"	93.3
#4	74.4
#10	56.8
#20	36.5
#40	27.0
#100	16.6
#200	13.1

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S4

Depth (ft): 0.0 - 1.0

Description: Tan silty sand (SM) with some gravel

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
					37.5	2.343	0.528		25.6	61.3	13.1

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

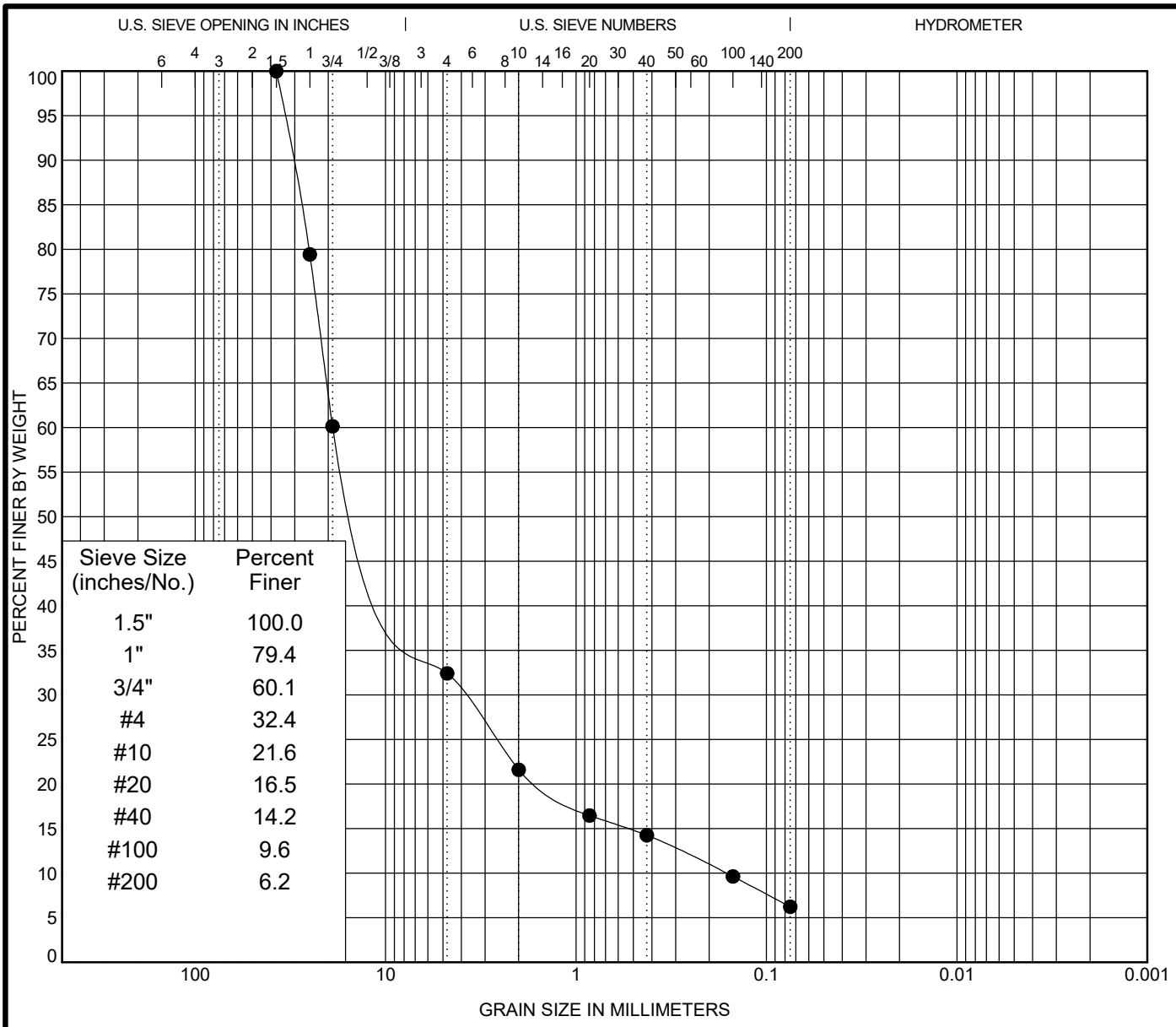
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 4

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



Sieve Size (inches/No.)	Percent Finer
1.5"	100.0
1"	79.4
3/4"	60.1
#4	32.4
#10	21.6
#20	16.5
#40	14.2
#100	9.6
#200	6.2

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S5

Depth (ft): 0.0 - 1.0

Description: Tan poorly graded gravel (GP-GM) with silt and sand

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			5.0	115.7	37.5	18.863	3.915	0.163	67.6	26.2	6.2

