

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Boating and Ocean Recreation
Honolulu, Hawaii 96819

July 14, 2023

Chairperson and Members
Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Land Board Members:

Subject: Approve Installation and Use of Three (3) New Water Chemistry Monitoring Offshore Mooring Buoys Outside of Established Offshore Mooring Areas at Olowalu, Island of Maui; Maihi Bay (Keauhou), Island of Hawaii; and Hoai Bay, Island of Kauai, for University of Hawaii, Oceanography Department

REQUEST:

The Division of Boating and Ocean Recreation (“DOBOR”) is requesting that the Board of Land and Natural Resources (“Board”) approve the installation of three (3) new water chemistry monitoring offshore mooring buoys for University of Hawaii, Oceanography Department (“Applicant”). As required by HAR 13-235-9, any applicant requesting to install a mooring outside of an established offshore mooring area must obtain approval from the Board.

The Applicant is proposing to install three (3) new water chemistry monitoring buoys: One (1) at Olowalu, Island of Maui (Coordinates: 20.804205° N, -156.605167° W); One (1) at Maihi Bay (Keauhou), Island of Hawaii (Coordinates: 19.548425° N, -155.963142° W); and One (1) at Hoai Bay, Island of Kauai (Coordinates: 21.876395° N, -159.471652° W). All three (3) buoys are equipped to allow mooring of a vessel for maintenance of the buoys. Routine inspection and maintenance of buoys will be the responsibility of the Applicant.

As all three (3) proposed buoys are located outside of a designated mooring area (as defined in HAR 13-235), the Applicant is requesting that the Board approve the installation and use of the moorings outside of an established offshore mooring zone, as required by HAR 13-235-9. The Applicant’s request is attached with Exhibit A.

PERMITS AND COMPLIANCE WITH STATE AND FEDERAL LAW:

In order to comply with Federal Law (Section 10 of the Rivers and Harbors act of 1899), DOBOR is requiring that all offshore moorings under their jurisdiction obtain a permit from the U.S. Army Corps of Engineers (“USACE”). In addition, to ensure that the mooring system is structurally sound, DOBOR is requiring that all offshore mooring permittees submit an Offshore Mooring Installation Plan, prepared by a licensed structural engineer, for approval.

The Applicant has obtained a Nationwide Permit Verification Letter from USACE and submitted an Offshore Mooring Installation Plan for each buoy, prepared by a licensed structural engineer, that have been approved by DOBOR Engineering Branch. The Applicant’s USACE Permit and approved Offshore Mooring Installation Plans are attached with Exhibit A.

Item J-1

In accordance with HAR 13-235-6, the National Marine Fisheries Service (NMFS) and DLNR, Division of Aquatic Resources (DAR) must determine whether an offshore mooring is detrimental to the habitat or spawning ground of marine life. Through the USACE permitting process, NMFS has been consulted and determined the offshore moorings have no detrimental effect to the habitat or spawning ground of marine life. DAR has also been consulted and concurred that the offshore mooring has no detrimental effect to the habitat or spawning ground of marine life.

HRS CHAPTER 343 - ENVIRONMENTAL ASSESSMENT:

In accordance with Hawaii Administrative Rule (HAR) Section 11-200.1 and the Exemption List for the Department of Land and Natural Resources (DLNR), approved by the Environmental Council, on November 10, 2020, it has been determined that the installation of the three (3) new water chemistry monitoring buoys is exempt from the preparation of an EA pursuant to the following exemptions:

General Exemption 3: Construction and location of single new, small facilities or structures and the alteration and modification of the facilities or structures and installation of new, small, equipment and facilities and the alteration and modification of the equipment or facilities, including but not limited to: (A) Single family residences less than 3,500 square feet, as measured by the controlling law under which the proposed action is being considered, if not in conjunction with the building of two or more such units; (B) Multi-unit structures designed for not more than four dwelling units if not in conjunction with the building of two or more such structures; (C) Stores, offices and restaurants designed for total occupant load of twenty individuals or fewer per structure, if not in conjunction with the building of two or more such structures; and (D) Water, sewage, electrical, gas, telephone, and other essential public utility services extensions to serve such structures or facilities; accessory or appurtenant structures including garages, carports, patios, swimming pools, and fences; and acquisition of utility easements.

Part 1, Item 20: Placement or construction of accessory structures such as office trailers, trash enclosures, bus shelters, picnic shelters, parking and fee collection facilities, checking stations, dock boxes, mooring cleats, bumpers, and mooring buoys, blocks and piles, and other similar structures accessory to existing facilities.

General Exemption 5: Basic data collection, research, experimental management, and resource and infrastructure testing and evaluation activities that do not result in a serious or major disturbance to an environmental resource.

Part 1, Item 5: Installation of new, small groundwater, surface water, or climatological monitoring and data collection equipment, structures that house or protect this equipment, and installation of electrical, telemetry, or communications systems to service this equipment.

RECOMMENDATION:

Approve the installation and use of three (3) new water chemistry monitoring buoys: One (1) at Olowalu, Island of Maui; One (1) at Maihi Bay (Keauhou), Island of Hawaii; and One (1) at Hoai Bay, Island of Kauai all of which are located outside of a designated offshore mooring area.

Approve Installation of Three (3) Water Chemistry Monitoring Buoys
Outside of Established Offshore Mooring Areas
Olowalu, Maui; Maihi Bay (Keauhou), Hawaii; Hoai Bay, Kauai
University of Hawaii, Oceanography Department

July 14, 2023

Respectfully Submitted,



EDWARD R. UNDERWOOD, Administrator
Division of Boating & Ocean Recreation

APPROVED FOR SUBMITTAL:



DAWN N. S. CHANG, Chairperson
Board of Land and Natural Resources

Attachment:

- A. Applicant's request for approval to install and use three (3) new offshore moorings, approved Offshore Mooring Installation Plans, Nationwide Permit Verification Letter from U.S. Army Corps of Engineers

EXEMPTION NOTIFICATION

Regarding the preparation of an environmental assessment pursuant to Chapter 343, HRS and Chapter 11-200.1, HAR

Project Title:	Installation and Use of Three (3) New Water Chemistry Monitoring Buoys: One (1) at Olowalu, Island of Maui; One (1) at Maihi Bay (Keauhou), Island of Hawaii; and One (1) at Hoai Bay, Island of Kauai for University of Hawaii, Oceanography Department
Project / Reference No.:	N/A
Project Location:	One (1) at Olowalu, Island of Maui (Coordinates: 20.804205° N, 156.605167° W); One (1) at Maihi Bay (Keauhou), Island of Hawaii (Coordinates: 19.548425° N, -155.963142° W); and One (1) at Hoai Bay, Island of Kauai (Coordinates: 21.876395° N, -159.471652° W)
Project Description:	Installation and use of three (3) water chemistry monitoring buoys to measure water quality parameters.
Chap. 343 Trigger(s):	Use of State Lands (submerged land)
Exemption Class No(s).:	General Exemption Type 3, Part 1 (De Minimis), Item 20 General Exemption Type 5, Part 1 (De Minimis), Item 5
Cumulative Impact of Planned Successive Actions in Same Place Significant?	No. There are no planned successive actions to be undertaken at the same location.
Action May have Significant Impact on Particularly Sensitive Environment?	No. The environment in the area of the proposed moorings were surveyed by DLNR-DAR divers to confirm sand bottom with no coral reefs or marine features that are critical for aquatic species habitat or spawning areas in the proximity of the mooring anchors.
Analysis:	The materials to be installed for the offshore moorings are chemically inert and do not pose a threat to essential marine habitat or endangered species and do not pose any hazard or obstruction to existing uses of the ocean in the area.
Consulted Parties:	<ul style="list-style-type: none"> - U.S. Army Corps of Engineers - DLNR, Division of Aquatic Resources
Recommendation:	The Board finds that the proposed three (3) water chemistry monitoring buoys will probably have minimal or no significant effect on the environment and declares that this project is exempt from the preparation of an environmental assessment.



