HHF PLANNERS
places for people

February 25, 2014

Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Dear Director:

SUBJ: NATIONAL ENVIRONMENTAL POLICY ACT NOTICE FOR PUBLICATION IN THE ENVIRONMENTAL NOTICE
FINDING OF NO SIGNIFICANT IMPACT (FONSI) FOR ENVIRONMENTAL ASSESSMENT (EA) FOR WAVE ENERGY TEST SITE, MARINE CORPS BASE HAWAII

Helber Hastert & Fee Planners, Inc., on behalf of Naval Facilities Engineering Command, Pacific, is submitting the subject Notice of Availability for the Finding of No Significant Impact for publication in the Office of Environmental Quality Control (OEQC) Environmental Notice.

If you have any questions, please contact Gail Renard of Helber Hastert & Fee Planners, Inc. at (808) 457-3167 or by e-mail at grenard@hhf.com.

Sincerely,

HELBER HASTERT & FEE, PLANNERS

Gail U. Renard
Senior Associate

Enclosures
(1) Final EA and Finding of No Significant Impact for Wave Energy Test Site, Marine Corps Base Hawaii (CD-ROM)
(2) NEPA Action EA/EIS Publication Form (hard copy and CD-ROM)

Pacific Guardian Center, Makai Tower | 733 Bishop Street, Suite 2590 | Honolulu, Hawai'i 96813
Telephone: 808.545.2055 | Facsimile: 808.545.2050 | www.hhf.com | e-mail: info@hhf.com

NEPA Action EA/EIS
Publication Form

Project Name:	Final Environmental Assessment and Finding of No Significant Impact (FONSI) for Wave Energy Test Site
Island:	O'ahu
District:	Ko'olaupoko
TMK:	n/a
Permits:	Department of the Army, Rivers and Harbors Act Section 10 permit
Applicant or Proposing Agency:	Naval Facilities Engineering and Expeditionary Warfare Center 1000 23rd Avenue Port Hueneme, CA 93043-4370 Ms. Alexandra De Visser, Telephone: (805) 982-6070
Consultant:	Helber Hastert & Fee, Planners 733 Bishop Street, Suite 2590 Honolulu, HI 96813 Ms. Gail Renard, Telephone: (808) 545-2055
Status:	The Final EA and FONSI have been completed. A Notice of Availability for the Final EA and FONSI was published in the Honolulu Star-Advertiser on February 21, 22, and 23, 2014. The EA addressing this action may be obtained from: Naval Facilities Engineering Command Pacific, Building 258 Makalapa Drive, Suite 100, JBPHH, HI 96860-3134 (Attn: EV21 WETS EA Project Manager); Telephone (808) 472-1450. A limited number of the EA on compact disc is available to fill single-unit requests.

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The proposed action will construct and operate two deep-water Wave Energy Test Site (WETS) berths for testing up to two wave energy conversion (WEC) devices in waters approximately 197 ft and 262 ft deep, respectively, located approximately 6,500 ft and 8,200 ft north of Mokapu Peninsula, Marine Corps Base (MCB) Hawaii, Kaneohe Bay, O'ahu, Hawai'i. The proposed action includes installation and operation of mooring systems for each berth, two surface-laid power and communication transmission cables, associated shoreside equipment, in-water scientific data gathering equipment to measure oceanographic and environmental conditions, and Building 614 renovation. Construction and installation of the berth infrastructure will begin during 2014, with decommissioning of WEC devices planned for 2016.

The purpose of the action is to provide facilities to evaluate the technical and economic feasibility of various wave energy conversion configurations for future U.S. Navy and U.S. Marine Corps applications. It is needed to provide deeper water conditions to test pre-commercial WEC devices with greater power generation potential and to advance the technology to meet Navy and USMC renewable energy goals.

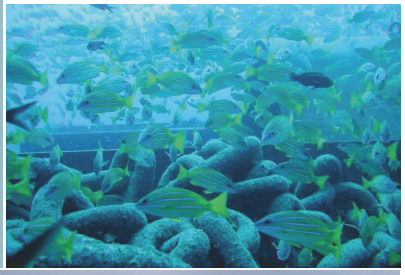
Based on the information gathered during the preparation of this EA, the Navy determined that the proposed action will not significantly impact human health or the environment.

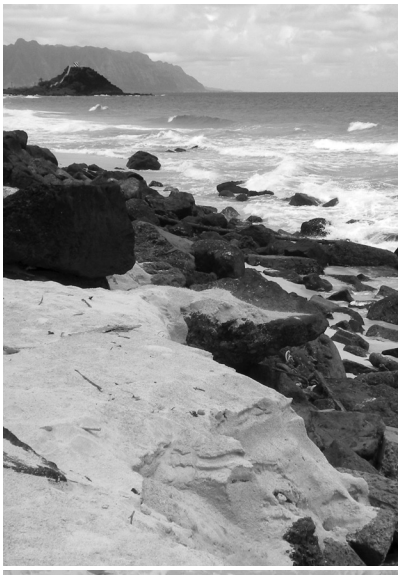
WAVE ENERGY TEST SITE
FINAL ENVIRONMENTAL ASSESSMENT

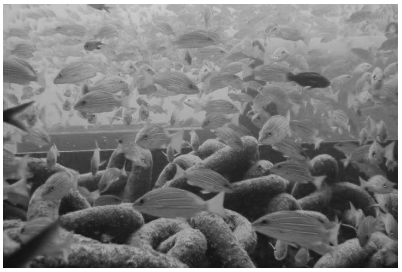
MARINE CORPS BASE HAWAII

NAVAL FACILITIES ENGINEERING COMMAND, PACIFIC
NAVAL FACILITIES ENGINEERING AND EXPEDITIONARY WARFARE CENTER

JANUARY 2014







WAVE ENERGY TEST SITE
FINAL ENVIRONMENTAL ASSESSMENT

MARINE CORPS BASE HAWAII

NAVAL FACILITIES ENGINEERING COMMAND, PACIFIC
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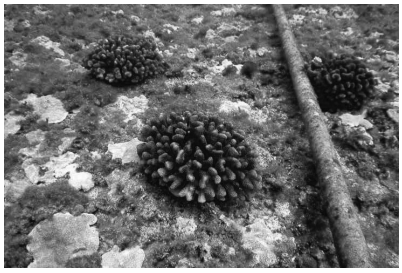
JANUARY 2014



DEPARTMENT OF DEFENSE
DEPARTMENT OF THE NAVY

FINDING OF NO SIGNIFICANT IMPACT FOR THE PROPOSED WAVE ENERGY TEST SITE AT MARINE CORPS BASE HAWAII, OAHU, HAWAII

Pursuant to section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969, as amended, and the Council on Environmental Quality regulations (40 CFR Parts 1500-1508) implementing the procedural provisions of NEPA, Chief of Naval Operations Instruction 5090.1D Environmental Readiness Program, and Marine Corps Order P5090.2A Environmental Compliance and Protection Manual, the Naval Facilities Engineering and Expeditionary Warfare Center gives notice that an Environmental Assessment (EA) has been prepared and that an Environmental Impact Statement is not required for the construction and operation of a deep-water Wave Energy Test Site (WETS) in waters off the north coast of Mokapu Peninsula, Marine Corps Base (MCB) Hawaii, Kaneohe Bay, Oahu, Hawaii.

The proposed action will construct and operate two deep-water WETS berths for testing up to two offshore wave energy conversion (WEC) devices at water depths of approximately 197 ft and 262 ft, respectively. The berths would be located approximately 6,500 ft and 8,200 ft offshore of MCB Hawaii, with each berth anchored by three mooring legs or variation thereof. The proposed action will include installation and operation of two trunk power and communication transmission cables; associated shoreside equipment including a new utility vault, above-ground power and fiber optic conduits on pedestals, an electrical equipment shelter; and Building 614 renovation for installation of data collection and monitoring equipment. The transmission cables will be surface-laid and routed from the deep-water WETS berths to closely follow the existing shallow-water wave energy cable alignment to shore, with the power cable connecting to the MCB Hawaii electrical grid. The project also includes the installation and operation of in-water scientific data gathering equipment in the vicinity of the berths. These oceanographic and environmental measurement devices include: three wave measuring ("Waverider"©) buoys; probes to measure the electromagnetic field signature of the undersea power cables; acoustic monitoring stations to measure sound levels from the WEC devices; and an active Acoustic Doppler Current Profiler to record ocean current and wave conditions. Construction and installation of the berths and mooring system will begin during 2014, with the first WEC device installed late 2014. The decommissioning of WEC devices is currently planned for 2016, but use of the site could extend beyond 2016 depending upon WEC device test activity and funding.

The purpose of the action is to provide facilities to evaluate the technical and economic feasibility of various wave energy conversion configurations as related to future U.S. Navy and U.S. Marine Corps (USMC) applications. The proposed action is needed to provide the appropriate deeper water conditions to test pre-commercial WEC devices with greater power generation potential and to assess and advance the technology to meet Navy and USMC renewable energy goals by 2020.

The alternatives evaluated include: a) Surface-Laid Cable Alternative (proposed action); b) Horizontal Directional Drilled (HDD) Alternative, which is the same as the proposed action,

except that the onshore portion of the transmission cable will be routed below grade through an approximately 2,000-ft long subsurface bore hole drilled from Building 614 to an offshore outlet point in approximately 33-ft deep water; and c) No Action Alternative in which no deep-water WETS would be established. The HDD Alternative was considered but rejected because it requires a more complex and costly shore landing and cable installation methodology than the proposed action. The No Action Alternative was rejected because it would not meet project objectives or the purpose and need to provide facilities to test WEC devices in deeper water in Hawaii. The Surface-Laid Cable Alternative is the preferred alternative and was selected because it will employ a less complex and costly shore landing and cable installation methodology and will have less impact to cultural resources while meeting all project objectives.

The proposed action will have no significant direct, indirect, or cumulative impacts to the following resources: climate, air quality, geology, soils, shoreline geomorphology, oceanographic conditions, water quality, natural hazards, marine biological resources, terrestrial biological resources, land and water use compatibility, cultural resources, recreation, infrastructure, public safety and visual resources. There will he no disproportionate effects on minority and low-income populations or environmental health risks to cbildren as a result of the proposed action.

The Navy conducted informal consultation with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) under Section 7 of the Endangered Species Act and determined that the proposed action may affect, but is not likely to adversely affect Federally threatened or endangered marine mammal and sea turtle species, proposed Federally-listed corals, or proposed Hawaiian monk seal critical habitat. NOAA Fisheries concurred with the Navy's determination. The Navy also conducted consultation on Essential Fish Habitat (EFH) with NOAA Fisheries in accordance with the Magnuson-Stevens Fishery Conservation and Management Act of 1976 and determined that the proposed action may adversely affect EFH. With implementation of best management practices (BMPs) recommended by NOAA Fisheries and accepted and agreed to by the Navy, effects to EFH will be minimal and insignificant. The Navy will implement BMPs to avoid or reduce potential adverse impacts on biological resources, such as posting biological observers to survey work areas for Federally-listed marine species; postponing work when Federally-listed marine species are within radii of work areas specified by NOAA Fisheries; maintaining a distance of 150 ft from Hawaiian monk seals and sea turtles that haul out onto beaches in the project area; routing and placing subsea cables and underwater equipment to avoid proposed Federally-listed corals; operating vessels at slow speeds within radii of concern for marine mammals or turtles; avoiding lowering work boat anchors onto coral; and avoiding introducing pollutants into the marine environment. Considering the proposed project activities and evaluation of potential impacts, the taking of marine mammals under the Marine Mammal Protection Act is unlikely during the installation and operation of the proposed deep-water WETS berth. Additionally, the proposed site is not prime habitat or nesting grounds for migratory bird species protected under the Migratory Bird Treaty Act.

The project area contains two historic properties: Mokapu Burial Area (Site 1017) which is listed on the National Register of Historic Places (NRHP); and Building 614 which is eligible for NRHP listing. MCB Hawaii determined that the proposed action would result in no adverse

effect to historic properties and consulted with the State Historic Preservation Officer (SHPO) under Section 106 of the National Historic Preservation Act. The SHPO did not object to this determination within the 30-day response period following receipt of the MCB Hawaii consultation letter and therefore, concurrence is assumed. The Navy also consulted with the State Office of Hawaiian Affairs and obtained their concurrence with this determination. The Navy will employ BMPs during construction and operation activities to avoid or minimize effects on historic properties including: archaeological monitoring during all ground-disturbing activities; and ensuring all construction and operation vehicles accessing the terrestrial project area are rubber-wheeled and remain on existing access roads.

The proposed action is listed among the *de minimis* activities agreed upon in 2009 between the Navy and the State of Hawaii Coastal Zone Management (CZM) Program, and is not subject to further review by the State CZM Program. The Navy notified the State CZM Program Office of its use of the De Minimis Activity List in the preparation of the EA and the Office acknowledged receipt of the Navy's notification. No further action is required.

Based on the information gathered during the preparation of this EA, the Navy has determined that the proposed action will not significantly impact human health or the environment.

The EA addressing this action may be obtained from: Naval Facilities Engineering Command Pacific, Building 258 Makalapa Drive, Suite 100, Pearl Harbor, HI 96860-3134 (Attn: EV21 WETS EA Project Manager); Telephone (808) 472-1450. A limited number of the EA on compact disc is available to fill single-unit requests.

Karen M. Foskey 2/4/14

KAREN M. FOSKEY
Head, Operational Environmental
Readiness and Planning Branch
Energy and Environmental Readiness
Division (OPNAV N45)

2/7/14

BRIAN ANNICHIARICO
Colonel, U.S. Marine Corps
Commanding Officer
Marine Corps Base Hawaii

Cover Sheet

Type of Document	Environmental Assessment (EA)
Title of the Proposed Action	Wave Energy Test Site
Lead Agency	Department of the Navy
Action Proponent	Commander Naval Facilities Engineering and Expeditionary Warfare Center
Location of the Proposed Action	Marine Corps Base Hawaii (MCB Hawaii), Kaneohe Bay, Oahu, Hawaii
For Further Information	Mr. Alan Suwa Naval Facilities Engineering Command, Pacific 258 Makalapa Drive, Suite 100 JBPHH, Hawaii 96860-3134 Telephone (808) 472-1450

Abstract

Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) proposes to construct and operate two wave energy test site (WETS) berths for testing offshore wave energy conversion (WEC) devices in waters off the north coast of Mokapu Peninsula at MCB Hawaii. The “deep-water” WETS berths would be located in approximately 197 feet (ft) (60 meters [m]) and 262 ft (80 m) of water, approximately 6,500 ft (2 kilometers [km]) and 8,200 ft (2.5 km), offshore of MCB Hawaii, respectively. The Proposed Action includes installation and operation of two trunk power and communications transmission cables, in-water scientific data gathering equipment, and associated shoreside electrical transmission and monitoring equipment. Construction of the new berths would occur within a one-year period, with the first deep-water WEC device installed in 2014. Subsequent WEC devices would be installed when another device developer is ready to begin testing, but no earlier than one month after installation of the first device. Timing of WETS decommissioning would be based on WEC device test activity and funding. It is currently planned for the 2016 timeframe, but use of the site could extend beyond that time.

Three alternatives were analyzed in the EA: 1) Surface-Laid Cable Alternative (Preferred), in which the power and communications cables would be landed on shore in the vicinity of an existing subsea transmission cable and routed to termination points with the MCB Hawaii electrical grid and monitoring equipment; 2) Horizontal Directional Drilled (HDD) Alternative, which is the same as the Proposed Action except the onshore portion of the transmission cable would be routed below grade through an approximately 2,000-ft (609-m) long subsurface bore hole drilled from Building 614 to an offshore outlet point in approximately 33 ft (10 m) of water and 3) No Action, in which no construction would occur and no deep-water WETS berths would be established.

The Proposed Action would not result in significant impacts to the following resources: climate, air quality, geology, soils, shoreline geomorphology, oceanographic conditions, water quality, natural hazards, marine biological resources, terrestrial biological resources, land and water use compatibility, cultural resources, recreation, infrastructure, public safety and visual resources. The Proposed Action would not create environmental health and safety risks that could disproportionately impact children or minority and low-income populations. The Proposed Action is listed among the *de minimis* activities agreed upon between the Navy and the State of Hawaii Coastal Zone Management (CZM) Program, and is not subject to further review by the State CZM Program. The State CZM office was advised on 11 July 2013 of the Navy’s usage of the De Minimis Activity List and the preparation of this EA; it acknowledged receipt of the Navy’s notification on 12 July 2013. The Navy found that the Proposed Action may affect, but is not likely to adversely affect Endangered Species Act (ESA) protected marine mammals and sea turtles, ESA proposed listed corals, or proposed Hawaiian monk seal critical habitat. The Navy conducted informal consultation with National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) under Section 7 of the ESA; NOAA Fisheries concurred with the Navy’s determination. The Navy conducted informal consultation on Essential Fish Habitat (EFH) with NOAA Fisheries and found that the Proposed Action may have adverse effects on EFH, but effects would be minimal and insignificant. The project area contains two historic properties: Mokapu Burial Area (Site 1017) is listed on the National Register of Historic Places (NRHP) and Building 614 is eligible for NRHP listing. MCB Hawaii determined that the Proposed Action would result in no adverse effect to historic properties and consulted with State Historic Preservation Officer (SHPO) under Section 106 of the National Historic Preservation Act. SHPO did not object to this determination and its concurrence is assumed due to lack of objection within the 30-day period following receipt of the

MCB Hawaii consultation letter dated 29 March 2013. The State Office of Hawaiian Affairs concurred with MCB Hawaii's no adverse effect determination in an electronic mail message dated 19 December 2013.

Based on the information gathered and analysis conducted during the preparation of this EA, the Navy has determined that the Proposed Action will have no significant impacts on the quality of the human environment.

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Appendices

Acronyms and Abbreviations

§	Section
ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profiler
AHPA	Archaeological and Historic Preservation Act
APE	area of potential effect
BASH	Bird Aircraft Strike Hazard
BMP(s)	Best Management Practice(s)
CALTRANS	California Department of Transportation
CEQ	Council on Environmental Quality
CH_4	methane
CFR	Code of Federal Regulations
cm	centimeter(s)
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CZ	Clear Zone
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	decibel(s)
DLNR	State of Hawaii, Department of Land and Natural Resources
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOH-CWB	State of Hawaii Department of Health, Clean Water Branch
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EMF	electromagnetic field
EO	Executive Order
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
FR	Federal Register
ft	foot (feet)
ft^2	square foot (feet)
FY	Fiscal Year
GHG	greenhouse gas(es)
GWP	global warming potential
ha	hectare(s)
HABS/HAER	Historic American Building Survey/Historic American Engineering Records
HAPC	Habitat Area of Particular Concern
HDD	Horizontal Directional Drilled
HECO	Hawaiian Electric Company
HINMREC	Hawaii National Marine Renewable Energy Center
hp	horsepower
HDPE	high density polyethylene
HUD	Housing and Urban Development
Hz	hertz
ICRMP	Integrated Cultural Resources Management Plan
in	inch(es)
INRMP	Integrated Natural Resources Management Plan

J-box	junction box
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kph	kilometers per hour
kV	kilovolt(s)
kW	kilowatt(s)
lb(s)	pound(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
MCB Hawaii	Marine Corps Base Hawaii
MBTA	Migratory Bird Treaty Act
MCO	Marine Corps Order
mi	mile(s)
mm	millimeter(s)
mi^2	square mile(s)
MMPA	Marine Mammal Protection Act
$MMTCO_2Eq$	million metric tons of carbon dioxide equivalent
MOA	memorandum of agreement
µPa	micro Pascal(s)
ms	millisecond(s)
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
mV	millivolt(s)
mV/m	millivolts per meter
mW	milliwatt(s)
MW	megawatt(s)
Mwh	megawatt hour(s)
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAVFAC EXWC	Naval Facilities Engineering and Expeditionary Warfare Center
Navy	Department of the Navy
NEPA	National Environmental Policy Act
NHL	National Historic Landmark(s)
NHPA	National Historic Preservation Act
nm	nautical mile(s)
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA National Marine Fisheries Service
NCCOS	National Centers for Coastal Ocean Science
NDSA	Naval Defensive Sea Area
NO_x	nitrogen oxide(s)
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
OHA	Office of Hawaiian Affairs
OPNAVINST	Chief of Naval Operations Instruction
OWC	Oscillating water column
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PM_{10}	Particulate matter less than 10 microns in diameter
PTO	power take-off
R	range in meters from the source
rms	root mean squared
ROV	remotely operated vehicle
SEL	sound exposure level

SHPO	State Historic Preservation Officer(s)
SL	source level
SO_2	sulfur dioxide
SPL	sound pressure level
TACAN	tactical air navigation system
TL	transmission loss
TTS	temporary threshold shift
TWhr	terawatt-hour(s)
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	United States Coast Guard
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
USFWS	U.S. Fish and Wildlife Service
USMC	United States Marine Corps
VFI	vacuum fault interrupter
VOC(s)	volatile organic compound(s)
WEC	wave energy conversion
WET	Wave Energy Technology
WETS	Wave Energy Test Site
WPRFMC	Western Pacific Regional Fishery Management Council
WQC	Water Quality Certification
yd	yard(s)
yd^3	cubic yard(s)

Executive Summary

Name of Action

Wave Energy Test Site, Marine Corps Base Hawaii

Type of Document

This Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act of 1969 (42 United States Code Section 4321 et seq.), as implemented by the Council on Environmental Quality regulations (40 Code of Federal Regulations Parts 1500-1508); Environmental Readiness Program Manual, Chief of Naval Operations Instruction 5090.1D of 10 January 2014; and Environmental Compliance and Protection Manual, Chapter 12, Marine Corps Order P5090.2A, CH 3 of 26 August 2013.

Proposed Action, Purpose and Need, and Geographical Region

Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) proposes to construct and operate a deep-water wave energy test site (WETS) for testing offshore wave energy conversion (WEC) devices in waters off the north coast of Mokapu Peninsula at Marine Corps Base Hawaii (MCB Hawaii), Oahu, Hawaii. The Proposed Action would provide facilities to evaluate the technical and economic feasibility of various wave energy conversion devices as related to future Navy and U.S. Marine Corps applications. The action is needed to provide the appropriate deeper water conditions to test WEC devices with greater power generation potential and to assess and advance the technology.

Construction/installation of the mooring system would begin in 2014 with installation of the first WEC device following in late 2014. Decommissioning is planned for 2016, but use of the deep-water WETS could extend beyond that time. The purpose of the action is to provide facilities to evaluate the technical and economic feasibility of various wave energy conversion configurations as related to future Navy and USMC applications. The Proposed Action could provide an innovative non-greenhouse gas emitting, scalable power source if it can be demonstrated to be efficient, reliable, and cost-effective. The action is also needed to accelerate wave energy device developers' technology to a commercial level in order for the Navy to meet its renewable energy goals by 2020.

Alternatives Considered

Three alternatives were analyzed in the EA:

- **Proposed Action (Surface-Laid Cable Alternative) (Preferred Alternative):** Construct and operate two deep-water WETS berths for offshore WEC devices at water depths of approximately 197 feet (ft) (60 meters [m]) and 262 ft (80 m), respectively. These "deep-water" WETS berths would be located roughly 6,500 ft (2 km) and 8,200 ft (2.5 km) offshore of MCB Hawaii, with each berth supported by a 3-point anchoring system or variation thereof. The Proposed Action includes installation and operation of two trunk power and communications transmission cables, associated shoreside equipment, and utilization of existing onshore data collection and monitoring facilities. The Proposed Action also includes installation and operation of scientific data gathering equipment in the vicinity of the deep-water berths.

  Under the Proposed Action, two 3-conductor subsea transmission cables originating from the deep-water WETS berths would be landed onshore in the vicinity of a transmission cable from an existing

shallow-water (98 ft [30 m]) wave energy test site. From that point, they would be routed to an onshore termination point generally using an existing above-ground, pedestal-mounted conduit system. Based on technical advantages and reduced cost, this alternative presents the preferred shore landing route and cable installation methodology. In general, WEC device installation would include offsite assembly and inspection; towing from Honolulu Harbor; connection to moorings floats; and connection of WEC device umbilical power cable to the device and subsea splice box.

Maintenance would involve inspections of WETS mooring infrastructure and periodic inspection and maintenance of WEC devices. No major repairs to the WETS mooring system are anticipated over its life. System and WEC device inspections would take place to monitor the condition of deployed hardware, with frequency of inspections predicated on the findings of the previous inspections. WEC devices would be decommissioned/removed upon completion of testing. Decommissioning/removal of WETS hardware and structures would involve consultation with relevant regulatory agencies. Specific details of the WEC device maintenance activities will be addressed for individual WEC devices as part of the required National Environmental Policy Act (NEPA) process to support the required U.S. Army Corps of Engineers (USACE) permitting prior to their deployment (i.e., separate from this NEPA EA).

The following table summarizes the number of vessels and personnel anticipated to be employed during construction, operation, maintenance and decommissioning for the Proposed Action and HDD Alternative. The table also summarizes the Navy and WEC device developer's responsibilities.

Summary of Project-Related Vessels, Personnel, and Responsibilities

Item	Proposed Action	HDD Alternative
Vessels (*WETS Infrastructure*)	Construction: 2-4 (not concurrent) Operation: 0 Maintenance: 1 Decommissioning: same as construction	Same as Proposed Action.
Vessels (*WEC devices)**	Construction: 2 Operation: 0 Maintenance: 1 Decommissioning: same as construction	Same as Proposed Action.
Vessels (*Scientific Data Gathering*)	Construction: 4 (not concurrent) Operation: 2 (not concurrent) Maintenance: 0 Decommissioning: same as construction	Same as Proposed Action.
Personnel (*WETS*)	Construction: 19 to 34 (not concurrent) Operation: 0 Maintenance: 4 to 6 Decommissioning: same as construction	Same as Proposed Action.
Personnel (*WEC devices*)*	Construction: 10 to 15 Operation: 1 to 2 Maintenance: 2 to 6 (topside); 6 to 10 (underwater) Decommissioning: Same as construction	Same as Proposed Action.
Personnel (*Scientific Data Gathering*)	Construction: 1 to 3 per device Operation: 1 to 3 (not concurrent) Maintenance: 0 Decommissioning: same as construction	Same as Proposed Action.
Responsibilities	Navy: Design, fabrication and installation of power transmission, grid connection and mooring systems. Inspection and maintenance of these components during operations. WEC device developer: Design and fabrication of specific WEC device, installation of WEC device, WEC device mooring line (hawser), umbilical cable connecting WEC device to subsea splice box.	Same as Proposed Action.

* Based on general anticipated WEC device installation and maintenance. Specific installation, maintenance and decommissioning methodology to be determined after WEC device developer selected; would be subject to NEPA compliance and regulatory permit requirements.

- **Horizontal Directional Drilled (HDD) Alternative:** This alternative involves a different configuration, route, and methodology for installing the power and data transmission cables from the deep-water WETS berths to shore and a different onshore electrical termination point. The other components are identical to the Proposed Action. In this alternative, instead of landing the cables through the surf zone and routing them over land to an existing below-grade vault via a system of pedestals, a single 6-conductor trunk transmission cable, instead of two 3-conductor cables, would be routed along the seafloor from the deep-water WETS berths to a subsurface bore hole in approximately 33 ft (10 m) of water. The cable would transition from the seafloor to shore via this opening drilled from the vicinity of Building 614 using trenchless directional boring technology. The general installation process for WEC devices would be similar to the Proposed Action.

  This alternative would involve maintenance activities similar to the Proposed Action for the WETS infrastructure and WEC devices. Specific maintenance activities for WEC devices would be identified by the selected device developer and addressed in a separate NEPA analysis for USACE permitting. No maintenance activities for the subsurface cable are expected during HDD Alternative operations. Decommissioning of the WEC devices and mooring systems would be similar to that of the Proposed Action. In its decommissioning, the HDD drill pipe would be pulled back and removed from the bore hole.

- **No Action Alternative:** No construction would occur, so status quo conditions would remain; no deep-water WETS berths would be established.

The following alternatives were considered but eliminated from detailed study. The rationale for their elimination is also presented. The alternate MCB Hawaii cable landing route, alternate Hawaii and U.S. Mainland sites alternatives would avoid the Mokapu Burial Area.

Other Alternatives Considered	Reasons for Dismissal
Alternate MCB Hawaii cable landing route	Potential to become damaged by MCB Hawaii training and operational activities; potential to disrupt existing ocean and shoreline recreational activities
Alternate subsea cable route	Greater potential for marine biological impacts
Alternate terrestrial electrical equipment sites	Greater cultural, biological and cost concerns
Alternative Hawaii sites	Inhospitable sea and weather conditions; incompatibility with existing training and operational activities; prohibitive cost
Alternative U.S. Mainland sites	Geographically remote locations without supporting construction and maintenance infrastructure

Regulatory Overview

The following Federal laws, policies and consultations may be relevant to implementing the Proposed Action:

- National Environmental Policy Act of 1969
- Historic Sites Act of 1935
- National Historic Preservation Act of 1966
- Archaeological and Historic Preservation Act of 1974
- Native American Graves Protection and Repatriation Act of 1990
- Coastal Zone Management Act of 1972
- Endangered Species Act of 1973
- Marine Mammal Protection Act of 1972
- Magnuson-Stevens Fishery Conservation and Management Act of 1976
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006
- Clean Water Act of 1972

- Section 10 Rivers and Harbors Act of 1899
- U.S. Coast Guard Requirements
- Clean Air Act of 1970
- Migratory Bird Treaty Act of 1918
- Executive Order 12898, Environmental Justice in Minority Populations and Low-Income Populations
- Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks
- Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (24 January 2007)
- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance (5 October 2009)
- Executive Order 13089, Protection of Coral Reefs

Summary of Environmental Impacts

The Proposed Action would not result in significant direct, indirect, or cumulative impacts to the following resources: climate, air quality, geology, soils, shoreline geomorphology, oceanographic conditions, water quality, natural hazards, marine biological resources, terrestrial biological resources, land and water use compatibility, cultural resources, recreation, infrastructure, public safety and visual resources.

The Navy initiated informal ESA Section 7 consultation with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) under Section 7 of the Endangered Species Act (ESA) on 6 June 2013. The Navy subsequently submitted a revised ESA consultation package and request for concurrence by NOAA Fisheries (21 and 22 November 2013, respectively). The Navy determined that the Proposed Action may affect, but is not likely to adversely affect any species listed or proposed as Federally threatened or endangered (e.g., sea turtles and marine mammal species such as humpback whales and Hawaiian monk seals), or their designated or proposed critical habitat. On 4 December 2013, NOAA Fisheries concurred with the Navy's ESA determination. Informal ESA and EFH consultation correspondence is included in Appendix D.

On 6 June 2013, the Navy conducted informal consultation on Essential Fish Habitat (EFH) with NOAA Fisheries (see Appendix D). The Navy determined that the Proposed Action may adversely affect EFH. However, the impacts would be minimal and insignificant with the implementation of best management practices (BMPs) recommended by NOAA Fisheries and accepted and agreed to by the Navy (see Appendix D for correspondence).

The project area contains two historic properties: Mokapu Burial Area (Site 1017) is listed on the National Register of Historic Places (NRHP) and Building 614 is eligible for NRHP listing. MCB Hawaii determined that the Proposed Action and HDD Alternative would result in no adverse effect to historic properties and consulted with State Historic Preservation Officer (SHPO) under Section 106 of the National Historic Preservation Act (see Appendix B for correspondence). SHPO did not object to this determination within the 30-day period following receipt of the MCB Hawaii consultation letter dated 29 March 2013. and its concurrence is assumed. The State Office of Hawaiian Affairs concurred with this determination by electronic mail on 19 December 2013.

The Proposed Action would not create environmental health and safety risks that could disproportionately impact children or minority and low-income populations. The Proposed Action would not reduce access currently provided to Native Hawaiian cultural claimants to conduct traditional practices at Mokapu Burial Area. The Proposed Action is listed among the *de minimis* activities agreed upon between the Navy and the State of Hawaii Coastal Zone Management (CZM) Program by exchange of letters dated 1 June 2009 and 9 July 2009, and is not subject to further review by the State CZM Program. The State CZM office was advised on 11 July 2013 of the Navy's usage of the De Minimis Activity List and the preparation of this EA; it acknowledged receipt of the Navy's notification on 12 July 2013.

Best Management Practices

Although the Proposed Action and HDD Alternative are not expected to result in significant impacts to the environment, the Navy will employ the BMPs, such as the following, to avoid or reduce potential adverse impacts of construction and operational activities. They are listed according to the resource area primarily affected.

Biological Resources and Water Quality

A. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the proposed action, particularly in-water activities such as boat operations, diving, and deployment of anchors and mooring lines.

   1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the Proposed Action for ESA-listed marine species.

   2. During construction or WEC device installation, surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

   3. Personnel shall remain alert for marine mammals before and during drilling. Do not commence hand drilling if a marine mammal is observed within 1,640 ft (500 m) of operation. Wait 30 minutes after the last sighting of the marine mammal before starting to drill. If drilling is already started and a marine mammal is sighted within 1,640 ft (500 m) after drilling has commenced, drilling can continue unless the marine mammal comes within 820 ft (250 m)[1] during drilling; operations should then cease until the animal is seen to leave the area of its own volition or after 30 minutes have passed since the last sighting.

   4. All in-water installation and maintenance work shall be postponed or halted when ESA-listed marine species are within 50 yards (yd) (46 m) of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species (other than Hawaiian monk seals on land) are noticed within 50 yd (46 m) after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that the activity would not affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

   5. All personnel will stay more than 150 ft (46 m) from Hawaiian monk seals and sea turtles that haul out on the beach.

   6. Personnel will not perform work on the beach during the time that a Hawaiian monk seal is hauled out if the work would be so loud as to expose them to 100 decibels referenced to 20 micro Pascals (μPa) in-air.

   7. Personnel will not perform work on the beach if turtle nesting is known or suspected to be occurring.

   8. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.

   9. Prior to deployment of the mooring and electrical transmission hardware on the seafloor, conduct remotely operated vehicle video surveys of the proposed hardware locations and routes. Use marine biological expert interpretation to identify marine resources in the area to ensure that no coral or potential suspensions are along the planned route. Actual placement of the hardware and

[1] The 1,640-ft (500-m) and 820-ft (250-m) zones of interest are based on California Department of Transportation (CALTRANS) recommendations for an in-water pile driving project (CALTRANS 2009).

cables could vary from the proposed survey route centerlines by no more than ±10 percent times the water depth. Cable laying will ensure that the cable remains taut so no slack will occur during cable placement.

10. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

11. Subsea cables shall be routed to minimize impacts to corals and all structures will be installed to avoid abrasion to corals. Colonies of *Montipora flabellata* and *M. patula* (corals proposed for listing under the ESA) observed along the subsea cable route shall be identified and avoided completely. Other corals shall be avoided to the highest degree practicable. Lay inshore subsea cables by floating and then lowering the cables to the seafloor with diver assistance within 100 ft (30 m) of the shallow-water WET cable, avoiding placing them on top of coral especially in the 33- to 100-ft (10- to 30-m) depth within the reef flat, escarpment and the deep reef platform zones. In depths below 100 ft (30 m) (i.e., beyond SCUBA diving depths), use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated infrastructure to avoid the sparsely scattered corals and formations.

12. Where coral heads are unavoidable and can be easily dislodged from the substrate, divers will attempt to pry the coral head from the substrate and move it an appropriate distance from the impact line of the cable.

13. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.

14. When piloting vessels, vessel operators shall alter course to remain at least 100 yd (91 m) from whales, and at least 50 yd (46 m) from other marine mammals and sea turtles.

15. Reduce vessel speed to 10 knots (18.5 kilometers per hour [kph]) or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots (9.3 kph) or less.

16. If despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 ft (15 m) away, and then slowly move away to the prescribed distance.

17. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.

18. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

19. Vessel and barge operators will strive to anchor project-related vessels/barges only in sandy substrate or limestone devoid of corals. Installation of a fixed mooring buoy in sandy/non-coral substrate will be considered if vessels visit the WETS berths frequently.

20. Develop a decommissioning plan for the installed structures to include criteria for deciding when to remove elements of the project and when to allow elements that are providing some benefit to the environment to remain in place after the project is completed.

B. Effects to the marine and terrestrial environment from project-related activities would be minimized.

21. Employ industry-standard BMPs to avoid discharge of pollutants into the marine environment.

22. A contingency plan to control toxic materials is required.

23. Appropriate materials to contain and clean potential spills shall be stored at the work site (including aboard project-related vessels), and be readily available.

24. All project-related materials and equipment placed in the water shall be free of pollutants.

25. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.

26. Fueling of land-based vehicles and equipment shall take place at least 50 ft (15 m) away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.

27. Spill containment areas would be established and used for refueling of small portable equipment.

Cultural Resources

The Proposed Action and HDD Alternative are not expected to result in significant impacts to cultural resources. BMPs would be employed during construction and operational activities, such as the following:

- Archaeological monitoring throughout all ground-disturbing activities.

- Hand-augur the first 6 to 10 ft (2 to 3 m) of the HDD bore hole in order to allow close monitoring and inspection by a qualified archaeologist for any cultural materials or layers encountered.

- Ensure all construction and operational period vehicles accessing the project area are rubber-wheeled and remain on existing access roads.

Conclusion

Based on the information gathered and the analysis conducted during the preparation of this EA, the Navy has determined that the Proposed Action will have no significant impacts on the quality of the human environment.

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Chapter 1

Purpose and Need

1.1 | Summary of Proposed Action

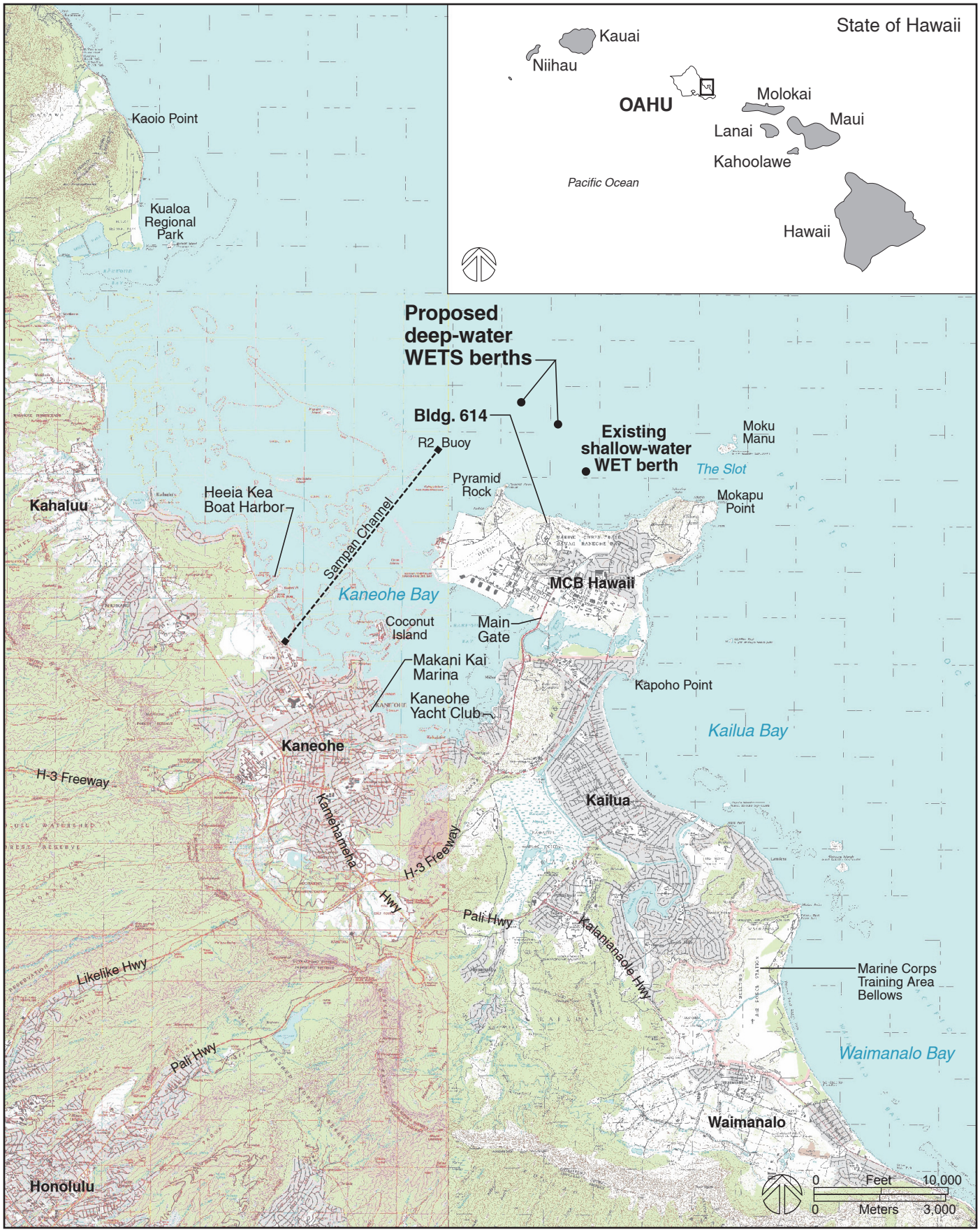
Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) proposes to construct and operate two deep-water berths for testing offshore wave energy conversion (WEC) devices approximately 6,500 feet (ft) (2 kilometers [km]) and 8,200 ft (2.5 km), respectively, off the north coast of Mokapu Peninsula at Marine Corps Base Hawaii (MCB Hawaii), Kaneohe Bay, Oahu, Hawaii (Figure 1-1). The proposed deep-water "Wave Energy Test Site" (WETS) berths would be located in waters with depths of approximately 197 ft (60 m) and 262 ft (80 m), respectively. The Proposed Action includes installation and operation of a 3-point mooring system for each berth, two trunk power and communications transmission cables, in-water scientific data gathering equipment, and associated shoreside electrical transmission and monitoring equipment. A maximum of two (2) WEC devices would be installed and operated (simultaneously) at the deep-water test site. Construction of the new berths would occur within a one-year period, with the first deep-water WEC device installed in 2014. Installation of a second WEC device would occur as soon as another developer is ready to start testing, but no sooner than one month after the first device is installed to allow for initial testing and grid connection. Funding for the testing project is committed through 2016 and the earliest the WETS would be decommissioned is 2016. However, use of the site could extend beyond that time. Upon decommissioning, WETS hardware and structures would be removed, subject to engineering and marine biology surveys and resource agency recommendations.

1.2 | Background

The Department of the Navy ("Navy") prepared an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for a Wave Energy Technology (WET) test project that addressed the phased installation and testing of up to six WEC buoys in waters approximately 100 ft (30 m) deep, approximately 3,300 ft (1,000 m) offshore of Mokapu Peninsula, MCB Hawaii (Navy 2003). (Note: The current WETS EA refers to the 2003 EA as the "2003 WET EA.") In September 2003, the anchor and subsea cable for one berth were installed and the first WET buoy system became operational in 2004. This test site includes a surface floating WEC device, one mooring site with a 3-point anchoring system, equipment canister, an onshore utility vault, undersea and onshore power and data/communications cables, a shoreside control room with monitoring equipment (Building 614), and a connection to the MCB Hawaii electrical grid (see Figure 1-2 for vicinity map). As covered in the 2003 WET EA, the original plan was to deploy up to six WEC devices (one at each of the six proposed berths simultaneously) over a two- to five-year period. Three WEC devices have been deployed at the existing WET site since it became operational in 2004; however each was installed, tested, and removed prior to the subsequent WEC device installation. (This EA refers to the existing WET berth at the 98 ft (30 m) water depth as the "shallow-water WET berth."[1])

Based on the potential for various renewable ocean energy resources at United States (U.S.) Navy and U.S. Marine Corps (USMC) installations, NAVFAC EXWC determined that constructing deep-water WETS berths at MCB Hawaii would be the most cost-effective and practicable means to test WEC

[1] The continued operation of and installation/operation of WEC devices and related scientific monitoring equipment at the shallow-water berth are addressed in a separate NEPA document, as it is an action that could be implemented with or without the Proposed Action covered in this EA. Likewise, this Proposed Action is not dependent on the continued operation of and installation/operation of WEC devices and related scientific monitoring equipment at the shallow-water berth.



Regional Location **Figure 1-1**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

Project Vicinity **Figure 1-2**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

devices that have significant potential for commercial applications, including demonstrating the feasibility of using wave power for Department of Defense (DOD) facilities worldwide. Existing data from surveys and studies documenting the conditions in the area and the impact of previous WEC systems on the marine environment provide information valuable to the planning and evaluation of a deep-water WETS in waters offshore of MCB Hawaii. A discussion of the alternative locations considered is presented in Section 2.6.

1.3 | Purpose and Need

The purpose of the action is to provide facilities to evaluate the technical and economic feasibility of various wave energy conversion configurations as related to future Navy and USMC applications. The Proposed Action could provide an innovative non-greenhouse gas emitting, scalable power source if it can be demonstrated to be efficient, reliable, and cost-effective.

The action is needed to provide the appropriate conditions to test WEC devices with greater power generation potential. Wave energy devices that have the potential to produce higher power levels need to be tested in deeper waters than the existing 98-ft (30-m) deep WET berth can provide. Though the existing shallow-water WET berth can serve as a test site for lower energy producing and smaller scale devices, larger systems--because of their size and extent of anchoring systems--would need to be tested in the 197-ft (60-m) to 262-ft (80-m) depth range to provide adequate clearance between the bottom of the device and the seafloor during periods of large swells. Therefore, wave energy test sites in deeper water are needed to assess and advance the technology.

The action would also advance the Navy's compliance with and implementation of Executive Order (EO) 13423 Strengthening Federal Environmental, Energy, and Transportation Management (24 January 2007) and EO 13514 Federal Leadership in Environmental, Energy, and Economic Performance (5 October 2009). These EOs emphasize sustainability and the development of renewable energy sources at Federal installations, reduction of greenhouse gas emissions and dependence on fossil fuel, and development of off-grid generation capabilities to increase energy security at Navy and USMC facilities. EO 13423 sets forth renewable energy goals that at least half of the statutorily required renewable energy a Federal agency consumes in a fiscal year come from new renewable sources.

The action is also needed to accelerate wave energy device developers' technology to a commercial level in order for the Navy to meet its renewable energy goals by 2020. Because wave energy has significant potential for power generation along U.S. coasts (including Hawaii)[2], research and investment that advances this technology is needed.

1.4 | Regulatory Overview

The following is a discussion of the primary Federal laws and consultations that may be relevant to implementing the Proposed Action.

1.4.1 National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] Section [§] 4321 et seq.), as amended, requires Federal agencies to prepare an EA or Environmental Impact Statement for Federal actions that have the potential to significantly affect the quality of the human environment, including both natural and cultural resources. This EA has been prepared pursuant to the NEPA as implemented by the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508); Environmental Readiness Program Manual, Chief of Naval Operations Instruction (OPNAVINST) 5090.1D, of 10 January 2014; and Environmental Compliance and Protection Manual, Chapter 12, Marine Corps Order (MCO) P5090.2A, CH 3 of 26 August 2013.

[2] Electric Power Research Institute 2011. See additional discussion in Section 4.15 (under Climate).

1.4.2 Historic Sites Act of 1935

The Historic Sites Act of 1935 (16 USC §§ 461-467) establishes as a national policy the preservation of historic resources, including sites and buildings. This Act led to the establishment of the National Historic Landmarks (NHL) program and the National Park Service (NPS) Historic American Building Survey/Historic American Engineering Records (HABS/HAER) program that promulgate standards for architectural and engineering documentation.

1.4.3 National Historic Preservation Act of 1966

The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC § 470) established a national policy for the preservation of historic properties as well as the National Register of Historic Places (NRHP), Advisory Council on Historic Preservation (ACHP), and State Historic Preservation Officers (SHPO).

Section 106 of the NHPA requires Federal agencies having direct or indirect jurisdiction over a proposed Federal or Federally-assisted undertaking to take into account the effects of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP. Federal agencies shall also afford the ACHP a reasonable opportunity to comment on such undertakings.

Section 110 of the NHPA requires Federal agencies to use, to the maximum extent feasible, historic properties available to the agency, have appropriate records made of historic properties prior to substantial alteration or demolition, and to the maximum extent possible, undertake planning and actions to minimize harm to an NHL, and afford the ACHP the opportunity to comment on proposed undertakings that may have an adverse effect on a NHL. Section 110 also states that where a Section 106 memorandum of agreement (MOA) has been executed, such MOA shall govern the undertaking and all of its parts.

1.4.4 Archaeological and Historic Preservation Act of 1974

The Archaeological and Historic Preservation Act (AHPA) of 1974 (16 United States Code [U.S.C.] § 469 et seq.) provides for the survey, recovery, and preservation of significant scientific, pre-historical, historical, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a Federal, Federally-licensed, or Federally-funded project. The Department of Interior's "Standards and Guidelines" were published in the Federal Register (FR) on September 29, 1983 (48 FR 44716) to advise on the manner in which this law will be implemented. AHPA requirements for identification, evaluation, and data recovery can be carried out in conjunction with the Section 106 NHPA process.

1.4.5 Native American Graves Protection and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, as amended, (25 U.S.C. 3001 et seq.) provides a process for museums and Federal agencies to return certain Native American cultural items--human remains, funerary objects, sacred objects, or objects of cultural patrimony --to lineal descendants, culturally affiliated Indian tribes and Native Hawaiian organizations. NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional and inadvertent discovery of Native American cultural items on Federal and tribal lands, and penalties for noncompliance and illegal trafficking. In addition, NAGPRA authorizes Federal grants to Indian tribes, Native Hawaiian organizations, and museums to assist with the documentation and repatriation of Native American cultural items, and establishes the Native American Graves Protection and Repatriation Review Committee to monitor the NAGPRA process and facilitate the resolution of disputes that may arise concerning repatriation under NAGPRA.

1.4.6 Coastal Zone Management Act of 1972

The U.S. Congress noted in the Coastal Zone Management Act (CZMA) of 1972 (16 USC § 1451 et seq.) a national interest in the effective management, beneficial use, protection and development of the coastal zone. While areas under the control of the Federal government are, by definition, excluded from the

State's coastal zone, Federal agency activities within or outside the zone that affect any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of an approved State Coastal Zone Management (CZM) program. If the Federal agency proponent determines that an effect on coastal resources is reasonably foreseeable, a consistency determination is submitted to the State of Hawaii's CZM Program. In 2009, the Navy and the Hawaii CZM Program developed an updated list of *de minimis* activities, which are expected to have insignificant direct or indirect coastal effects and, with application of corresponding mitigation and conditions identified in the list, would be exempt from a negative determination or consistency determination from the Hawaii CZM Program. This list of *de minimis* activities includes activities occurring at MCB Hawaii, including the project area. One of the conditions is the notification of the Hawaii CZM Program office by the Navy or USMC of *de minimis* list usage for projects that require an EA. The Navy informed the Hawaii CZM Program office by electronic mail on 11 July 2013 of the Navy's intent to apply the 2009 *de minimis* activity list and the preparation of this EA. The Navy's notification was acknowledged by the Hawaii CZM Program on 12 July 2013 by electronic mail. Relevant CZMA correspondence, including the 2009 *de minimis* activity list, is included as Appendix F.

1.4.7 Endangered Species Act of 1973

Section 7 of the Endangered Species Act (ESA) of 1973 (16 USC §§ 1531-1544) requires that Federal agencies ensure that proposed actions are not likely to jeopardize the continued existence of Federally threatened or endangered species or result in the destruction or adverse modification of designated critical habitat. Regulations implementing the ESA require that to avoid this situation of jeopardizing the species' existence, the Federal agency is required to determine if Federally threatened or endangered species are present in the area affected by the proposed action and consult with either or both of the appropriate resource agency (National Oceanic and Atmospheric Administration [NOAA] National Marine Fisheries Service [NOAA Fisheries] or U.S. Fish and Wildlife Service [USFWS]) when the agency proponent determines that a proposed action may affect a Federally threatened or endangered species.

1.4.8 Marine Mammal Protection Act of 1972

Marine Mammal Protection Act (MMPA) of 1972, as amended (16 U.S.C. 1361 et seq.) was enacted to protect and conserve marine mammal species, or population stocks of those species, so that they continue to be significant functioning elements in the ecosystem of which they are a part. Consistent with this objective, management goals should include maintaining or returning marine mammals to their optimum sustainable population. The MMPA provides a moratorium on importation and the issuance of permits for the taking of marine mammals and their products, unless exempted or authorized under the MMPA. Prohibitions also restrict the following:

- Take of marine mammals on the high seas;
- Take of any marine mammal in waters or on lands under the jurisdiction of the United States;
- Use of any port, harbor, or other place under the jurisdiction of the United States to take or import a marine mammal;
- Possession of any marine mammal or product taken in violation of the MMPA;
- Transport, purchase, sale, export, or offer to purchase, sell, or export any marine mammal or product taken in violation of the MMPA or for any purpose other than public display, scientific research, or enhancing the survival of the species or stock; and
- Import of any marine mammal.

Authorizations and exemptions from these prohibitions are available for certain specified purposes. Any marine mammal listed as endangered or threatened under the ESA automatically has depleted status under the MMPA, which adds further restrictions.

1.4.9 Magnuson-Stevens Fishery Conservation and Management Act of 1976

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA) (16 U.S.C.1801 et seq.) is the governing authority for all fishery management activities that occur within its jurisdictional waters or Exclusive Economic Zone (EEZ) (i.e., within the U.S. 200 nautical mile [nm] or 370 kilometer [km] limit from shore). This Act halts overfishing by foreign fleets and aids the development of the domestic fishing industry.

Essential Fish Habitat (EFH) coordination and consultation requirements were established by the 1996 reauthorization of the MSFCMA and the Department of Commerce's EFH consultation regulations (50 CFR 600.905-930). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity." An area within the designated EFH that is particularly important and/or sensitive is a Habitat Area of Particular Concern (HAPC). Regional Fishery Management Councils, established under the Act, are responsible for preparing and amending fishery management plans (FMPs) for each fishery under their authority that requires conservation and management. Any Federal action that might have an adverse effect on quality and/or quantity of EFHs is subject to consultation requirements with NOAA Fisheries.

According to the *Final MCB Hawaii Integrated Natural Resources Management Plan Update* (INRMP) (MCB Hawaii 2011), EFHs for several fish species complexes (e.g., adult and juvenile bottomfish, eggs and larvae) and crustacean species assemblages (e.g., juvenile, adult, and larvae of spiny lobsters) are found in waters around pertinent MCB Hawaii coastlines (MCB Hawaii 2011).

Hawaii EEZ fisheries are under the jurisdiction of the Western Pacific Regional Fishery Management Council (WPRFMC), which prepares FMPs for each fishery under its jurisdiction. Because the WPRFMC is moving toward an ecosystem-based approach to fisheries management, it is restructuring its management framework from species-based FMPs to place-based Fishery Ecosystem Plans (FEPs). The FEP for the Hawaii Archipelago (WPRFMC 2009) was developed as an ecosystem-based approach to fisheries management for Hawaii's Coral Reefs, Bottomfish, Precious Corals, Crustacean and Pelagic Fisheries currently under Council jurisdiction. It incorporates by reference and replaces the WPRFMC's existing Bottomfish, Seamount Groundfish, Crustaceans, Precious Corals, Coral Reef Ecosystems and Pelagics FMPs and reorganizes their associated regulations into a place-based structure. It also incorporates community input and local knowledge into the management process.

1.4.10 Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006

This Act (Public Law 109-479) amends the MSFCMA. It was passed to help strengthen enforcement of U.S. fishing laws, end overfishing through management measures, improve the use of data in fisheries management, and enhance international cooperation to address illegal, unreported and unregulated fishing and by-catch of protected living marine resources. To help end overfishing, the Act directs Regional Fishery Management Councils to establish annual quotas in Federally-managed fisheries and increase in the number of limited-access privilege programs that assign specific shares of the annual harvest quota to eligible fishermen, fishing communities and regional fishery associations. The Act creates several programs to improve the quality of information for fishery managers including establishing regional registries for recreational fishermen and facilitating community based efforts to restore local fish habitats by promoting partnerships between Federal agencies and state and local organizations.

1.4.11 Clean Water Act of 1972

The Clean Water Act (CWA) of 1972 (33 USC §1251 et seq.) is the primary Federal law that protects the nation's waters, including lakes, rivers and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters. Section 401 of the CWA requires a Water Quality Certification (WQC) be obtained from the State (or Territory) for actions that require a Federal permit to conduct an activity, construction or operation that may result in discharge to waters of the United States.

The State of Hawaii Department of Health, Clean Water Branch (DOH-CWB) issues the WQC for Hawaii waters. Section 402 of the CWA establishes the National Pollution Discharge Elimination System (NPDES) general permit to regulate point source discharges of pollutants into waters of the U.S., including stormwater discharges associated with construction activities. The NPDES permit is required for construction activities that disturb a land area of one acre (ac) (0.4 hectare [ha]) or more and discharge stormwater from the construction site to waters of the U.S. The DOH-CWB issues the NPDES for Hawaii waters. Section 404 of the CWA requires a permit for discharge of dredged or fill material into a wetland or other navigable water of the U.S. The U.S. Army Corps of Engineers (USACE) issues this permit.

1.4.12 Section 10 Rivers and Harbors Act Permit

The Rivers and Harbors Act of 1899 (33 USC §403 et seq.) requires USACE approval for any structure or work that obstructs or alters navigable waters of the U.S. or modifies the course, location, condition, or capacity of any harbor or channel of navigable waters of the U.S.

1.4.13 U.S. Coast Guard Requirements

The U.S. Coast Guard (USCG) has eleven statutory missions: 1) ports, waterways, and coastal security; 2) drug interdiction; 3) aids to navigation; 4) search and rescue; 5) living marine resources; 6) marine safety; 7) defense readiness; 8) migrant interdiction; 9) marine environmental protection; 10) ice breaking; and 11) other law enforcement. The project area is located within USCG's District 14, which has units in Hawaii, American Samoa, Saipan, Guam, Singapore and Japan. USCG District 14 enforces Federal laws on the high seas and navigable waters of the U.S. and its possessions, and maintains aids to navigation such as buoys. USCG District 14's Office of Aids to Navigation Branch is responsible for Federal aids to navigation, regulates private aids to navigation, issues Local Notice to Mariners, and evaluates navigable waterways to ensure they are adequately marked. Published on a weekly basis, Local Notices to Mariners are developed and issued by each USCG District and are the primary means for disseminating information concerning establishment of, changes to, and deficiencies in aids to navigation and any other information pertaining to the safety of the waterways within each District. They generally include the information on channel conditions, obstructions, hazards to navigation, dangers, anchorages, restricted areas, in-water construction areas, and similar items. The Proposed Action would require USCG approval for new Private Aids to Navigation (e.g., lighting and reflectors) to be affixed to the WEC devices and associated buoys. USCG Local Notice to Mariners would also be requested for the deployment of in-water infrastructure and equipment associated with the Proposed Action.

1.4.14 Clean Air Act of 1970

The Clean Air Act (42 USC 85), enacted in 1970 and last amended in 1990, requires the U.S. Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for wide-spread pollutants from numerous and diverse sources considered harmful to public health and the environment. USEPA established NAAQS for six principal pollutants ("criteria pollutants"): carbon monoxide (CO), lead, nitrogen dioxide, ozone (with nitrogen oxides [NO_x] and volatile organic compounds [VOCs] as precursors), particulate matter (less than 10 microns in diameter [PM_{10}] and less than 2.5 microns in diameter [$PM_{2.5}$]), and sulfur dioxide (SO_2). Areas where concentration levels are below the NAAQS for a criteria pollutant are considered "attainment" areas, while areas where a criteria pollutant equals or exceeds the NAAQS are considered in "nonattainment." Air quality permits are required for major sources of (1) pollutants affecting ambient air quality, (2) hazardous air pollutants, and (3) new sources. The project area is in an attainment area for all criteria pollutants.

1.4.15 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act of 1918 (MBTA), as amended, was originally implemented between the U.S. and Great Britain for the protection of migratory birds. Later amendments implemented treaties between the U.S. and Mexico, Japan and the Russia.

The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. An exemption to the MBTA that allows incidental take of migratory birds by DOD during military readiness activities was finalized in February 2007 (FR Vol. 72, No. 39). As directed by Section 315 of the 2003 National Defense Authorization Act, this rule authorizes such take, with limitations, that result from military readiness activities. If DOD determines that a proposed or an ongoing military readiness activity might result in a significant adverse effect on a population of a migratory bird species, they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.

1.4.16 Potential Permits, Approvals, and Required Consultations

Table 1-1 summarizes the permits, approvals, and required consultations the Navy or its contractor may be required to obtain prior to construction.

Table 1-1: List of Potential Permits, Approvals, and Required Consultations

Oversight Agency	Permit, Approval or Consultation
U.S. Navy	• NEPA documentation (deep-water WETS infrastructure and WEC devices) • Airfield Safety Waiver
MCB Hawaii	• Marine Corps Installations Command Site Approval
U.S. Army Corps of Engineers	• Department of the Army, Rivers and Harbors Act Section 10 Permit (required for deep-water WETS infrastructure and WEC devices) • Department of the Army, CWA Section 404 Permit (required for discharge at underwater outlet of horizontal directional drilling)
U.S. Coast Guard	• Local Notice to Mariners issuance • Approval for navigational aids on WEC devices and associated buoys
U.S. Department of Commerce, National Marine Fisheries Service	• Informal Consultation (ESA and EFH)
State of Hawaii Department of Land and Natural Resources, Historic Preservation Officer	• NHPA Section 106 Consultation
State of Hawaii DOH-CWB	• CWA Section 402 NPDES Permit for construction areas disturbed by construction activities, including discharge of horizontal directional drilling fluid into surface waters • CWA Section 401 WQC (required for discharge at underwater outlet for horizontal directional drilling alternative)
State of Hawaii Department of Business, Economic Development and Tourism, Office of Planning	• Coastal Zone Management Program Federal Consistency De Minimis Activity List usage notification and acknowledgement
Hawaiian Electric Company	• Electrical grid interconnection approval

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Chapter 2

Alternatives Including the Proposed Action

This chapter describes the Proposed Action and alternatives, including a summary of the environmental consequence of each alternative. It also describes the alternatives that were considered but dismissed, as well as the rationale for eliminating them from further consideration.

2.1 | Summary of Proposed Alternatives

The following alternatives were considered in accordance with NEPA, CEQ regulations for implementing NEPA, OPNAVINST 5090.1D, of 10 January 2014 and MCO P5090.2A, CH 3 of 26 August 2013:

- **Proposed Action-Surface-Laid Cable Alternative (Preferred Alternative):** Construct and operate a deep-water WETS that would include two berths for offshore wave energy conversion (WEC) devices at water depths of approximately 197 ft (60 m) and 262 ft (80 m), respectively. These "deep-water" WETS berths would be located roughly 6,500 ft (2 km) and 8,200 ft (2.5 km) offshore of MCB Hawaii, with each berth supported by a 3-point anchoring system or variation thereof. The Proposed Action includes installation and operation of two trunk power and communications transmission cables, associated shoreside equipment, and utilization of an existing onshore facility for data collection and monitoring. The Proposed Action also includes installation and operation of scientific data gathering equipment in the vicinity of the deep-water berths.

  Under the Proposed Action, two 3-conductor subsea transmission cables originating from the deep-water WETS berths would be landed onshore in the vicinity of the existing shallow-water WET trunk cable. From that point, they would be routed to an onshore termination point using the existing above-ground, pedestal-mounted conduit system, where possible[1]. Based on minimal technical complexity and cost, this alternative presents the preferred shore landing route and cable installation methodology.

- **Horizontal Directional Drilled (HDD) Alternative:** This alternative presents a different configuration, route, and installation methodology for installing the communications and data transmission cables from the deep-water WETS berths to shore and a different onshore electrical termination point. The other components are identical to the Proposed Action. In this alternative, instead of landing the cables through the surf zone and routing them over land to an existing below-grade vault via a system of pedestals, a single 6-conductor trunk transmission cable, instead of two 3-conductor cables, would be routed along the seafloor from the deep-water WETS berths to a subsurface bore hole in approximately 33 ft (10 m) of water. The cable would transition from the seafloor to shore via this opening drilled from the vicinity of Building 614 with this trenchless directional boring technique.

- **No Action Alternative:** No construction would occur, so status quo conditions would remain; no deep-water WETS berths would be established.

Each of the alternatives is described in more detail in Sections 2.2, 2.3 and 2.5.

[1] The utility gained from the use of this infrastructure is not dependent on the continued operation of and installation/operation of WEC devices at the shallow-water berth.

2.2 | Proposed Action (Surface-Laid Cable Alternative)

2.2.1 General Description

The Proposed Action is to construct and operate two deep-water WETS berths for pre-commercial WEC devices. At completion, the deep-water WETS berths would support the installation and operation of two WEC devices simultaneously. Figure 2-1 illustrates the locations of two potential WEC mooring berths comprising the deep-water WETS at depths of 197 ft (60 m) and 262 ft (80 m), respectively. The deep-water WETS berths would include several systems and components: WEC devices, moorings, power and communications transmission, control and metering, and scientific data collection devices. These components are summarized below and described in more detail in Section 2.2.2.

a. Construction of two deep-water WEC mooring berths (A and B in Figure 2-1), each of which would have three mooring legs. These moorings would anchor the WEC devices, and because different types of WEC devices could be tested at the WETS, they would be designed to offer enough flexibility to support point absorber or oscillating water column WEC device mooring requirements. The mooring system is being designed as a three-point system; however, depending on the specific WEC device design, the device developers may utilize fewer than three legs to secure their devices.

b. Installation and operation of undersea power and communications cables from the deep-water mooring locations to an existing onshore electrical grid connection point within MCB Hawaii. At water depths less than 100 ft (30 m), the new subsea cables would be routed within a 100-ft (30-m) wide corridor aligned parallel to and on the west side of the existing shallow-water WET berth trunk cable (see Figure 2-1). The installation process would be similar to that of the existing transmission cable from the shallow-water berth.

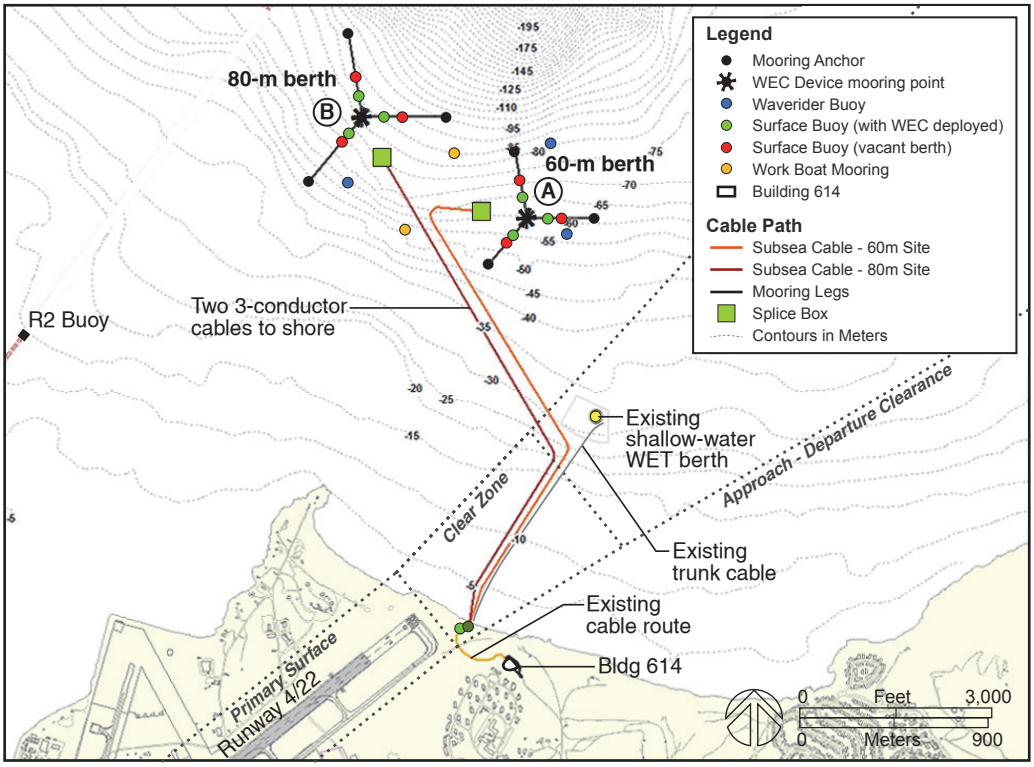
c. Onshore, the surface-laid cable shore landing configuration would route and install two 3-conductor subsea (trunk) and terrestrial cables using construction methodology similar to that used for the existing power transmission cable from the shallow-water WET berth. Both trunk cables would be terminated at a new above-ground utility vault to be located next to an existing above-ground vault.

d. Construction of an onshore electrical equipment shelter in a previously disturbed area along an unpaved road located between the new utility vault and Building 614.