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

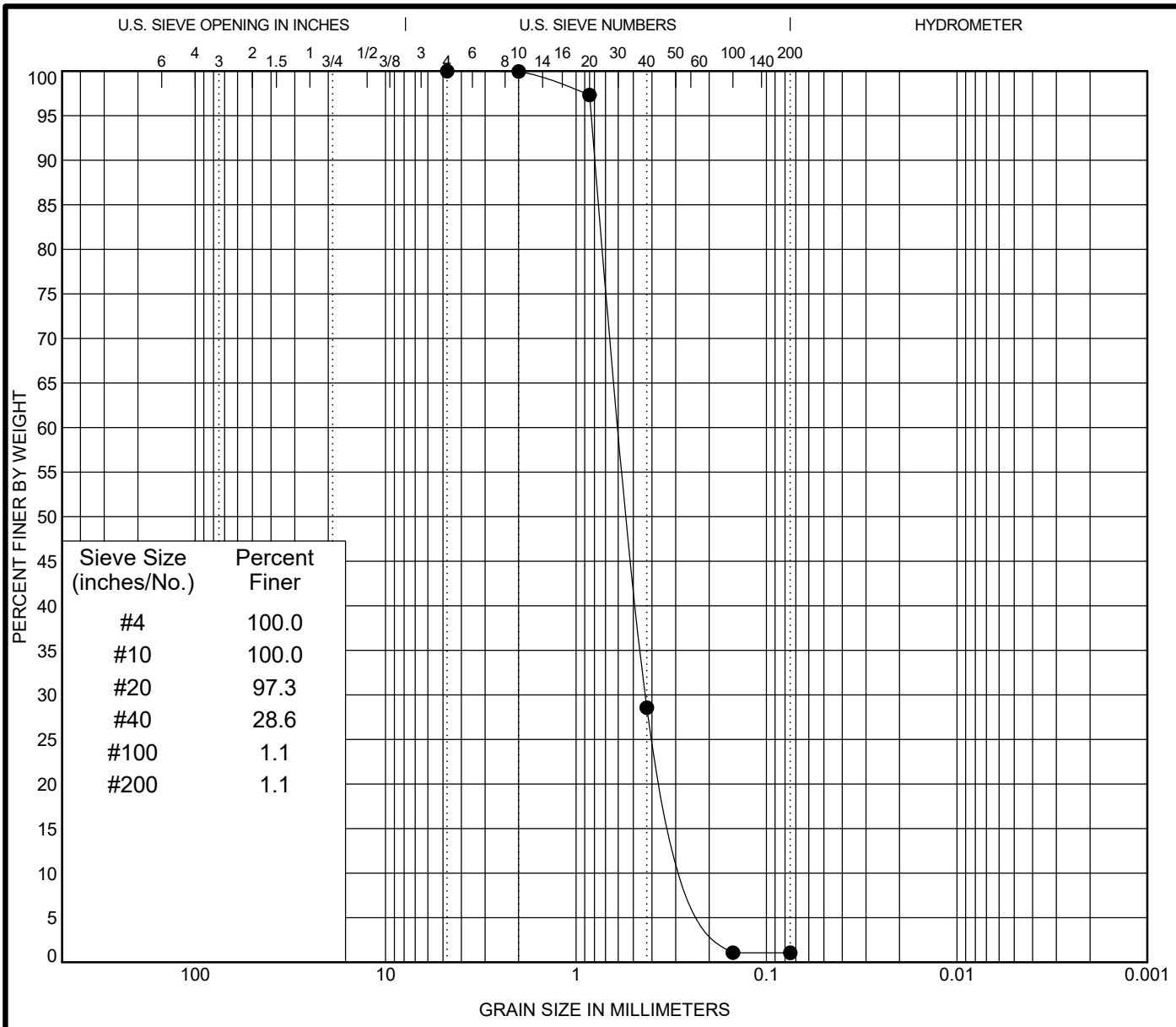
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 5

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



Sieve Size (inches/No.)	Percent Finer
#4	100.0
#10	100.0
#20	97.3
#40	28.6
#100	1.1
#200	1.1

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S6

Depth (ft): 0.0 - 1.0

Description: Tan sand (SP) with traces of silt

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			1.5	2.8	4.75	0.583	0.431	0.21	0.0	98.9	1.1