UNIVERSITY
of HAWAII®
MĀNOA

April 5, 2023

Dr. Christopher Sabine
1000 Pope Rd.
Honolulu, HI
96822

SUBJECT: Request for Approval of a New Offshore Moorings Outside of a Designated Offshore Mooring Area and Declare the Moorings Exempt from Requirement for Preparation of Environmental Assessment at Olowalu, Maui, Hoai Bay, Kaua'i, and Keauhou, Hawai'i

Submitted to:
Board of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Submitted by:
Dr. Christopher Sabine

Request:

In accordance with HAR 13-235-9, Dr. Christopher Sabine hereby requests approval from the Board of Land and Natural Resources ("Board") to install three new offshore moorings for three water chemistry buoys at Olowalu, Maui, Hoai Bay, Kaua'i, and Keauhou, Hawai'i, which are outside of designated offshore mooring areas. In accordance with HRS Chapter 343 and HAR 200.1-8 Dr. Christopher Sabine further requests that the Board declare installation and use of the mooring exempt from the requirement to prepare an environmental assessment due to the use of submerged state land.

Reason and Justification for Request

Installation of Offshore Mooring Outside of an Existing Offshore Mooring Area:

This mooring will be used for the anchoring of water quality buoy, called MAPCO₂ buoys, which are specifically designed by the National Oceanic and Atmospheric Administration (NOAA) Pacific Marine Environmental Laboratory (PMEL) to measure water chemistry measurements to study ocean acidification, including pH and partial pressure of carbon dioxide in the ocean water and air. The buoy will also collect data for other aspects of water quality including temperature, salinity, dissolved oxygen, chlorophyll, and turbidity.

Environmental Assessment Exemption:

The proposed offshore mooring falls under the Department of Land and Natural Resources' Exemption List, approved by the Environmental Council on November 10, 2020 under the following exemption:

General Exemption Type 3: Construction and location of single new, small facilities or structures and the alteration and modification of the facilities or structures and installation of new, small, equipment and facilities and the

alteration and modification of the equipment or facilities, including but not limited to: (A) Single family residences less than 3,500 square feet, as measured by the controlling law under which the proposed action is being considered, if not in conjunction with the building of two or more such units; (B) Multi-unit structures designed for not more than four dwelling units if not in conjunction with the building of two or more such structures; (C) Stores, offices and restaurants designed for total occupant load of twenty individuals or fewer per structure, if not in conjunction with the building of two or more such structures; and (D) Water, sewage, electrical, gas, telephone, and other essential public utility services extensions to serve such structures or facilities; accessory or appurtenant structures including garages, carports, patios, swimming pools, and fences; and acquisition of utility easements.

Part 1, Item 20: Placement or construction of accessory structures such as office trailers, trash enclosures, bus shelters, picnic shelters, parking and fee collection facilities, checking stations, dock boxes, mooring cleats, bumpers, and mooring buoys, blocks and piles, and other similar structures accessory to existing facilities.

Permitting and DOBOR Approval:

Permits from the U.S. Army Corps of Engineers have been obtained, see attached permit verification letters POH-2023-00062, POH-2023-00063, POH-2023-00064.

Offshore mooring plans, prepared by a licensed structural engineer in the State of Hawai‘i, have been approved by the Division of Boating and Ocean Recreation, see attached approved offshore mooring plans.

Description of Offshore Mooring:

Single point mooring with the following anchor, mooring line, tackle, and buoys designs:

Anchor: Type, material, and size/weight.

- **Type:** 2 stacked train wheels
- **Material:** high tensile hardened steel
- **Size:** 0.97m diameter, 0.35 m height off bottom
- **Weight:** 1800 lbs (air weight), ~1500 lbs (in water weight)

Chain/lines: Type, length, material, and size.

- **Type:** simple chain, and nylon and bungee mooring developed by Buoy Technology LLC each bungee having vertical buoy loading of mean: 200-250 lb., and max: ~800 lb.
 - **Technical notes on type:** the moorings are comprised of simple chain, nylon and bungee mooring, with a taught line design to meet 'leave no trace' protected area guidelines. The bungees are a proven design, supplied by BuoyTec, and have demonstrated decades of successful operation in the marine environment. These moorings required a site-specific upfront mooring design effort. The following list highlights the custom components that are made for these moorings:
 - Bungee Termination Plates
 - Bi moor Mooring Termination Plate
 - Nylon Line: The nylon is coated with polyurethane line stiffener (International Intershield 259-line stiffener) to retard the growth of marine organisms on the line.
 - There is a swivel located right above, and right below the bungees to prevent them from tangling and twisting.
 - The anchors are a two-railroad wheel stack design with a water weight of ~1500lb, and an air weight of ~ 1730 lb.

- **Material:** 3/4" Chain, and for bungee: "Natsyn" synthetic rubber, Minimum Stretch ~130%, Mean Stretch ~200%, Max Stretch ~300%
- **Length:** Length is inclusive of the component list above and determined via the following technical calculations:
Technical notes on the calculations for length: BuoyTec, the company manufactures the mooring bungee, runs static computer simulations on various mooring design iterations. NOAA PMEL's engineers assisted in double-checking this design iteration using numerical simulation program, WHOI CABLE (dynamic loading), and by using a CAD program to verify geometry and bungee stretch limits.
- The elastic tether line length, chain length, and shackle rating needed were determined via the following site-specific characteristics:
 - Olowalu – 3 x 6.0-meter elastic tether stretched to 11.2 meters
Water Depth and Time (used to calculate MW, HW, and LW):
 15m (50 ft) on April 26, 2022 at 10:15 am
Wave Height (based on SWAN model):
 Average: 0.4 m, Max (since 2016): 4 m
Currents (based on ROMS model):
 Predominant Direction: SE, Average Speed: 0.2 m/s
 - Hoai Bay – 3 x 6.0-meter elastic tether stretched to 11.9 meters
Depth and Time (used to calculate MW, HW, and LW):
 15.85m (52 ft) on April 13, 2022, at 8:11 am
Wave Height (based on SWAN model):
 Average: 0.8 m, Max (since 2016): 2.4 m
Currents (based on ROMS model):
 Predominant Direction: SE, Average Speed: 0.2 m/s
 - Keauhou – 3 x 6.0-meter elastic tether stretched to 11.0 meters
Depth and Time (used to calculate MW, HW, and LW):
 15 m (50 ft) on June 16, 2022, at 12:08 pm
Wave Height (based on SWAN model):
 Average: 0.6 m, Max (since 2016): 3.9 m
Currents (based on ROMS model):
 Predominant Direction from 2007-2017: SE. Average Speed: 0.238 m/s

Tackle:

- Type, size, material per each buoy/mooring system:
 - 15 x 3/4" SAS,
 - 2-Link 3/4" Chain,
 - 2x 3-ton swivel,
 - 3/4" chain (1.0 m for Hawai'i and Kaua'i, 0.5 m for Maui),
 - Connector rings (top and bottom),
- Location of shackles, swivels, splices, thimbles, etc:

Buoys (subsurface and surface): Type, material, size, and location along mooring line.

- **Type:** MAPCO₂ buoy developed by NOAA PMEL and manufactured by Sunbacker Fiberglass: (<https://www.pmel.noaa.gov/co2/file/MAPCO2> and <https://sunbacker.com/oceanographic/>), as a modified version of the DART-3-ETD buoy hull. The buoy has several unique features that make it a good candidate for the near reef environment including its relatively small size, a tamper resistant cover, clamps for mounting a water quality sensors instrumentation from Seabird Scientific and Sunburst Sensors, a highly configurable subsurface instrument platform to accommodate additional strap on sensors.

- **Material:** Galvanized mild steel framework, encased in a foam filled molded fiberglass hull, with a polyurea overcoat. The buoy has an air weight, with an installed MApCO2 system, of 950 lb. and a displacement of 2380 lb.
- **Size:** The buoy has an air weight, with an installed MApCO2 system, of 950 lb. and a displacement of 2380 lb. It has an in water depth of bridle 1.2 m, and is approximately in diameter.
- Location along mooring line: Surface; buoys are at the top attached to the end of the mooring line for each location

Location of Offshore Mooring:

Olowalu, Maui (20.804205, -156.605167)
Hoai Bay, Kaua'i (21.876395, -159.471652)
Keauhou, Hawai'i (19.548425, -155.963142)

Purpose of Offshore Mooring:

Autonomous water quality monitoring, with a particular focus on parameters to measure ocean acidification, including pH and partial pressure of carbon dioxide in the ocean water and air. These autonomously collected water quality data, will also include: temperature, salinity, dissolved oxygen, chlorophyll a, and turbidity. This data will be transmitted by satellite and will be available online through the PacIOOS website for the community (<https://www.pacioos.hawaii.edu/water-category/wqbuoy/>).