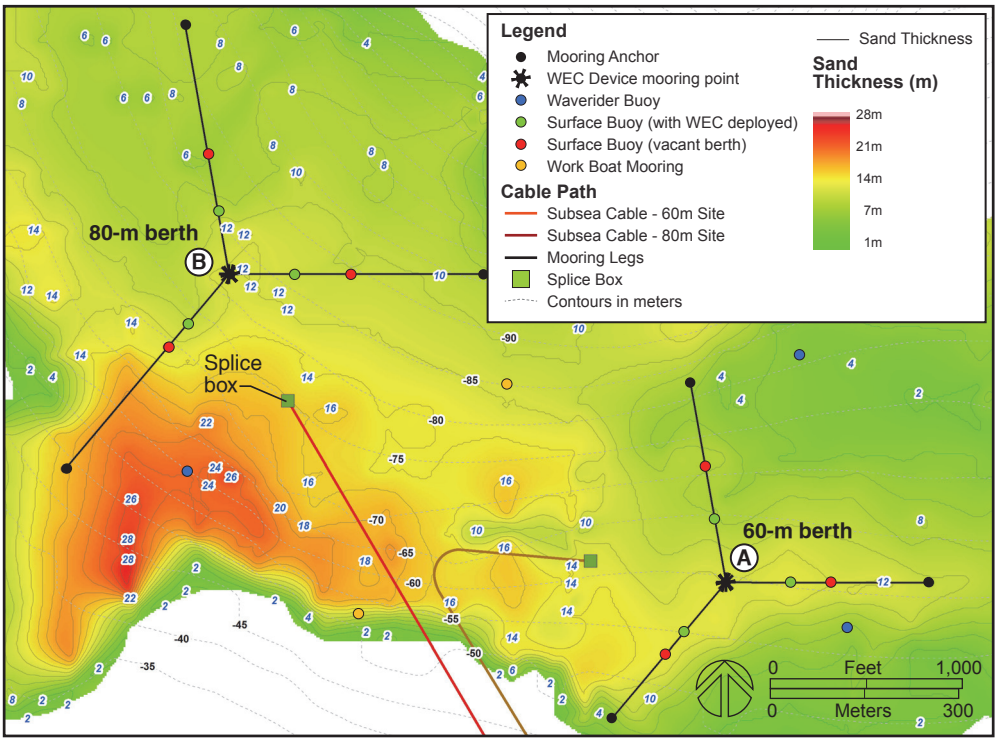
e. Electrical power conduits would be routed from the new utility vault to the new electrical equipment shelter and connect to the MCB Hawaii electrical grid at an existing below-grade vault. A fiber optic conduit would be routed to Building 614, where it would terminate. The new conduits would utilize existing above-ground pedestals to the maximum extent possible. Approximately three to five new pedestals would be required to support the new above-ground conduits where they emerge from the new utility vault. The existing pedestal system would be reused for the remainder of the routes except for short segments that may be routed below grade near the existing below-grade vault.

f. Installation and operation of up to two new WEC devices at a time at the deep-water test site.

g. Annual inspections of WETS mooring infrastructure and periodic inspection and maintenance of WEC devices.



Mooring and Cable Configuration



Seafloor Sand Depth at Deep-Water Berths

Source: Sound & Sea Technology, Inc.

Surface-Laid Cable Alternative

Figure 2-1

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h. Decommissioning/removal of WEC devices by the device developers upon completion of testing. Decommissioning/removal of WETS hardware and structures in consultation with relevant regulatory agencies (i.e., primarily NOAA Fisheries). Removal procedures similar to installation procedures. (See Section 2.2.5 for mooring component disposal details.)

i. Renovation and utilization of six additional rooms within Building 614 for electrical switch control, remote monitoring, and storage.

j. Installation and operation of in-water equipment to gather scientific data on: 1) wave height/direction and currents near the deep-water WETS berths, 2) electromagnetic fields associated with the WETS electrical power transmission lines, and 3) underwater acoustics.

The project area is comprised of the affected locations (i.e., seafloor, water column, and terrestrial areas and facilities) of the components of the Proposed Action: WEC devices; scientific data gathering equipment; mooring systems; subsea and shoreside transmission systems; transmission cable support systems; shoreside electrical equipment, facilities, access, termination points; and affected rooms in Building 614.

2.2.2 System Components

2.2.2.1 Deep-Water WEC Devices

Two basic types of WEC devices[2] are likely to operate at the proposed deep-water WETS and are described in detail below: 1) point absorber and 2) oscillating water column. Examples of WEC devices are shown in Figure 2-2 and summarized in Table 2-1.

A ***point absorber*** is a wave device with dimensions much smaller than the wavelength of the incident ocean wave. These devices use the rise and fall of the water level or the surge motion (i.e., toward and away from shore) about a single point to convert wave motion into usable energy. They may use relative motion or water pressure to convert wave motion into power. The upper half of Figure 2-2 shows examples of point absorber buoys.

In the “float and spar” configuration shown, the float(s) follows the wave surface as it passes the device while the spar(s) remains relatively stationary, thus producing a differential motion between the two components of the buoy.

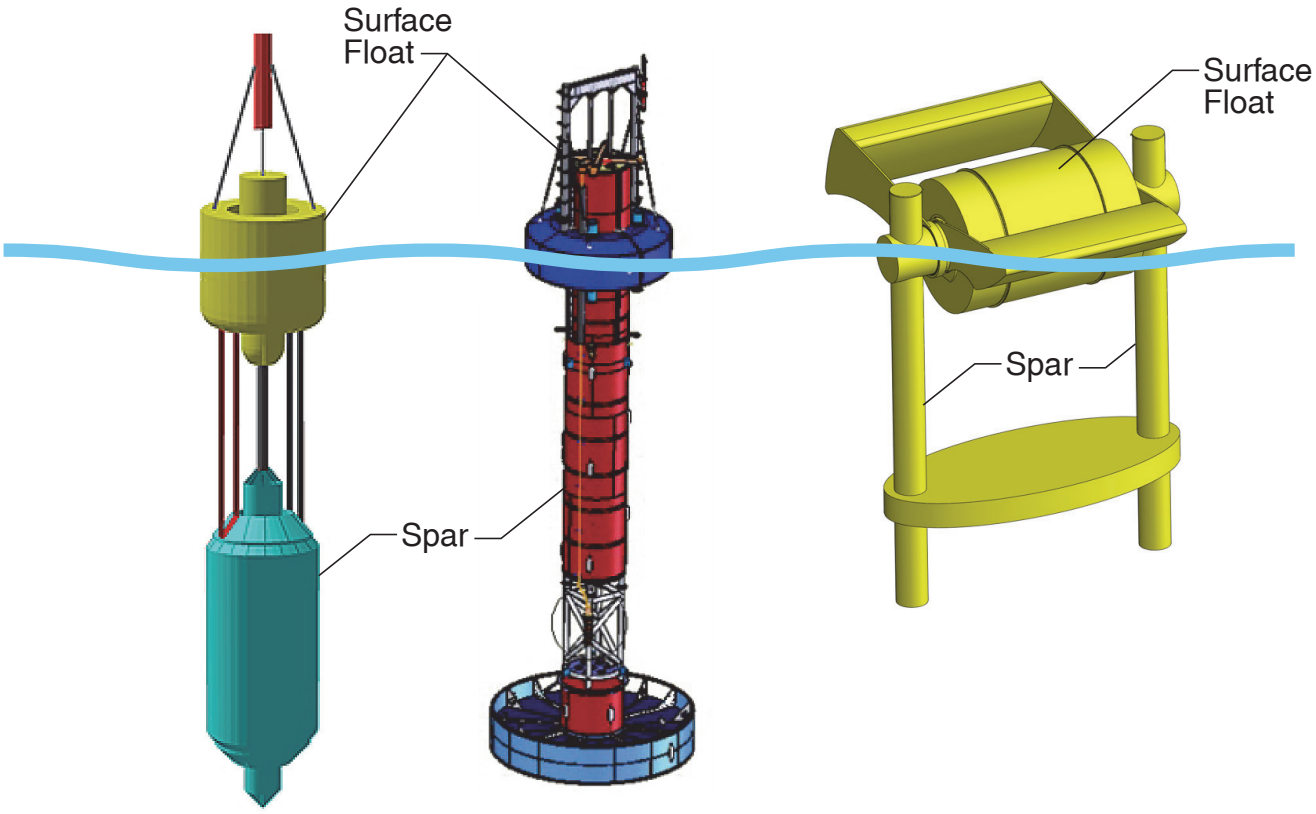
Oscillating water column (OWC) WEC devices use the rise and fall of the ocean water level inside a chamber to force air through a turbine/electrical generator. Power is generated when sea water enters through a subsurface opening into a chamber with air above it. Wave movement then causes the water column to move up and down, thereby forcing air through an opening to a turbine. The turbine used may be bi-directional where the turbine reverses with alternating air flow from the rise and fall of the water level, or, the turbine may rotate in the same direction regardless of airflow direction. The bottom half of Figure 2-2 shows examples of two typical OWC devices.

(Note: Other types of wave energy devices beside the point absorber and oscillating water column configurations, such as attenuators and overtopping devices, would be addressed in future NEPA documentation if their technologies show sufficient promise or merit to being deployed at the proposed deep-water WETS.)

Table 2-1 summarizes the typical properties of point absorber and OWC devices.

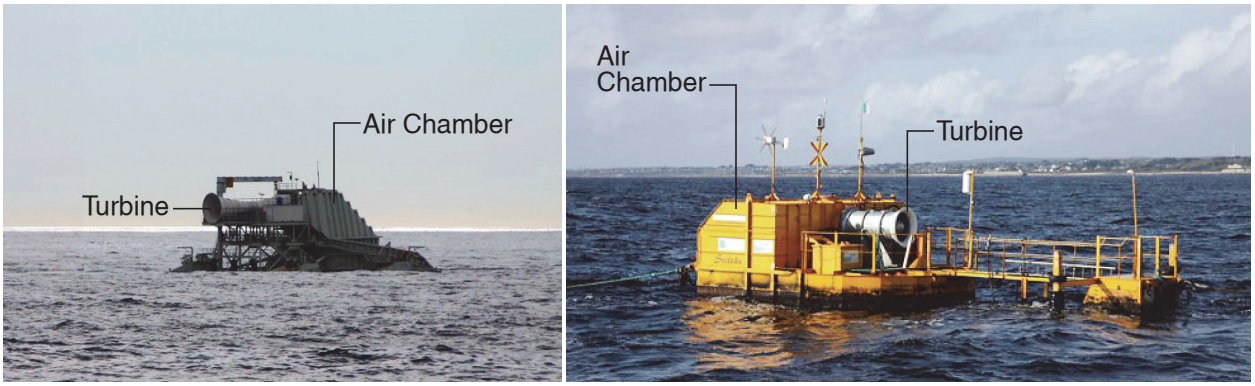
[2] Deployment and maintenance of the individual WEC devices at the deep-water WETS berths would require both NEPA documentation (separate from this EA) and Rivers and Harbors Act, Section 10 permits from the Department of the Army.

Example Point Absorber Buoys



Typical Float & Spar Buoys

Example Oscillating Water Column Devices



Representative Wave Energy Conversion Devices **Figure 2-2**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

Table 2-1 Typical Point Absorber and Oscillating Water Column WEC Device Properties

Property	Point Absorber	Oscillating Water Column
Width	16 to 72 ft (5 to 22 m)	66 to 82 ft (20 to 25 m)
Length	16 to 82 ft (5 to 25 m)	49 to 164 ft (15 to 50 m)
Height	13 to 203 ft (4 to 62 m)	66 to 82 ft (20 to 25 m)
Height Above Water Line	5 to 30 ft (1.5 to 9 m)	7 to 36 ft (2 to 11 m)
Dry Weight	8 to 1,320 short tons (7 to 1,200 tonnes)	8 to 1,320 short tons (7 to 1,200 tonnes)
Power Take-Off	a) Vegetable-based hydraulics or gear drive connected to electrical generator; or b) Magnetic generator technology	Air turbine connected to electrical generator
Mechanical Operation	Two or three main components oscillate relative to each other	Oncoming waves force air through turbine via internal chamber
Power Output	10 to 1,000 kilowatt (kW)	500 to 1,000 kW

The WEC devices would be equipped with reflectors and lighting complying with the USCG specifications, as Private Aids to Navigation. The USCG District 14 would specify the color and flash rate of the navigation light to be installed on the WEC devices deployed offshore of MCB Hawaii. Warning signs would also be attached to the WEC devices as deterrents to unauthorized boarding (e.g., “Danger—Keep Clear—Navy Wave Energy Program,” “U.S. Navy Property—Keep Off,” and “Danger—High Voltage—Keep Clear”). Closed circuit television cameras would be used to monitor the WEC devices for unauthorized boarding and/or vandalism that occurs on the devices.

In general, WEC devices do not have entanglement or entrapment points and move relatively slowly with the frequency of passing waves. In cases where WEC devices incorporate components that move relative to each other (e.g., float and spar), the spacing between the moving parts would be minimal (e.g., less than 1 in [2.5 cm]), posing negligible potential entanglement or entrapment hazards for inspection and maintenance personnel or unauthorized divers or boaters who approach the equipment. WEC device mechanical and electrical components would not be exposed and there would be nothing on the outside deck that presents a danger to inspection and maintenance personnel or unauthorized persons who board the device.

2.2.2.2 Power Take-Off

The power take-off (PTO) subsystem contained within each WEC device is the mechanical-electrical device that converts kinetic wave energy into electrical energy. Wave energy PTO types generally fall into one of four different categories:

1. *Hydraulic*. Hydraulic PTO configurations are based on fluid hydraulic technology. Linear wave action is captured and translated into rotational motion using hydraulic components, circuits, and controls. Major components may include a combination of hydraulic cylinders, pumps, motors, accumulators, and fluid controls. Hydraulic fluids used for WEC devices are typically non-petroleum, environmentally-safe fluids such as vegetable-based oils that are biodegradable and non-harmful if ingested.

2. *Mechanical Direct Drive*. Mechanical direct drive PTO configurations utilize a mechanical link, gear or other mechanical connection to capture linear wave motion to drive an electric generator.

3. *Magnetic Direct Drive*. Magnetic direct drive PTO configurations involve permanent magnets and coils. Wave motion is translated into relative displacement between these two components, which in turn induces an electric current.

4. *Turbine Drive*. Turbine drive PTO configurations involve wave-forced movement of air or water through a turbine-generator unit. Turbine size varies by the type of OWC device, but generally range from 3.3 to 5 ft (1 to 1.5 m) in diameter and 5 to 6.6 ft (1.5 to 2 m) long.

2.2.2.3 Mooring System

The following describes a representative mooring system planned for the deep-water WETS. The actual system installed may vary from this description in materials, dimensions, connections, etc., but would fall within the general framework and function described. The mooring system would support either point absorber- or OWC-type devices. The deep-water mooring system would be a three-point, conventional catenary design, with each leg located approximately equidistant from each other in a circular configuration around each of the two WEC device locations.[3] Figure 2-1 shows the proposed locations of the three-point mooring systems and Figure 2-3 illustrates a schematic diagram of a typical mooring leg profile. The bottom material in the proposed deep-water WETS mooring sites is comprised of a sand layer at least 16.4 ft (5 m) deep, which is suitable for commercially available drag embedment anchors. (See Figure 2-1 for map of seafloor sand thickness at the deep-water WETS). Therefore, commercially available anchors (e.g., Bruce or claw anchor) are likely to be used at the deep-water WETS. The steel anchors will be proof-loaded to 150 tons (136 tonnes) during installation, which will secure them from moving during storms. Estimated anchor dimensions are provided in Table 2-2.

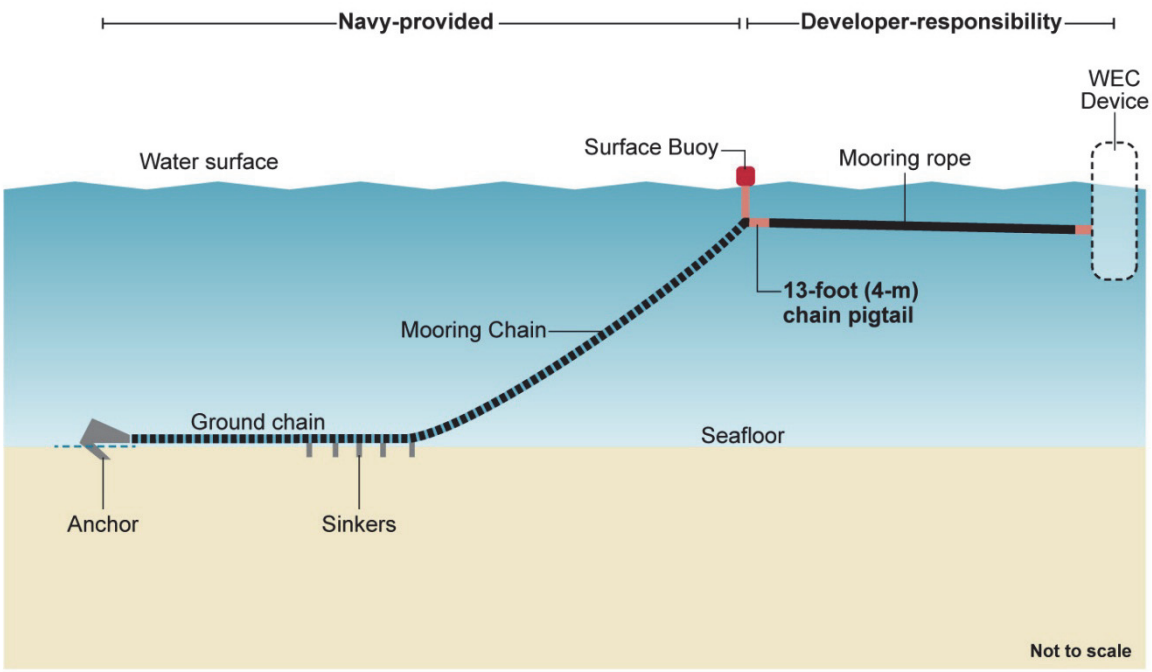


Figure 2-3: Schematic Mooring System Profile

In plan view (Figure 2-1), the anchors would be located approximately 922 ft (281 m) from the center of the 197-ft (60-m) depth WETS berth (Mooring A) and 1,155 ft (352 m) from the center of the 269-ft (82-m) depth WETS berth (Mooring B). The anchors would be connected to 3-inch (in) (7.6-centimeter [cm]) ground chain, or similar apparatus. From the anchor, approximately five concrete sinker weights would be connected to a length of mooring chain to increase anchor holding capacity and minimize movement of the chain and anchor on the seafloor. Approximately 700 ft (213 m) of chain would extend through the

[3] Individual WEC device developers may not require all three mooring legs to secure their specific devices; however, the deep-water mooring system is being designed as a three-point system.

water column to a 13-ft (4-m) long chain pigtail connected to the bottom of a surface buoy (see Figure 2-3). The surface buoy (approximately 10 ft [3 m] in diameter) would have a steel core with an outer polyurethane jacket and be equipped with reflectors and lights in accordance with USCG requirements. The mooring chain would float directly above the last sinker weight and would be under tension. The length of chain that is attached to the last sinker--called the mooring chain (Figure 2-3)--would be equivalent to the depth of the water. Therefore, there would be no slack or movement of the chain that would scour the substrate around the anchor and sinkers. When a WEC device is installed, the mooring rope that would be necessary to allow the device to be secured to the mooring chain would be put in place at that time. The mooring rope would be removed when the WEC device is removed.

The surface buoys would be equipped with lighting, reflectors and warning signage (e.g., "U.S. Navy Property—Keep Off") as required by the USCG.

Under the Proposed Action, the Navy would install and maintain the mooring system up to and including the chain pigtail and surface buoy. The WEC device developers[4] would be responsible for the remaining components needed to connect their devices to the mooring system (e.g., 6-in [15-cm]) nylon mooring rope—or hawser--connecting to the chain pigtail at the surface float). The mooring lines connecting the WEC devices to the surface floats would be pre-tensioned and not subject to slack conditions during device testing, presenting minimal entanglement hazard to swimmers or divers in the water.

The properties of the proposed WETS mooring components are summarized in Table 2-2.

Table 2-2 WETS Mooring Component Properties

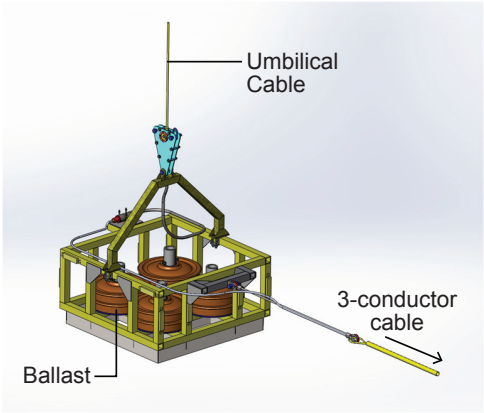
Component	Dimensions	Composition/Material	Weight
Anchor (Bruce FFTS MK4)	16 ft x 11 ft x 19 ft (4.8 m by 3.4 m by 5.8 m)	steel	11 tons (10 tonnes)
Chain shot (stud link)	3 in (7.6 cm)	steel	7,650 pounds force
Surface buoy	Diameter: 15 ft (4.6 m) Height: 10 ft (3 m)	foam	12,400 lb (5,625 kg)
Sinker	4.6 ft by 4.6 ft by 4.6 ft (1.4 m by 1.4 m by 1.4 m)	concrete	7.5 tons (6.8 tonnes)
Mooring rope	Length: Approximately 100 ft (30 m) Diameter: 6 in (15 cm)	nylon	n/a

2.2.2.4 Transmission Cable System (Subsea and Terrestrial)

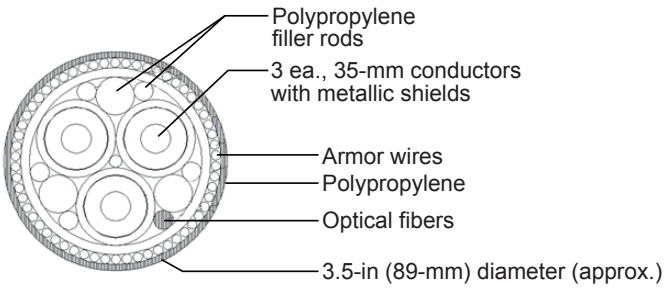
(The following describes a representative transmission cable system planned for the deep-water WETS. The actual system used may vary from this description in materials, dimensions, connections, etc., but would fall within the general framework and function described.) Two power and communications cables would transmit electrical power and data from the deep-water WEC devices to onshore facilities. Figure 2-4 schematically illustrates the undersea power and communications cable system (Note: For ease in reading, Figure 2-4 does not show the mooring system). The power conductors within the power transmission cable would be rated for 15 kilovolts (kV) and the cable would also contain fiber optic cable for transmitting data and communications information.

The system would include an "umbilical" cable from each device connected to a 3-conductor trunk transmission cable at a splice box anchored to the seafloor. Each of the two trunk cables would then be routed to shore on the surface of the seafloor.

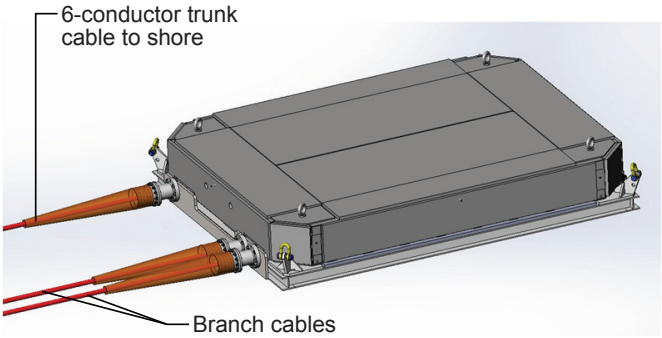
[4] Device developers would be selected as part of NAVFAC EXWC's Broad Agency Announcement process advertised under the Commerce Business Daily under Fiscal Year 2013 Alternative Energy Initiatives. The first WEC device developers to test at the deep-water WETS will be selected by a project-specific review board in mid-FY14.



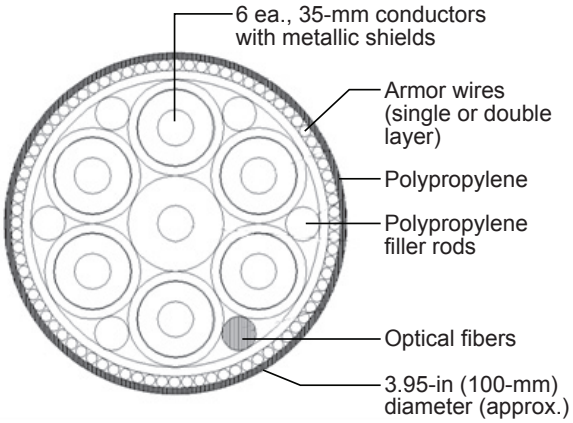
Splice Box



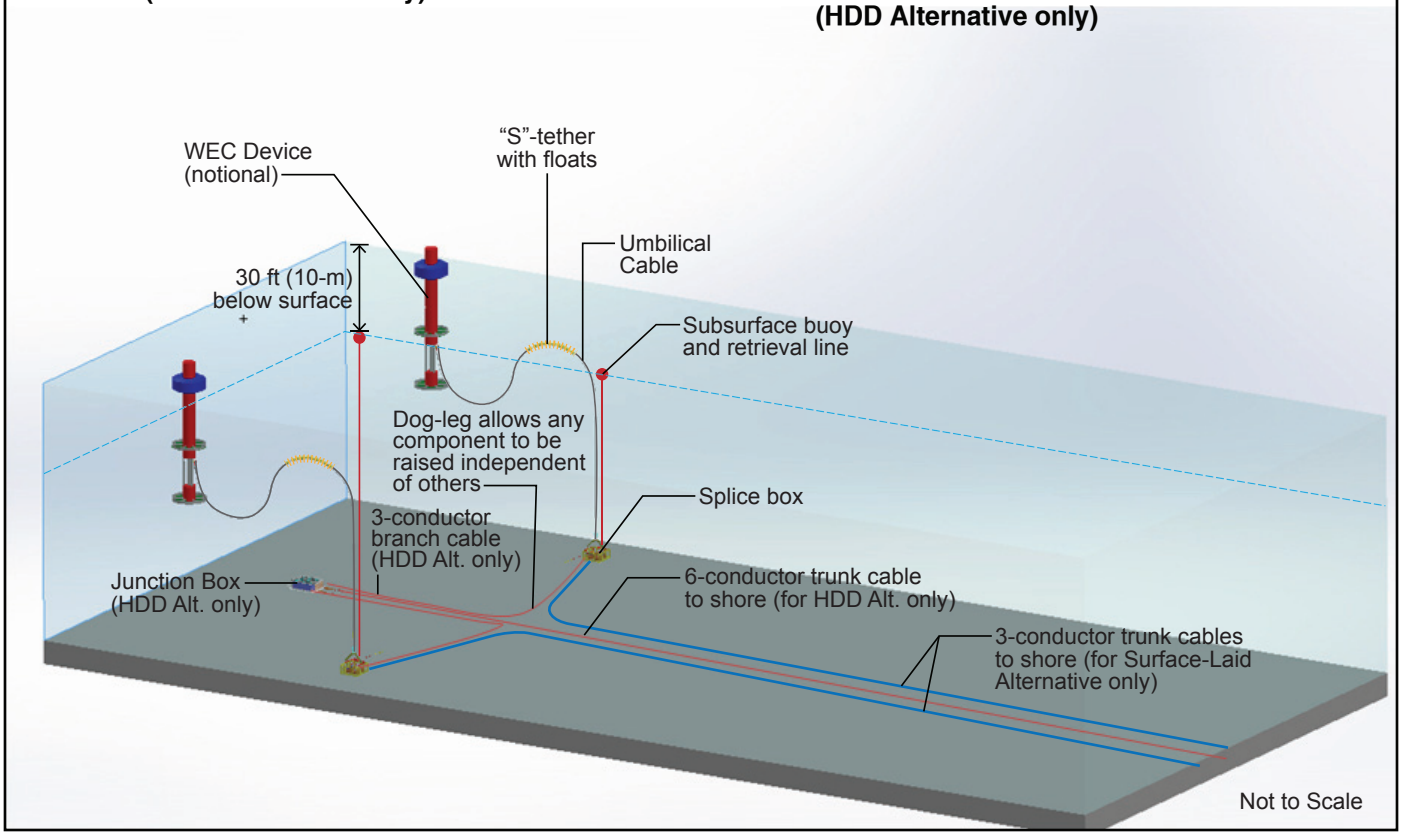
Three-Conductor Cable Cross-Section



J-Box (HDD Alternative only)



Six-Conductor Cable Cross-Section (HDD Alternative only)



Subsea Transmission Cable System **Figure 2-4**

Wave Energy Test Site Environmental Assessment
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Umbilical Cables and Splice Boxes. Each WEC device developer is to provide a short section of 3-conductor umbilical cable containing the electrical power output and fiber optic data lines that would extend from each deep-water WEC device through the water column and connect to a splice box on the seafloor (Figure 2-4). Each splice box consists of a steel frame anchored by weights and fitted with splice housings for power conductors and fiber optic lines. When different WEC device developers deploy their respective devices at the deep-water WETS, the splice boxes would be raised to the water surface so the umbilical cables for the new devices can be connected to the respective trunk cable.

As seen in Figure 2-4, a series of floats would be used to create an "S-tether" in the top portion of the umbilical, with this section of cable suspended in the water column in the "S" configuration. The umbilical segment closest to the WEC device would sink under its own weight, while the floats raise the next umbilical section to a depth that would still allow safe passage for any vessel traffic that would typically traverse the area (i.e., 30 ft [9 m]). The "S-tether" is a typical configuration used for WEC device umbilicals as it allows the device to move laterally and vertically in a limited watch circle in order to avoid straining the cables and connections. To facilitate the launch and future recovery of the splice box, a wire rope retrieval line would be connected between the splice box and a subsurface float. The subsurface float would be located approximately 30 ft (9 m) below the ocean surface.

3-Conductor Trunk Transmission Cables. A three-conductor, single-armored trunk transmission cable (approximately 3.5 in or 89 millimeters [mm] in diameter) would be connected to each umbilical (for each WEC device) and extend from the splice box to its landing point onshore. The cables would also contain optical fibers for communications and have excess capacity for additional conductors if required in the future. As seen in Figure 2-4 (blue cables), there would be a bend or "dogleg" in the undersea alignment of the trunk cables as they are routed near the deep mooring locations and splice boxes in which the power conductors and fiber optics would be spliced to those in the umbilical cables. This dogleg is necessary to provide sufficient cable length so the cable and splice boxes can be raised to the surface independently of each other. This configuration also avoids dragging the trunk cables on the seafloor as well as excessive slack, which could cause the cables to become kinked or abraded as they are raised from and lowered to the seafloor.

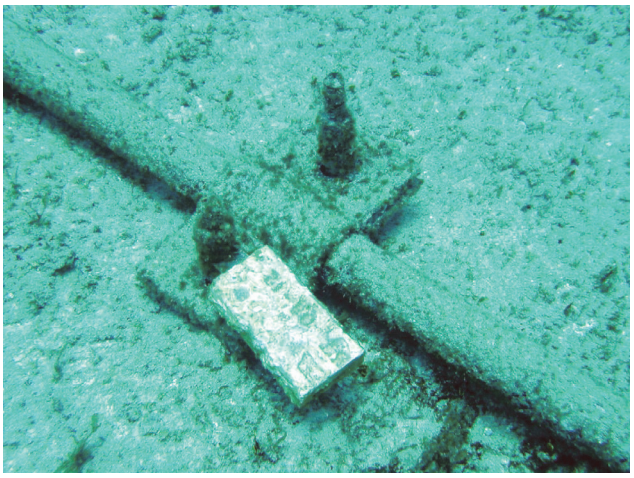
The subsea cables would be encased in a high strength steel armor wire jacket, which would protect it from being damaged by anchors inadvertently dropped on it by typical vessels that transit the area. If an anchor from a large boat were to snag and damage the subsea cable or if a diver intentionally vandalized and breached the cable, the transmission circuit's ground fault protection system would immediately shut off power in the circuit.

The undersea cable would be anchored along its length from the shoreline to a depth of approximately 100 ft (30 m) by either rock bolts (Figure 2-5 [A] and [B]) or protective split pipe (Figure 2-5 [C] and [D]), with the anchoring and spacing dependent on conditions of the affected substrate.

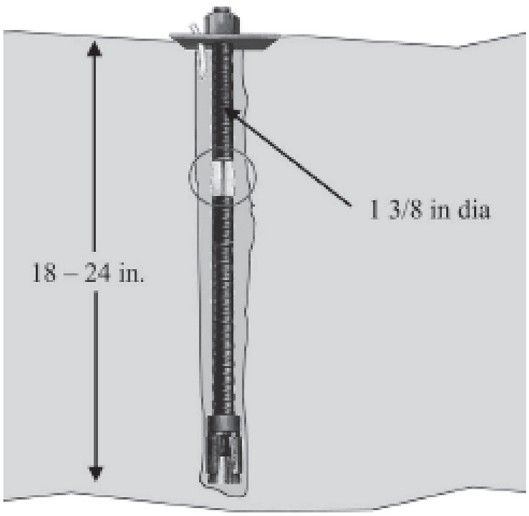
2.2.2.5 Onshore Electrical Equipment and Facilities

The WEC device developers using the deep-water WETS would be required to condition the power output of their WEC devices so they are compatible with MCB Hawaii's electrical grid prior to transmission through the subsea trunk cable. All grid connections would meet the interconnection requirements of the local electrical utility (i.e., Hawaiian Electric Company [HECO]) prior to connection. During the initial testing of any WEC device, the power generated would be diverted through an onboard resistor bank that consumes or burns off the power. During this phase of testing, the proper operation of the device as well as the quality of the generated power would be determined. The power will be redirected to the subsea trunk cable and the switch closed to allow connection to the MCBH grid only after determination that the generated power is acceptable for grid connection and HECO approval. Some WEC device developers may choose not to connect their devices to the MCB Hawaii electrical grid or may not obtain approval by HECO to connect to the grid. In these cases, the testing would continue with the power being burned off onboard the WEC device.