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

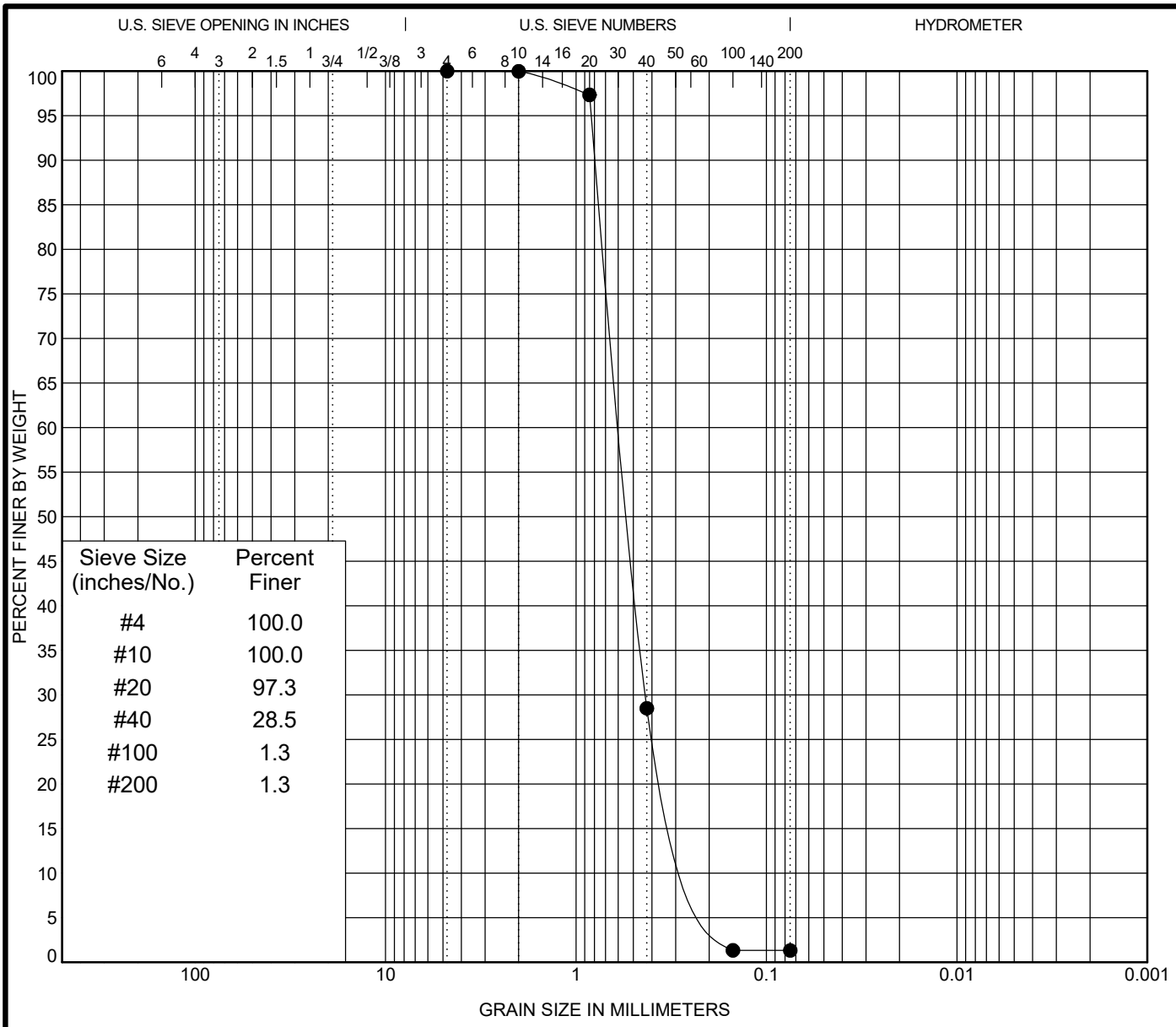
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 6

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S7

Depth (ft): 0.0 - 1.0

Description: Tan sand (SP) with traces of silt

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			1.5	2.8	4.75	0.584	0.431	0.209	0.0	98.7	1.3

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

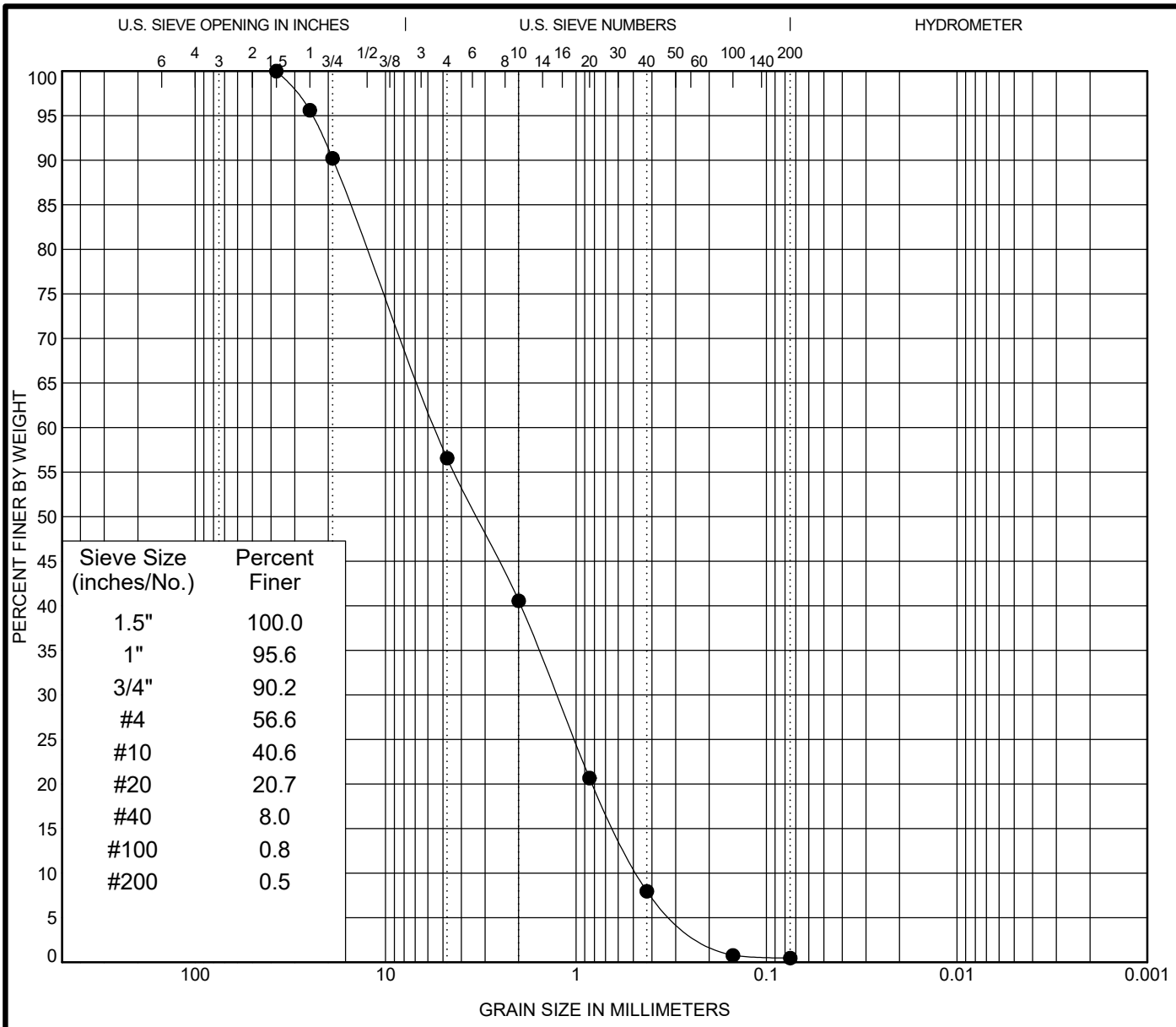
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 7