Impact on Coastal Ecosystem and Marine Habitat:

The impact of the offshore mooring is negligible. The mooring site is not within the Special Management Area or Shoreline Setback Area. The site does not provide habitat for any known endangered species, plants, birds, or mammals. The site is not within, and does not border any National Area Reserve, Marine Conservation District or estuary. The site is not on or close to, any coral reef or coral colonies. No dredge or fill activities will be involved with use of the mooring. The mooring is installed in an area approved for the installation of offshore moorings by the DLNR Division of Boating and Ocean Recreation.

Impact on Historic Properties:

There are no historic properties located in the vicinity of the proposed offshore mooring.

Impact on Cultural Resources and Practices:

The proposed offshore mooring will not adversely impact cultural resources or practices.

Sincerely,



Christopher L. Sabine
Professor, Oceanography Department
Interim Vice Provost for Research and Scholarship, UH Manoa



US Army Corps of Engineers
Honolulu District
BUILDING STRONG®

DEPARTMENT OF THE ARMY PERMIT COMPLIANCE CERTIFICATION

File Number:
Project Title:

PERMIT TYPE: Nationwide Permit #5 Scientific Measurement Devices

NAME OF PERMITTEE: Christopher Sabine

DATE OF ISSUANCE: March 30, 2023

DATE OF EXPIRATION: March 14, 2026

The permittee must, upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address or via email within thirty (30) days of completion of work:

U.S. Army Corps of Engineers, Honolulu District
Regulatory Office
Building 230, CEPOH-RO
Fort Shafter, HI 96858-5440
Email: CEPOH-RO@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of this permit, you are subject to permit suspension, modification or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

Christopher Sabine Digitally signed by Christopher Sabine
Date: 2023.04.12 16:34:22 -10'00'

Signature of Permittee

April 12, 2023

Date



DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

March 30, 2023

SUBJECT: Nationwide Permit Verification for Water Quality Buoy, Olowalu, Island of Maui; Maihi Bay, Keauhou, Island of Hawaii; Hoai Bay, Poipu, Island of Kauai; Hawaii Department of the Army File No. POH-2023-00062, POH-2023-00063, POH-2023-00064

Christopher Sabine
University of Hawai'i Manoa
1000 Pope Rd.
Honolulu, HI 96822

Dear Dr. Sabine:

The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Branch has completed review of your Pre-Construction Notification dated March 16, 2023, requesting authorization for the proposed installation of water quality buoys off the waters of Maui, Hawaii, and Kauai located at 20.8042, -156.6052, Olowalu, Island of Maui, Hawaii; 19.5486, -155.9633, Maihi Bay, Keauhou, Island of Hawaii, Hawaii; and 21.8764, -159.4717, Hoai Bay, Poipu, Island of Kauai, Hawaii. Please reference Department of the Army (DA) file number POH-2023-00062, POH-2023-00063, and/or POH-2023-00064, respectively, in any future correspondence related to this permit.

This letter verifies your activity complies with the terms and conditions of Nationwide Permit (NWP) #5, (Scientific Measurement Devices) issued on February 25, 2022. This NWP verification letter is being issued pursuant Section 10 of the Rivers and Harbors Act of 1899 for work or structures in or affecting navigable waters of the U.S. You are authorized to conduct the following work below the mean high water mark (MHW) as described below and as depicted on the enclosed drawings (Enclosure 1):

The installation of a water quality measuring buoy (offshore mooring system) at three separate sites. The systems would consist of an anchor, chain/lines, and buoy.

- The anchor consists of two stacked train wheels made of hardened steel weighting approximately 1500 lbs. in water. The footprint of the anchor is approximately 11 square feet.
- The chain/lines consist of a 1.64-foot long (Maui) or 3.28-foot long (Hawaii and Kauai), 3/4 in. chain and three 19.68-foot elastic tethers that have a stretch up to 36.75 feet (Maui), 36.09 feet (Hawaii), and 39.04 feet (Kauai).
- The buoy is a MAPCO2 buoy developed by NOAA Pacific Marine Environmental Laboratory (PMEL) and manufactured by Sunbacker Fiberglass. It is constructed of steel and fiberglass with a polyurea overcoat. It has an air weight of 950 lb. and a displacement of 2380 lb.

- The anchor would be placed at a water depth of 50 feet at Maui and Hawaii and a depth of 52 feet at Kauai. At all three locations, the maximum swing circle of mooring would be 100 feet. The systems would be removed once all data collection is complete, up to ten years after installation.

Based upon the information and plans you provided, we hereby verify that the work described above, is authorized by Nationwide Permit (NWP) No. 5, Scientific Measurement Devices. NWP No. 5 and its associated Regional and General Conditions can be accessed at the following link on the USACE Honolulu District website: <https://www.poh.usace.army.mil/Missions/Regulatory/Permits/Nationwide-Permits/>. You must comply with all terms and conditions associated with NWP No. 5, as well as with the special conditions listed below:

Special Condition 1: The permittee's use of the permitted activity must not interfere with the public's right to free navigation on all navigable water of the U.S.

Special Condition 2: The permittee must install and maintain, at their expense, any safety lights and signals prescribed by the U.S. Coast Guard (USCG), through regulations or otherwise, on your authorized facilities. The USCG may be reached at D14-DG-PJ-dpw@uscg.mil.

Special Condition 3: The permittee understands and agrees that, if future operations by the U.S. require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or their authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

Special Condition 4: Endangered Species Act, Section 7 Consultation Requirements. The permittee must comply with the attached Standard Local Operating Procedures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES) general conditions and best management practices (BMPs) (Enclosure 2).

Special Condition 5: Magnuson-Stevens Act, Essential Fish Habitat Consultation Requirements. The permittee must comply with the Conservation Recommendations for EFH species provided in the EFH Programmatic (Enclosure 3)

Verification of your project under this NWP is valid until **March 14, 2026** unless this NWP is modified, reissued, or revoked prior to that date. It is incumbent upon you to remain informed of changes to the NWPs. If the Corps modifies, reissues, or revokes

any NWP at an earlier date, we will issue a public notice announcing the changes. Failure to comply with all terms and conditions of this NWP verification invalidates this authorization and could result in a violation of the Rivers and Harbors Act and subsequent enforcement action. This authorization does not relieve you of the responsibility to obtain any other federal, state, and/or local authorizations required by law.

Your project complies with the requirements of the Clean Water Act, Section 401 Blanket Water Quality Certification (WQC) WQC1092 issued for this Nationwide Permit by the State of Hawaii Department of Health, Clean Water Branch. You are responsible for complying with the attached General Conditions of this WQC (Enclosure 4).

Your project complies with the requirements of the Coastal Zone Management Consistency Concurrence for this Nationwide Permit issued by the State of Hawaii Department of Business, Economic Development and Tourism, Office of Planning during the Nationwide Permit reissuance process in 2021.

Lastly, General Condition #30 requires a signed certification be submitted to this office upon completion of work. Please fill out the associated DA file number and project title with location, sign and date, and return the enclosed *Compliance Certification* form (Enclosure 5) within 30 days of completion of work to the email address specified below or to the email address or mailing address indicated on the Compliance Certification form.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should you have any questions related to this authorization, please contact me CJ Cayanan at (808) 835-4107 or via email at Cristian.J.Cayanan@usace.army.mil. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at <https://regulatory.ops.usace.army.mil/ords/f?p=136:4>.

Sincerely,

A handwritten signature in black ink, appearing to read 'CJ Cayanan', with a long horizontal flourish extending to the right.