(A) Existing Grouted Rock Bolts

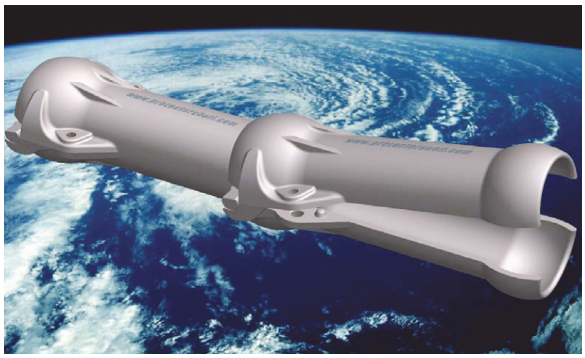


(B) Rock Bolt Section



(C) Existing Split Pipe-Protected Cable

(D) Sample Split Pipe



Specifications

Segment Length - Overall	506mm
Effective Installed Length/segment pair	440mm
Minimum Internal Diameter	130mm - for cables up to 115mm Dia
Maximum External Diameter	290mm
Material	Spheroidal Graphitic Iron to AS1431
Wall thickness (9mm)	(ISO 1083) 400MPa / 12% elongation
Impact Resistance	12m Drop test or 26kg
Tensile Strength	>100kN
Minimum Bend Diameter	4.0m
Weight per Segment	21kg
Weight per installed metre (air)	48kg
Weight per installed metre (water)	42kg

Transmission Cable Anchoring and Protection **Figure 2-5**

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In the Proposed Action, the two trunk cables would come ashore near the original shallow-water WET cable shore landing (Figure 2-6). A new above-ground utility vault would be installed immediately adjacent to an existing above-ground vault onshore. (See Photo 1 for existing vault.) The new vault would be 5 ft [1.5 m] wide by 7 ft [2 m] long by 5 ft [1.5 m] high (approximately the same size and shape as the existing vault). The new power transmission cables from the two additional WEC devices would transmit power at 11,500 volts.

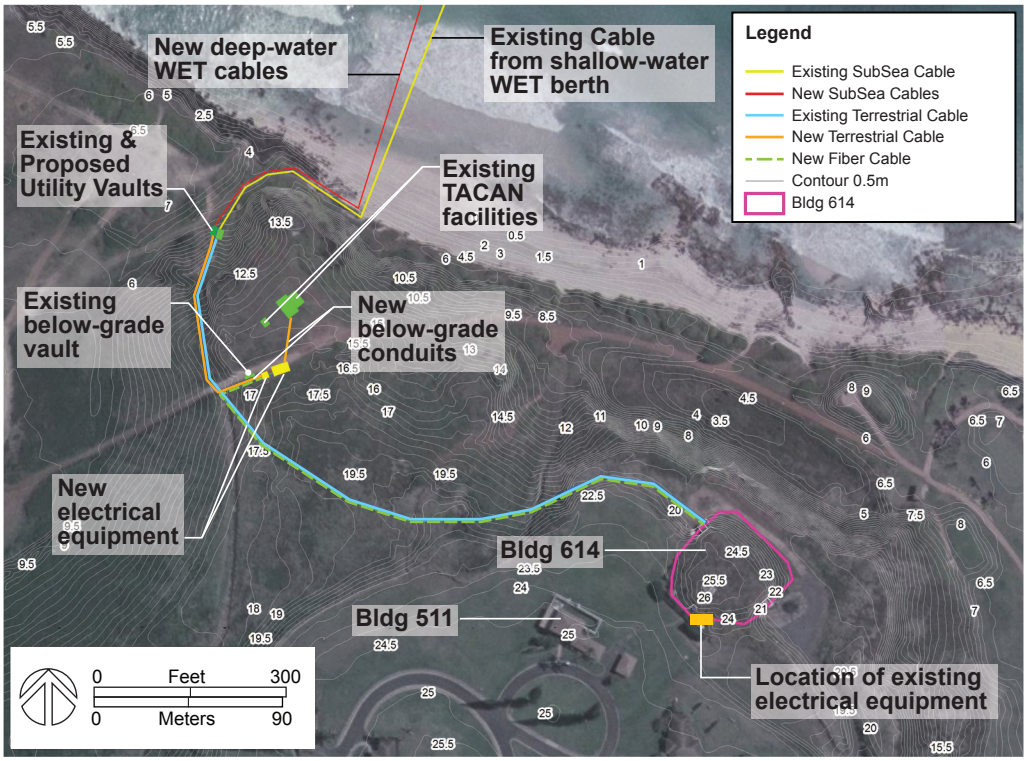
Photo 1: Existing Utility Vault

From the new vault, three conduits (two containing power conductors and one containing fiber optics) would be routed using the existing above-ground pedestals where possible (see Photo 2 for existing conduits and pedestals and Figure 2-6 for terrestrial cable route). The two new electrical conduits would be approximately 4 in (10 cm) in diameter and the fiber optic conduit would be approximately 2 in (5 cm) in diameter. New fiberglass platforms (i.e., struts) would be added to the existing pedestals to exclusively support the three new conduits. (Note: Approximately one-half of the new fiberglass platforms would be centered over the existing concrete-filled PVC support post, as shown in the Figure 2-6 diagram, and the remaining platforms would be cantilevered over the posts to maintain the proper conduit alignment.) The new conduits would be supported by three to five new pedestals for an approximately 15-ft (4.5-m) section where they first emerge from the new utility vault until the point they can be aligned with the existing conduit route. The new pedestals would be similar to the existing pedestals and would be supported by concrete-filled conduit piping reinforced by 1-in (2.5-cm) diameter rebar. They would extend between 12 in (30 cm) and 24 in (61 cm) above grade (height would vary with terrain). The rebar would be the only subsurface component of the pedestal system, and would extend a maximum of 3 ft (0.9 m) below grade. Figure 2-6 includes schematic diagrams of alterations to existing pedestals (to support the new power and fiber optic conduits) and the proposed new pedestals.

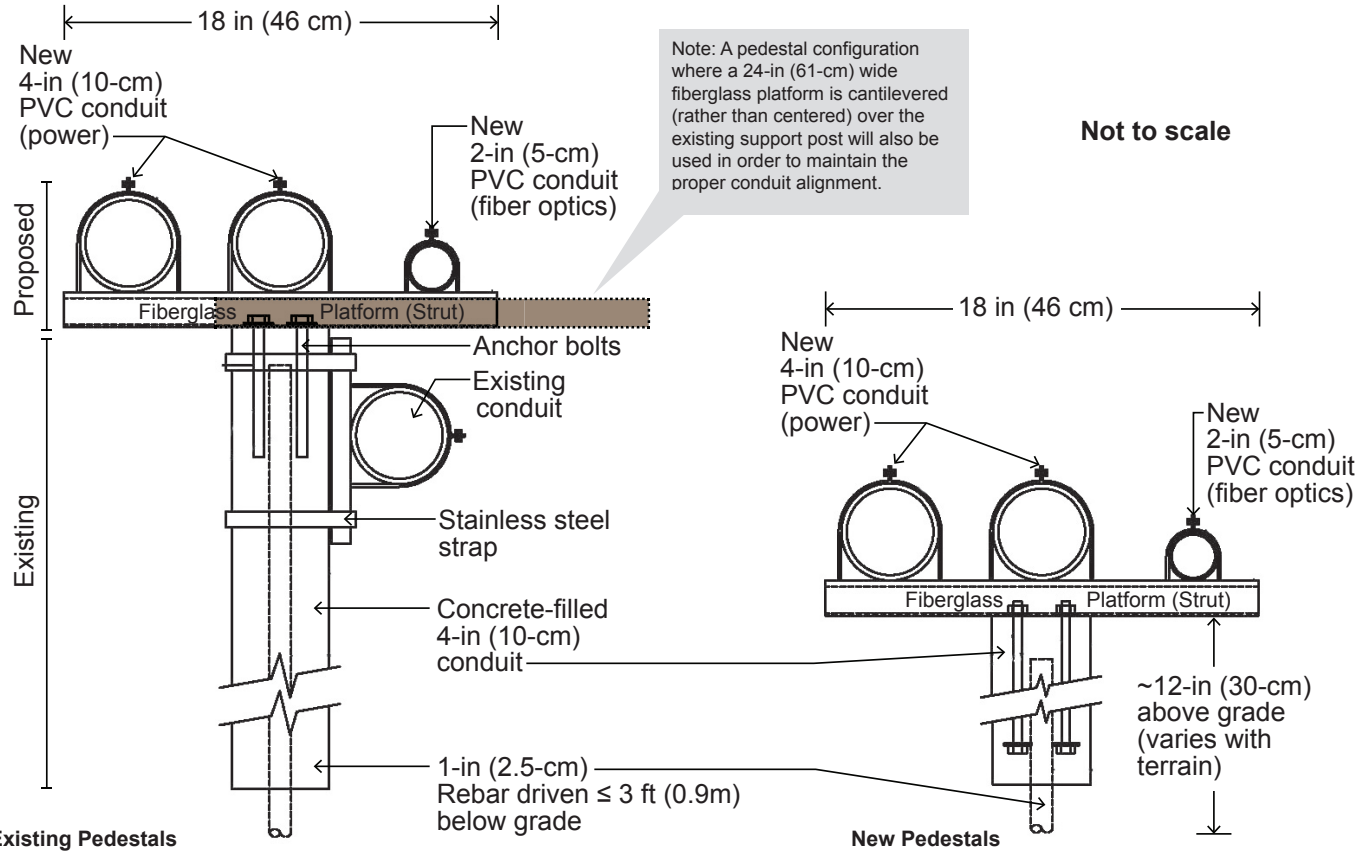
Photo 2: Existing Conduit and Pedestals

From there, the new conduits would be routed on the existing pedestals to an existing unpaved access road approximately 240 ft (73 m) south of the new utility vault. At that point, they would transition to below-grade conduits and be routed to existing below-grade vaults approximately 125 ft (38 m) to the northeast, where the power conductors would terminate and connect to the MCB Hawaii electrical grid (Figure 2-6). This area has been previously disturbed with considerable ground modification including the deposition of imported fill and grading of the ground surface. It is the new location for tactical air navigation (TACAN) facilities (including an equipment shelter and antenna tower) that are in the process of being relocated from a temporary site on the southeast side of the airfield runway (see Figure 2-6 for location of TACAN facilities).

The power conduits would terminate in a new electrical equipment shelter (12 ft [3.9 m] long by 6 ft [1.8 m] wide by 8 ft [2.4 m] high) situated on a 6-in (15-cm) thick concrete pad (see Figure 2-6).



Coordinate System: UTM Zone 4 North - Depth/Elevation in Meters
Data Source: Sea Engineering, RSIMS, NOAA
Geovisualization by Sound & Sea Technology, Inc. April 2013



Surface-Laid Cable Route and Pedestal/Conduit Configurations **Figure 2-6**

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The equipment shelter would accommodate disconnect switchgear, metering equipment, and circuit protection components. A new vacuum fault interrupter (VFI) (5 ft [1.6 m] long by 5 ft [1.6 m] wide by 5 ft [1.6 m] high) would be mounted on a 6-in (15 cm) concrete pad adjacent to the equipment shelter. The power lines would then be routed through the VFI and connected to the MCB Hawaii electrical grid at the existing below-grade vault adjacent to the proposed VFI unit.

The fiber optic conduit would also diverge from the existing pedestal route at the unpaved access road and be routed below grade to the new electrical equipment shelter along with the power conductor conduits.[5] The fiber optic conduit would enter and exit the electrical equipment shelter and then be routed from there to Building 614 using existing pedestals. In Building 614, individual fibers would be routed to the rooms designated for use by the WEC device developers (see Figure 2-7). Except for three to five new pedestals at the new above ground vault near shore, no new pedestals would be required to support the power and fiber optic conduits.

Six work and storage rooms in Building 614 (Rooms 103, 104, 107, 108, 109, and 110) would be renovated for spaces to meter and monitor the WEC devices and data gathering equipment. Figure 2-7 identifies the affected rooms in Building 614. Facility upgrades would be internal to the building and include installation of a new split-system air conditioning unit, new doors, electrical and lighting upgrades, and carpet removal. No external lighting at Building 614 would be installed as part of the Proposed Action.

2.2.2.6 Scientific Data Gathering Equipment

The Proposed Action also includes installation of several oceanographic and environmental measurement devices related to the WEC device operations proposed for the deep-water WETS berths. The data gathering devices are funded by the U.S. Department of Energy (DOE) under grants made to Hawaii National Marine Renewable Energy Center (HINMREC) at the University of Hawaii at Manoa.

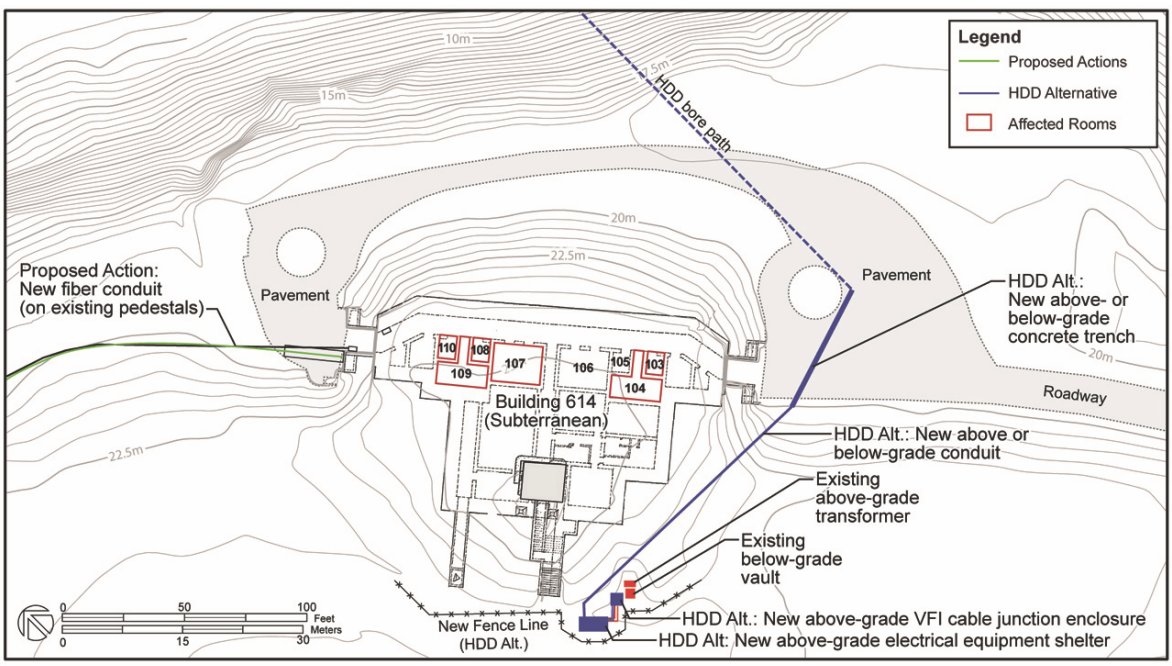


Figure 2-7: Building 614 Site Plan

[5] This fiber optic branch to the electrical equipment shelter is needed to transmit data to MCB Hawaii on the electrical power from the WEC devices that enters the Base electrical grid. The fiber optics that continue on to Building 614 would transmit data on the functioning of the WEC devices for monitoring by the Government and the device developers.

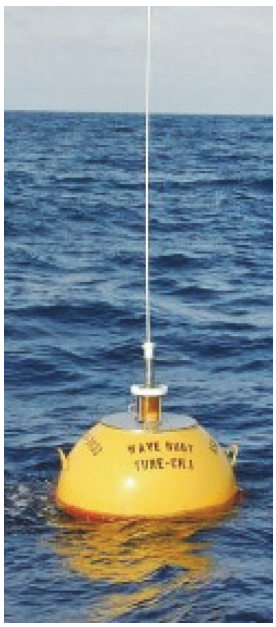
The data gathering devices include: three (3) wave measuring ("Waverider"©) buoys in the vicinity of the deep-water WETS, probes to measure the electromagnetic field (EMF) signature of the undersea power cables, acoustic monitoring stations to measure sound levels from the WEC devices, and an active Acoustic Doppler Current Profiler to record ocean current and wave conditions. These devices would be installed and operated by HINMREC and removed by the completion of the WETS testing period. After removal, the scientific data gathering equipment would be reused for other projects or appropriately disposed of in compliance with relevant Federal and state regulations. See Figure 2-8 for representative images of each of these data gathering devices. Data collected by these devices in conjunction with the Proposed Action would be available for public use. The devices could be deployed by one to two people, in addition to a boat handler.

Wave height and wave direction. "Waverider©" buoys have become the standard for measuring wave height and direction by using accelerometers and a compass mounted in a stabilized platform. The proposed installation would use the directional version MKIII model with the measured data transmitted via Iridium two-way satellites. The 3-ft (0.9-m) diameter buoy weighs 495 pounds (lb) (225 kilograms [kg]) (in air) and resolves the wave field to approximately 0.4 in (1 cm) in height and 1.4 degrees in direction with accuracies of 0.5% to 1% of measured height value and 0.5 degrees for direction. Using standard recording parameters, three years of continuous operation can be achieved. The University of Hawaii deploys and maintains the Waverider© buoys installed throughout Hawaii. This type of data would assist in understanding the wave energy technologies being tested as well as how wave energy technologies can more effectively produce energy. These buoys would also provide data that can be used to better characterize the Kaneohe Bay area ecosystem. The three proposed buoy locations are shown in Figure 2-1.

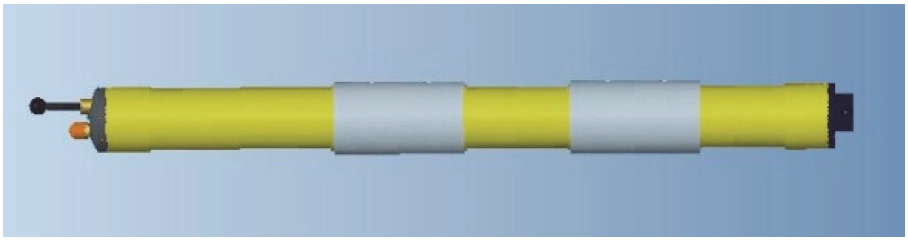
Electromagnetic field probes. Two EMF probe units would measure EMF levels resulting from operation of the energized trunk transmission cables from the deep-water WETS berths. The units consist of field recorders connected to a flat 4-ft (1.2 m) by 5-ft (1.5-m) platform that would be placed on the seafloor. A surface marker buoy would be attached to allow for retrieval. One unit would be deployed within 6.5 ft (2 m) of the trunk cable being measured and the other would be located about 3,280 ft (1 km) from the cable in an area of similar depth, as a "control" site.

Acoustic monitoring. To passively receive sound data, three acoustic monitoring stations would be employed at various times throughout the WETS operational period. Each station consists of hydrophones (underwater microphone) encased in a waterproof covering that would be used to listen and record sounds emitted by the WEC devices. Each station would be 72 in (1.8 m) long by 6 in (15 cm) in diameter. They would initially be deployed near each WEC device (three hydrophones per device) and gradually moved further distances away to record noise attenuation patterns. Because they are buoyant in water, the stations would be weighted down with lead weights (coated with non-biodegradable plastic to prevent leaching into the water and similar to those commonly used in divers' weight belts) attached to the corners of the mounting crates/structures to ensure they remain in place on the sea floor.

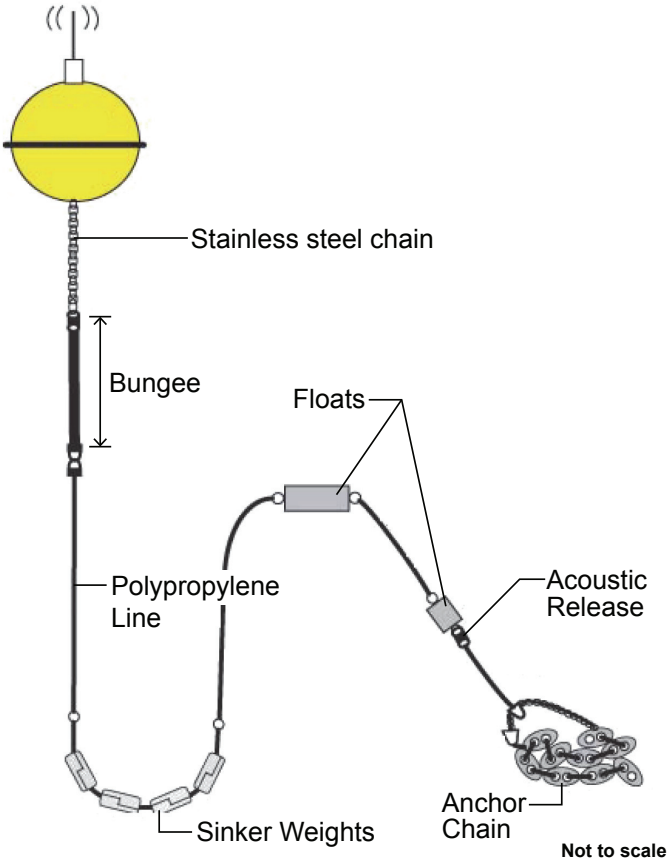
The monitoring stations would be deployed from a small boat-mounted crane by one or two people. The stations would require deployment of subsurface buoys (approximately 10 in [25 cm] in diameter) to facilitate retrieval of the stations by divers. These subsurface buoys would be deployed approximately 98 ft (30 m) below sea level. The stations would be operational for approximately two years, with fieldwork beginning in the first quarter of 2014. Removal of the stations (including plastic-coated lead weights) would use the same assets as their deployment (i.e., small boat and divers).



Waverider Buoy

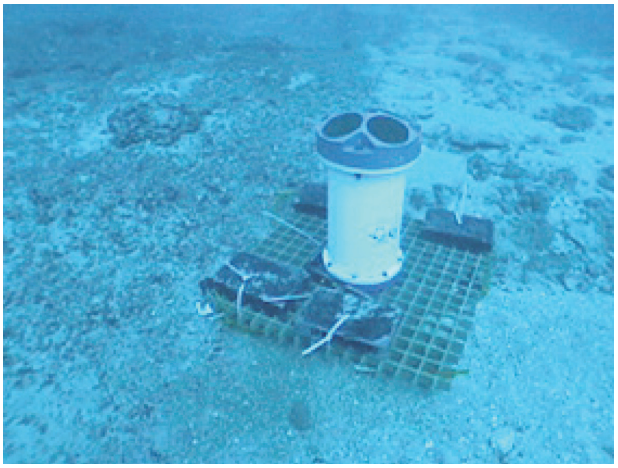


Main body of acoustic monitoring station



Waverider Buoy Profile

EMF Probe



ADCP Wave Measurement Device

Representative Scientific Data Gathering Equipment **Figure 2-8**

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Doppler Profiler. An Acoustic Doppler Current Profiler (ADCP) would be deployed on the seafloor near the deep-water WETS berths to record real time wave and current data. It emits sound bursts[6] into the water and calculates wave and current data based on the Doppler shift of the returning echoes.

The ADCP proposed for use is 16 in (40 cm) high and 9 in (23 cm) in diameter. It would be bolted to a fiberglass grate base approximately 24 in (60 cm) by 24 in (60 cm) and installed on and retrieved from the seafloor using the same procedures as for the acoustic monitoring stations (i.e., by small boat, utilizing subsurface buoys facilitating retrieval by divers). Four 22-lb (10-kg) weights would be tied to the corners of the grate base to anchor the assembly on the seafloor. Upon completion of the WEC device, the ADCP (including grate and weights) would be removed by divers.

2.2.3 Construction and Installation Methodology

This section provides a general description of the construction and installation procedures and methodology for the Proposed Action. The total duration for all components of the construction and installation would be approximately 60 days. It should be noted that these procedures represent the best available information based on current project information and may be adjusted as details on environmental conditions and engineering plans progress.

2.2.3.1 Mooring Installation

The general procedure for installation of a drag embedment anchor mooring system would take three to five days and is outlined below.

Once the anchors and mooring hardware are assembled at a harbor-side work area at Honolulu Harbor, the following deployment steps would be followed.

1. Anchors and associated mooring hardware would be loaded on an offshore work boat or barge with a heavy lift capability. One of the following support vessel options would be used:

    a. Cable/mooring deployment vessel (overall length approximately 400 ft [122 m]) with crew of 20 to 30 and small boat (overall length approximately 50 ft [15 m]) with crew of four.

    b. Crane barge approximately 160 ft (49 m) long by 65 ft (20 m) wide with crew of five; deck barge approximately 165 ft (50 m) long by 40 ft (12 m) wide; two tug boats (overall length approximately 60 ft [18 m]) with crew of four.

2. The offshore work boat/barge would transit to the first mooring anchor site and position itself over the desired deep-water WETS berth anchor position using dynamic positioning or by deploying a temporary mooring using onboard boat anchors.

3. The first anchor would be lowered into position using a ground chain, which would be slightly longer than the water depth at the anchor site.

4. Once the anchor has been set on the bottom, the first sinker weight would be connected to the ground chain as the chain is deployed. (Figure 2-3 shows a profile view of associated mooring components.)

5. The work boat would then warp toward the center of the mooring area while connecting and lowering the remaining sinker weights with the mooring chain such that the ground chain is laid taught on the bottom.

[6] The ADCP would transmit 600-kilohertz frequency sound bursts (with durations of less than 12 milliseconds) up to 10 times per second. The standard procedure is to collect raw data for a 20-minute interval every hour.

6. Once the last sinker weight reaches the bottom, the balance of the mooring chain would continue to be paid out.

7. When the end of the mooring chain is reached, the chain pigtail and surface float would be attached where it would be allowed to float above the last sinker weight.

8. The work boat and barge would return to Honolulu Harbor and load anchors and mooring hardware for the remaining moorings.

9. Steps 2 through 7 would be repeated to install all mooring legs.

2.2.3.2 Cable and Splice Box Installation

On the day of installation, a cable laying vessel would be anchored with a four-point mooring approximately 1,640 ft (500 m) offshore. If the vessel has dynamic positioning, it would hold position at the shore end location utilizing the dynamic positioning system. The proposed shore landing point for the cable is near the existing shallow-water WET cable landing on the MCB Hawaii shoreline (Figure 2-1). The nearshore route (i.e., to the 100-ft [30-m] depth) of both new subsea cables would be parallel to and within 100 ft (30 m) to the west of the existing shallow-water WET berth subsea cable.

The cable shore landing and subsea installation would be accomplished as follows:

1. Using an onshore pulling line and winch or other truck-mounted pulling equipment (e.g., excavator or backhoe) located near the existing utility vault, the end of the trunk cable is pulled off the vessel towards shore. The vehicles and equipment would utilize existing roadways to access the site.

2. During the cable shore landing operation, a crew of four to six persons will staff the beach area. In addition, a team of four to five divers, two to three boat handlers, and a 45-ft (14-m) workboat would support nearshore operations during the cable landing operation.

3. As the cable leaves the vessel it is buoyed on the surface using floats tied to the cable at regular intervals of 10 ft (3 m). The floats prevent the cable from contacting the seafloor during the shore landing.

4. After the end of the cable reaches shore, additional cable is pulled onshore to provide enough cable for routing the cable over land from the beach to the new onshore utility vault.

5. The cable would be anchored to the shore above the high water mark using rock bolts.

6. Divers would then remove the floats, starting from the beach out and progressing to the installation vessel. As the divers cut the floats off the cable, divers from an accompanying small support boat would guide the cable to the seafloor, readjusting it, if necessary, to ensure that it is properly placed on the seafloor (i.e., to avoid placement on coral colonies where possible, and remove excessive slack or tension in the line).

7. After the beached cable is anchored and the floats removed, the vessel would be ready to install/lay the cable.

8. The installation vessel would pay out cable as needed to maintain proper levels of tension along the subsea cable route.

The splice boxes would be installed as follows:

1. When the installation vessel is laying the 3-conductor trunk cable for the first of the two splice boxes, it would slow to a stop when it is about 130 to 165 ft (40 to 50 m) from the intended splice box location.

2. The vessel winch would lift the splice box off the boat deck and then lower it to its final location.

The cable deployment procedure would be repeated for the second trunk cable and splice box. The in-water installation process for the subsea cables and associated equipment would occur over a period of one to two days.

Following its installation, each undersea cable would be anchored along its length to a depth of approximately 100 ft (30 m) by either rock bolts (Figure 2-5 [A] and [B]) or protective split pipe (Figure 2-5 [C] and [D]), with the type of anchoring and spacing dependent upon the seafloor conditions (e.g., hard or soft substrate). Divers would use hand drills to drill a 24-in (61-cm) deep by 1.5-in (4-cm) diameter hole in the hard substrate. A treaded rock bolt would then be inserted and grouted in place by divers using a hand-held applicator that dispenses a two-part epoxy mixed internally within the applicator. No grout would be released into the water during the process.

Depending on weather conditions and the amount of split pipe to be used, the cable anchoring process could be completed in one week (after completion of the cable installation). The hollow, self-securing rock bolts would be filled with grout which would set within 24 hours. No trenching would be required. The offshore route would avoid areas of high vertical relief, which would cause cable suspensions, and follow branches of sand deposits that extend seaward from the beach through the sand channel zone, where practical. The offshore route (i.e., greater than 100-ft [30-m] depths) would be planned during the design phase following completion of a route elevation and visual inspection survey via remotely operated vehicle (ROV) in deeper waters, subject to interpretation by marine biologists.

2.2.3.3 WEC Device Installation

This section describes the general anticipated procedure for WEC device installation. It should be noted that, because the WEC device developers have not yet been selected for research/testing at the deep-water WETS,[7] the devices that are ultimately deployed may have different installation procedures. Deployment of the individual WEC devices at the deep-water WETS berths would require both NEPA documentation (separate from this EA) and Rivers and Harbors Act, Section 10 permits from the Department of the Army.

Final assembly and inspection of the WEC devices would occur offsite, and the devices would be towed from Honolulu Harbor to the deep-water WETS offshore of MCB Hawaii. In addition to the tugboat towing the WEC device, a work boat and dive boat would be used during the installation. These vessels would proceed to the WETS ahead of the tugboat, and the workboat would position itself in the center of the mooring array. The work boat or tugboat would have an overall length between 50 and 100 ft (15 to 30 m). The following general procedures would be used in the installation of each of the WEC devices at the deep-water WETS. (Note: Detailed installation procedures are dependent on the WEC device configuration and will be provided as part of the NEPA evaluation and USACE permit required for each specific WEC device deployment.)

Mooring Connection:

1. The dive boat would proceed to each of the mooring surface floats and divers would disconnect and retrieve the temporary mooring (if used) from the surface float chain pigtail.

[7] The first WEC device developers to test at the deep-water WETS will be selected by a project-specific review board in mid-FY14.

2. The WEC device would be towed to the WETS berth and its tending lines transferred to the work boat.

3. Some WEC point absorbers require ballasting. If required, the device would be ballasted down to achieve the proper orientation for mooring. (OWC devices do not need ballasting prior to connecting to mooring.)

4. The WEC device would first be connected to the two windward mooring surface floats so its last mooring line can be attached to the downwind surface float without being under tension.

5. After all the mooring lines are released, the work boat would perform final ballasting (if required) and system checkout for the WEC device.

Power Cable Umbilical Connection:

1. Subsurface floats are attached to the device's umbilical cable.

2. Divers would assist work boat crew to connect the WEC umbilical cable to the device.

3. The work boat moves into position over the splice box.

4. Divers would connect a retrieval line to the subsurface buoy attached to the splice box.

5. The splice box would be recovered onto the deck of the work boat.

6. The WEC umbilical cable end would be connected (spliced) to the conductors and fiber in the splice box.

7. The splice box would be sealed and lowered back to the seafloor.

2.2.3.4 In-Water Work Protocols

During in-water construction and installation operations, the following general protocols and management practices would be implemented to protect public and contractor safety, and to minimize impacts to vessel navigation and MCB Hawaii operations.

General Site Management. During all operations, the contractor's on-site team would be supervised by a Project Manager. The Project Manager would be responsible for the overall planning and logistics of the job and coordinate construction activities with the USCG and MCB Hawaii Waterfront Operations. The Project Manager would actively work with the vessel captain during field operations to monitor recreational vessel activity around the work site.

The four-point mooring utilized by the contractor would be marked by surface floats attached at each mooring location. When work is complete, these surface floats would be removed.

Deep-Water WETS Berth Infrastructure Deployment. Prior to deployment of the infrastructure components at the deep-water WETS berths, the contractor would notify USCG District 14 and request a Local Notice to Mariners. The contractor would notify the USCG when the in-water work is completed. The USCG would issue a Local Notice to Mariners which would be broadcast and available to all mariners until the job is completed.

During operations, the contractor would display the required maritime signal flags (including the International Alpha Code and recreational dive flags, as needed). The contractor would monitor radio Channels 16 (USCG) and 82a (MCBH Waterfront Operations). The vessel captain and/or deckhand would actively monitor the work area and identify any recreational vessels which are of concern. Vessels which appear as though they may enter the work area would be contacted via Channel 16 and/or 82a and notified to redirect their current course to stay clear of the work site. If vessels do not respond on Channel 16 or 82a the contractor would sound their horn or whistle for 5 or more prolonged blasts. As a final step, if the recreational vessel still maintains its current course, the contractor would use their small boat(s) to approach the vessel and advise them to redirect their course around the worksite.

WEC Device Deployment. Prior to deployment of the WEC device, the developer would obtain approval for Private Aids to Navigation from the USCG District 14, which would specify the color and flash rate of the navigation light to be installed on the device. During WEC device deployment operations, the contractor would follow the same protocols as for the deep-water WETS infrastructure deployments.

Shore Cable Landing. For the shore cable landing, the protocols outlined above in the deep-water WETS berth infrastructure deployment would be utilized. The Local Notice to Mariners would extend from the shore to the final offshore point of the subsea cables. In addition, the contractor would use workboats to help maintain a safety perimeter around the work site. During the shore cable landing, the contractor would have a supervisor onshore as well as a Project Manager offshore. The shoreside supervisor and Project Manager would coordinate activities and work with the vessel captains to actively monitor vessel traffic in the surrounding area.

2.2.3.5 Onshore Electrical System

Utility Vault. The new utility vault would be installed adjacent to and have the same outside dimensions as the existing vault (i.e., 5 ft by 7 ft [1.5 m by 2 m]). The vault would be a modular unit assembled (bolted together) at the site. Prior to installing the new vault, a 6-in (15.2-cm) thick concrete pad would be constructed to support the utility vault. The process would involve constructing a wood form with the same footprint as the new vault, into which a thin layer of sand would be placed as a bed for the wet concrete. Steel rebar would be placed on the sand across the length and width of the footprint at 12-in (30-cm) intervals to reinforce the concrete pad. The form would be filled from a concrete truck or trailer. After the pad has cured (4 to 5 days), a small crane or backhoe would be used to lift the new vault from a delivery vehicle (e.g., medium size flatbed truck or similar truck/trailer rig) onto the pad. Alternatively, the vault would be placed on a surface of crushed gravel. Neither foundation would require excavation or grading.