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



Sieve Size (inches/No.)	Percent Finer
1.5"	100.0
1"	95.6
3/4"	90.2
#4	56.6
#10	40.6
#20	20.7
#40	8.0
#100	0.8
#200	0.5

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S8

Depth (ft): 0.0 - 1.0

Description: Tan poorly graded sand (SP) with gravel

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			0.6	11.5	37.5	5.472	1.27	0.475	43.4	56.1	0.5

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GEOTECHNICAL ENGINEERING

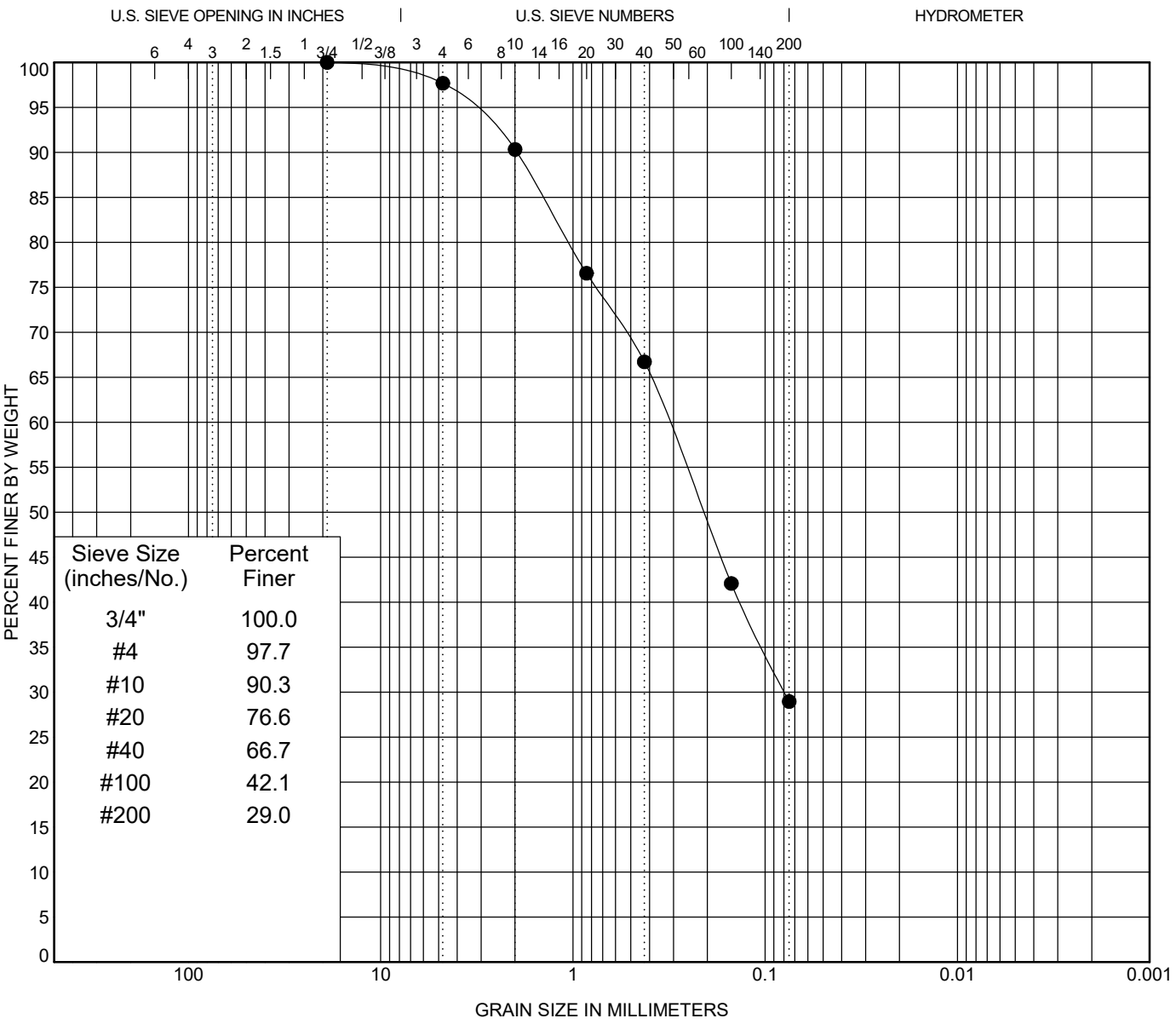
W.O. 8647-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 8