CJ Cayanan
Regulatory Specialist, Regulatory Branch

Enclosures

Electronic cc:

U.S. Coast Guard, SecHonoWaterWays@uscg.mil

State of Hawaii Department of Health, Clean Water Branch

Darryl C Lum darryl.lum@doh.hawaii.gov

State of Hawaii Office of Planning, Coastal Zone Management Program

Debra Mendes Debra.L.Mendes@hawaii.gov

Amy Markel (University of Hawai'i Manoa) amarkel@hawaii.edu

OLOWALU, MAUI OFFSHORE BUOY MOORING FOR: NOAA/PMEL MAPCO₂

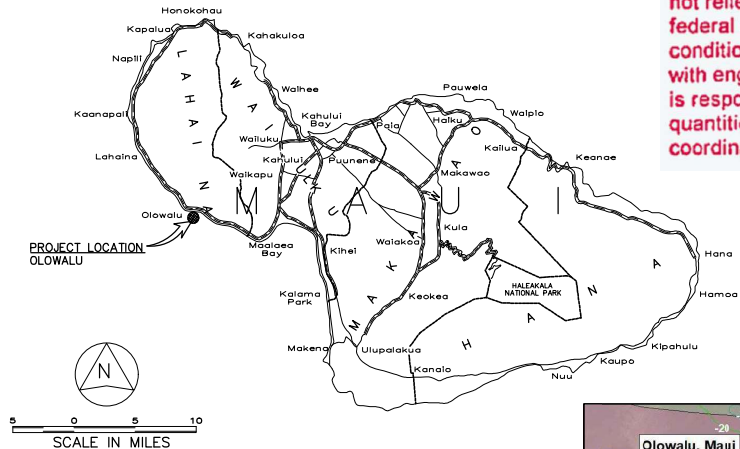
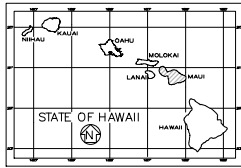
GPS COORDINATES OF MOORING : 20.804205°N, 156.605167°W
APPROXIMATE WATER DEPTH : 50'

**Department of Land and Natural Resources
Division of Boating and Ocean Recreation
PLAN REVIEW:**

Approved Approved, as noted
 Rejected Revise & Resubmit

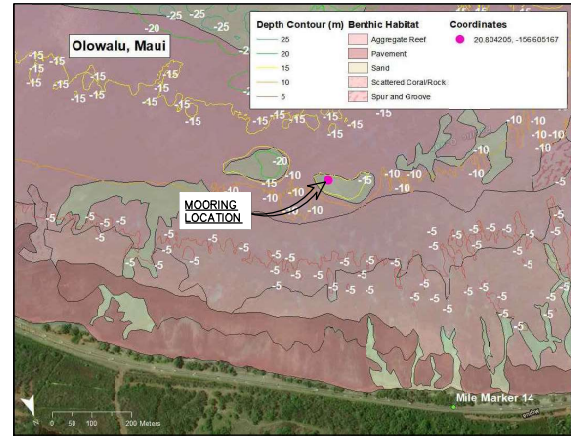
By: f-hdp Date: 1/17/2023

Corrections, comments or approval of plans shall not relieve the contractor from other local, state, federal or other agency regulations or permit conditions. This review is for general conformance with engineering design guidelines. The contractor is responsible for confirming all dimensions, quantities, fabrication requirements, and coordination with all other trades.



SCALE IN MILES
0 5 10

VICINITY MAP



LOCATION MAP

**ALLSHORE
ENGINEERING, LLC.**

61-655 KAMEHAMEHA HIGHWAY
HALEIWA, HAWAII 96712 • (808) 349-4990



JM Murrell

EXPIRES DATE OF THE LICENSE 4/30/2024
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

GENERAL NOTES
CONTRACTOR/OWNER BUILDER SHALL CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS AT THE JOBITE BEFORE PROCEEDING WITH THE WORK AND NOTIFY ENGINEER OF ANY DISCREPANCIES FOR RESOLUTION.
ALL CONSTRUCTION SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE AND THE LATEST COUNTY OF HAWAII/STATE OF HAWAII AMENDMENTS AND ORDINANCES AND/OR THE CITY AND COUNTY OF WHERE THIS PROJECT IS LOCATED AND HAVING JURISDICTION.

REVISION MARK • DATE • DESCRIPTION

PROJECT
PROPOSED
OLOWALU, MAUI
OFFSHORE BUOY MOORING
FOR:
NOAA/PMEL MAPCO₂
CONTACT: CHRISTOPHER SABINE
UNIVERSITY OF HAWAII MANOA
2500 CAMPUS ROAD
HONOLULU HI, 96822
PHONE: (808) 956-0813

GPS COORDINATES: 20.804205°N
156.605167°W

SHEET TITLE
TITLE SHEET

JOB NO. 2015-0007.155a DRAWING NO.
DRAWN JMM T-1
CHECKED JMM
DATE NOV. 22, 2022 SHEET 1 OF 3

INDEX TO DRAWINGS

SHEET NUMBER	DRAWING NUMBER	DESCRIPTION
1	T-1	TITLE, INDEX TO DRAWINGS, AND VICINITY MAP
2	S-1	MOORING NOTES AND DETAILS
3	S-2	MOORING PLAN

GENERAL:

- A. WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE BUILDING CODE AS STATED BELOW. HOWEVER, WHERE REFERENCE IS MADE TO PERFORMANCE CONFORMING TO OTHER STANDARDS THE MORE STRINGENT SHALL APPLY.
 - 1. COUNTY OF MAUI AMENDED IBC, 2018
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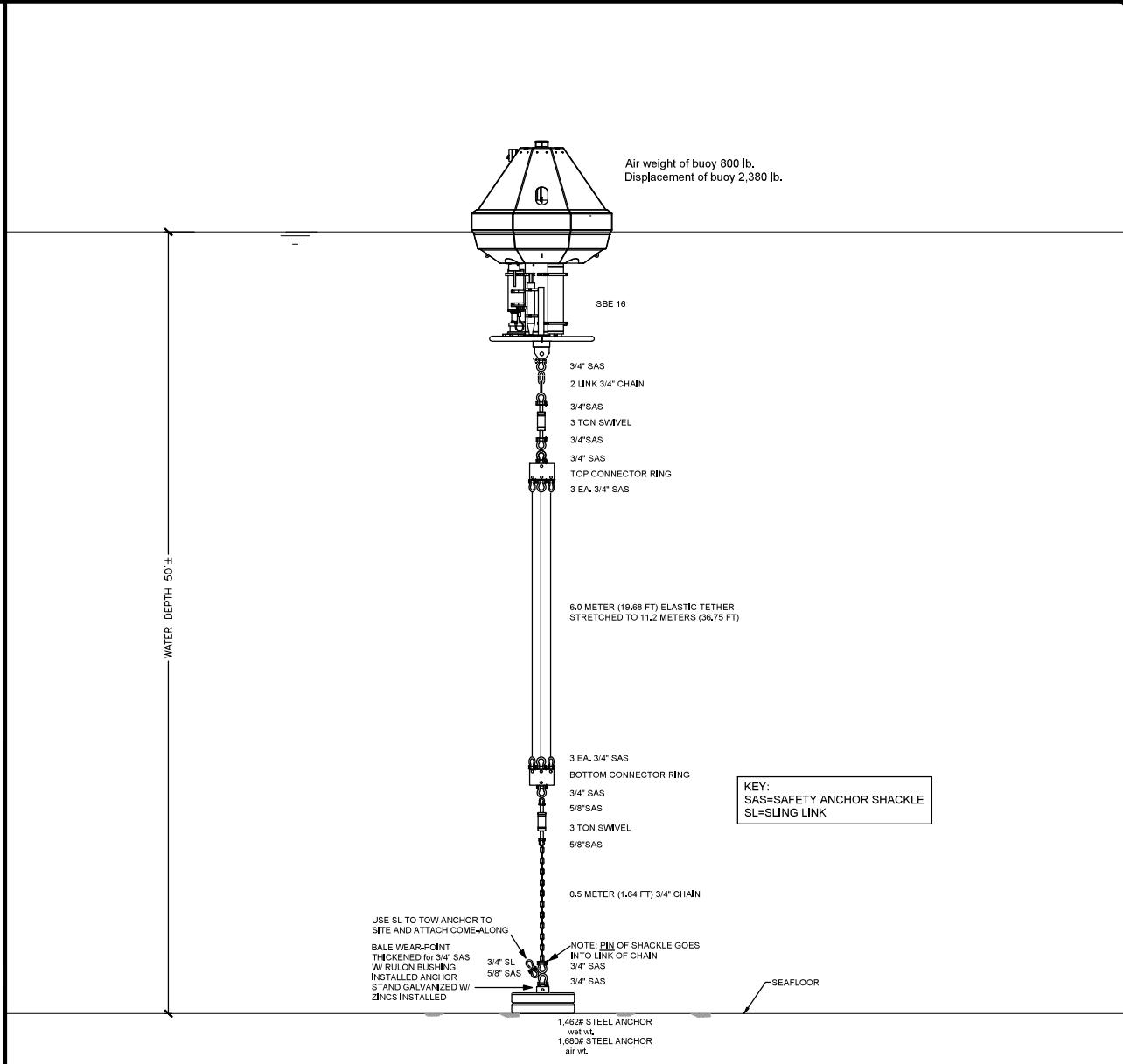
- A. WIND DESIGN DATA:
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 - 1. MAX CURRENT: 70 CM/SEC (2.30 FT/SEC)
- C. WAVES:
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NOT TO SCALE

ALLSHORE ENGINEERING, LLC.