New Pedestals. A total of approximately three to five new pedestals would be needed to support the deep-water WETS power and fiber optic conduits as they exit the new utility vault. At each new pedestal location, a 5-ft (1.5-m) long, 1-in (2.5-cm) diameter steel rebar would be driven into the ground to a depth of approximately 3 ft (0.9 m). A 5-in (12.7-cm) diameter by 24-in (61-cm) long PVC pipe would be lowered over and centered around the exposed rebar, then filled with concrete. (Note: The final above-ground height of the pedestal would vary with the terrain, but range between 12 in [30 cm] and 24 in [61 cm]. Excess lengths of rebar and PVC pipe would be cut accordingly.) The concrete would be mixed in small batches at the site and carried to the work area in buckets. A section of threaded rod would be embedded into the top of the concrete while it is still wet. After the concrete has cured (4 to 5 days), a fiberglass platform (i.e., strut) would be bolted to the top of the pedestal using the threaded rod. The new conduits would then be secured to the fiberglass platform with stainless steel straps (see Figure 2-6 for schematic drawing of new pedestals).

Electrical Equipment Shelter. Trench excavation would be required to install the electrical and fiber optic conduits below-grade for approximately 90 ft (27 m) prior to their connection to the electrical equipment shelter and VFI, and ultimately to the existing below-grade vaults. The electrical equipment shelter and VFI would be installed at the site. The power and fiber conduits would be concrete encased (minimum 3-in [7.6-cm] thick concrete coverage around conduits) in a below-grade trench (18 to 36 in [46

to 90 cm] wide and a maximum of 36 in [91 cm] deep) from the existing above ground pedestal route to the electrical equipment shelter, VFI and existing below-grade vault. The new electrical equipment shelter would be installed on a new concrete pad (6 in [15 cm] high by 14 ft [4.3 m] long by 7 ft [2.1 m] wide). The new VFI would be installed on a new concrete pad (6 in [15 cm] high by 5 ft [1.5 cm] wide by 5 ft [1.5 cm] long). Only rubber-tired construction vehicles would be used, and they would utilize only existing access roads to the staging and project areas.

Laydown areas would be needed at the new vault site (approximately 350 square feet [ft^2] or 33 square meters [m^2]) and near the proposed electrical equipment shelter and VFI site (approximately 650 ft^2 or 60 $m^{2)}$. Existing road surfaces would be used for these laydown areas.

2.2.4 Best Management Practices

In order to reduce the potential for adverse effects on the environment, best management practices (BMPs) would be incorporated into the construction and operation of the Proposed Action. For example:

A. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the proposed action, particularly in-water activities such as boat operations, diving, and deployment of anchors and mooring lines.

   1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the Proposed Action for ESA-listed marine species.

   2. During construction or WEC device installation, surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

   3. Personnel shall remain alert for marine mammals before and during drilling. Do not commence hand drilling if a marine mammal is observed within 1,640 ft (500 m) of operation. Wait 30 minutes after the last sighting of the marine mammal before starting to drill. If drilling is already started and a marine mammal is sighted within 1,640 ft (500 m) after drilling has commenced, drilling can continue unless the marine mammal comes within 820 ft (250 m)[8] during drilling; operations should then cease until the animal is seen to leave the area of its own volition or after 30 minutes have passed since the last sighting.

   4. All in-water installation and maintenance work shall be postponed or halted when ESA-listed marine species are within 50 yards (yd) (46 m) of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species (other than Hawaiian monk seals on land) are noticed within 50 yd (46 m) after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that the activity would not affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

   5. All personnel will stay more than 150 ft (46 m) from Hawaiian monk seals and sea turtles that haul out on the beach.

   6. Personnel will not perform work on the beach during the time that a Hawaiian monk seal is hauled out if the work would be so loud as to expose them to 100 decibels referenced to 20 micro Pascals (μPa) in-air.

   7. Personnel will not perform work on the beach if turtle nesting is known or suspected to be occurring.

[8] The 1,640-ft (500-m) and 820-ft (250-m) zones of interest are based on California Department of Transportation (CALTRANS) recommendations for an in-water pile driving project (CALTRANS 2009).

8. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.

9. Prior to deployment of the mooring and electrical transmission hardware on the seafloor, conduct ROV video surveys of the proposed hardware locations and routes. Use marine biological expert interpretation to identify marine resources in the area to ensure that no coral or potential suspensions are along the planned route. Actual placement of the hardware and cables could vary from the proposed survey route centerlines by no more than ±10 percent times the water depth. Cable laying will ensure that the cable remains taut so no slack will occur during cable placement.

10. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

11. Subsea cables shall be routed to minimize impacts to corals and all structures will be installed to avoid abrasion to corals. Colonies of *Montipora flabellata* and *M. patula* (corals proposed for listing under the ESA) observed along the subsea cable route shall be identified and avoided completely. Other corals shall be avoided to the highest degree practicable. Lay inshore subsea cables by floating and then lowering the cables to the seafloor with diver assistance within 100 ft (30 m) of the shallow-water WET cable, avoiding placing them on top of coral especially in the 33- to 100-ft (10- to 30-m) depth within the reef flat, escarpment and the deep reef platform zones. In depths below 100 ft (30 m) (i.e., beyond SCUBA diving depths), use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated infrastructure to avoid the sparsely scattered corals and formations.

12. Where coral heads are unavoidable and can be easily dislodged from the substrate, divers will attempt to pry the coral head from the substrate and move it an appropriate distance from the impact line of the cable

13. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.

14. When piloting vessels, vessel operators shall alter course to remain at least 100 yd (91 m) from whales, and at least 50 yd (46 m) from other marine mammals and sea turtles.

15. Reduce vessel speed to 10 knots (18.5 kilometers per hour [kph]) or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots (9.3 kph) or less.

16. If despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 ft (15 m) away, and then slowly move away to the prescribed distance.

17. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.

18. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

19. Vessel and barge operators will strive to anchor project-related vessels/barges only in sandy substrate or limestone devoid of corals. Installation of a fixed mooring buoy in sandy/non-coral substrate will be considered if vessels visit the WETS berths frequently.

20. Develop a decommissioning plan for the installed structures to include criteria for deciding when to remove elements of the project and when to allow elements that are providing some benefit to the environment to remain in place after the project is completed.

B. Effects to the marine and terrestrial environment (including cultural resources) from project-related activities would be minimized.

21. Employ industry-standard BMPs to avoid discharge of pollutants into the marine environment.

22. A contingency plan to control toxic materials is required.

23. Appropriate materials to contain and clean potential spills shall be stored at the work site (including aboard project-related vessels), and be readily available.

24. All project-related materials and equipment placed in the water shall be free of pollutants.

25. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.

26. Fueling of land-based vehicles and equipment shall take place at least 50 ft (15 m) away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.

27. Employ archaeological monitoring during all ground-disturbing activities in compliance with NHPA Section 106.

28. Ensure that all construction and operational period vehicles accessing the project area are rubber-wheeled and remain on existing access roads

29. Spill containment areas would be established and used for refueling of small portable equipment.

2.2.5 Maintenance and Decommissioning

Maintenance activities would involve inspections of mooring components and surface buoys (one small boat and four to six personnel). No major repairs are anticipated over the life of the WETS mooring system. System and WEC device inspections would take place to monitor the condition of deployed hardware. As such, WETS moorings and devices will be inspected within 30 to 60 days of deployment and subsequent inspection will be conducted on a frequency predicated on the findings of the previous inspection; the inspections may occur once every quarter. An ROV will be used to inspect the deep-water moorings and divers will inspect components in the shallow water areas. WEC device developers would likely conduct routine inspection and periodic maintenance of their devices. Because the WEC device developers have not yet been selected, the specific details of the corresponding WEC device maintenance activities are not yet known. Maintenance activities that are not covered by this EA and specific to individual WEC devices will be addressed as part of the required NEPA and USACE permitting process prior to their deployment.

WEC devices would be removed by their developers upon completion of the test period for each individual device. Recovery (i.e., decommissioning) of the WEC devices would use the same or similar assets and methods used for their installation (see Section 2.2.3.3). Anticipated procedure involves

recovering and towing the WEC device with a work boat or tug boat. Overall boat length would likely be 50 to 100 ft (15 to 30 m), depending on the WEC device.

In general, WETS hardware and structures would be removed at the end of the operational period. At the end of the operational period, engineering and biological surveys of the offshore and terrestrial hardware will be conducted. The results of these surveys will be reviewed in consultation with appropriate regulatory agencies (i.e., NOAA Fisheries) to determine whether it would be more appropriate to leave all or part of the hardware in place. Based on review of the survey results, detailed procedures will be developed for removal of the appropriate hardware components.

After removal, the mooring components would be turned over to the Navy Inactive Ship On-Site Maintenance Office at Pearl Harbor Middle Loch. Sections of the transmission cables would be cut into shorter lengths and sold to a recycler for recovery of the copper inside the cable.

2.3 | HDD Alternative

2.3.1 General Description

This alternative is similar to the Proposed Action, with the exception of the route and method of the subsea and onshore trunk transmission cable route and landing. In the HDD Alternative, instead of two 3-conductor trunk cables being routed to shore directly from the WEC device splice boxes, the branch cables from the two individual splice boxes (one for each deep-water WETS berth) would be combined into a single 6-conductor trunk cable at a junction box (“J-box”). Furthermore, instead of landing the cable on shore near the location of the existing shallow-water WET berth trunk cable as in the Proposed Action, the trunk cable would come ashore through a bore hole at a water depth of approximately 33 ft (10 m), drilled from the vicinity of Building 614. See Figure 2-9 for the HDD mooring and cable configuration, including a map of the local sand depth. As in the Proposed Action, the cable would be aligned parallel to (and within 100 ft [30 m] to the west of) the existing shallow-water WET berth subsea cable to a water depth of about 100 ft (30 m). It would also be protected by split pipe and/or grouted rock bolts along its route through areas of high hydrodynamic energy and the surf zone to the bore hole entry point.

The systems and components that comprise the HDD Alternative are as follows:

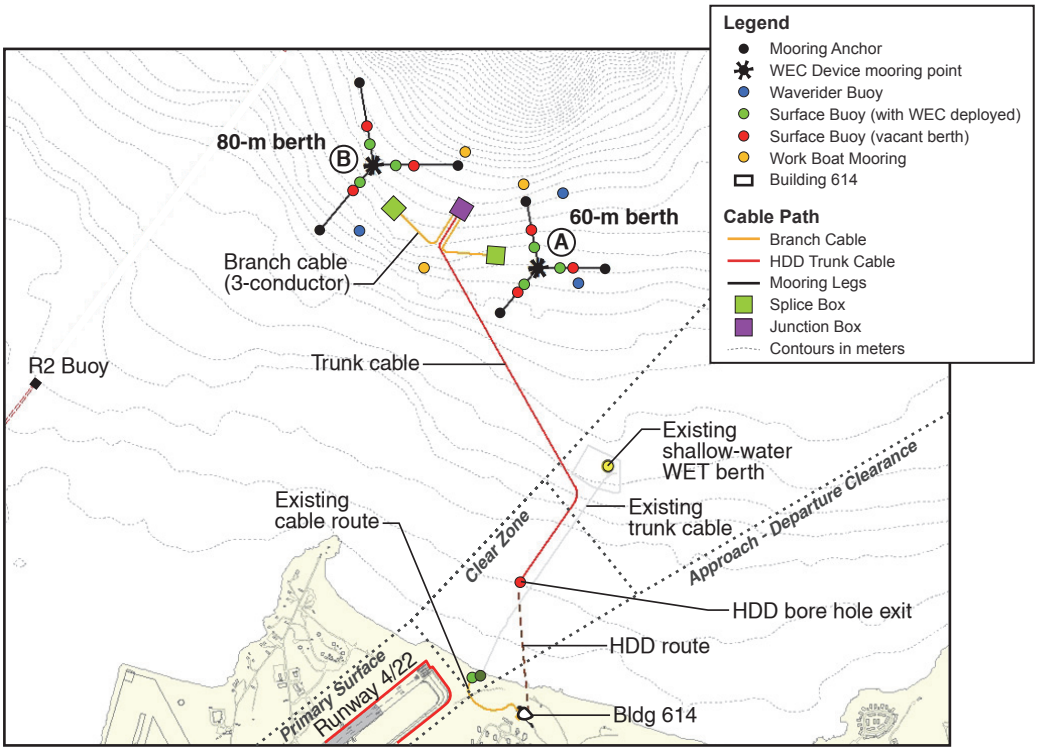
a. Construction of two deep-water WEC mooring berths (*same as Proposed Action*).

b. Installation and operation of undersea power and communications cables from the deep-water mooring locations to the existing onshore electrical grid connection point on the south side of Building 614. The nearshore segment of the transmission cable would be installed below-grade by means of an HDD process. In this process, the cable would be installed via a 2,000-ft (609-m) bore hole drilled from a point near Building 614 to a point offshore in a water depth of about 33 ft (10 m), passing beneath the shoreline area and nearshore surf zone.

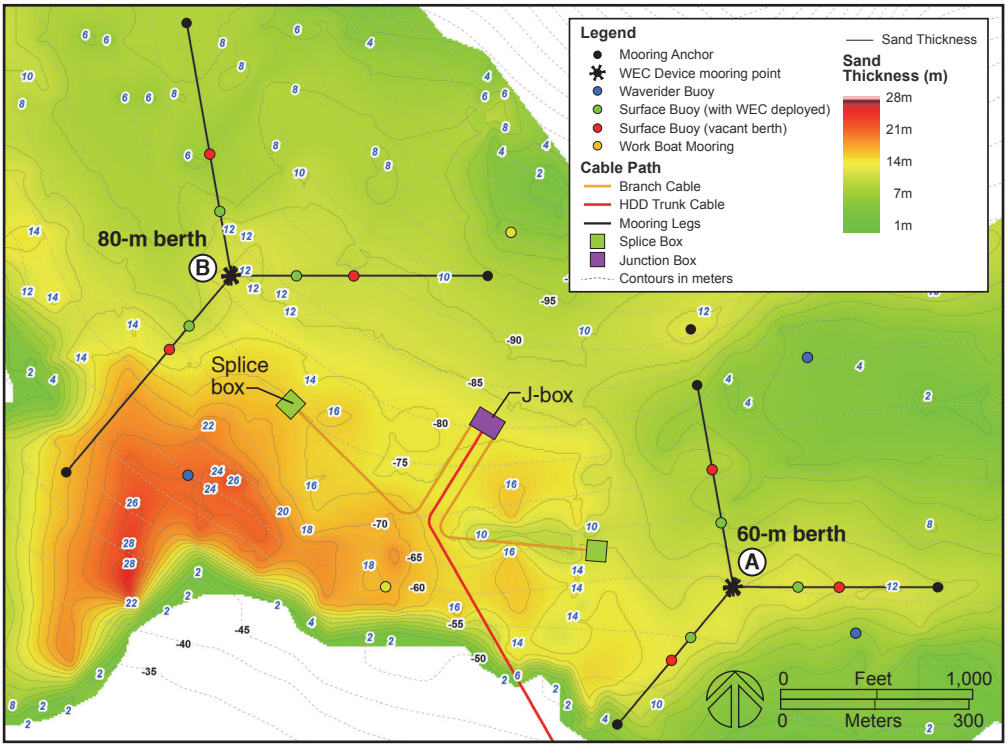
c. Construction of an electrical equipment shelter on south side of Building 614. This requires realignment of an existing fence that shields the south side of Building 614 from the adjacent officer family housing unit (see Figure 2-7 for proposed alignment).

d. Installation of onshore electrical utility trench (above- or below-grade) on east side of Building 614 to route cables to equipment shelter. This trench would be pre-cast concrete with a galvanized steel cover and assembled in place.

e. Installation and operation of up to two new WEC devices at the deep-water test site (*same as Proposed Action*).



Mooring and Cable Configuration



Seafloor Sand Depth at Deep-Water Berths

Source: Sound & Sea Technology, Inc.

HDD Alternative

Figure 2-9

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f. Renovation and utilization of six additional rooms within Building 614 for electrical switch control, remote metering, and storage (same as Proposed Action). (Note: Two rooms were renovated as part of the original shallow-water WET installation).

g. Installation and operation of in-water scientific data gathering equipment (*same as Proposed Action*).

The HDD Alternative project area is similar to that of the Proposed Action up to the subsea cable's entry into the HDD Alternative bore hole. From there, the HDD Alternative project area includes the bore hole route, terrestrial cable route to Building 614 upon exiting from the bore hole, and shoreside electrical equipment, access and termination points, and Building 614.

2.3.2 System Components

2.3.2.1 Deep-Water WEC Devices
Same as Proposed Action. See Figure 2-2.

2.3.2.2 Power Take-Off
Same as Proposed Action.

2.3.2.3 Mooring System
Same as Proposed Action. See Figure 2-3.

2.3.2.4 Transmission Cable System (Subsea and Terrestrial)
As in the Proposed Action, a series of power and communications cables would transmit electrical power and data from the deep-water WEC devices to onshore facilities. In the HDD Alternative, the system includes:

- Umbilical cable* (*contains electrical power and fiber optic data lines from each WEC device*)
- Splice box* (*anchored to the seafloor*)
- Three-conductor branch cables (*one from each splice box; two total*)
- Junction box (*"J-box," connects the two branch cables to the trunk transmission cable*)
- Six-conductor (trunk) transmission cable (*routed from J-box to the MCB Hawaii onshore electrical equipment facilities*)
- HDD subsurface bore hole (*used to route the trunk transmission cable below grade to exit near Building 614*)

*same as Proposed Action

The primary differences between the two alternatives are:

- Under the HDD Alternative, the two 3-conductor cables (one for each deep-water WETS berth) would be routed from the subsea splice boxes to a J-box, where the power and fiber optic lines would be combined into a single 6-conductor trunk transmission cable. This single, larger trunk cable (vice two 3-conductor trunk cables in the Proposed Action) would be extended to onshore facilities from the J-box (red cables in Figure 2-4). Figure 2-9 shows the notional location of the WETS mooring and transmission lines under the HDD Alternative. (Note: The maximum diameter of HDD bore hole that can be drilled from the vicinity of Building 614 cannot accommodate two 3-conductor cables; therefore, they must be combined into a single 6-conductor trunk cable in this alternative.)

- For the HDD Alternative shore landing, power conductors and fiber optic cables would emerge from the onshore HDD bore hole on the southeast side of Building 614, then be routed across an existing paved area via an above- or below-grade concrete trench (12-in [30-cm] wide by 12-in [30-cm] high) with a steel cover. Once across the paved area, the power conductors and optical

fibers would be routed to the rear (south side) of Building 614 on five to ten new above-ground pedestals (Figure 2-7). Figure 2-10 indicates the relative locations of the proposed conduit routing from the HDD bore via the concrete trench, pedestals and into an above-ground equipment shelter at the south side of Building 614.

- Under the HDD Alternative, a segment of the existing fence and trees/bushes separating Building 614 from the adjacent family housing area would be realigned approximately 12 to 15 ft (4 to 5 m) closer to the family housing area to accommodate the new electrical equipment shelter. The resulting fenceline would be over 100 ft (30 m) from the nearest family housing unit.

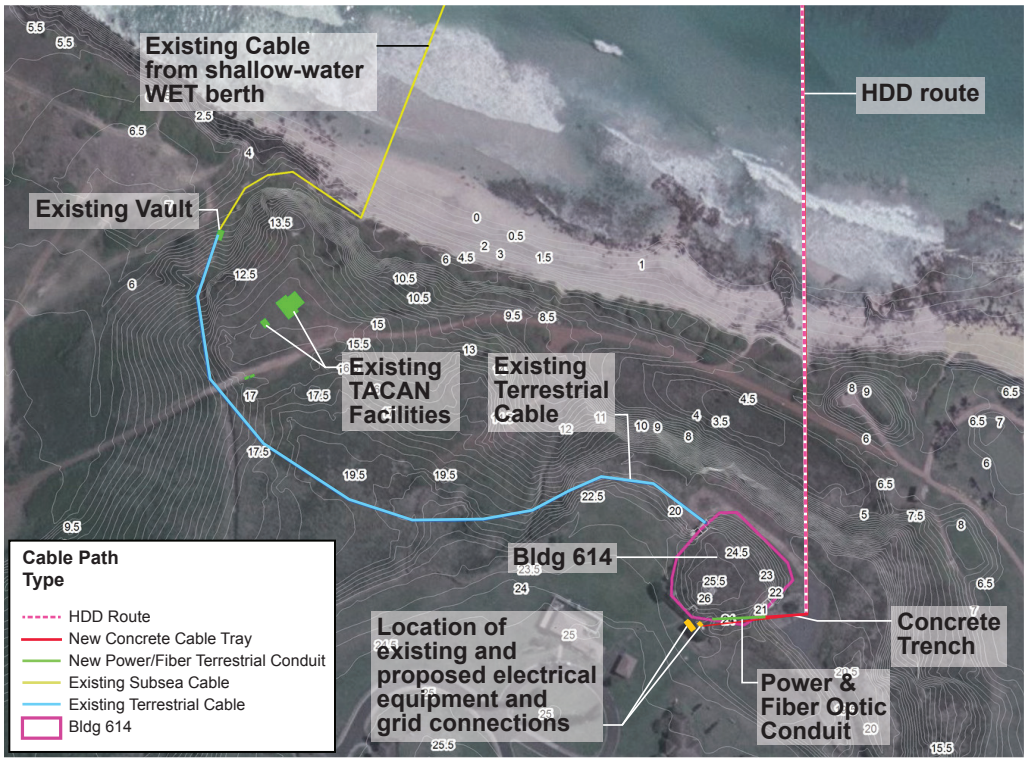
Umbilical Cables and Splice Boxes. Same as Proposed Action. See Figure 2-4 for schematic illustration.

3-Conductor Branch Cables. A three-conductor, single armored branch transmission cable would be connected to each umbilical and extend from the splice box to a submerged junction box serving both WEC devices. The conductors would be rated for 15 kV. As seen in Figure 2-4 (red cables on seafloor), there would also be a bend or "dogleg" in the undersea alignment of the branch cables as they extend from the umbilical splice boxes to the junction box at which they terminate.

Junction Box (HDD Alternative only). A subsea junction box assembly, consisting of the junction box and a platform, would be located approximately 8,000 ft (2,450 m) offshore at a depth of approximately 260 ft (80 m), in a location equidistant from the two deep-water mooring sites (see Figures 2-4 and 2-9). The junction box ("J-box") would house the connections of the three-conductor, single-armored ***branch*** cables to the main power transmission (***trunk***) cable that would run to the onshore electrical grid. The platform would serve as an anchor for the J-box and cable armor terminations, with approximate dimensions of 5 ft (1.5 m) wide, 8.2 ft (2.5 m) long, and 1.6 ft (0.5 m) high, and an approximate weight of 1,500 lbs (683 kg). The steel J-box, coated with a marine grade epoxy, would have a saddle mount to strap the J-box to the anchor plate, terminations for the shore cable, and lifting eyes for raising and lowering.

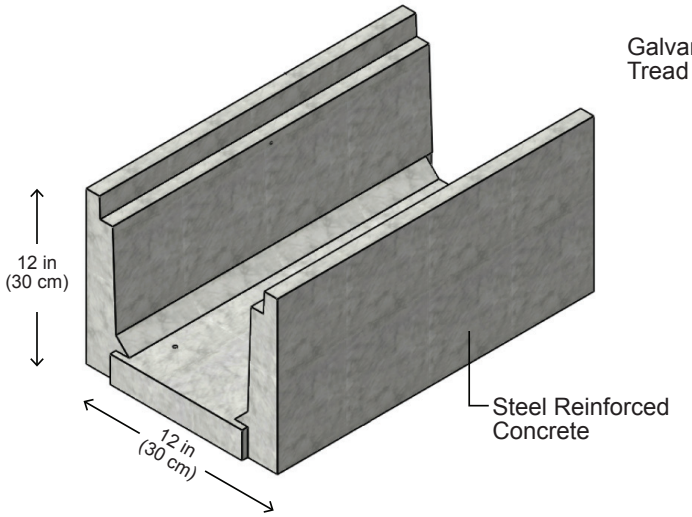
Six-Conductor Trunk Transmission Cable (HDD Alternative only). A six-conductor, single- or double-armored cable would be used for the main power transmission (trunk) cable and would run from the offshore J-box to the onshore electrical grid (red seafloor cable in Figure 2-4). The conductors within this cable would be rated for 15 kV and the cable would also contain fiber optic cable for communications (see Figure 2-4 for cable cross-section). The cable would be approximately 3.95 in (100 mm) in diameter. Similar to the Proposed Action, the subsea route for the HDD Alternative trunk cable would avoid areas of high vertical relief, which would cause cable suspensions, and follow branches of sand deposits that extend seaward from the beach through the sand channel zone, where practical. The offshore route would be planned during the design phase following completion of a route elevation and visual inspection survey. The trunk cable would run from the J-box to a point at a water depth of about 33 ft (10 m), where the trunk cable would be landed onshore via the HDD method. The HDD method is a steerable trenchless procedure, with the cable route drilled in an arch along a prescribed bore path with a surface launched drilling rig. This would minimize its impacts to the surrounding area while at the same time offer maximum cable protection in the energetic nearshore zone. The directional boring would extend from a point southeast of Building 614 out to the shallow water HDD breakout point.

The undersea cable would be anchored along its length from the bore hole exit point (in 33 ft [10 m] of water) to a depth of approximately 98 ft (30 m) by either rock bolts (Figure 2-5 [A) and (B]) or protective split pipe (Figure 2-5 [C] and [D]), with the anchoring and spacing dependent on conditions of the affected substrate (similar to the Proposed Action).

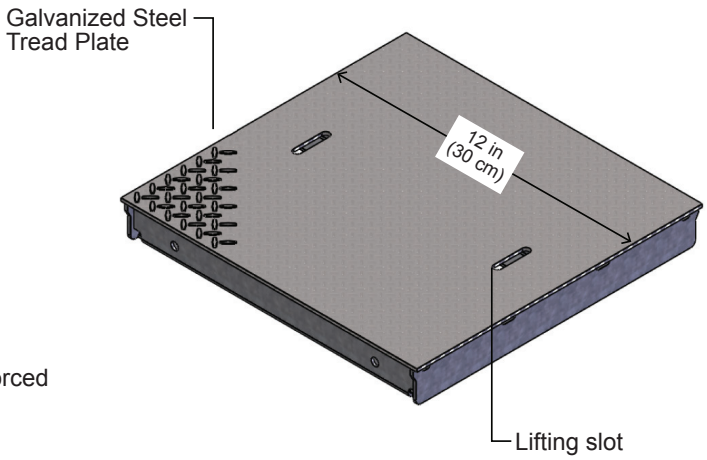


Coordinate System: UTM Zone 4 North - Depth/Elevation in Meters
Data Source: Sea Engineering, RSIMS, NOAA
Geovisualization by Sound & Sea Technology, Inc. April 2013

0 Feet 300
0 Meters 90



Example Concrete Trench
Source: (images): Concast 2011



Example Trench Cover

HDD Alternative: Onshore Communications and Electrical Equipment

Figure 2-10

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MCB Hawaii, Kaneohe Bay

2.3.2.5 Onshore Electrical Equipment and Facilities

Onshore, a conduit containing the power and fiber optic lines would be routed from its HDD exit point, across an existing concrete pad, toward the south side of Building 614 in either an above- or underground pre-cast concrete trench with a steel cover, approximately 12-in (30-cm) wide by 12-in (30-cm) deep. Figures 2-7 and 2-10 indicate the relative locations of the existing and proposed onshore electrical equipment and facilities for the HDD Alternative, including trench location and example images. Once the conduit reaches the slope at the south side of Building 614, it would be routed via an above-ground conduit to a new above-ground electrical equipment shelter (12 ft [3.9 m] long by 6 ft [1.8 m] wide by 8 ft [2.4 m] high), situated on a 6-in (15 cm) high concrete pad (same facility as in the Proposed Action). Five to ten new pedestals would be needed to support above-ground cables in this alternative. Their size and installation methodology would be similar to the Proposed Action.

The equipment shelter would house electrical disconnect switchgear, metering equipment and circuit protection components. Similar to the Proposed Action, the HDD Alternative also includes a new VFI. The power lines would then be routed through the VFI and connected to the MCB Hawaii electrical grid at the existing manhole adjacent to the proposed VFI. The size and functions of the electrical equipment shelter and VFI would be the same as in the Proposed Action. A portion of an existing fence and trees/bushes separating Building 614 from the adjacent officer family housing unit would be realigned 12 to 15 ft (4 to 5 m) closer to the family housing area to accommodate the equipment shelter (see Figure 2-7). The existing trees and bushes would be removed by professional landscapers following MCB Hawaii procedures using hand tools. The postholes for the new section of fence would be dug by hand using shovels. The new trees and bushes would be planted using picks and shovels. Approximately 4,000 ft^2 (0.09 ac) of land would be affected. There would be no excavation except for removal of the tree stumps and digging of the post holes. The resulting fenceline would be over 100 ft (30 m) from the nearest family housing unit.

The fiber optic cable would diverge from the power conduit and enter Building 614 through an existing below-grade vault at the rear (south side) of Building 614 (Figure 2-7). Existing below-grade conduits would route the fiber optic cable to Room 107 from which the individual fibers would be routed to the rooms used by the various WEC device developers (same as Proposed Action).

In the HDD Alternative, the same six work and storage rooms in Building 614 (Rooms 103, 104, 107, 108, 109, and 110) would be renovated for use in metering and monitoring the deep-water and shallow-water WEC devices and scientific data gathering equipment as in the Proposed Action (see Figures 2-7 and 2-8). The renovation work (e.g., installation of a new split system air conditioning unit, electrical and lighting upgrades, new doors and carpet removal) would be the same in both alternatives.

2.3.2.6 Scientific Data Gathering Equipment

Same as Proposed Action. See Figure 2-8 and Section 2.2.2.6.

2.3.3 Construction and Installation Methodology

As in the Proposed Action, the construction and installation procedures described in this section for the HDD Alternative represent the best available information based on current project information and may be adjusted as details on environmental conditions and engineering plans progress. The descriptions focus on differences in the HDD Alternative construction methodology with that of the Proposed Action. Construction methodology for the mooring installation and WEC device installation would be the same as for the Proposed Action, and therefore are not discussed in this section (refer to Sections 2.2.3.1 and 2.2.3.3).

2.3.3.1 General

The HDD Alternative cable installation involves a trenchless directional boring technique where a 2,000 ft (610 m) bore hole would be drilled beginning approximately 30 to 50 ft (9 to 15 m) east of Building 614, pass beneath the shoreline area and the nearshore surf zone, and emerge underwater at a water depth

of about 33 ft (10 m), at a point approximately 400 ft (122 m) from the shoreline. Figure 2-9 shows the potential routing of the offshore portion of the HDD-installed cable. Figure 2-11 includes a plan view of the drilling site, the likely construction equipment needed, and their general dimensions.

The bore hole, shown in profile in Figure 2-11, would be a minimum of 30 ft (9 m) below grade until its exit point offshore. (Note that the vertical axis in Figure 2-11 has been expanded by a factor of 8 compared to the horizontal axis for clarity.) The bore hole would be cased with plastic pipe to preserve the integrity of the hole. This alternative would involve the following general construction methodology.

2.3.3.2 Drilling Site, Equipment and Procedure

Some vegetation in a previously disturbed area adjacent to Building 614 would be cleared to accommodate construction vehicles and allow sufficient setback from the slope edge to achieve the necessary drill angle as shown in Figure 2-11. HDD equipment would include the following:

- 10-ft x 30-ft (3-m x 9-m) long, 100,000-lb (45,359-kg) capacity HDD drill rig (largest capacity capable of accessing the Building 614 site)
- 40-ft (12-m) flatbed trailer with water tanks, mud storage and mixing system
- Drill pipe racks
- Water for drilling operations would be supplied (through a hose) from a fire hydrant located in the family housing area south of Building 614. Alternatively, water can be supplied by 1 to 3 daily deliveries of water via 3,000-gallon (11,356-liter) tanker trucks.

A 6.5-in (16.5-cm) diameter pilot hole would first be drilled, followed by a 10-in (25.4-cm) diameter reamer. HDD operations would be conducted for 12 hours per day (daytime), seven days a week for approximately 30 days. After drilling is complete, a 6-in (15.2-cm) diameter high density polyethylene (HDPE) conduit would be pulled into the bore. The HDPE conduit would be left in place and each end would be capped and sealed off to prevent water or earth infiltration. The initial 6 to 10 ft (2 to 3 m) of the bore hole would be hand-augured to begin the HDD process through a single 10-in (25-cm) drill entry hole.

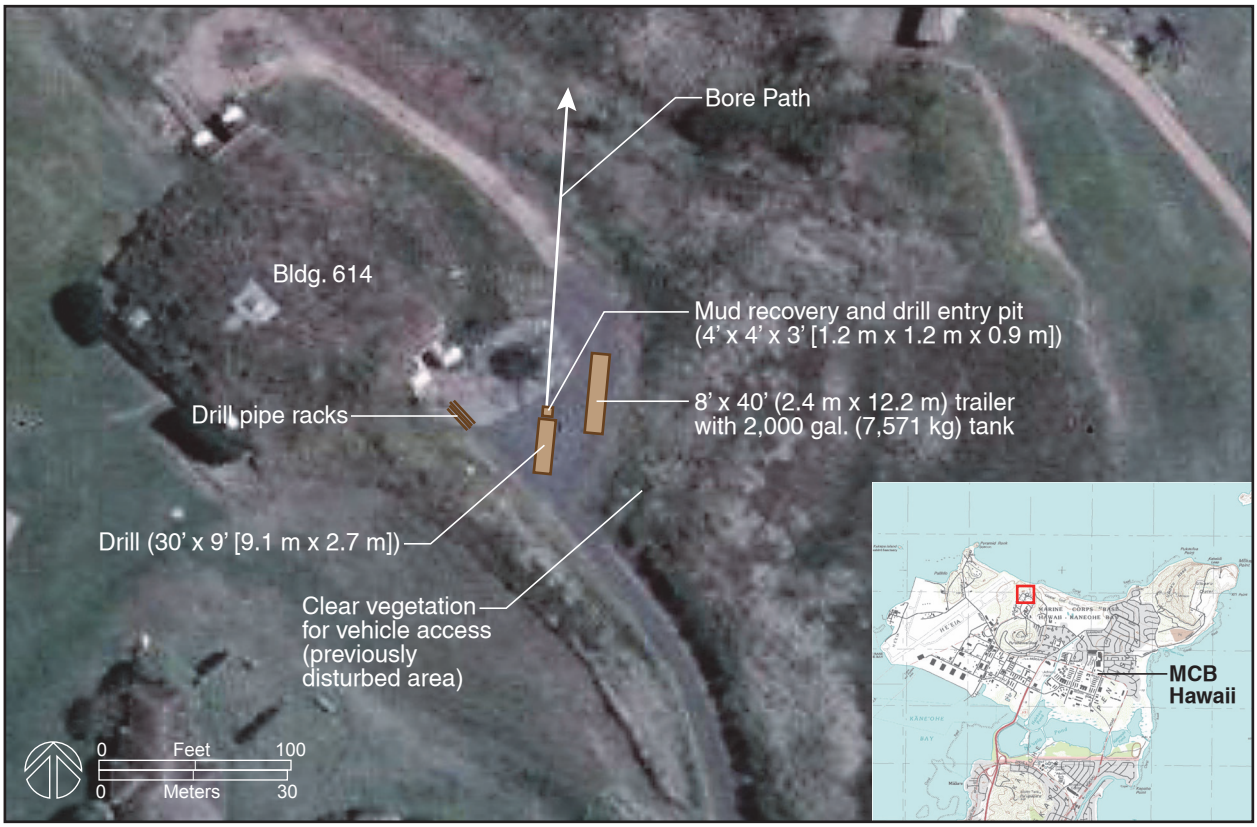
During the drilling operation, drilling fluid[9] would be pumped down the length of the drill pipe and flow back out of the bore hole, flushing drill cuttings into the onshore mud recovery pit. Drilling fluid is a slurry composed of a carrier fluid and solids, with the carrier fluid typically consisting of approximately 95% water and approximately 5% inorganic bentonite clay. A fluid recycling system would be used, where the used drilling fluid is pumped from the mud recovery pit in front of the drill rig to a recycling unit. In the recycling unit (which has a shaker screen and a series of filters that remove solids from the drilling fluid), cuttings from the bore are separated from the drilling fluid and stockpiled at the drill site for offsite disposal after HDD operations are completed. The clean bentonite slurry is recycled back to the HDD drilling rig. The boring process would result in approximately 20 to 30 cubic yards (yd^3) (15 to 23 cubic meters [m^3]) of dried drill cuttings, which would be disposed of in a landfill or could be reused as fill if needed offsite.