LAB GRAIN SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23



Sieve Size (inches/No.)	Percent Finer
3/4"	100.0
#4	97.7
#10	90.3
#20	76.6
#40	66.7
#100	42.1
#200	29.0

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: S9

Depth (ft): 0.0 - 1.0

Description: Tan silty sand (SM) with traces of gravel

Test Date: June 16, 2023

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
					19	0.32	0.079		2.3	68.7	29.0

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GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY DREDGING SEDIMENT

Plate B - 9

LAB_GRAIN_SIZE 8647-00.GPJ GEOLABS.GDT 6/28/23

Appendix D

Grain Size Distribution for
Beach Area Sediment Samples

GEOLABS, INC.
94-429 Koaki Street, Suite 200
Waipahu, Hawaii 96797
Phone: (808)841-5064

LETTER OF TRANSMITTAL

DATE: March 14, 2024	**JOB NO:** 8647-10
ATTENTION: Mr. Robert Walker	
RE: Laboratory Testing Services	
Maunalua Bay Boat Launch Facility	
Makapuu, Oahu, Hawaii	

TO: Integral
98-820 Moanalua Road, Space 5 #706
Aiea, HI 96701

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

NO.	DATE	PAGES	DESCRIPTION
1	3/6/2024	4	Sieve Analysis (ASTM C117 & C136) for 4 bag samples

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ___ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit ___ copies for distribution
☒ As requested ☐ Returned for corrections ☐ Return ___ corrected prints
☐ For review & comment ☐ Returning for Further Processing and Return
☐ FOR BIDS DUE _____ 20____ ☐ SIGNED AND RETURNED

REMARKS: Transmitting additional results of the laboratory sieve analysis for the grain size distribution of 4 bag samples (delived to our laboratory on 2/28/2024), to determine the grain size distribution.