61-655 KAMEHAMEHA HIGHWAY
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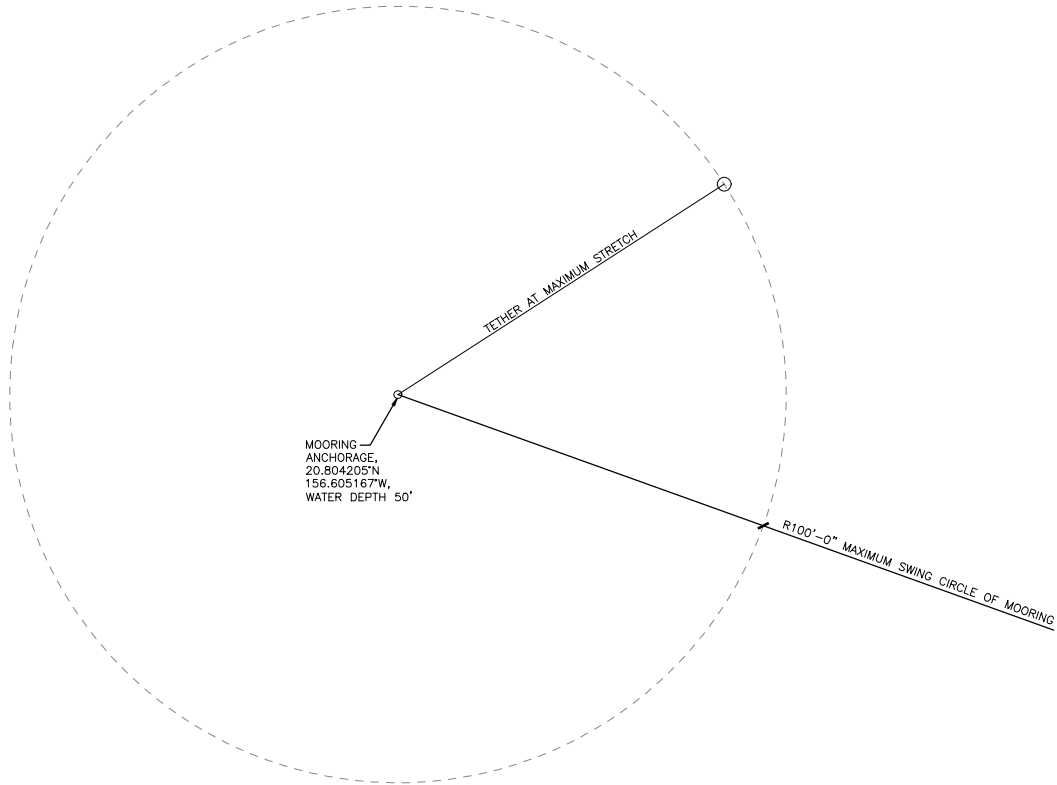
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REVISION MARK • DATE • DESCRIPTION

PROJECT
PROPOSED
OLOVALU, MAUI
OFFSHORE BUOY MOORING
FOR:
NOAA/PMEL MAPCO₂
CONTACT: CHRISTOPHER SABINE
UNIVERSITY OF HAWAII MANOA
2500 CAMPUS ROAD
HONOLULU HI, 96822
PHONE: (808) 956-0813
GPS COORDINATES: 20.804205°N
156.605167°W

SHEET TITLE
MOORING NOTES AND DETAILS

JOB NO. 2015-0007.155a DRAWING NO.
DRAWN JMM
CHECKED JMM
DATE NOV. 22, 2022
S-1
SHEET 2 OF 3



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SCALE: 1/8" = 1'-0"

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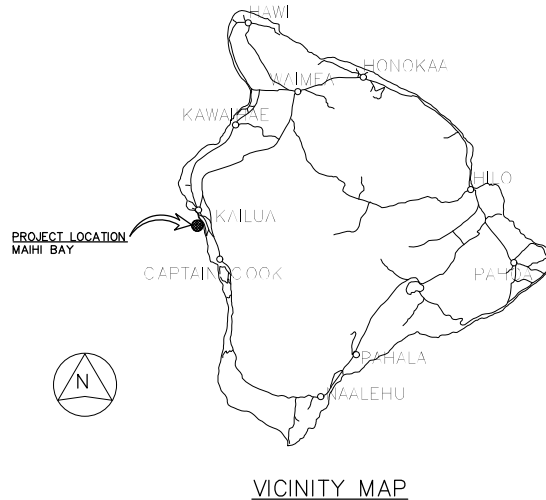
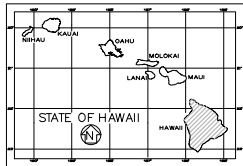
SHEET TITLE
MOORING PLAN

JOB NO. 2015-0007.155a DRAWING NO.
DRAWN JMM
CHECKED JMM
DATE NOV. 22, 2022

DRAWING NO. S-2
SHEET 3 OF 3

MAIHI BAY, KEAUHOU, HAWAII OFFSHORE BUOY MOORING FOR: NOAA/PMEL MAPCO₂

GPS COORDINATES OF MOORING : 19.548425°N, 155.963142°W
APPROXIMATE WATER DEPTH : 50'

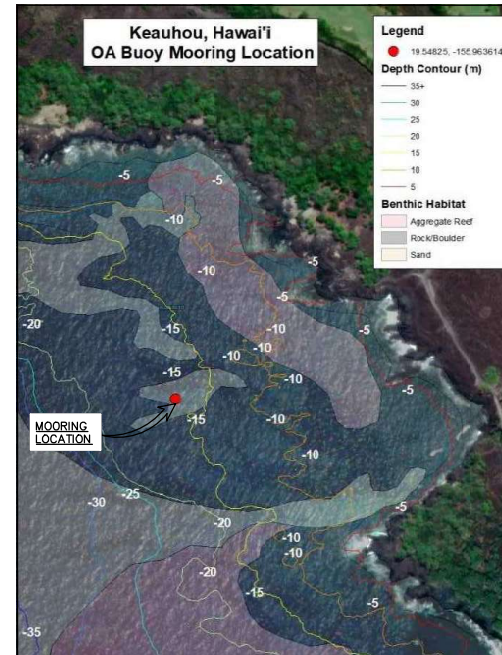


**Department of Land and Natural Resources
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By: JMM Date: 1/17/2023

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**ALLSHORE
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GPS COORDINATES: 19.54861°N
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SHEET TITLE