At the bore exit site, the reamer would exit the seafloor with a minor discharge of drilling fluid (estimated at 3,000 gallons [11.4 m^3]—or less than one percent of the total drilling fluid used). Some of this drilling fluid would be pulled back into the bore hole and returned to shore as the drill pipe is retrieved.

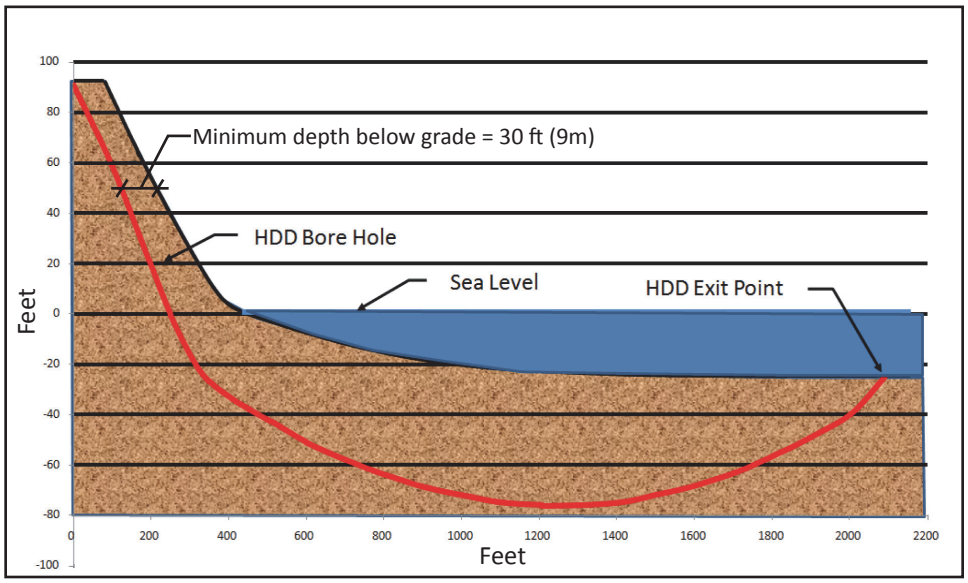
A drill management plan would be developed and implemented for the HDD Alternative that includes monitoring for fluid loss during operations, a fluid loss response plan, and installation of appropriate spill containment. Other BMPs could include use of drilling fluids that coagulate when coming in contact with ocean water to facilitate cleanup and removal.

[9] Drilling fluid is used to transport drilled solids from cutting the bore out of the bore hole, keep the solids in suspension to prevent plugging of the bore, stabilize the bore hole walls, and cool and lubricate the drilling equipment.

Proposed HDD Construction Site Layout



HDD Bore Hole Vertical Profile



*Note: Vertical axis expanded 8x

HDD Site Layout and Bore Hole Profile **Figure 2-11**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

2.3.3.3 Trunk Cable Installation

Prior to the cable installation, a light weight synthetic pulling line would be installed in the HDD conduit by attaching the pulling line to a pipeline "pig" and forcing the pig through the HDPE conduit with compressed air. Divers would retrieve the pig and attach it to a surface float for later retrieval.

On the day of installation, the following procedures would be conducted:

1. A cable installation vessel would be anchored with a four-point mooring about 98 ft to 131 ft (30 m to 40 m) seaward of the HDD seafloor exit point (in 33 ft [10 m] water depth, approximately 1,640 ft [500 m] offshore) (Figure 2-9).

2. The surface float and synthetic pulling line installed earlier would be retrieved and a wire rope pulling line would be attached to the synthetic line.

3. The wire pulling line would then be pulled through the HDD conduit and attached to a portable winch near the onshore end of the HDD conduit and the trunk cable attached at the seaward end of the wire rope pulling line.

4. The onshore winch would pull the wire rope and attached trunk cable from the cable laying vessel through the HDD conduit onto shore where the cable would be anchored to a flange (i.e., external rim or lip) on the end of the HDD conduit. Once the cable enters the concrete trench, the power cable conductors would be spliced to individual conductor wires, which would then be pulled through the PVC conduit by hand to the equipment shelter terminus at the rear of Building 614.

5. The cable laying vessel would then move seaward from the shore, deploying the cable as it follows the pre-planned cable route, similar to the surface laid cable deployment procedures for the Proposed Action.

6. Once the vessel has reached the site of the J-box, the J-box would be connected to the 6-conductor trunk cable and both 3-conductor branch cables, and then lowered to the bottom.

7. The installation vessel would deploy both branch cables along the same route while moving towards the final location of the first splice box.

8. Once it is in the correct location, the vessel would deploy the first splice box.

9. The vessel would then retrieve the second branch cable from the seafloor and repeat the procedure for the second splice box.

The near shore portion of the undersea 6-conductor trunk cable would be anchored along its length from the shoreline to a depth of approximately 100 ft (30 m) by either rock bolts or protective split pipe, with the type of anchoring and spacing dependent upon the environmental conditions (e.g., the substrate). This is the same process as in the Proposed Action.

2.3.3.4 In-Water Work Protocols

During in-water construction and installation operations, the same general protocols and management practices as in the Proposed Action would be implemented to protect public and contractor safety, and to minimize impacts to vessel navigation and MCB Hawaii operations (see Section 2.2.3.4).

2.3.3.5 New Pedestal Installation

Approximately five to ten new pedestals would be needed to support the deep-water WETS power and fiber optic conduit above-ground after it exits the concrete trench on the east side of Building 614. The installation methodology would be similar to that described for the Proposed Action (see Section 2.2.3.5).

2.3.4 Best Management Practices

Best management practices for the HDD Alternative would be the same as the Proposed Action with the addition of:

a. Develop a drill management plan that includes specific BMPs to minimize drill mud releases to the water column

b. Hand-augur the first 6 to 10 ft (2 to 3 m) of the HDD bore hole in order to allow close monitoring and inspection by a qualified archaeologist for any cultural materials or layers encountered.

2.3.5 Maintenance and Decommissioning

Similar to the Proposed Action, maintenance activities for the HDD Alternative would involve inspections of mooring components and surface buoys. No major repairs are anticipated over the life of the WETS mooring system. System and WEC device inspections would be at a similar frequency and involve similar activities as under the Proposed Action. WEC device developers would likely conduct routine inspection and periodic maintenance of their devices. Because the WEC device developers have not yet been selected, the specific details of the corresponding WEC device maintenance activities are not yet known. Similar to the Proposed Action, maintenance activities that are not covered by this EA and specific to individual WEC devices will be addressed as part of the required NEPA and USACE permitting process prior to their deployment. No maintenance activities for the subsurface cable are expected during HDD Alternative operations. Decommissioning of the WEC devices and mooring systems would be similar to that of the Proposed Action. In its decommissioning, the HDD drill pipe would be pulled back and removed from the bore hole. The HDPE conduit would be left in place and each end would be capped and sealed off to prevent water or earth infiltration. The HDPE conduit would be sufficient to preserve the structural integrity of the surrounding earth.

2.4 | Comparison of Surface-Laid Cable vice HDD

Both the Proposed Action (Surface-Laid Cable Alternative) and the HDD Alternative are technically feasible as methods of landing the power and fiber optic cables ashore at MCB Hawaii. Table 2-3 summarizes a comparison of surface-laid cable and HDD systems with respect to a variety of technical and regulatory issues.

Table 2-3: Comparison of Surface-Laid Cable and HDD Options

Issue	Surface-Laid (Proposed Action)	HDD
Cable Survivability	Split pipe is required to protect the cable in highly energetic surf zone	Cable is buried through surf zone
Construction Issues	May require temporary vegetation clearing along existing conduit route	Drill cuttings & unused drill mud must be disposed of; identifying cultural remains if any occur in drill mud would be difficult
Visual Impact	Cable, conduit, electrical equipment shelter, and VFI visible in inshore, beach and upland areas	None – after drilling is complete, except for realignment of existing fenceline shielding Building 614 from adjacent family housing unit
Cultural Sensitivity (upland area)	Uses existing and new PVC pedestals. Requires subsurface installation of power and fiber conduits in previously disturbed area (near TACAN relocation site)	Requires 10-in (25-cm) hole drilled in culturally sensitive area; installs new PVC pedestals

Table 2-3: Comparison of Surface-Laid Cable and HDD Options (continued)

Issue	Surface-Laid (Proposed Action)	HDD
Natural Resource Sensitivity	No adverse impacts to ESA-protected species, critical habitat or wildlife sanctuaries. Temporary displacement of native and non-native vegetation (not Federally- or State protected) during shore infrastructure installation.	No adverse impacts to ESA-protected species, critical habitat or wildlife sanctuaries. Minor removal of non-native vegetation (not Federally- or State-protected) for shoreside electrical equipment. Revegetation with plants from approved list.
Cable Shore Routing and Termination	Requires a new above-ground vault and below-grade conduit. Uses existing above ground pedestals where possible	Requires an above- or below-grade concrete trench on the south side of Building 614
Clean Water Act	No known issues	Up to 3,000 gallons of drill mud may be discharged at seafloor end of drill hole
Technical Feasibility	No problems identified with current installation over past 9 years	Industry standard (subsurface boring); requires additional offshore component (J-box)
Cost	lower than HDD	higher than surface-laid cable

2.5 | No Action Alternative

Under this alternative, the deep-water WETS berths would not be constructed in the waters offshore of MCB Hawaii.

The No Action Alternative would not meet the project objectives, nor support the purpose and need for the action. However, it is carried through the EA analysis to satisfy CEQ requirements and to provide a benchmark to compare the magnitude of environmental effects of the action alternatives.

2.6 | Alternatives Considered but Eliminated from Detailed Study

In addition to the Proposed Action and HDD Alternative, several alternatives were considered but eliminated from further study: an alternative cable landing route at MCB Hawaii and other Navy- or USMC-controlled sites in the Hawaiian Islands and U.S. mainland.

2.6.1 Alternative MCB Hawaii Cable Landing Route

An alternate shore landing configuration and route for the communications and data transmission cables from the proposed deep-water WETS berths to shore was also considered. The other ocean-based components are identical to the Proposed Action. In this alternative, instead of being landed through the surf zone and routed over land to Building 614 in the vicinity of the transmission cable from the shallow-water WET berth as in the Proposed Action, a single 6-conductor trunk transmission cable or two 3-conductor cables would be routed along the seafloor from the deep-water WETS berths to the vicinity of Pyramid Rock Beach. This conceptual alternative was proposed at a meeting with Native Hawaiian organizations affiliated with Mokapu Peninsula and stakeholders held at MCB Hawaii on 7 November 2012. The intent of this cable landing alternative was to avoid the Mokapu Burial Area, a culturally sensitive area. MCB Hawaii Public Works staff, the project's design engineers, and the project proponent (NAVFAC EXWC) reviewed and analyzed the feasibility of this alternative. There are several major obstacles that do not make this alternative feasible. First, this would represent studying, surveying, and designing a new subsea and terrestrial cable alignment, delaying the project by two to three years. Funding for the Proposed Action would likely lapse during this period. Second, Pyramid Rock Beach and the immediate area support a high degree of ocean and beach activities (recreational and operational). These activities were documented in the 2003 WET EA for the shallow-water WET berth. A cable landing in the area would be disruptive to the recreational activities and may become damaged by the operational activities (that include amphibious landings). Third, MCB Hawaii Public Works staff indicated that electrical transmission infrastructure is limited in the area of Pyramid Rock. That area of MCB Hawaii is

served by overhead primary transmission lines with nearest transformer producing 120/208 volts. There are no suitable facilities available for the WEC device developers in the area for monitoring operations and equipment. For these reasons, this alternative cable landing route was eliminated as a feasible alternative.

2.6.2 Alternative Subsea Cable Route

In the Proposed Action, the nearshore sections of the subsea transmission cables are intentionally sited parallel to and within 100 ft (30 m) to the west of the subsea cable from the existing shallow-water WET berth. An alternative subsea cable route was initially considered, in which the new subsea cables would be aligned in a more direct (i.e., shorter) route from the offshore splice boxes to the shore landing point. In the original routing, the nearshore portions of the new cables (i.e., at depths of 100 ft [30 m] or less) were not parallel the existing shallow-water WET berth cable; instead, they approached the shore landing site from the northwest rather than the northeast (as in the Proposed Action). A March 2013 reconnaissance level Navy marine survey of the alternate (direct) cable route indicated that the proposed cable corridor presented greater biological concerns than the established shallow-water WET cable corridor (NAVFAC EXWC Scientific Diving Services 2013). As a result, at depths up to 100 ft (30 m), the subsea cable route was realigned to within 100 ft (30 m) of the existing shallow-water WET berth cable—an area that has been well-documented since 2003 by numerous pre- and post-construction marine surveys (see detailed discussion in Section 3.7). Each of the subsea cables would need to be approximately 700 to 800 ft (213 to 244 m) longer in the revised route (i.e., Proposed Action) than in the original route.

2.6.3 Alternative Terrestrial Electrical Equipment Sites

In addition to the Proposed Action's terrestrial cable routing and electrical equipment alignment, location, and grid connection point, two other alternatives were considered, but dismissed:

South side of Building 614. In this alternative, the new electrical equipment shelter and VFI would be constructed at the rear of Building 614, in the same locations described for the HDD Alternative. The electrical and fiber optic conduits would be routed from the new utility vault near the shoreline to Building 614, where the power conduits would connect to the MCB Hawaii grid at an existing underground vault (same as HDD Alternative). In addition to the 3 to 5 new pedestals needed where the conduits exit the new utility vault, this alternative would require 15 to 20 new pedestals to support the conduits where they would diverge from the existing conduit from the shallow-water WET berth to be routed to the rear of Building 614. This alternative would require that two power conductors be extended an additional approximately 700 ft (213 m), thus adding significant costs associated with the additional materials and labor. This alternative was dismissed due to its substantially higher cost relative to the Proposed Action.

Adjacent to Shoreline Utility Vaults. In this alternative, the new electrical equipment shelter and VFI would be located in the vicinity of the existing and proposed utility vault. Similar to the Proposed Action, the power cables would be routed to the existing below-grade electrical vault near the TACAN relocation site, where they would connect to the MCB Hawaii grid. Also similar to the Proposed Action, the new fiber optic cable would be routed to Building 614 on existing pedestals. This alternative was dismissed due to cultural resources concerns related to the proximity to the shoreline and native plant species and location within a known cultural site (the Mokapu Burial Area). The location of the terrestrial electrical equipment in the Proposed Action, while also within the boundaries of the Mokapu Burial Area, is a previously disturbed site, and its use would decrease the disturbance to natural and cultural resources, relative to the other alternatives considered.

2.6.4 Alternative Hawaii Sites

In addition to MCB Hawaii, alternative sites elsewhere on Oahu and Kauai were evaluated for suitability to support a WETS in the 2003 WET EA (U.S. Navy 2003): Pacific Missile Range Facility at Makaha Point and Nohili Point, both on the island of Kauai; Marine Corps Training Area Bellows at Waimanalo, Oahu;

and Joint Base Pearl Harbor-Hickam West Loch Annex. Among the four alternate sites, only the Pearl Harbor site was found to be suitable for the WET; the other three were dismissed from further consideration for a variety of reasons including inhospitable weather and sea conditions, incompatibility with existing training and operational uses, and prohibitive cost (refer to the 2003 WET EA for greater detail). The Pearl Harbor site was not selected because of its minimal wave energy environment (i.e., would not adequately meet project objectives). For these reasons, these sites were eliminated from detailed study and not carried through the environmental analysis.

2.6.5 Alternative U.S. Mainland Sites

As noted in Section 1.2, NAVFAC EXWC assessed Navy and USMC bases for their ocean energy resource potential. Three locations were identified as having average annual wave power values greater than 10 kW per 3.3 ft (1 m) of wave face and a high resource stability throughout the year (i.e., minimal seasonal variation). MCB Hawaii was one of the three locations, with Navy-controlled San Clemente Island and San Nicolas Island in Southern California identified as two other locations with active wave climates. As remote locations with isolated power grids, San Clemente Island and San Nicolas Island were determined to be less desirable locations for locating WETS since they do not have large, existing infrastructure (i.e., work boats, harbors, repair facilities, etc.) and are geographically remote. Therefore, these alternative locations were eliminated from further consideration as deep-water WETS sites and are not carried through the EA analysis.

2.7 | Summary of the Predicted Environmental Effects of the Proposed Alternatives

Table 2-4 summarizes the environmental consequences of the Proposed Action, HDD Alternative, and No Action Alternative, as discussed in Chapter 4 Environmental Consequences.

Table 2-4: Summary of Environmental Consequences of the Proposed Action and Alternatives

Resource Area	Proposed Action	HDD Alternative	No Action
Climate and Air Quality	No significant impact during construction, operations, maintenance or decommissioning. Potential long-term beneficial impacts to climate and air as wave energy technology and applications are advanced by the Proposed Action, resulting in the reduction of air pollutant and greenhouse gas emissions due to fossil fuel consumption.	Similar to Proposed Action.	No impact. No beneficial impacts from advances in wave energy technology.
Geology and Soils	No significant impact during construction, operations, maintenance or decommissioning. Minimal land disturbance and no alteration of existing geologic or topographic features.	Similar to Proposed Action, except for generation of approximately 20 to 30 yd^3 (15 to 23 m^3) of dried drill cuttings from HDD bore hole, which would be disposed of in a landfill or reused as fill offsite.	No impact.
Shoreline Geomorphology	No significant impact during construction, operations, maintenance or decommissioning. Minimal disturbance to the shoreline (including sand and revetments).	No impact.	No impact.
Oceanographic Conditions	No significant impact due to distance between deep-water WEC devices and their distance from shore.	Same as Proposed Action.	No impact.
Water Quality	No significant impact during construction, operations, maintenance or decommissioning. No anticipated hazardous or polluting discharges into marine waters.	Similar to Proposed Action, except for release of drilling fluid into marine waters.	No impact.
Natural Hazards	No impact during construction, operations, maintenance or decommissioning.	Same as Proposed Action.	No impact.

Table 2-4: Summary of Environmental Consequences of the Proposed Action and Alternatives (continued)

Resource Area	Proposed Action	HDD Alternative	No Action
Marine Biological Environment	No significant impact during construction, operations, maintenance or decommissioning. Installation and operation may affect, but are not likely to adversely affect marine mammals, sea turtles, or proposed ESA corals, and not likely to result in destruction or adverse modification of proposed Hawaiian monk seal critical habitat. Installation may adversely affect EFH, but effects would be minimal and insignificant. Operation, maintenance and decommissioning would have no effect on EFH.	Similar to Proposed Action.	No impact.
Terrestrial Biological Environment	No significant impact during construction, operations, maintenance or decommissioning. No Federally- or State-listed plant species affected. Minimal disturbance to Hawaiian Monk Seals that may occasionally haul out on a nearby beach.	Similar to Proposed Action, except no potential for disturbance to Hawaiian Monk Seal, as no infrastructure would be placed on the shoreline. New pedestals would not be located on the shoreline or in ecologically sensitive areas.	No impact.
Land and Water Use Compatibility	No significant impact during construction, operations, maintenance or decommissioning. Construction operations near the shoreline would be located within areas restricted from public access. Maritime signal flags to be used during in-water construction activities and coordinated with USCG and MCB Hawaii Waterfront Operations. All in-water surface equipment (e.g., buoys, WEC devices) would be equipped with safety lighting and warning signs.	Similar to Proposed Action.	No impact.
Cultural Resources	No significant impact during construction, operations, maintenance or decommissioning. Archaeological monitoring to be conducted during any ground disturbance.	Similar to Proposed Action (i.e., no significant impact). Initial 6 to 10 ft (2 to 3 m) of HDD subsurface bore hole to be hand-augured. Archaeological monitoring to be conducted during any ground disturbance.	No impact.
Recreation	No significant impact. Short-term construction-related impacts as recreational boaters are directed around in-water work areas. No long-term adverse impacts to recreation.	Same as Proposed Action.	No impact.
Infrastructure	No significant impact to electrical grid, demand, supply or cost. Potential insignificant beneficial impacts from additional power generation	Same as Proposed Action.	No impact.
Public Safety	No significant impact. USCG-compliant navigation lights and warning signs and flags to be employed during and after construction.	Same as Proposed Action.	No impact.
Visual Resources	No significant impact. WEC devices and infrastructure would not affect significant or historical views.	Similar to Proposed Action.	No impact.

Chapter 3

Affected Environment

This chapter describes the existing environmental setting and establishes baseline conditions for environmental resources with the potential to be directly or indirectly affected by the Proposed Action and HDD Alternative. Environmental consequences of the construction and operation of the action alternatives are compared with the baseline conditions and described in Chapter 4. Because both action alternatives evaluated in this EA are located at MCB Hawaii, the resource areas assessed are limited to Mokapu Peninsula and offshore waters. The relevant resource areas and/or issues addressed are listed below:

- Climate and Air Quality
- Geology and Soils
- Shoreline Physiography
- Oceanographic Conditions
- Water Quality
- Natural Hazards
- Marine Biological Environment
- Terrestrial Biological Environment
- Land and Water Use Compatibility
- Cultural Resources
- Recreation
- Infrastructure
- Public Safety
- Visual Resources

3.1 | Climate and Air Quality

Hawaii's geographic location at the margin of the tropics and within a zone of prevailing northeasterly trade winds contributes to its mild climate conditions with moderate temperatures and humidity, and low variability in temperature (Juvik and Juvik 1998). Two seasons are recognized in Hawaii: summer (May through September) and winter (October through April). The topographic variations of the Hawaiian Islands—with their mountain ridges and peaks interspersed with valleys and broad slopes--create a range of climates and diverse ecosystems within a relatively small land mass. Rain and clouds are formed when warm moist air is deflected and rises over the steeply sloped windward coasts and slopes (i.e., orographic rainfall). Winter storms that occur between October and April produce the State's heaviest rains. Due to the prevailing trade wind weather, Windward areas of Oahu (such as MCB Hawaii) typically enjoy cooler temperatures and higher annual rainfall compared with Leeward Oahu.

Air quality in the State can be generally characterized as relatively clean and low in pollution. Data from State of Hawaii Department of Health air quality monitoring stations indicate that the State was in attainment of all NAAQS in 2011, with the exception of exceedances for SO_2 and $PM_{2.5}$ in communities near the volcano on Hawaii Island, and an isolated $PM_{2.5}$ exceedance from fireworks during the New Year's celebration (considered an exceptional event) (State of Hawaii 2012). Because the State is in attainment of the NAAQS, it is not subject to the Clean Air Act's General Conformity Rule. The few sources of criteria air pollutants in the project area include aircraft departing from Runway 4/22, boats transiting the offshore areas, and infrequent vehicle traffic accessing the Building 614 or the TACAN site.

3.2 | Geology and Soils

Mokapu Peninsula was created by volcanic activity building cones of molten rock (lava) and steam-broken ash. Fluctuations in sea level caused by glacial activities alternately flooded and exposed the coastline, allowing thick limestone platforms and sediments to form from coral reefs that developed in the shallows between volcanic features during periods of higher sea stands. These platforms and sediments make up much of the relatively porous, calcareous land surface existing at Mokapu Peninsula today

(Henderson 1994 in MCB Hawaii 2001). There are three remnant volcanic features that create visual landmarks in the otherwise flat peninsula: the tuff cone, Ulupau Head Crater (683 ft or 208 m) on the northeast corner; the low lava flow outcrop Pyramid Rock or Kuau on the northwest shore; and the 378-ft (116-m) cinder cone, Puu Hawaii Loa, located near the center of the peninsula (MCB Hawaii 2001).

The white sand of the north shore of Mokapu Peninsula is remnant of hard-shelled marine organisms and the erosion of coral reef structures. Heleloa sand dunes, created by the prevailing trade winds blowing beach sand inland, fringe the north shore of Mokapu Peninsula. The hillside along the onshore cable route is comprised of Rock Land, and a majority of the terrestrial soils in the project area surrounding Building 614 consist of Molokai Silty Clay Loam 7 to 15% slopes (U.S. Department of Agriculture 1972).

3.3 | Shoreline Geomorphology

The north shore of Mokapu Peninsula is an approximately 8,000-ft (2,439-m) long, continuous sandy beach, except where a rock revetment protects the seaward end of the airfield runway (Runway 4/22). The 1,100-ft (335-m) revetment extends seaward of the sandy beach into the ocean. West of the revetment, the 2,000-ft (610-m) shoreline is generally undeveloped. East of the revetment, Hilltop Beach (fronting the subsea cable landing, Building 614 and Kaneohe Klipper Golf Course) and North Beach, together, extend 5,500 ft (1,676 m) east to the base of Ulupau Head Crater. The width of the beach averages between 50 and 60 ft (15 to 18 m).

3.4 | Oceanographic Conditions

Hawaiian waters consistently have some of the highest wave energy measured in the world. Four primary wave types are used to characterize Hawaii's wave climate: (1) northeast trade wind waves, (2) North Pacific swell, (3) south swell, and (4) Kona storm waves. Northeast trade wind waves are present throughout the year but are most frequent in summer months (May to October). They result from steady trade winds which blow from the northeast over long stretches of ocean. Deep water trade wind waves typically have periods of 5 to 8 seconds and heights of 3 to 10 ft (1 to 3 m). The proposed project site is fully exposed to trade wind waves.

The North Pacific swell is produced by severe winter storms in the Aleutian area of the north Pacific and by mid-latitude, low-pressure atmospheric systems. North swells may arrive in Hawaiian waters throughout the year but are largest and most frequent during the winter months of October through March. These swells approach from the sector west through north, with periods of 13 seconds to 20 seconds and typical deep water heights of 4.9 to 9.8 ft (1.5 to 3 m). The proposed project site is partially sheltered from the approach of the north Pacific swell and only the more northerly of these swells influence the area.

In addition to the two predominate wave types affecting Hawaii's waters, tropical cyclones or hurricanes generate large waves that impact Hawaii. Although infrequent, these waves present the worst-case conditions for most coastal areas. Analysis of the waves generated by the two most recent hurricanes that impacted Oahu (Hurricane Iniki in 1992 and Hurricane Iwa in 1982) indicates that the waves approached from the southeast through west directions. The project site was relatively sheltered from severe waves during these two hurricanes.

Less intense low-pressure systems (cyclones) of subtropical origin, which usually develop northwest of Hawaii in winter and move slowly eastward, are referred to as Kona storms. They are accompanied by southerly winds, from which the storm derives its name (Kona means "leeward" in Hawaiian), and by the clouds and rain that have made Kona storms synonymous with bad weather in Hawaii (Juvik and Juvik 1998). The proposed deep-water WETS is sheltered from direct Kona storm waves.

Wave heights measured during a 10-month period between August 2000 and June 2001 were extrapolated to the approximate conditions at the existing shallow-water WET berth (i.e., water depth of approximately 100 ft [30 m]) (see Appendix E in Navy 2003). The largest significant wave height was calculated to be 13.8 ft (4.2 m), with no severe storms or hurricanes occurring during the study period. Estimates of extreme wave conditions, resulting from extreme wind waves and hurricane waves, predicted maximum wave heights at the shallow-water WETS berth of 15.7 ft (4.8 m) and 44.6 ft (13.6 m), respectively.

3.5 | Water Quality

The waters of Kailua Bay and outer portions of Kaneohe Bay—including the existing and proposed WETS berths--are designated Class A marine waters. The management objective of Class A waters is to protect the waters for recreational and aesthetic enjoyment. Marine waters surrounding Mokapu Peninsula are classified and regulated by the State of Hawaii under Title 11 Hawaii Administrative Rules, DOH, Chapter 54 Water Quality Standards. There are no drinking water sources, streams or wetlands within or adjacent to the terrestrial project area.

3.6 | Natural Hazards

According to the Federal Emergency Management Agency Flood Insurance Rate Map (FIRM), Building 614 is within Zone D, an area with possible but undetermined flood hazards (Community Panel No. 15003C0280F, revised September 24, 2004). The FIRM map indicates that the proposed surface-laid cable route would traverse areas designated as within Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zone AE) with a base elevation of 16 ft (4.9 m) and a coastal flood zone with velocity hazard (wave action) (Zone VE) with a base elevation of 16 ft (4.9 m). Tsunami evacuation maps for the City and County of Honolulu indicate that Building 614 is outside the tsunami evacuation zone and located above the tsunami inundation zone (City and County of Honolulu Tsunami Map 7 Kailua [Inset 1] August 25, 2010). The Uniform Building Code (UBC) contains classifications of seismic hazards based on the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time. The UBC contains six seismic zones, ranging from zero (0) (no chance of severe ground shaking) to four (4) (ten percent chance of severe shaking in a 50-year interval). The island of Oahu is classified in Zone 2A (U.S. Geological Survey [USGS] 2013).

3.7 | Marine Biological Environment

This section describes marine biological resources in the areas potentially affected (directly or indirectly) by the Proposed Action. Both of the alternatives are generally located in the same area, with the exception of the subsea cable routes of the Proposed Action and HDD Alternatives. Differences in potentially affected areas between the two alternatives are noted, where applicable. The section is organized into several subsections:

1. Threatened, Endangered and Protected Species
2. Marine Habitats
3. Marine Invertebrates
4. Marine Vegetation
5. Fish and EFH
6. Critical Habitat

Marine biological resources in the vicinity of and/or potentially affected by construction and operation of the existing shallow-water WET berth infrastructure and operation were surveyed prior to construction and described in the 2003 WET EA. In addition to baseline (i.e., pre-WEC device deployment) condition information, the Navy conducted a marine biological monitoring program for the shallow-water WET berth, WEC devices, mooring equipment and power transmission cable at various times between the initial buoy deployment in October 2003 and June 2007. A total 50 person-dives were completed between October

2003 and October 2004 to document initial impacts, with periodic monitoring continuing (27 dives) between October 2004 and June 2007.

The Navy also conducted an updated marine ecological assessment of selected marine biological resources in the initial survey area in May 2011 (28 dives), with an associated report published dated September 2011 (NAVFAC EXWC 2011), included as Appendix A.2 of this EA. The Year 1 (i.e., October 2003 to October 2004) monitoring report is included as an appendix in the 2011 updated marine assessment (Appendix A of this EA). All the surveys focused on Federally threatened and endangered species, corals and coral reefs, fishery target species, EFH, and alien species. There was no evidence that operation of the existing shallow-water WET berth resulted in increased stress, disease, or abnormalities in any of the marine organisms present within the project area.

These baseline and follow-on surveys of the shallow-water WET berth site provide important information on what conditions were in marine habitat zones similar to and near those that would be affected by the deep-water WETS (pre-deployment) and what impacts to marine biological resources can be reasonably anticipated if the deep-water WETS berths are established.

In addition to the Navy's marine ecological surveys, multi-agency marine ecological surveys were performed at or near the shallow-water WET berth site in 2002 and 2004 (USFWS et al. 2008). The Navy's 2011 marine ecological assessment analyzed monitoring data from the 2005 – 2007 time period and the May 2011 surveys and compared those findings with the Year 1 monitoring effort and the multi-agency surveys.

There were no discrepancies between the USFWS 2008 findings and those of the Navy's May 2011 study. The survey station at the 39-ft (12-m) water depth most closely matched the location of the Navy's mid-depth surveys. The qualitative and quantitative data gathered by the Navy between 2003 and 2013 have shown no detectable adverse impacts to any marine natural resources, including any Federally-listed or proposed threatened or endangered species, EFH or any fishery target species. The information gathered from the survey data are presented within the individual marine resource sections (3.7.1 Threatened, Endangered and Protected Species, 3.7.2 Marine Habitats, 3.7.3 Marine Invertebrates, 3.7.4 Marine Vegetation, 3.7.5 Fish and EFH).

The proposed deep-water WETS berths are compatible with all the recommendations made by the multi-agency survey team (USFWS, NOAA, USGS, Bishop Museum, University of Hawaii and Hawaii DLNR) for the marine natural resources offshore MCB Hawaii (USFWS et al. 2008).

In March 2013, the Navy conducted a reconnaissance level marine survey (10 dives) of an earlier alternative alignment of the subsea cable (NAVFAC EXWC Scientific Diving Services 2013). This original cable route was aligned in a more direct route from the deep-water WETS mooring berths to the shore landing and did not parallel the existing shallow-water WET berth cable. It instead approached the shore landing from a northwesterly direction. The survey biologists subjectively observed that, compared with the existing shallow-water WET cable corridor, the original direct route corridor exhibited greater topographic complexity; more coral species and specimens of greater size; higher refuge value for fish and marine invertebrates; and greater fish diversity and total biomass (see Section 2.6.2 for discussion of the original alternative). As a result of the March 2013 survey, the Navy revised the planned subsea cable corridor to be parallel to, and within 100 ft (30 m) west of, the existing shallow-water WET cable in order to reduce potential impacts to biological resources. The March 2013 Navy survey also included several points along the existing shallow-water WET berth subsea cable route.