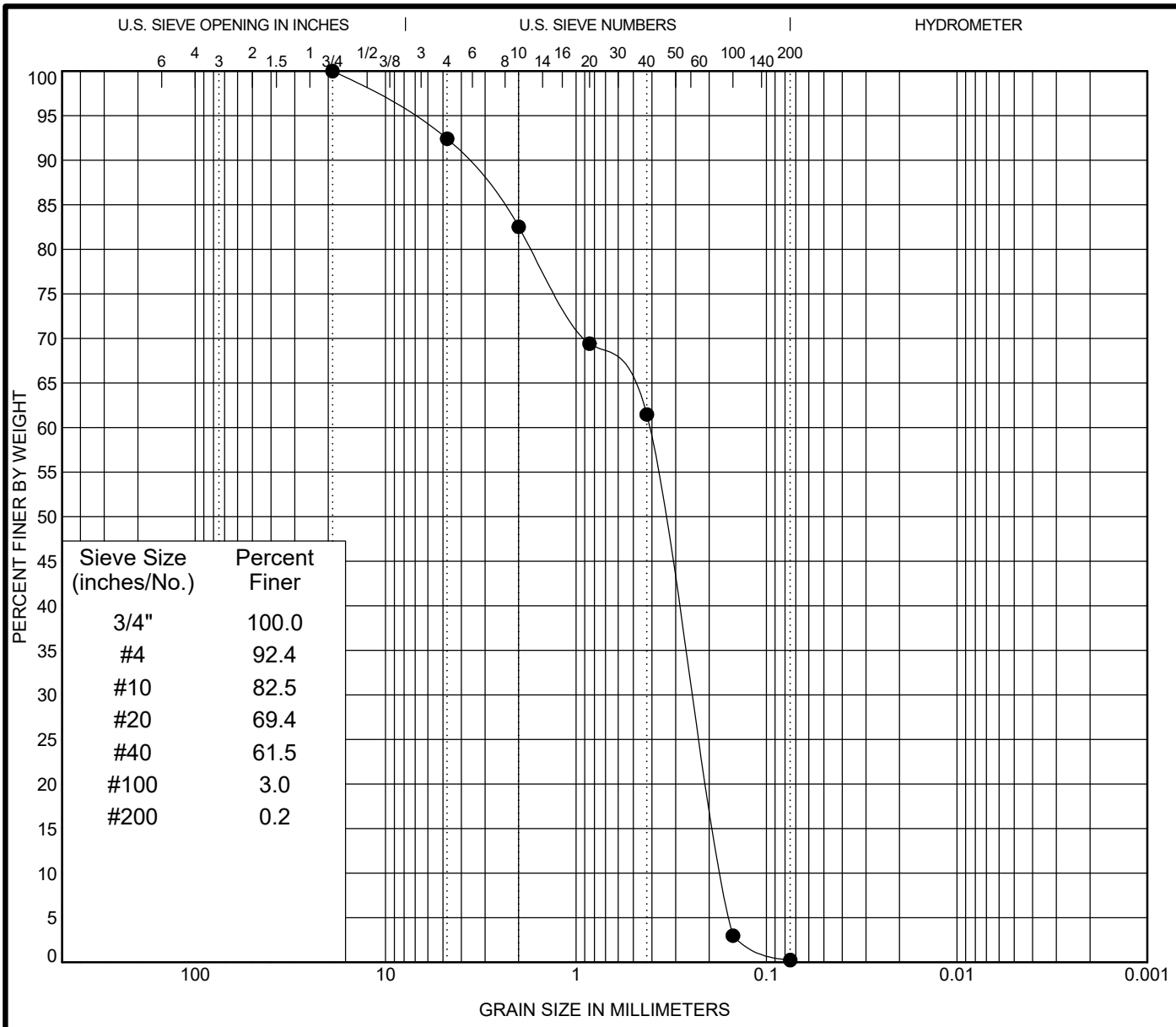
COPY TO _____

SIGNED: _____
John Y.L. Chen, P.E.
Vice President

JC:

If enclosures are not as noted, kindly notify us at once.

(h:\jchen\transmittal form.doc)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: B2-1

Depth (ft): 0.0 - 1.0

Description: Tannish brown poorly graded sand (SP)

Test Date: March 11, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			0.8	2.4	19	0.414	0.243	0.17	7.6	92.2	0.2

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

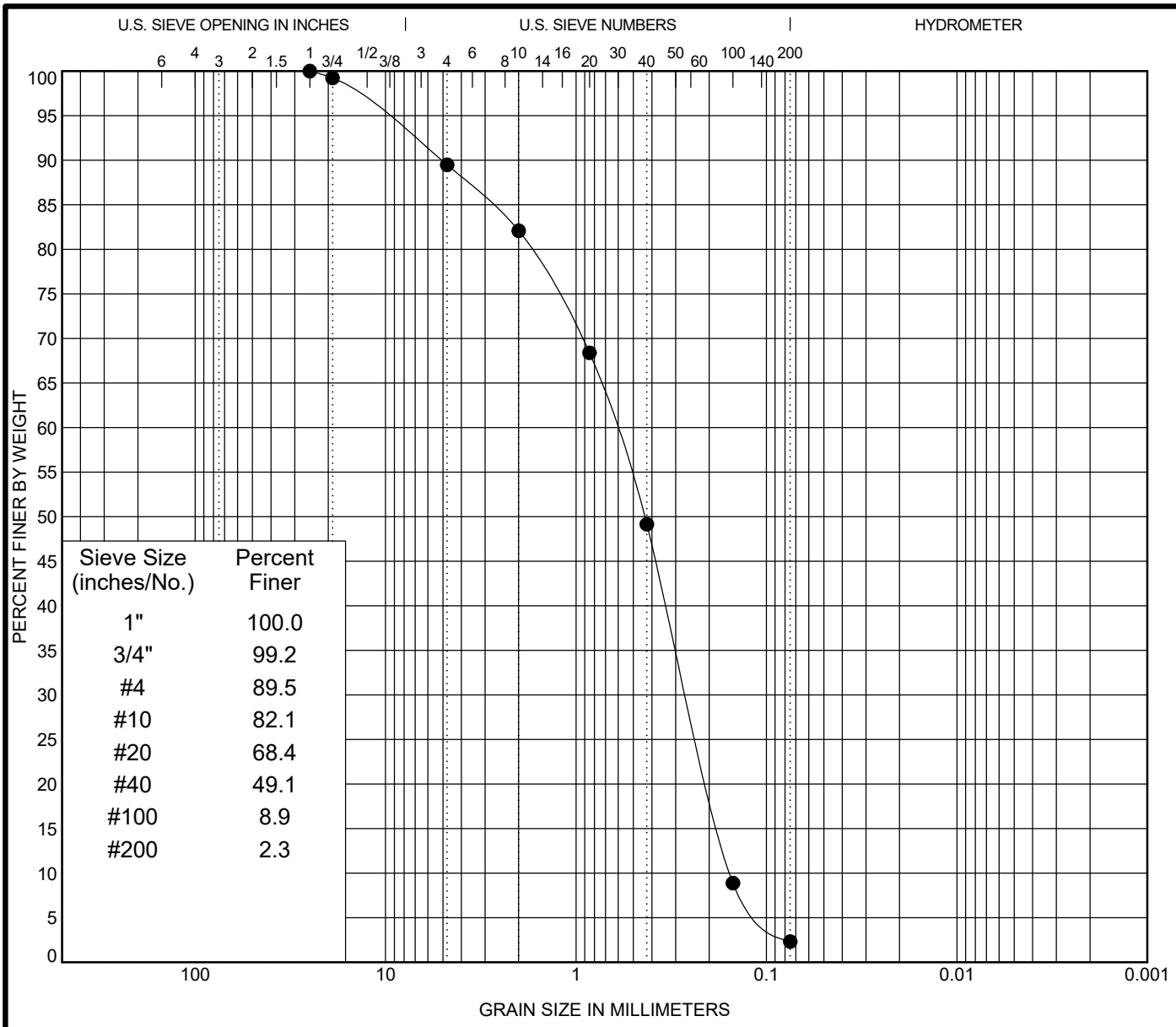
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 1