TITLE SHEET

JOB NO. 2015-0007.155c DRAWING NO.
DRAWN JMM T-1
CHECKED JMM
DATE NOV. 22, 2022 SHEET 1 OF 3

INDEX TO DRAWINGS		
SHEET NUMBER	DRAWING NUMBER	DESCRIPTION
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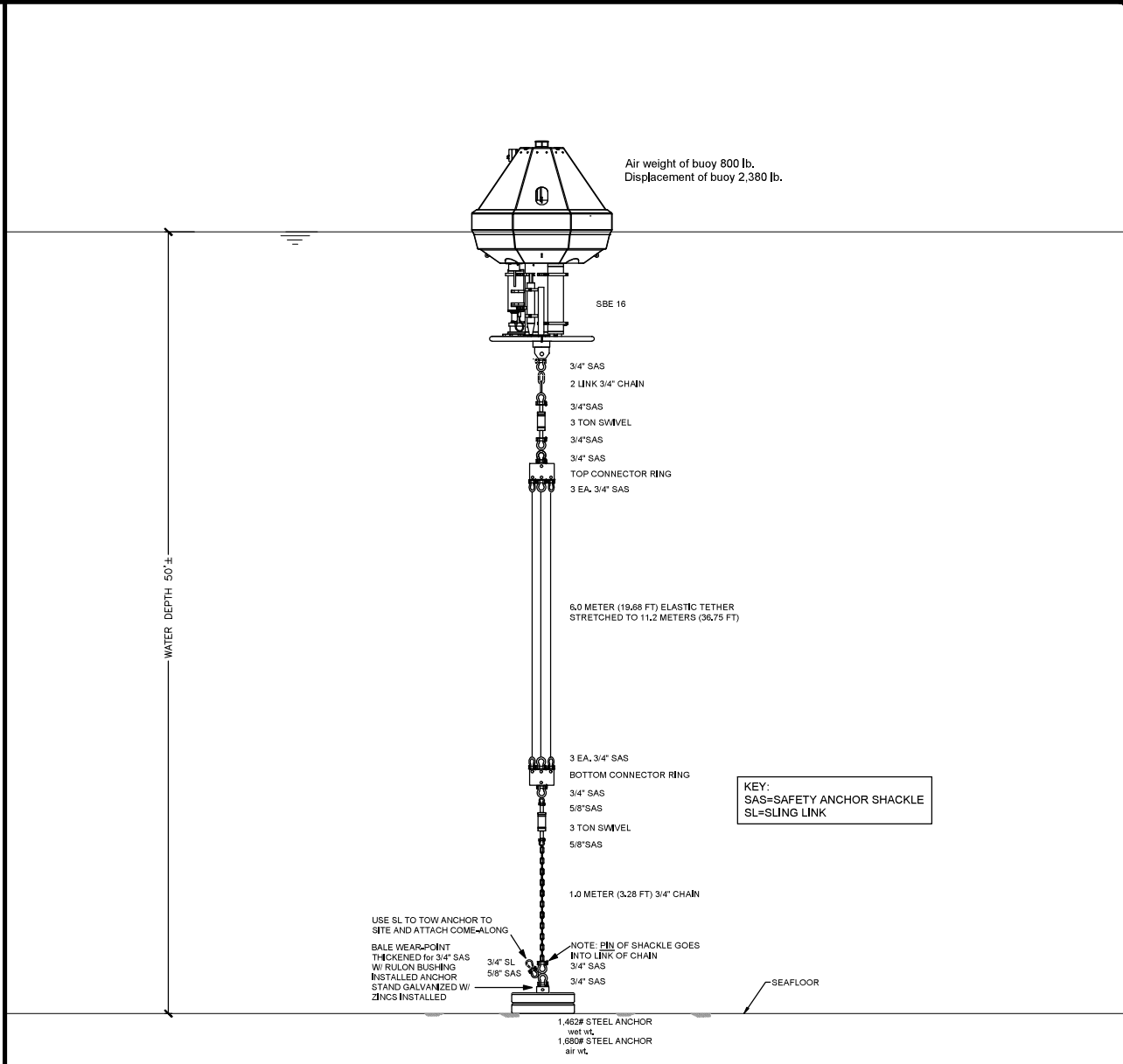
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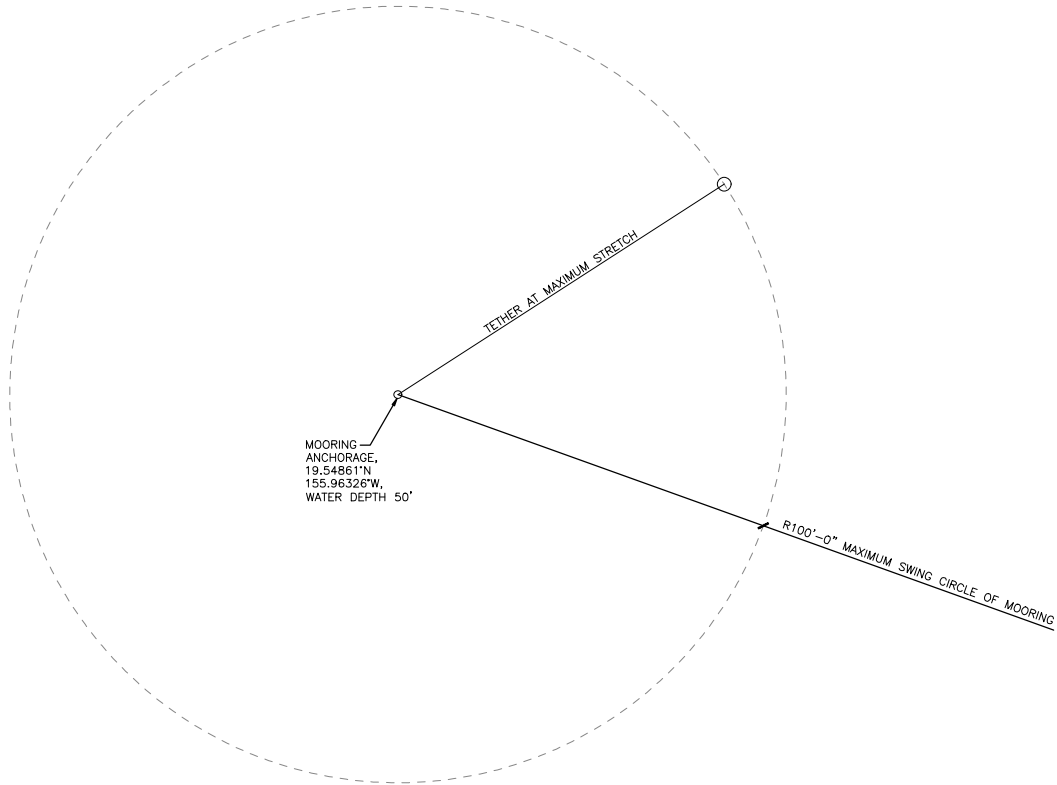
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CONTACT: CHRISTOPHER SABINE
UNIVERSITY OF HAWAII MANOA
2500 CAMPUS ROAD
HONOLULU HI, 96822
PHONE: (808) 956-0813
GPS COORDINATES: 19.54861°N
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SHEET TITLE
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JOB NO. 2015-0007.155c DRAWING NO.
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CHECKED JMM
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S-1
SHEET 2 OF 3



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MOORING PLAN

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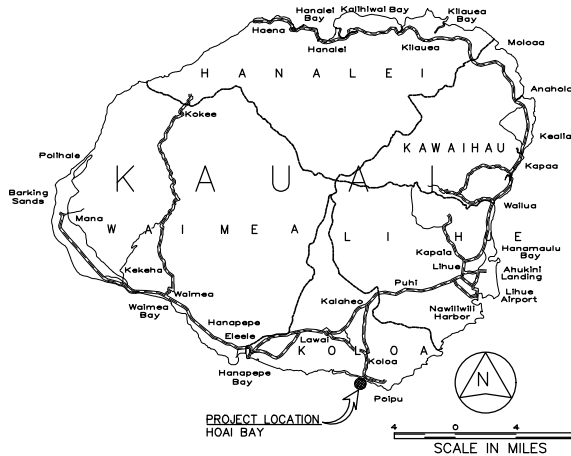
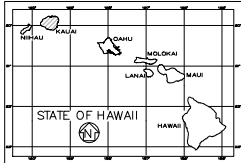
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S-2
SHEET 3 OF 3

HOAI BAY, KAUAI OFFSHORE BUOY MOORING FOR: NOAA/PMEL MAPCO₂

GPS COORDINATES OF MOORING : 21.876395°N, 159.471652°W
APPROXIMATE WATER DEPTH : 52'