There are no critical habitats within MCB Hawaii-controlled property (including submerged lands) and the project area is not within or adjacent to any wildlife sanctuaries. The project area does not fall within the

Hawaiian Islands Humpback Whale National Marine Sanctuary, which is 9.8 mi (15.8 km) to the northeast of the project area at its nearest point.

3.7.1 Threatened, Endangered and Protected Species

This section describes the protected species that may be affected by the Proposed Action or HDD Alternative. More than 25 species of marine mammal and two species of sea turtle may occur in the U.S. Exclusive Economic Zone around the Hawaiian Islands. Many of the species are found in deep water (>984 ft or 300 m), very distant from the Islands, or are rare visitors to the area. The deep-water WETS berths would be in water with depths of 262 ft (80 m) or less, therefore, the marine mammal species that may be observed at the project site are limited. The list of marine mammals that may utilize the WETS habitat are humpback whale (*Megaptera novaeangliae*) (seasonally), false killer whale (*Pseudorca crassidens*), spinner dolphin (*Stenella longirostris*), bottlenose dolphin (*Tursiops truncatus*), short-finned pilot whale (*Globicephala macrorhynchus*), and Hawaiian monk seal (*Monachus schauinslandi*). Other marine mammal species with deep-water habitat preference, may on rare occasions, transit through the area, including, pantropical spotted dolphins (*Stenella attenuata*), pygmy killer whales (*Feresa attenuata*), melon-headed whales (*Peponocephala electra*), pygmy sperm whales (*Kogia breviceps*), and dwarf sperm whales (*Kogia sima*). In extremely rare cases, other species of pinniped have been seen in the Hawaiian Islands, but those incidents are so rare that they will not be addressed in this document. Five marine species protected by the ESA have been reported in the ocean areas around the existing shallow-water WET berth and proposed deep-water WETS berths and transmission line(s): endangered Hawaiian monk seal, endangered humpback whale, endangered Main Hawaiian Islands insular false killer whale stock, threatened green sea turtle (*Chelonia mydas*), and the endangered hawksbill sea turtle (*Eretmochelys imbricata*). In addition, in December 2012, NOAA proposed the listing of 66 species of coral, two of which are present in the vicinity of the shallow-water WET berth and transmission line; blue rice coral (*Montipora flabellata*) and ringed rice coral (*Montipora patula*).

3.7.1.1 Marine Mammals

All marine mammal species are protected by the Marine Mammal Protection Act of 1972 (MMPA). The Federally- and State-endangered ***Hawaiian monk seal*** is endemic to the Hawaiian Islands (i.e., found only in Hawaii), although in the past there were rare sightings of individuals at Johnson Atoll, Wake Island, and Palmyra Atoll. Individuals have a life expectancy of 25 to 30 years. The species is critically endangered, but the majority of the population is in the Northwest Hawaiian Islands. There is a small population of approximately 130 individuals in the Main Hawaiian Islands. The population, while declining overall, is increasing in the Main Hawaiian Islands. At up to 7.5 ft (2.2 m) long and 450 lbs (204 kg), females are slightly larger than males, who are up to 7 ft (2.1 m) long and 375 lbs (170 kg). Monk seals spend half to two-thirds of their time at sea foraging in waters surrounding atolls, islands and on offshore reefs, submerged banks, seamounts, and deep water coral beds. Juveniles have been known to forage in sand fields. Monk seals primarily forage on benthic and demersal prey (i.e., live and feed on or near seafloor); they have a varied diet that includes fish, octopus, squids, crabs, lobster, and shrimp. Adults are generally nocturnal hunters, while juveniles forage diurnally on species that hide in the sand or under rocks (MCB Hawaii 2011). Monk seals breed and haul-out on sand, corals, and volcanic rock. (Note: Terrestrial activities of the Hawaiian monk seal at MCB Hawaii are addressed in Section 3.8.3.) NOAA Fisheries is in the process of revising critical habitat for the Hawaiian monk seal and is considering areas within the Main Hawaiian Islands (see Section 3.7.6 Critical Habitat).

The Federally- and State-endangered ***humpback whale*** is a migratory species whose length ranges from 40 to 60 ft (12 to 15 m) and weighs between 25 to 40 tons (22.6 to 36.2 metric tons). Most humpback whales spend summer in temperate and polar waters to feed, and winter in tropical waters for mating and calving. Humpback whales found in Hawaiian waters are from the Central North Pacific Stock that winters in Hawaii and migrates to British Columbia and Alaska in summer. As baleen whales, they feed on krill, small crustaceans and fish. Foraging does not occur around Hawaii. Although they occur relatively close to shore in the Main Hawaiian Islands, areas of highest concentration are in the Maui Basin, Penguin Banks, the north shore of Oahu, the Northwest shore of Kauai, around Niihau, and the northwest side of

the Island of Hawaii. Of the baleen whales that were hunted aggressively during the period of whaling, humpback whale populations in the Pacific have recovered more rapidly than the other species.

False killer whales are one of the larger species of Delphinid reaching maximum length of 16-19 ft (5-6 m). They appear dark grey to black in color, and along with pilot whales (*Globicephala* sp.), melon-headed whales (*Peponocephala electra*) and pygmy killer whales (*Feresa attenuata*) make up a group of delphinids known as "blackfish." Like other delphinids, false killer whales are highly social. They are long-lived (~60 years) and are found throughout the world in tropical and temperate oceans. They are a top-order predator that feed on large pelagic fish as well as deep water prey such as squid. In Hawaii, they feed on large fish, including yellowfin, skipjack, and albacore tuna, mahimahi, ono, and broadbill swordfish. In Hawaii, false killer whales have been found to have populations that adhere to particular ranges. The population of false killer whales that is close to the Main Hawaiian Islands, the Hawaiian Insular Stock, is comprised of about 150 individuals and is in decline primarily due to negative interactions with the longline fishing industry and sport fishing. In November 2012, NOAA Fisheries declared the stock a Distinct Population Segment that is protected under ESA. This stock moves throughout the Main Hawaiian Islands, ranging from Niihau to the Island of Hawaii, staying within approximately 62 mi (100 km) from shore.

While the majority of the 24 cetacean species known to occur around the Hawaiian Islands primarily utilize deep, offshore waters, a handful of species are seen commonly in the nearshore waters around Oahu, including bottlenose dolphins, spinner dolphins, and short-finned pilot whales. Pantropical spotted dolphins, pygmy killer whales, melon-headed whales, pygmy and dwarf sperm whales, may utilize Oahu's nearshore waters infrequently. All marine mammals (cetaceans and pinnipeds) found in Hawaii are protected under the MMPA.

No Federally threatened or endangered species or marine mammals were seen or heard within 1,625 ft (500 m) of the anchor base or transmission cable of the existing shallow-water WET berth during the May 2011 surveys, although pods of spinner dolphins were sighted during transits through Kaneohe Bay and the Main Channel to and from the survey areas. No endangered Hawaiian monk seals (*Monachus schauinslandi*) were sighted underwater or from the dive boat. There has been no evidence that Hawaiian monk seals have become entangled or entrapped in any of the equipment associated with the installation or operation of the shallow-water WETS berth.

3.7.1.2 Sea Turtles

The Federally- and State-threatened ***green sea turtle*** (*Chelonia mydas*) is indigenous (i.e., native to Hawaii but also found elsewhere) and is the largest hard-shell sea turtle, averaging three feet (0.9 m) in length and weighing 300 to 350 lbs (136 to 159 kg). Green sea turtles utilize ocean beaches for nesting and open ocean and coastal areas for feeding. Adult green sea turtles are almost exclusively herbivorous and feed primarily on seagrass and algae (MCB Hawaii 2011).

In February 2012, NOAA Fisheries and the USFWS received a petition from the Association of Hawaiian Civic Clubs to identify the Hawaiian green turtle population as a Distinct Population Segment (DPS) and delist the DPS under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.). On 1 August 2012, NOAA Fisheries subsequently found that the petitioners presented substantial scientific and commercial information indicating that delisting the Hawaiian population of green sea turtle from the ESA may be warranted, and commenced a status review of the petitioned species (ongoing).

The endangered ***hawksbill sea turtle*** (*Eretmochelys imbricata*) is also indigenous and is a small to medium sized marine turtle, averaging 2.5 ft (0.8 m) in length and weighing 100 to 150 lbs (45 to 68 kg). They frequent rocky areas, coastal reefs, shallow coastal areas and estuaries, and prefer water depths of less than 65 ft (20 m). Hawksbill sea turtles are often associated with the coral reef community and feed primarily on sponges, other invertebrates, and algae (MCB Hawaii 2011).

The Navy has conducted more than 10 years of in-water diving surveys for turtle presence at several locations around Oahu. These density measurements estimate turtle presence on Oahu at 1.125 turtles per square kilometer (km^2)[1] (<1% of those being hawksbill turtles) (Navy 2012b).

According to the Navy's 2003-2013 surveys and the multi-agency surveys done in 2004, there were no sightings of endangered hawksbill sea turtles (*Eretmochelys imbricata*) at or in the vicinity of the existing shallow-water WET berth, no green sea turtles (*Chelonia mydas*) were sighted underwater, and only one green turtle was seen within 1,625 ft (500 m). These surveys also concluded that installation and operation of the WEC devices and associated infrastructure at the shallow-water WET berth has not resulted in increased forage/food sources for hawksbill or green sea turtles. Therefore, the equipment has not served as an attractant for these protected species, based upon increased food sources. No threatened or endangered species were seen or heard within 1,625 ft (500 m) of the anchor base or transmission cable of the existing shallow-water WET berth during the May 2011 surveys, although green sea turtles were sighted during transits through Kaneohe Bay and the Main Channel to and from the survey areas. No sea turtles were sighted during the March 2013 surveys. There has been no evidence that sea turtles have become entangled or entrapped in any of the equipment associated with the installation or operation of the shallow-water WET berth.

3.7.1.3 Corals

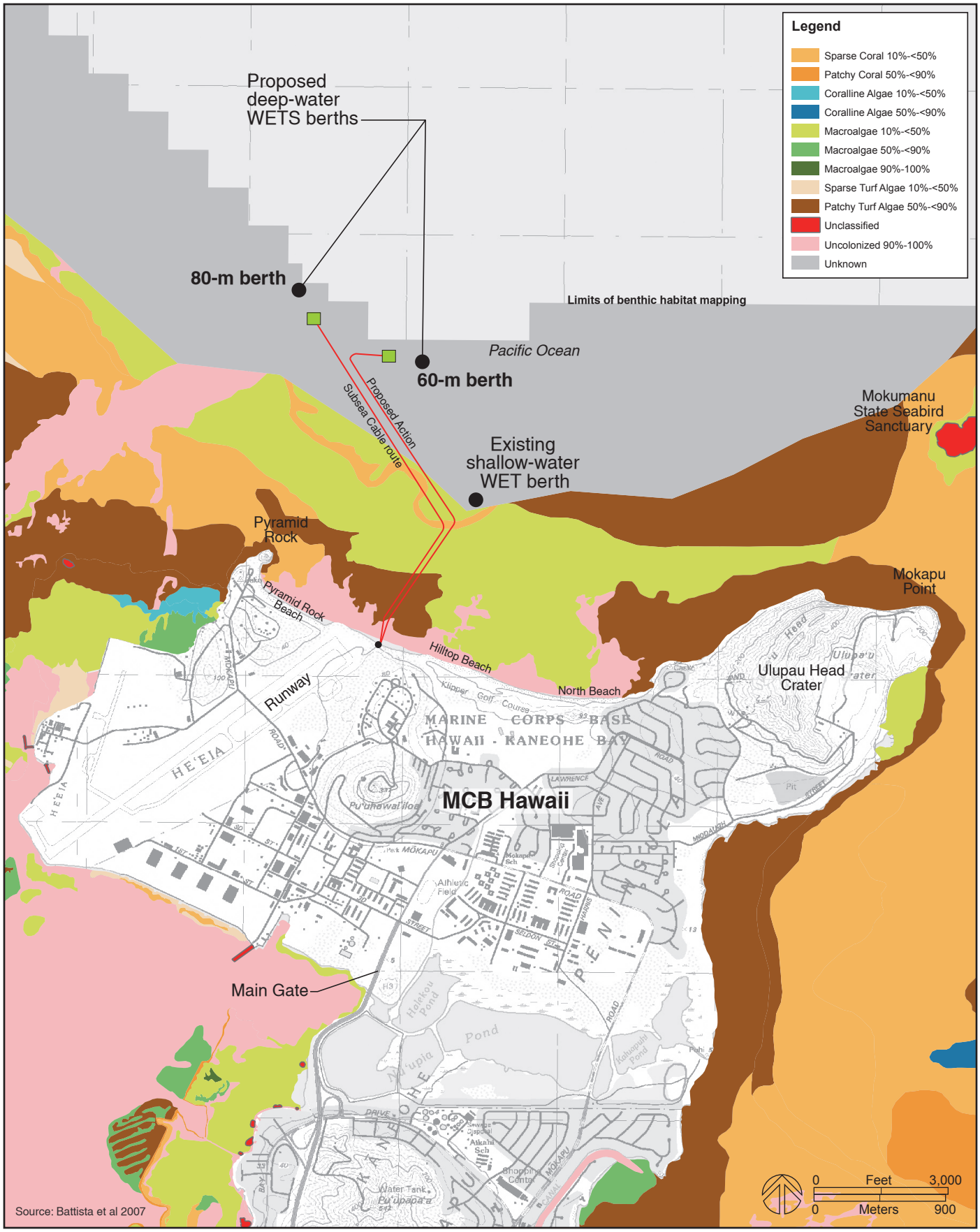
In November 2012, NOAA Fisheries proposed the listing of 66 species of coral as threatened or endangered, including two species endemic to Hawaii (*Montipora patula* and *M. flabellata*). These two species, both proposed as "threatened," were found during initial and monitoring surveys of the marine environment at the existing shallow-water WET berth/transmission lines. A proposed rule for listing these coral species was published in the Federal Register in December 2012 (Volume 77, No. 236) for additional public comment. Additional information on coral species and other marine biological resources found at the existing shallow-water WET berth site is provided in Section 3.7.3.

The two proposed species were found sporadically scattered in the reef flat zone (i.e., wide seafloor plateau of relatively solid, flat limestone from approximately the 30-ft [9.1-m] water depth to approximately 50-ft [15-m] depth; refer to Section 3.7.2 Marine Habitats). The variety of stony corals within the project area is low (see Sections 3.7.2 Marine Habitats and 3.7.3 Marine Invertebrates), and the species present and growth forms assumed are typical of a very high energy environment. *M. patula* and *M. flabellata* were only observed in flat, encrusting growth forms at water depths between 40 and 100 ft (12 and 30 m) in small, widely scattered colonies.

3.7.2 Marine Habitats

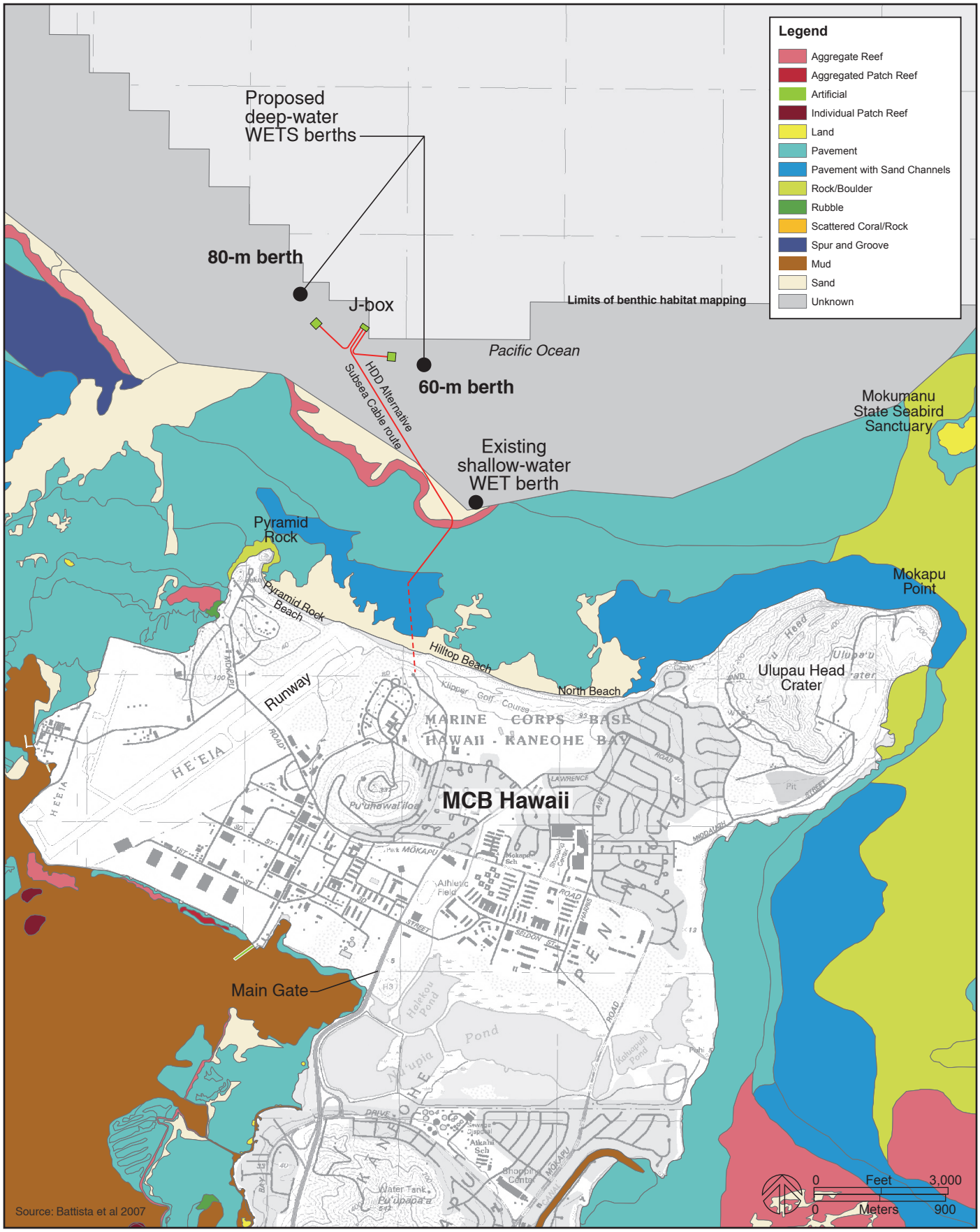
The NOAA National Centers for Coastal Ocean Science (NOAA NCCOS) produced maps of shallow-water benthic habitats for the eight main Hawaiian Islands (Battista et al. 2007). Benthic habitat types were digitally mapped in a geographic information system using visual interpretation of orthorectified[2] IKONOS satellite imagery[3]. Figures 3-1 and 3-2[4], respectively, show the biological cover types and geomorphological structure types as classified by the NOAA benthic habitat mapping system. In NOAA's classification, "cover type" refers only to the predominant biological component colonizing the surface of the feature and does not address its location, and "structure" refers to the predominate physical structural composition (and not its location).

[1] 1 km^2 = 0.39 square miles (mi^2)
[2] I.e., removal of topographic distortions caused by variations in topography and the angle of the satellite or other airborne image sensor during acquisition of the aerial image.
[3] An accuracy assessment system to evaluate the thematic accuracy of NOAA NCCOS's benthic habitat mapping was conducted for detailed geomorphological structure and detailed biological cover type (BAE Systems Sensor Solutions Identification & Surveillance 2007). The assessment concluded that the overall accuracy for major cover, major structure, and detailed structure was over 90% and over 83% for detailed cover.
[4] The subsea trunk transmission cable routes for the Proposed Action and HDD Alternative are shown on Figures 3-1 and 3-2, respectively.



Benthic Habitats: Biological Cover **Figure 3-1**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay



Benthic Habitats: Geomorphological Structure **Figure 3-2**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

Four major classes of biological cover type (Live Coral, Macroalgae, Turf Algae, and Uncolonized) and two major classes of geomorphological structure (Unconsolidated Sediment and Patch Reef) (excluding unclassified and unknown areas) were identified in NOAA's benthic habitat mapping in the areas that may be directly affected by the Proposed Action and alternatives[5] (i.e., off the north shore of Mokapu Peninsula). Within the four major biological cover classes, there are subclasses identifying the percentage of the dominant cover type (e.g., sparse coral 10% to <50%). Table 3-1 contains descriptions of the relevant biological cover and geomorphological classes (major and detailed). Figures 3-1 and 3-2 show the detailed (not major) classes of biological cover and geomorphological structure, respectively.

The nearshore substrate off the north shore of Mokapu Peninsula is characterized as ***uncolonized*** (by biotic cover). This corresponds to the underlying geomorphological structure of ***sand***. Moving seaward in the direction of the proposed deep-water WETS berths (i.e., north), the predominate biotic cover is ***patchy turf algae***, which overlies a geomorphological structure of ***pavement with sand channels***. The benthic mapping indicates a fairly continuous area of ***sparse macroalgae*** (10% to <50%) extending generally parallel to the north shore of Mokapu Peninsula. A geomorphological structure of ***pavement*** underlies the biotic cover in this area. A ribbon of ***sparse coral*** (10% to <50%) extends in a northwest-southeast direction about 3,000 ft (914 m) offshore of Mokapu Peninsula. This ribbon overlies a geomorphological structure of ***aggregate reef***.

The marine ecological assessment for the shallow-water WET project (Appendix H in 2003 WET EA) described the shallow-water WET berth project area as comprised of six basic habitat types or zones. These six zones, described below, have remained generally unchanged with the installation and operation of the existing shallow-water WET berth, and continued to accurately characterize the conditions in May 2011 (NAVFAC EXWC 2011).

Sand-Boulder Zone. The ocean bottom just seaward of the beach, from a depth of zero to approximately 12 to 15 ft (3.7 to 4.6 m), consists of a bed of coarse-grain carbonate sand that is kept in a state of continual resuspension by wave energy. Interspersed on the sand bed are boulders that are continually swept by resuspended sand. Some of the boulder riprap that was used to construct the revetment securing the end of the runway has separated from the structure and is submerged in the nearshore area. The sandy area immediately seaward of the base runway may shift seasonally, with the limestone outcrops alternately being buried and exposed. This zone ranges from a width of 400 ft (122 m) at the east end of the beach to 700 ft (213 m) near Pyramid Rock on the west. As a result of continuous resuspension of sand with passing waves, the substrate from the shoreline through the sand-boulder zone contains little marine vegetation or coral.

No fish or other marine vertebrates, and little marine vegetation or coral, were observed residing in the sand-boulder zone during the 2002 marine survey.

Sand Channel Zone. Farther offshore from the sand-boulder zone, the ocean bottom consists of consolidated limestone bisected by small channels, which vary in width and eventually end in ridge formations. These spur and groove formations are oriented roughly perpendicular to the bottom contours and the shoreline. Generally 3 to 4 ft (0.9 to 1.2 m) of relief is present between the bottom of the channels and the adjacent ridges. While the channel bottoms typically consist of flat and scoured limestone with a thin veneer of sand, some live coral is present on the ridges. The sand channel zone transitions from the sand-boulder zone at depths of approximately 12 to 18 ft (3.6 to 5.5 m) and extends to a depth of 30 to 35 ft (9.1 to 10.6 m).

[5] The NOAA shallow-water benthic mapping does not extend to the WETS deep-water berth locations; however, it does encompass the portion of the proposed power and fiber optic transmission cable route(s) at water depths of up to 100 ft (30 m).

Table 3-1: Benthic Habitat Biological Cover and Geomorphological Structure Types

	Major Cover Class	Detailed Cover Class and Description
BIOLOGICAL COVER	Live Coral	Substrates colonized by live reef building corals and other organisms. Habitats within this category have at least 10% live coral cover. • Sparse Coral: Discontinuous live coral with breaks in coverage. Resulting coral coverage is too diffuse, irregular, or located in isolated patches of coral that are too small to be mapped as continuous coral. Overall live coral cover is estimated at 10%-<50% of the bottom.
	Macroalgae	Substrates with 10 percent or greater coverage of any combination of numerous species of red, green, or brown macroalgae. Usually occurs in shallow backreef and deeper waters on the bank/shelf zone. • Sparse Macroalgae: Discontinuous macroalgae with breaks in coverage. Resulting macroalgae coverage is too diffuse, irregular, or located in isolated patches that are too small to be mapped as continuous macroalgae. Overall cover is estimated at 10%-<50% of the bottom.
	Turf Algae	A community of low lying species of marine algae composed of any or a combination of algal divisions dominated by filamentous species lacking upright fleshy macroalgal thali. • Patchy Turf: Discontinuous Turf algae with breaks in coverage. Resulting turf algae is too diffuse, irregular, or located in isolated patches that are too small to be mapped as continuous Turf algae. Overall cover is estimated at 50% to <90% of the bottom.
	Uncolonized	Substrates not covered with a minimum of 10% of any of the above biological cover types. This habitat is usually on sand or mud structures. Overall uncolonized cover is estimated at 90%-100% of the bottom.
	Unknown	Cover uninterpretable due to turbidity, cloud cover, water depth, or other interference.
	Major Structure Class	**Detailed Structure Class & Description**
GEOMORPHOLOGICAL STRUCTURE	Unconsolidated Sediment	Sand: Coarse sediment typically found in areas exposed to currents or wave energy.
	Patch Reef	Coral formations that are isolated from other coral reef formations by sand, seagrass, or other habitats and that have no organized structural axis relative to the contours of the shore or shelf edge. • Pavement: Flat, low-relief, solid carbonate rock with coverage of macroalgae, hard coral, zoanthids, and other sessile invertebrates that are dense enough to begin to obscure the underlying surface. • Pavement with Sand Channels: Habitats of pavement with alternating sand/surge channel formations that are oriented perpendicular to the shore or bank/shelf escarpment. The sand/surge channels of this feature have low vertical relief relative to spur and groove formations and are typically erosional in origin. This habitat type occurs in areas exposed to moderate wave surge. • Aggregate Reef: High relief lacking sand channels of spur and groove.
	Unknown	Cover uninterpretable due to turbidity, cloud cover, water depth, or other interference.

Source: Battista et al. 2007

The constant state of resuspension in the sand channel zone restricts settlement of bottom dwelling organisms on both the sand and limestone surfaces. Macrobiota observed in this zone were scattered heads of the branching coral *Pocillopora meandrina*, native to Hawaii, which grow along the vertical sides of the reef channels.

Reef Flat Zone. Offshore from the sand channel zone, the emergent reef flat becomes more solid as sand cover decreases. The spur and groove formations end around the 30- to 35-ft (9.1- to 10.6-m) water depth, and the seafloor from that point to approximately the 50-ft (15-m) depth is a wide plateau of relatively solid, flat limestone. Some scattered areas of vertical relief exist, generally due to potholing, coral growth, or the presence of small limestone ridges and ledges. The bottom slope in this zone is approximately 1 to 70 (rise to run).

The surface of the limestone reef flat consists of a short algal turf that binds a thin layer of carbonate sediment. Macrobiota in this zone include sporadic heads of the coral *P. meandrina* and flat encrustations of the corals *Porites lobata* (native), *Montipora capitata* (native), *Montipora patula*, and *Montipora flabellata*. As noted in Section 3.7.1, *M. patula* and *M. flabellata* were proposed by NOAA Fisheries for ”threatened” status under the ESA. The dominant algae on the platform are clumps of the genera *Porolithon* (native). Coral growth is greater along the edge of the ledges than the flat areas, and fish are more likely to frequent the areas of coral growth. Colonies of the native coral *Pocillopora eydouxi* up to 2 ft (0.6 m) in height occur infrequently in this zone; schools of aloiloi or white-spotted damselfish (*Dascyllus albisella*, endemic) reside within the coral.

Escarpment Zone. The escarpment zone can be defined as the area extending from the 50-ft (15-m) depth contour to approximately the 90- to 95-ft (27- to 29-m) depth contour. At a depth of 50 to 65 ft (15 to 20 m), the angle of the bottom increases by 25 to 30 degrees. While there are bottom slopes as steep as 1 to 7 (rise to run), no prominent vertical ledges or wave-cut notches are present in the shallow-water WET berth area. The bottom is relatively flat limestone with widely scattered areas of vertical relief.

The primary macrobiota on the escarpment is the flat encrusting coral *M. capitata*. In some localized areas, this species covers up to 50 percent of the substrate. The following fish were observed in the escarpment zone during the 2002 underwater site assessments: taape or blue-lined snapper (*Lutjanus kasmira*), alaihi or crown squirrelfish (*Sargocentron diadema*), yellowstripe squirrelfish (*Sargocentron ensiferum*), uu or bigscale soldierfish (*Myripristis berndti*), kumu or whitesaddle goatfish (*Parapeneus porphyreus*), lauwiliwili or milletseed butterflyfish (*Chaetodon miliaris*), kikakapu or multiband or pebbled butterflyfish (*Chaetodon multicinctus*), laui pala or yellow tang (*Zebrasoma flavescens*), papio or omilu or bluefin trevally (*Caranx melampygus*), and damselfish (*Dascyllus albisella)*. Of these species, the milletseed butterflyfish, multiband butterflyfish, and white-spotted damselfish are known to be endemic to the Hawaiian Islands.

Deep Reef Platform Zone. From the bottom of the escarpment zone, the seafloor slopes gradually to a depth of approximately 100 ft (30.5 m) where it becomes almost featureless. The flat limestone surface is covered by sand 1 to 2 in (2.5 to 5 cm) deep, and covered in some areas by algal turf. The seafloor topography remains relatively constant and barren through the depth range of this zone.

The most plentiful macrobiota are scattered heads of the coral *P. meandrina* and flat encrustations of the coral *M. capitata.* Macrobiotic composition varies from relatively high coral cover above the 95-ft (29-m) depth contour to the relatively little cover below this boundary. Other species known to transit the area at this depth include the endangered humpback whale (*Megaptera novaeangliae*), threatened green sea turtle (*Chelonia mydas*), and endangered Hawaiian monk seal (*Monachus schauinslandi*). It is possible that other marine mammals such as spinner dolphins, bottlenose dolphins, and false killer whales occasionally transit the area.

Undercut Ledges. At several locations at the eastern end of the deep reef platform, a system of small undercut ledges runs parallel to the depth contours (in the vicinity of the shallow-water WET berth). A ledge with an approximate length of 25 ft (7.6 m) exists at the 93-ft (28.3-m) depth and a 150-ft (45.7-m) long ledge system exists at around the 100-ft (30.5-m) depth contour (Figure 3-2 in 2003 WET EA).

Increased populations of fish and coral occur around the ledges. Species of reef fish observed during the 2002 marine surveys included blue-lined snapper, squirrelfish, goatfish, milletseed butterflyfish, multiband butterflyfish, and yellow tang. The predominant coral was the encrusting form of *M. capitata*, which covered large areas of the upper lips of the undercut ledges. While several species of sea urchins are present along these undercut ledges, other invertebrates were not identified in the area.

***Deep Water Zone*.** The deep water zone was not assessed during the 2003 WET EA and refers to habitat beyond the 98-ft (30-m) depth. In 2011, Sea Engineering, Inc. conducted a multibeam bathymetry survey of the proposed deep-water WETS berths. The area is characterized by extensive flat and featureless substrate with occasional sand ribbons and barchans (dunes). There were patches of algae and, in some areas, sparsely scattered coral heads. The areas chosen for placement of the deep-water WEC device anchoring systems are characterized by featureless sandy substrate. Pelagic species of fish are present in the water column, but there is minimal to no relief or sheltered habitat for benthic or reef associated organisms. The same species of marine mammal and sea turtle that transit through the deep reef platform zone are likely to transit the Deep Water Zone.

3.7.3 Marine Invertebrates

During the initial surveys conducted prior to installation of the shallow-water WEC device, no coral species rare to the Hawaiian Islands were sighted. The dominant coral (based upon percentage of the seafloor covered) was *M. capitata*. The USFWS team estimated coverage of this species was only one percent (USFWS et al. 2008). The Navy biologists' subjective estimate of overall habitat cover by *M. capitata* in the 39-ft depth was 2 to 5 percent. For the seafloor transects parallel to the cable at that depth, 11.1 percent of the points were coral of all species.

Macroinvertebrates observed in the USFWS survey and the Navy's May 2001 survey included many of the same species, such as octopus (*Octopus sp*.), cone shells (yellow cone [*Conus flavidus*], spiteful cone [*C. lividus*], marbled cone [*C. marmoreus*]), and common sea urchins (banded sea urchin [*Echinothrix calamaris*], blue-black urchin [*E. diadema*], rock-boring urchin [*Echinometra mathaei*]). These macroinvertebrates are all native to Hawaii with the exception of *Conus marmoreus*, which is of Indo-Pacific origin.

There were no subjectively detectable changes in the macroinvertebrate population at the existing shallow-water WET berth between 2003 and 2007. During the May 2011 survey there appeared to be substantial increase in the number of sea urchins (particularly *Echinothrix calamaris*). The increased number of urchins had also been observed by Stephen H. Smith, the preparer of the Navy's 2011 survey report (NAVFAC EXWC 2011), at other Oahu locations during 2011.

There was no evidence that any portion of the shallow-water WET berth power cable had moved since being installed in 2003 and no evidence that any corals had been damaged due to movement of the power cable. The 2011 survey verified that none of the corals observed on or immediately adjacent to the anchor base complex or transmission line showed any signs of disease or stress since 2003 (e.g., lesions, excessive mucus production, abnormal densities of macro-bioeroders or predation by the native Crown-of-Thorns starfish [*Acanthaster planci*]), with the exception of some moderate bleaching[6] found on

[6] Coral bleaching is the phenomenon in which zooxanthellae (the symbiotic dinoflagellates which live within the coral tissue) either lose some of their pigments or when the zooxanthellae are actually expelled by the coral. The most common causes of bleaching are increased water temperatures and increased light levels. Corals and zooxanthellae can recover from minor episodes of bleaching. Between 2003 and 2011 mild bleaching has been present within various coral species around Oahu. No major bleaching

P. meandrina and *M. capitata* (on the seafloor). The minor bleaching was found on coral at distances of at least 490 ft (150 m) from any equipment associated with the shallow-water WET berth.