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 3/11/24



Sieve Size (inches/No.)	Percent Finer
1"	100.0
3/4"	99.2
#4	89.5
#10	82.1
#20	68.4
#40	49.1
#100	8.9
#200	2.3

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: C1-1

Depth (ft): 0.0 - 1.0

Description: Tannish brown poorly graded sand (SP)

Test Date: March 11, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			0.7	4.1	25	0.628	0.259	0.154	10.5	87.2	2.3

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GEOTECHNICAL ENGINEERING

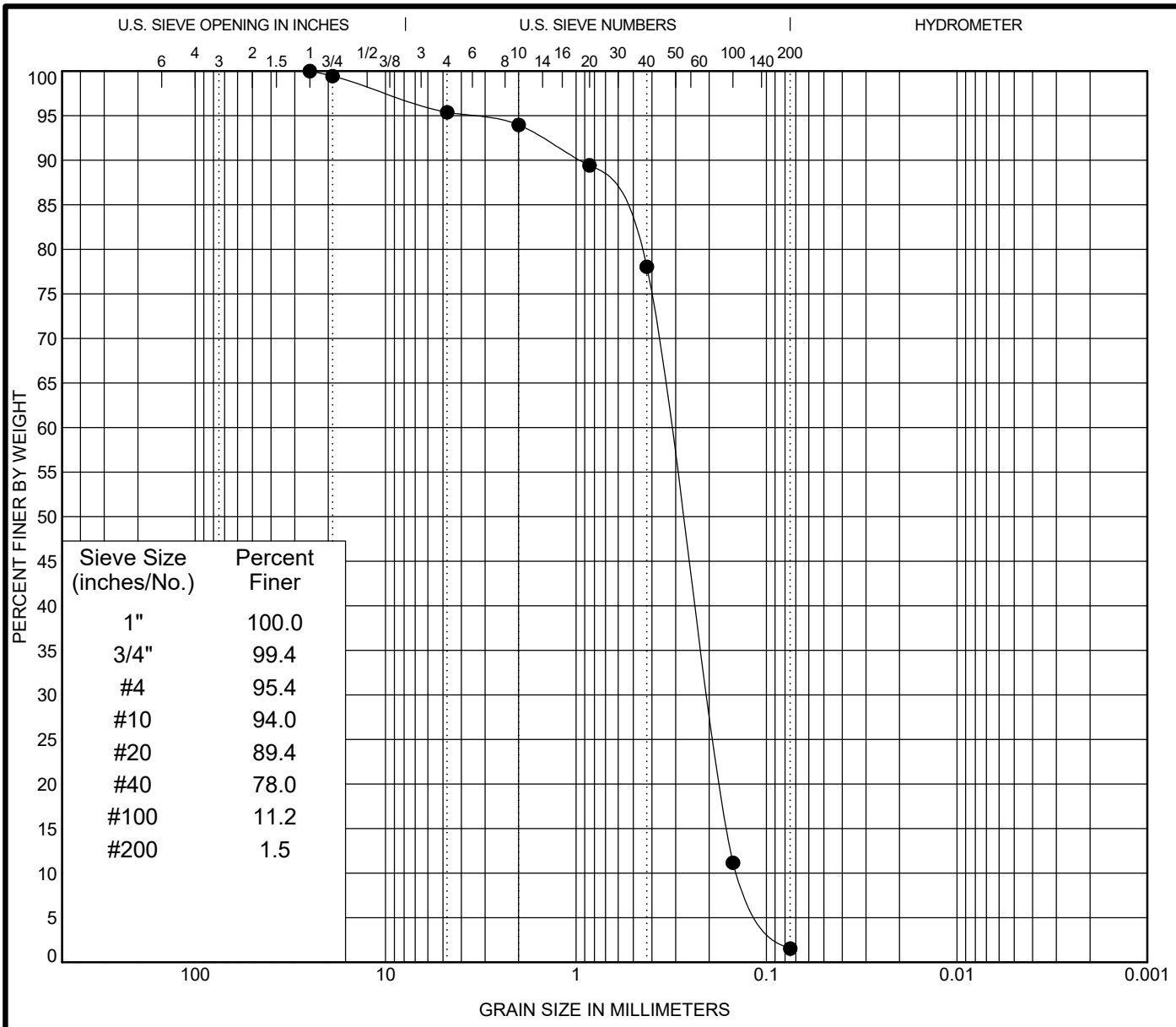
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 2