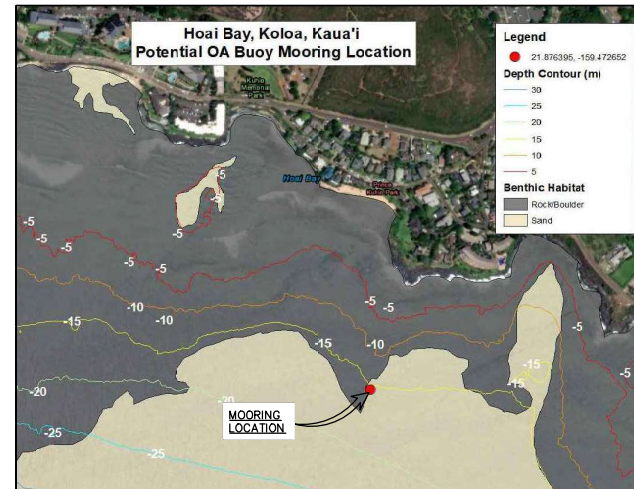
VICINITY MAP

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SHEET TITLE
TITLE SHEET

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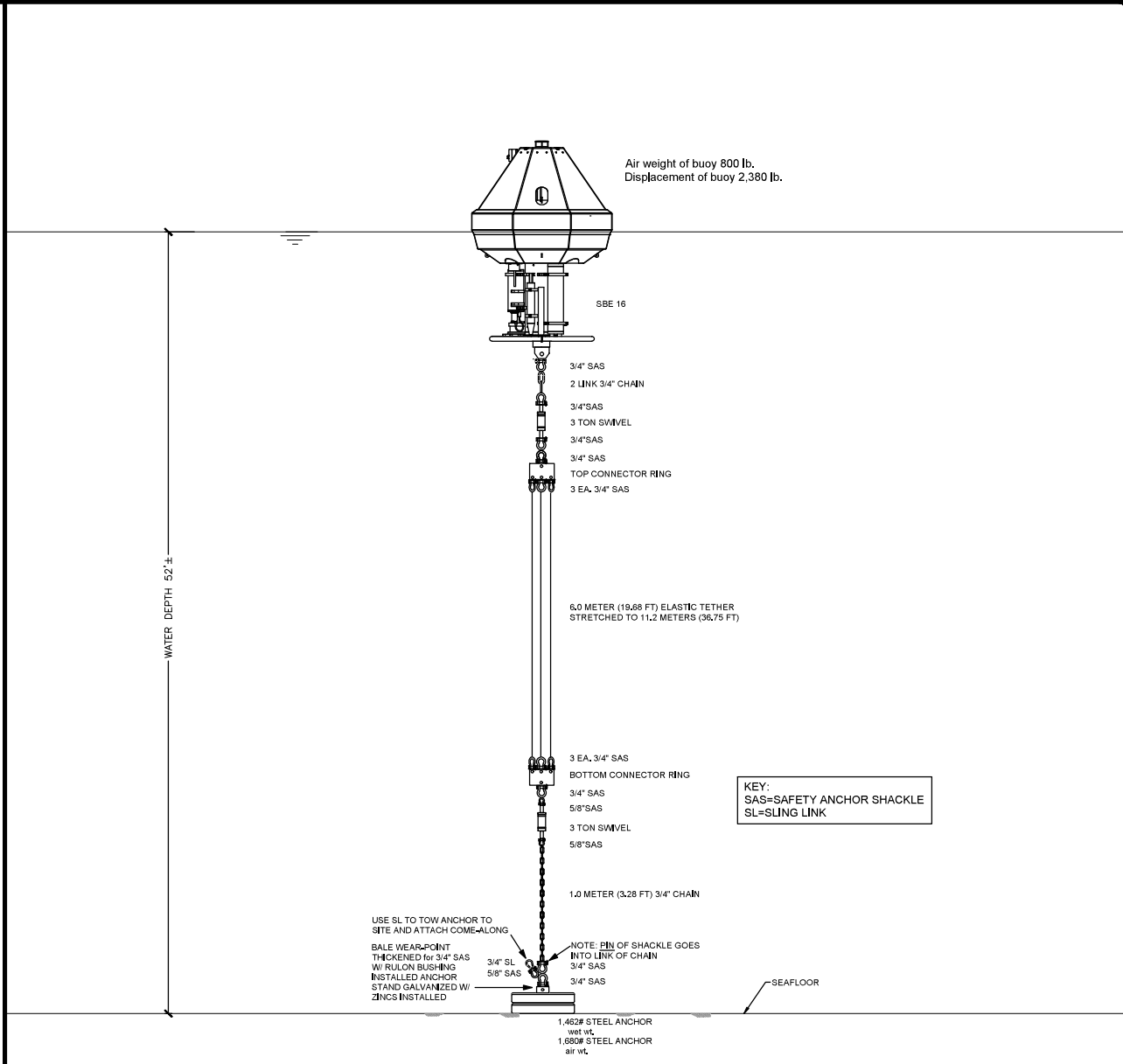
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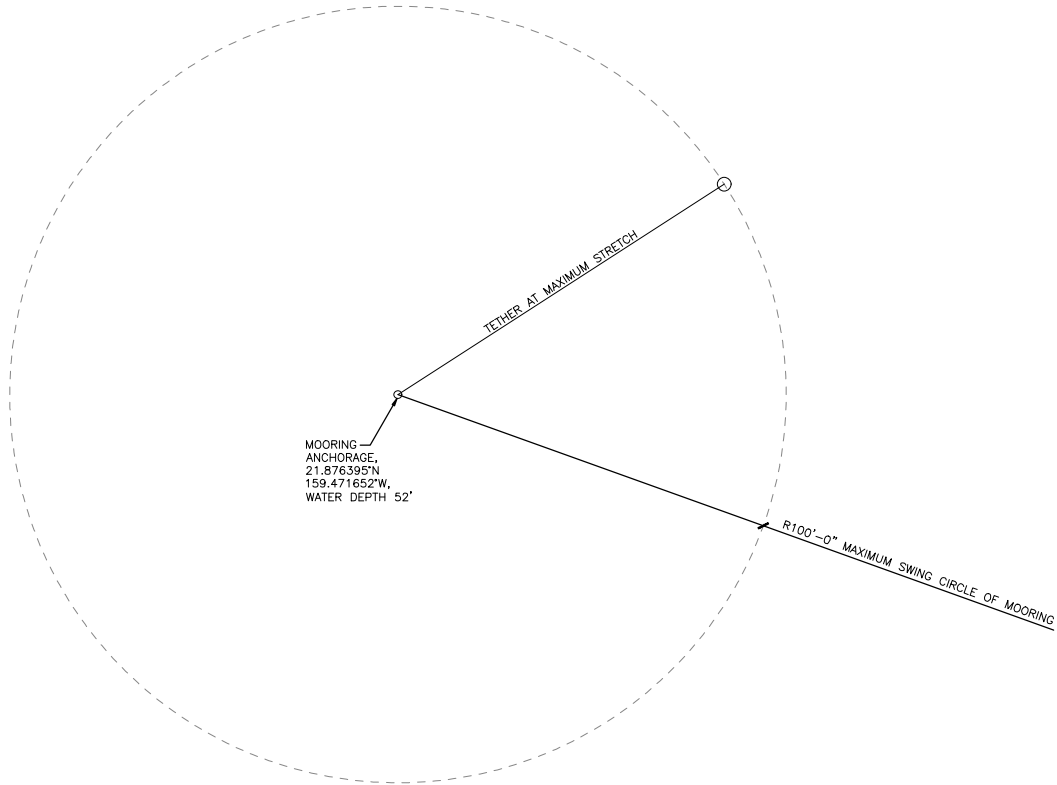
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S-1
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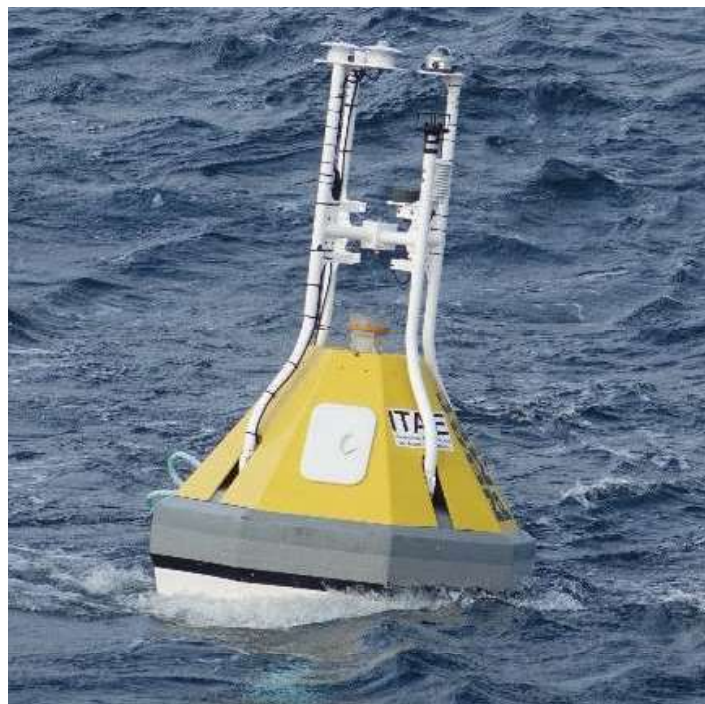
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SHEET 3 OF 3