LAB GRAIN SIZE 8647-10.GPJ GEOLABS.GDT 3/11/24



Sieve Size (inches/No.)	Percent Finer
1"	100.0
3/4"	99.4
#4	95.4
#10	94.0
#20	89.4
#40	78.0
#100	11.2
#200	1.5

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample: C2-1

Depth (ft): 0.0 - 1.0

Description: Tannish brown poorly graded sand (SP)

Test Date: March 11, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			0.9	2.3	25	0.321	0.201	0.138	4.6	93.9	1.5

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GEOTECHNICAL ENGINEERING

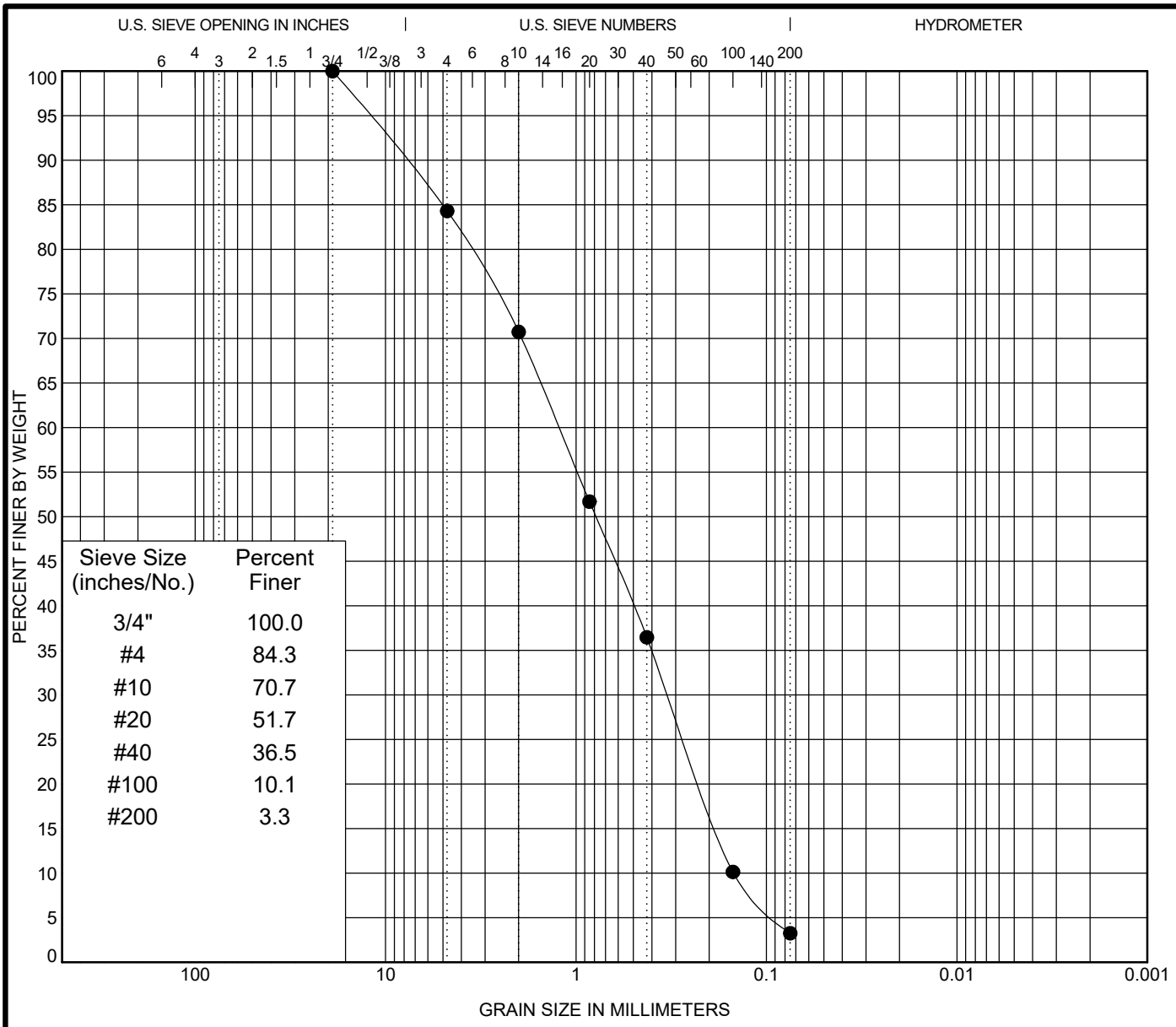
W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 3

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 3/11/24



Sample: C3-1

Depth (ft): 0.0 - 1.0

Description: Tannish brown poorly graded sand (SP) with some gravel

Test Date: March 11, 2024

LL	PL	PI	Cc	Cu	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
			0.6	8.3	19	1.235	0.329	0.148	15.7	81.0	3.3

GEOLABS, INC.

GEOTECHNICAL ENGINEERING

W.O. 8647-10

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUNALUA BAY BOAT RAMP

Plate B - 4

LAB_GRAIN_SIZE 8647-10.GPJ GEOLABS.GDT 3/11/24