NOAA-PMEL M_ApCO₂ O-A Buoy Planning Document

A Best Practices Guide to PMEL's Very Shallow Water M_ApCO₂ O-A System

Rev # NLS_01_28_2022



Noah Lawrence-Slavas
NOAA-PMEL

Figure #11: A typical flatbed boom truck, available for rent in many parts of the world, is a great tool for getting the buoy and anchors into the water



Towing to the Deployment Site:

Anchor (refer to video):

There are numerous options available for towing and deploying the O-A system's anchors using small boats. After some-experimentation with using a single 4,000 lb. pillow bag and a large steel circular float, NOAA-PMEL designed the anchor-liftbag-bar assembly shown in figure 12 (drawing in Appendix B). This assembly consists of two 2,000 lb. salvage tubes (model CBST-2000, <http://www.carterbag.com/salvage.html>) affixed to a horizontal aluminum lifting bar. The two wheel anchor assembly is slung below the bar with a TR-7 release hook (for quick release operating instructions, see: <http://www.seacatch.com/scopmanual.pdf>). The assembly draws ~ 5' - 6' (1.5-2m) of water. The anchor is attached to this assembly on land, and then the whole assembly is lowered into the water (lift from the single lifting point directly above the anchor attachment point (refer to video)). Once in the water, the assembly is towed out to the site. The front (tow point) for the assembly is the longer end of the bar which juts out beyond the liftbags (left hand side in figure 12a). The two salvage tubes should be tied into the front lifting point with a rope bridle to prevent the bags from separating while towing. Additionally, the back end of the bags should be tied together, and if needed, the bags cinched together at the three lifting points, to prevent excessive movement / wear between bags. The bags should be towed slowly (i.e. ~1-3 knts) to prevent loss in buoyancy due to hydrodynamic pressure causing the pressure relief valves to vent. During long tows the bags might need to be topped off, so an air cylinder should be available on the tow boat. If using a larger vessel (40'+) the assembly should be towed behind the vessel using a long compliant (nylon) tow rope. When towing with a smaller vessel the anchor-liftbag-bar assembly should be cinched up against the side of the tow

boat, as far forward as practical. By cinching up the anchor-liftbag-bar assembly fore and aft in this manner, the bags can be handled by a boat as small as ~20' while still maintaining the ability to maneuver (restricted, behaves like two boats rafted together). This method takes advantage of the ridged boat hull, using it as a lever (think moment arm) on which the engines can act to maneuver the anchor assembly. **WARNING:** You will need to make some provisions for rapidly releasing the anchor assembly from the boat, in case the lift bags suffer from a rapid loss of pressure. If you try to tow the anchors behind a boat of this size (20'), the engines will not have a lever arm on which to act upon the anchor's mass and the boat will act like a pendulum swinging randomly around the anchor assembly (learned from experience). **DO NOT** attempt to tow the anchors behind the boat in this manner as you will have no directional control!

Figure #12a: NOAA-PMEL's anchor deployment- lift bag-bar assembly enables the towing and accurate placement of the anchor(s) at the deployment site using a small boat and divers

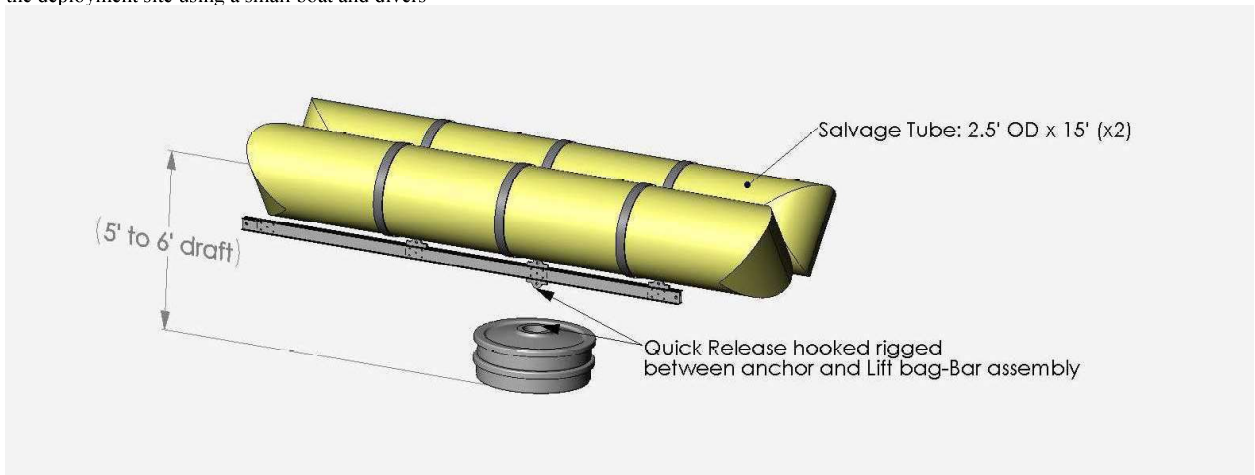


Figure #12b: The Anchor deployment-lift bag-bar assembly in action!



O-A Buoy:

The O-A Buoy has a draft of 1.2m when towed vertically. If needed, the draft can be reduced by attaching floatation to the buoy's bridle ring, and towing the system on its side. If towing the buoy on its side, please orient the top of the buoy forward. If towing the buoy in the vertical orientation (preferred) it is best to rig a two point harness between the bridle ring tow / lifting point, and the upper lifting point (figure 10, two point lift). Rig another line from the bridle ring on the opposite side from the lifting point, and cinch the buoy up nice and tight against the bow of the tow boat (for the reasons given in the anchor towing description), reference figure 13. The buoy should never be towed if the MApCO2 system is active and not in "deployment mode", additionally the buoy should be towed gently (~1-3 knts) to avoid damaging the MApCO2 system.

Figure #13: Towing the MApCO2 O-A buoy out to the deployment site



Single Point Mooring Deployment (refer to video):

1. The buoy is staged near the deployment site at the water's edge (pier, ship, beach, etc.). At this time the MAPCO2 system is installed in the buoy and fired up (requires at least 24 hrs, notify PMEL when system is started). Additionally, the mooring is built and attached to the buoy.
2. Before beginning deployment operations, the MAPCO2 system's data is checked (verify with PMEL), and the system is put into deployment mode.
3. Option A (Integrated buoy anchor, "buoy-first" deployment, Preferred):
 - a. The mooring is attached between the buoy and the anchor, and triple checked for accuracy, bungee twists, and cotter pins.
 - b. The anchor drop position is located and marked
 - c. If deploying off of a ship:
 - i. At the deployment site the buoy is lowered over the side using the A-frame.
 - ii. Once the buoy is in the water, a small boat will hook onto the buoy and pull it way from the ship (to keep the bungee mooring taught).
 - iii. The anchor will then be lowered over the side, rigged with a quick release hook (at this point the anchor is attached to the buoy via the bungee mooring, think buoy first deployment).
 - iv. Once the anchor is in the water (~ 0.5 meter below the surface) the small boat will remove all slack from the mooring, by pulling on the buoy.
 - v. The drop position will be re-verified, and the ship repositioned over the drop site if necessary. Depending on conditions, a brief snorkel may be required just prior to dropping the anchor to verify that the mooring bungees are not tangled.
 - vi. The anchor will be dropped by activating the quick release, as the anchor falls the small boat will let go of the buoy (to limit the deployment tensions (drag) on the mooring).
 - d. If using a small boat (not recommended, see option B):
 - i. The buoy is lowered into the water.
 - ii. The anchor-liftbag-bar assembly is built on land, the liftbags filled, anchor attached and lowered into the water (connected to the buoy with the mooring).
 - iii. The buoy and the anchor-liftbag-bar assembly are then secured to the side of the small boat, on either side of the bow.
 - iv. A snorkeler coils up and zip-ties the loose mooring components to the buoy bridle ring for towing (extra slack in the mooring which is attached between the buoy and the anchor).
 - v. The buoy and anchor are towed out to the site.
 - vi. Once on site; the anchor assembly is released from the small boat, and the buoy untied so that it is only attached to the small boat via a single line running to the upper lifting point (thru the hole in the cowling).
 - vii. Snorkelers free the mooring from the buoy bridle and check it for twisted or tangled bungees.