Scleractinian corals have successfully recruited to and grown on existing shallow-water WET berth project equipment. The density of corals on the power transmission cable is, in fact, greater than the density of corals on the adjacent seafloor areas. The first coral detected on the anchor chains was *P. meandrina* sighted in February 2005 (see Table 1 in Appendix A for representative data). More coral recruitment has been observed on the anchor chains than on any other portion of the equipment complex. *Pocillopora meandrina* (Figure 3-3, Photo A) was the overwhelmingly dominant recruit (>90%) of all recruits observed. The other species which were observed growing on the anchor chains were *P. damicornis* (native), *Montipora capitata*, and *Porites lobata*. In spite of signs of predation by parrotfish in 2005, the number and size of the colonies steadily increased through 2007. By 2011, the subjectively estimated biomass of corals growing on the anchor chains was greater than in 2007, but the total number of colonies was less.

Within less than 18 months of the transmission cable installation at the existing shallow-water WET berth, the flora and fauna on the cable closely matched the flora and fauna adjacent to the cable and within 81 ft (25 m) on either side (see Figure 3-3, Photo B). At the time of the May 2011 survey, the cable supported a healthy cover of turf algae, crustose coralline algae, other algae, and scleractinian corals (see Figure 3-3, Photo C). Macroscopic biotic cover, including the coral *P. meandrina*, was greater on the power cable than on the seafloor at all depths. This was to be expected, because much of the seafloor is covered with unstable sand and rubble, while the power cable provides a stable, hard surface that is slightly elevated and thus less vulnerable to sand scour. Pocillopora meandrina provides important microhabitat for many small invertebrate species as well as certain fin fish. Its presence may contribute to an increase in biomass and biodiversity in the study area.

3.7.4 Marine Vegetation

While species such as the calcareous Green algae *Halimeda sp*. and the Brown algae *Padina sanctae-crucis* (both native to Hawaii) were well represented and abundant in some areas in the vicinity of the shallow-water WET berth equipment, the majority of the algal cover was contributed by turf algae. The power transmission cable installed and used for the 2003 WET shallow-water device had been overgrown by the surrounding algal species (see section 3.7.3 Marine Invertebrates). There was no differentiation between the biotic cover of the seafloor and the cable.

No invasive macroalgae were observed during the surveys. Seagrass only occurs in very small patches in the project area (i.e., in the Reef Flat Zone).

3.7.5 Fish and EFH

Table 3-2 summarizes selected fin fish sightings during the 2005 to 2007 and May 2011 surveys. The anchor base and associated equipment appear to have increased habitat complexity and vertical relief, resulting in an increase in fin fish diversity and biomass in the immediate vicinity; however, no statistical comparisons were made. Between 2003 and 2007, the Bluestriped snapper (*Lutjanus kasmira*), Yellowfin goatfish (*Mulloidichthys vanicolensis*) and Threespot Chromis (*Chromis verater*) were the most abundant species during most survey periods. Estimates for schooling reef fish species vary dramatically both spatially and temporally. Figure 3-3, Photo D shows a few of the fish species most commonly sighted during the surveys.

events have occurred during that time period around Oahu. The bleaching observed on some of the corals within the study areas was not considered to be significant, based upon the low percentage of colonies exhibiting bleaching (<10 percent) and the degree to which those colonies were bleached. Fewer than 10 colonies were observed to have been bleached to the point of complete colony mortality during the observation periods covered by this report.

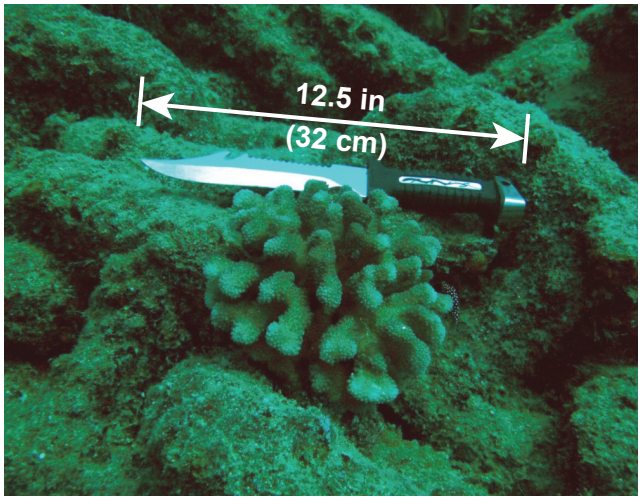


Photo A: *Pocillopora meandrina* on anchor chain. Note dense cover of turf algae. (May 2011)

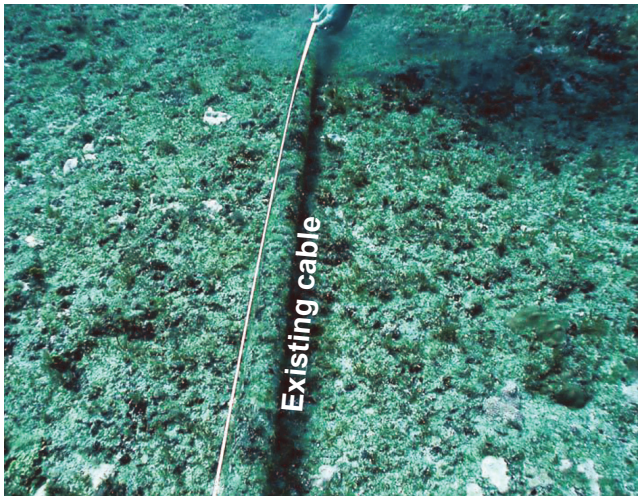


Photo B: Power transmission cable in seaward portion of Reef Flat Zone; note that cable is nearly indistinguishable from the surrounding sea floor. (September 2004)

Photo C: Hawaiian Bigeye (*Priacanthus meeki*) with Bluestriped snapper (*Lutjanus kasmira*) in background. Photo taken adjacent to existing anchor base. (May 2011)

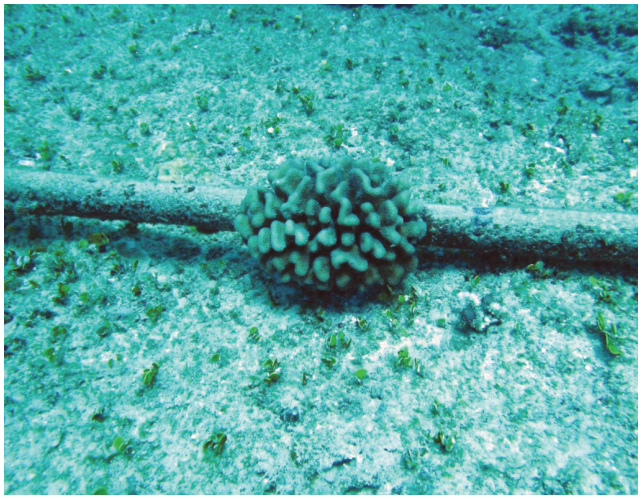


Photo D: *Pocillopora meandrina* (tentative) on power transmission cable at approximately 50-ft (15-m) depth. (May 2011)

Source: NAVFAC EXWC 2011

Representative Marine Biota Photos (Existing Shallow-Water WET Berth) **Figure 3-3**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

Table 3-2: Summary of Fish Abundance Estimates for Selected Species and/or Groups (Existing Shallow-Water WET Berth)

Species	Range of Individuals Sighted		
	Oct 2003 to Sept 2004	Oct 2004 to June 2007	May 2011
Bigeyes - Priacanthidae *Priancanthus meeki*	<10<25	<10<50	<10
Butterflyfishes - Chaetodontidae All species	>25<50	>25<100	>25<50
Damselfishes-Pomacentridae *Chromis verater*	>25<200	>50<200	>25<100
Dameslfishes - All other species	>25<100	>25<100	>25<50
Moray Eels-Muraenidae All species	0 - 1	0 - 4	1
Goatfishes-Mullidae *Mulloidichthys vanicolensis*	<25~100	>50<200	>25<50
Goatfishes - All other species	<10<100	>25<200	>10<25
Groupers - Serranidae *Cephalopholis argus*	0 -3	0 - 6	0
Jacks, Trevallies, Mackerel Scad - Carangidae *Caranx melampygus*	0 - <10	0 - <25	<10
Jacks, Trevallies, Mackerel Scad *Decapterus macarellus & Selar crumenopthalmus*	0<100	0 - <200	<25
Jacks, Trevallies, Mackerel Scad All other Jacks & Trevallies	0-5	0-<25	0
Parrotfishes-Scaridae All species including juveniles	>25<50	>25<50	>25<50
Puffers & Porcupinefishes -Tetraodontidae & Diodontidae All Species	<10 to <10	<10	<10
Snappers - Lutjanidae *Lutjanus kasmira*	0~500	>50<500	>25<50
Snappers (Jobfish) *Aprion virescens*	0<10	0<10	0
Snapper - All other species	<10<25	>10<100	>10<25
Emperors-Lethrinidae *Monotaxis grandoculis*	>10<25	>10<50	<10
Squirrelfishes-Holocentridae All species	>10<50	>10<50	>10<25
Soldierfishes-Holocentridae All species	>10<25	>10<25	>10<25
Surgeonfishes-Acanthuridae All Species	<10<25	>10<50	>10<25
Unicornfishes-Acanthuridae All Species	0<25	0<25	0
Triggerfishes-Balistidae All species	<10 to <10	<10 - <25	<10
Moorish Idol-Zanclidae *Zanclus cornutus*	>10<25	>10<25	>10<25

Source: NAVFAC EXWC 2011, Table 4.

Essential Fish Habitat for several fish species complexes (e.g., adult and juvenile bottomfish, eggs and larvae) and crustacean species assemblages (e.g., juvenile, adult, and larvae of spiny lobsters) are found in waters around pertinent MCB Hawaii coastlines (MCB Hawaii 2011). No HAPC has been designated or identified in the project area (i.e., existing and proposed WETS berth and infrastructure locations and transmission line routes).

Executive Order 13112, Invasive Species (64 FR 6183) defines “invasive species” as an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Other than three fish species intentionally introduced in the 1950s from French Polynesia as potential game fish, no alien or invasive flora or fauna were detected by Navy biologists at the shallow-water WET berth anchor base, power transmission cable or adjacent surveyed areas. During the multi-agency marine

ecological assessment performed in 2004, no alien or invasive species were reported from study sites closest to the shallow-water WET berth project area. The three introduced fin fish species are the Peacock grouper (*Cephalopholis argus*), Blacktail snapper *Lutjanus fulvus*) and Bluestriped snapper (*Lutjanus kasmira*). These non-indigenous species were described as "invasive" in the MCB Hawaii Coral Reef Ecosystem Management Study (Sustainable Resources Group International, Inc. 2002). The Bluestriped snapper was the most numerically abundant species during the May 2011 surveys and ranked between first and third on all previous surveys.

The existing shallow-water wave energy equipment provides stable hard substrate and vertical relief on an otherwise sandy and slightly homogeneous substrate. This may result in an increase of invertebrate recruitment and habitat complexity, which in turn may potentially increase overall biomass and diversity of invertebrates and fish around the equipment.

3.7.6 Critical Habitat

One of the purposes of the ESA is to conserve those ecosystems on which the species are dependent in order to promote the species' survival and recovery. Areas considered essential for survival and recovery may be proposed for designation as "critical habitat." While terrestrial areas of MCB Hawaii and adjacent marine waters out to 500 yd (454 m) from its shorelines are specifically excluded from the proposed designation, the planned deep-water WETS berths are within an area that has been proposed for Hawaiian monk seal critical habitat designation (76 FR 32026, 2 June 2011).

3.8 | Terrestrial Biological Environment

3.8.1 Flora

Native seastrand vegetation and non-native koa haole (*Leucaena leucocephala*) shrub land are dominant plant communities along the proposed onshore cable route, new electrical equipment facilities, and at Building 614 in the Horizontal Directional Drilling (HDD) site. Native sea strand vegetation occupies the undeveloped shorelines of Hilltop Beach and the cable landing site shoreward of the sandy beach. Native coastal plants such as naupaka (*Scaevola sericea*), pauohiiaka (*Jacquemontia ovalifolia*), ilima (*Sida fallax*), ohelo kai (*Lycium sandwicense*), and akulikuli (*Sesuvium portulacastrum*) are present. Non-native species such as silky jackbean (*Canavalia sericea*), Chinese violet (*Asystasia gangetica*) and various grasses are also present at the cable landing site. The flora at the proposed electrical equipment shelter near the TACAN and at Building 614 is dominated by non-native plants such as koa haole (*Leucaena leucocephala*), Guinea grass (*Panicum maximum*), and Chinese violet (*Asystasia gangetica*). A list of all plants observed during a 4 November 2011 site visit by NAVFAC Pacific Natural Resources Branch staff to the Surface-Laid Cable Alternative overland route and the vicinity of Building 614 is listed in Table 3-3.

MCB Hawaii follows an ecosystem management approach in managing natural resources within its jurisdiction, according to the INRMP (MCB Hawaii 2011) (see discussion of INRMP in Section 4.16.2).

3.8.2 Fauna

There are no critical habitats on MCB Hawaii and the project area is not within or adjacent to any wildlife sanctuaries. While wetlands and Wildlife Management Areas on Mokapu Peninsula provide breeding habitat for waterbirds, no such habitat exists within the proposed terrestrial project area. Migratory seabirds and shorebirds frequent the shoreline of Hilltop Beach. Some of these birds are protected under the MBTA. MBTA birds observed along the project area shoreline include iwa or great frigatebird (*Fregataminor palmerstoni*), and kolea or Pacific golden plover (*Pluvialis fulva*). Uau kani or wedge-tailed shearwater (*Puffinus pacificus*) have been observed seasonally in the general vicinity of the cable route (MCBH 2006). Birds have attempted to nest near this location but no nests have been successful. Management actions for shearwaters are not conducted at this location due to the proximity to the fixed-wing runway (Runway 4/22) and the potential for Bird Aircraft Strike Hazard (BASH). Laysan albatross (*Phoebastria immutabilis*) may occur in the area seasonally during the months of November to February.

Similar migratory seabirds would be present in the area proposed for the electrical equipment shelter and VFI (i.e., near the TACAN relocation site) as at the cable landing site. These include the iwa or great frigatebird (*Fregataminor palmerstoni*), and kolea or Pacific golden plover (*Pluvialis fulva*). The kolea only occur seasonally from the months of November to May. Due to its proximity to the runway, this area is managed to prevent BASH.

Table 3-3: Plants Observed at Potentially Affected Terrestrial Areas

Common Name	Scientific Name	Family
Century plant	*Agave sisalana*	Agavaceae
Beggar's tick	*Bidens alba*	Asteraceae
Sourbush	*Pluchea carolinensis*	Asteraceae
Christmas berry	*Schinus terebinthifolius*	Anacardinaceae
Seaside heliotrope	*Heliotrope curassavicum*	Boraginaceae
Tree heliotrope	*Tournefortia argentea*	Boraginaceae
Australian salt bush	*Atriplex semibaccata*	Chenopodiaceae
Pohuehue	*Ipomoea pes-caprae subsp. brasiliensis*	Convolvulaceae
Pau o hiiaka	*Jacquemontia ovalifolia subsp. sandwicensis*	Convolvulaceae
Silk Jackbean	*Canavalia sericea*	Fabaceae
Koa haole	*Leuceaena leucocephala*	Fabaceae
Naupaka	*Scaevola sericea*	Goodenaceae
Chinese violet	*Asystasia gangetica*	Limaceae
Ilima	*Sida fallax*	Malvaceae
Milo	*Thespesia populnea*	Malvaceae
Alena	*Boerhavia repens*	Nyctaginaceae
Pitted beardgrass	*Bothriochloa pertusa*	Poaceae
Buffelgrass	*Cenchrus ciliaris*	Poaceae
Guinea grass	*Panicum maximum*	Poaceae
Akiaki	*Sporobolus virginicus*	Poaceae
Akulikuli	*Sesuvium portulacastrum*	Portulacaceae
Ohelo kai	*Lycium sandwicense*	Solanaceae
Vervain	*Stachytarpheta cayennesis*	Verbenaceae

Source: NAVFAC Pacific 2011 site visit

Establishment of any avian wildlife within the vicinity of proposed project footprint is not favored by MCB Hawaii due to the proximity to Runway 4/22 and potential for BASH. These areas as well as the general vicinity of Building 614 are patrolled by the U.S. Department of Agriculture Wildlife Services to manage BASH.

Terrestrial mammals known to transit the project site include feral cats, mongoose, and rats.

3.8.3 Threatened and Endangered Species

As described in Section 3.7.1, the Hawaiian monk seal (*Monachus schauinslandi*) is listed as "endangered" under the ESA. It is present along the shoreline of North Beach, where individuals occasionally haul-out and rest on the beach near the end of the Kaneohe Klipper Golf Course. It has also

been sighted on the shoreline near the existing shallow-water WET berth transmission cable landing and on Pyramid Rock Beach (MCB Hawaii 2011). The Hawaiian monk seal is the only ESA-listed threatened or endangered species that is known to occur near the terrestrial areas potentially affected by the Proposed Action. MCB Hawaii staff and Hawaii Monk Seal Response Team Oahu volunteers monitor the presence of monk seals that use beaches along MCB Hawaii's shoreline areas. NOAA Fisheries is in the process of revising critical habitat for the Hawaiian monk seal and is considering areas within the Main Hawaiian Islands; however the terrestrial project area currently does not include any existing or proposed Hawaiian monk seal Critical Habitat.

3.9 | Land and Water Use Compatibility

The MCB Hawaii-controlled terrestrial and offshore areas that may be affected by the Proposed Action and the HDD Alternative support a variety of uses, including operational, recreational, open space, and family housing. Onshore, land uses in the vicinity of the terrestrial cable route, electrical equipment facilities, surface segment of the HDD cable, and Building 614 include: Hilltop Beach to the north; the aircraft runway to the west; existing and proposed TACAN facilities east of the surface cable route; Officers' Family Housing atop the hillside directly south of Building 614; and the Kaneohe Klipper Golf Course to the southeast.

There are safety and clearance zones associated with the airfield at MCB Hawaii Kaneohe Bay (see Figure 1-2). For the fixed-wing runway (Runway 4/22), these include:

- Primary Surface – an area on the ground that extends 750 ft (228.6 m) on either side of the runway centerline and extends 200 ft (61 m) beyond the ends of the runway.
- Clear Zone (CZ) – areas on the ground that extend 3,000 ft (914.4 m) from each end of the runway to provide aircraft overrun areas and unrestricted visibility on airfield lighting. The CZs are trapezoidal in shape. The starting width (at the runway end) is 2,000 ft (609.6 m) wide, while the ending width is 2,784 ft (848.6 m).
- Accident Potential Zone (APZ) I and II – APZ I begins at the end of the CZ, is 3,000 ft (914.4 m) wide and 5,000 ft (1,524 m) long. APZ II is the area extending beyond APZ I to 15,000 ft (4,572 m) from the runway end. APZ II is 3,000 ft (914.4 m) wide and 7,000 ft (2,134 m) long.

The existing utility vault for the shallow-water WET berth is located within the CZ for Runway 4/22. The temporary airfield safety waiver (KNB-23/K-35[T]) that allowed the utility vault to be installed within the CZ was modified into a permanent waiver by letter of 6 September 2012. The waiver also included installation of a second utility vault to support the new deep-water WETS berths. Both utility vaults are or will be located below the elevation of the runway primary surface.

The proposed electrical equipment shed and VFI are within the Runway 4/22 CZ and airfield safety waivers have been requested for their installation.

In addition, entry into shoreline areas extending 300 ft [91 m] outward on either side of the main runway is restricted.

The proposed deep-water WETS berths are located at depths of 197 ft (60 m) and 269 ft (82 m), respectively, in waters within a Naval Defensive Sea Area (NDSA), established by EO 8681 in 1941.[7]

[7] EO 8681 states that "…the territorial waters within Kaneohe Bay between extreme high water mark and the sea and in and about the entrance channel within a line bearing northeast true extending three nautical miles from Kaoio Point, a line bearing northeast true extending four nautical miles from Kapoho Point, and a line joining the seaward extremities of the two above-described bearing lines, are hereby established and reserved as a naval defensive sea area for purposes of national defense, such area to be known as "Kaneohe Bay Naval Defensive Sea Area"; and the airspace over the said territorial waters is hereby set apart and reserved as a naval airspace reservation for purposes of national defense, such reservation to be known as "Kaneohe Bay Naval Airspace Reservation." The proposed deep-water WETS sites are located within the NDSA boundaries identified in the EO.

MCB Hawaii restricts access and use in waters around its perimeter extending from the shoreline to 500 yd (457 m), an area designated as a security buffer zone (hereinafter referred to as the 500-yd buffer zone). Entry restrictions imposed by EO 8681 were suspended for the area within the NDSA but outside the 500-yd (457-m) buffer zone (32 CFR §761.4[d][7]); however, they are subject to reinstatement at any time when required for national defense. See Section 3.11 Recreation for a more detailed discussion of allowable recreational use and access in areas affected by the Proposed Action and HDD Alternative.

3.10 | Cultural Resources

Cultural resources are defined as districts, landscapes, sites, structures, objects, and ethnographic resources, as well as other physical evidence of human activity, that are considered to be important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources include archaeological resources, historic architectural resources, and traditional cultural properties related to prehistoric/pre-contact (prior to European contact) and historic/post-contact periods.

Properties are evaluated for nomination to the NRHP and for NRHP eligibility using the following criteria (36 C.F.R. § 60.4(a)-(d)):

Criterion A: Be associated with events that have made a significant contribution to the broad patterns of American history

Criterion B: Be associated with the lives of persons significant in the American past

Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction

Criterion D: Yield, or may be likely to yield, information important in prehistory or history

MCB Hawaii established the Proposed Action's area of potential effect (APE) (as defined at 36 CFR § 800.16(d)), with respect to NHPA Section 106 compliance, to be limited to the footprint of the WETS project, which includes the installation of the transmission cables and rehabilitation of Building 614. The APE for the affected area is shown in the site maps included in Appendix B (NHPA Section 106 Correspondence).

3.10.1 Archaeological Sites

The Mokapu Burial Area (Site 1017) is one of 52 recorded archaeological sites on Mokapu Peninsula, and is considered of particular significance. Site 1017 is listed on the NRHP under Criteria A (associated with events that have made a significant contribution to the broad patterns of history) and D (have yielded, or may be likely to yield, information important in prehistory or history). It extends 0.9 mi (1.5 km) along the northern coastline of Mokapu Peninsula, from the east side of the Kaneohe Klipper Golf Course on the east to a point south of Pyramid Rock on the west. The site has an average width of about 2,460 ft (750 m) from the shoreline up and into the sand dunes. Although there had been numerous reports of human skeletal remains eroding from the Mokapu Dunes since the 1880s, the actual documentation of an intact burial was not made until 1915, with McAllister (1933)[8] establishing it as an archaeological site (Prishmont et al. 2000[9]; Tuggle and Hommon 1986[10]; Tuggle 2002[11]). Subsequent studies of the site

[8] McAllister, J. Gilbert. Archaeology of Oahu. B.P. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu. 1933.
[9] Prishmont, Laura Ann and Lisa Anderson. Archaeological Subsurface Testing in Conjunction with the Airfield Runway Repairs Project in the Mokapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii. Ogden Environmental and Energy Services Company, Inc. Honolulu. 2000.
[10] Tuggle, H. David and Robert J. Hommon. Historic Property Inventory, Marine Corps Air Station, Kaneohe Bay: History, Survey, and Site Descriptions. 1986.

have yielded an abundance of data regarding prehistoric Native Hawaiian burials and mortuary practices. More than 1,500 individual sets of remains have been found with a majority being traditional pre-Contact burials.

The Mokapu Burial Area is a significant archaeological site where archaeological features are known to be present. Access to the site by the general public is restricted; however, under the Archaeological Resources Protection Act (16 U.S.C. 470aa-9 470mm; Public Law 96-95 and amendments), cultural claimants are allowed to visit the site. Although it is not an active burial area, Site 1017 (along with other sites at MCB Hawaii) is visited by the Native Hawaiian community, especially those with cultural ties to the area (i.e., ancestors had once inhabited the area). Visitation requests are made to the MCB Hawaii Cultural Resource Manager and approval is coordinated with the MCB Hawaii Public Affairs Office and Base Security. Because Site 1017 spans a majority of the northern Mokapu Peninsula coastline, it is accessible from points other than the project area.

3.10.2 Historic Buildings/Structures

Building 614, known as Battery French, was constructed in 1943 by the U.S. Army and named in honor of Colonel Forrest J. French, who died in March 1944 during a campaign in the southwest Pacific. This concrete underground structure was constructed during WWII as part of the Coastal Defense Network for Oahu. One of only two extant artillery batteries at MCB Hawaii Kaneohe Bay, Battery French originally housed two 6-in (20-cm) guns (later removed) that were mounted in long range barbette carriages located on concrete pads with the guns' underground support areas and battery command post located between them (Mason Architects, Inc. 2012). Battery French featured advanced technology of its time such as powered operation and automatic controls. Its design resembles the Army's 200-series of batteries that were developed in the 1940s and is considered an intermediate seacoast weapon defense post.

Building 614 is 144 ft (44 m) in overall length, 60 ft (18 m) in overall width, and rises 15 ft (5 m) above ground surface. The battery has 6-ft thick (1.8 m) concrete walls and a roof covered with an earthen berm at least 3-ft (0.9-m) thick (Mason Architects, Inc. 2012). The guns were removed in the period following World War II, however the two concrete pads surrounding the circular gun emplacements have been retained. The ready boxes (concrete ammunition receptacles) remain at each entry of the battery. Building 614 retains its battery command post in the center of the berm, which afforded panoramic views of the ocean. A pyramidal concrete projection on the roof formerly supported the battery's radar antenna, once camouflaged with a water tank wooden structure. With the exception of Rooms 105 and 106 (used by the shallow-water WET device developers), the interior of Building 614 has not been used since the 1990s.

Building 614 is eligible for listing in the NRHP due to its significance as a military fortification for Oahu during WWII. The construction at that time was highly standardized and designed to withstand naval and aerial bombardment. Some of its character-defining features include:

- concrete structure; unadorned, painted flat surfaces (exterior and interior),
- berm over the concrete structure with natural vegetation,
- concrete pads where guns were mounted,
- concrete command post at the center of the structure,
- box-like entrances, and
- interior layout (T-shaped corridor system and spaces) (Mason Architects, Inc. 2012).

[11] Tuggle, H. David. A Preliminary Summary of the Bowles Records Concerning Mokapu Excavations, Oahu. 2002.

The facility retains integrity of design as a coastal defense fortification during WWII and is considered eligible for listing in the NRHP based on Criteria A (associated with events that have made a significant contribution to the broad patterns of history) and C (distinctive characteristics/design).

The view of the historic battery is primarily from the ocean and the adjacent military family housing neighborhood. It is fairly prominent on the hillside when viewed from the ocean, and the view from the adjacent family housing area is of the command center portion of the facility that protrudes from the center of the bunker and the berm, which is covered by natural vegetation.

3.11 | Recreation

An analysis of the Proposed Action's potential impacts on marine public safety and recreational uses was prepared by John Clark, and is included as Appendix C. This section incorporates information on existing conditions from the report. Mokapu Peninsula is a broad headland that separates Kailua Bay and Kaneohe Bay, and the waters off of Mokapu Peninsula are the primary transit corridor for small craft traveling between the two bays, as well as for boats arriving/departing Kaneohe Bay from other ports. Kailua Bay and Kaneohe Bay are recognized as the largest and most popular ocean recreation sites in Windward Oahu, with a number of public boat ramps providing access for trailered boats at each bay. In addition to the public boat ramp at Heeia Kea Small Boat Harbor, boating facilities along Kaneohe Bay include three private marinas (the 190-slip Kaneohe Yacht Club, the 80-slip Makani Kai Marina and the MCB Hawaii Marina and Outdoor Recreation and Equipment Center [for military members and other qualified individuals]), and a number of private piers and residential slips (Figure 1-1).

Boating and fishing are the primary activities that occur in and around the proposed deep-water WETS berths. Specific ocean activities include sailing, bottom fishing and trolling (both commercial and recreational), and non-motorized boats such as outrigger canoes and kayaks traversing the area. The route for boaters traveling between Kaneohe and Kailua Bays typically involves following Sampan Channel at the east end of Kaneohe Bay to Buoy R2, then passing the seaward side of Moku Manu Island. Some boaters elect to go through the channel between Moku Manu Island and Mokapu Point, informally known as "The Slot" (Figure 1-1). However, due to strong trade wind and seasonal high surf conditions, waters in The Slot are turbulent, so many boaters avoid it unless seas are calm. Boaters using The Slot pass between the existing shallow-water WET berth and proposed deep-water berths.[12]

A number of sailing races are held in the vicinity of the proposed deep-water WETS berths. A typical race course involves starting at the R2 Buoy (the head buoy at Sampan Channel) out to Moku Manu Island and back. Other races include the Kalakaua Cup, an annual sailboat race from Waikiki to Kaneohe that transits the NDSA, with boats heading for Sampan Channel, and the Pacific Cup, a sailing race from California to Hawaii (finishing in Kaneohe Bay) held in even-numbered years. Boats competing in the Pacific Cup normally pass seaward of Moku Manu Island, but may proceed through The Slot if conditions are calm.

Bottom fishing and trolling are popular in the project area seaward of the 500-yd (47-m) buffer zone**.** The area around the 100-ft (30-m) depth contour is known as "Ono Run" for the ono, or wahoo (*Acanthocybium solandri*), that are attracted to the ledge. Fishing also occurs for aku or skipjack tuna (*Katsuwonus pelamis*), uku or gray snapper (*Aprion virescens*), moano kali (*Parupeneus cyclostomus*), and other bottomfish species.

Activities within the 500-yd (457-m) buffer zone are strictly controlled, and all vessels within this area are subject to inspection (MCB Hawaii Base Order P1710.1, 12 June 2012 Base Recreational Activities).

[12] A small arms range surface danger zone emanating from a rifle range located within Ulupau Head Crater extends over water beyond Moku Manu Island (including The Slot). Passage through this danger zone is periodically prohibited (marked by flags). A boat guard is posted to watch for boats that may enter the danger area during training exercises with machine guns or larger weapons. Firing is ceased until the transiting boat has safely cleared the area (NAVFAC Hawai'i 2006a).

Access for recreational boating activities within the restricted access area is limited to active duty military personnel and MCB Hawaii civilian employees, and no commercial fishing is allowed. Commercial fisherman, individuals and/or organizations desiring entry into this restricted area are required to apply in writing to the Commanding General, MCBH Kaneohe Bay. The existing shallow-water WET berth is located approximately 0.5 mi (0.8 km) offshore, seaward of the 500-yd (457-m) buffer zone. The proposed deep-water WETS berths would be located at the depths of 197 ft (60 m) and 269 ft (82 m), respectively, approximately 1.5 mi (2.4 km) offshore, outside the 500-yd (457-m) buffer zone but within the boundary of the NDSA established by EO 8681.

Designated coastal recreational areas along the northern shoreline of the installation are located at Pyramid Rock Beach, Hilltop Beach and North Beach (Figure 1-2). Pyramid Rock Beach is located to the west of the main runway, and both Hilltop Beach and North Beach are to the east of the main runway. (Entry into shoreline areas extending 300 ft [91 m] outward on either side of the main runway is restricted.) Recreational activities along the shoreline are typical of coastal areas, including beachcombing, bodysurfing, surfing, swimming, fishing and diving, with most of the activities taking place within 1,000 ft (305 m) of shore. Recreational use of these shoreline areas is limited to active duty, retired, Reserve, and National Guard military personnel and their families, current and retired MCB Hawaii civilian employees, and guests sponsored by DOD active duty service members and their dependents, and Reserve, National Guard or retired DOD service members. Access to the general public is limited to scheduled community events. The terrestrial transmission cable route and supporting electrical facilities area not within any areas designated for recreational use. Generally, very little swimming, surfing, snorkeling or other recreational activities take place between Pyramid Rock and the proposed deep-water WETS (i.e., more than 1,000 ft [305 m] from shore), with the exception of limited diving activities between the R2 Buoy and Moku Manu Island. Some SCUBA diving occurs near Moku Manu, mainly on the underwater ledges that are on the seaward and east sides of the island. These offshore areas are accessed by boat rather than by persons in the water (i.e., swimming or snorkeling).

3.12 | Infrastructure

The discussion of infrastructure is limited to the electrical power system, as the Proposed Action and HDD Alternative would not include substantive additional demand for or changes to other infrastructure or utility systems (e.g., potable water, wastewater, stormwater drainage, transportation facilities).

HECO supplies electrical power to MCB Hawaii via two 46-kilovolt (kV) transmission lines. These lines enter at HECO's Mokapu Substation, located near the Main Gate, at which there are three 10/12 megavolt ampere transformers that step down the incoming voltage to the on-base primary distribution voltage of 11.5 kV. The power is fed to MCB Hawaii Main Substation in Building 5092, where it is then distributed to three substations (Building 1125 [Substation #1], Building 820 [Substation #2], and Building 5033 [Substation #3]), then distributed throughout the installation, including to Building 614.

Monthly electrical usage data for Fiscal Year (FY) 2008 to FY2010 show the following:[13]

- FY08 114,805 megawatt hours (Mwh) annual / 313 Mwh average day
- FY09 107,069 Mwh annual / 293 Mwh average day
- FY10 107,155 Mwh annual / 294 Mwh average day

The average electrical load of the MCB Hawaii electrical grid is approximately 14 megawatts (MW). The existing terrestrial power lines from the shallow-water WET berth connects to the underground MCB Hawaii electrical distribution system at a point adjacent to the south of Building 614 (see Figures 2-6 and

[13] MCB Hawaii Facilities Department in Final Environmental Impact Statement for the Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii (Navy 2012a). The annual average day energy usage is based upon varying days for each year vice 365 days/year.

2-7). There are existing below grade electrical and communications vaults located along an unimproved roadway near the proposed electrical equipment shelter site (see Figure 2-6).

3.13 | Public Safety

Public safety considerations along the shore and within the nearshore portions of the project area are addressed in MCB Hawaii Base Order P1710.1 (12 June 2012). During periods of high surf, powerful longshore currents, especially at Pyramid Rock Beach, can pose hazards to swimmers and surfers. According to MCB Hawaii Base Order P1710.1, lifeguards are assigned to Pyramid Rock Beach and North Beach, but not to Hilltop Beach. Lifeguards are normally on duty Monday through Friday from 1130 to 1800 and on weekends, holidays, and liberty periods from 0800 to 1800. Lifeguards have authority to enforce regulations pertaining to beach safety. Military police, MCB Hawaii Waterfront Operations staff, and the MCB Hawaii Federal Conservation Law Enforcement Officer monitor entry into the buffer zone and enforce all Federal and State statutes, regulations and regulations within the buffer zone. Air traffic controllers in the tower also watch for violators.

As noted in Section 3.9 Land and Water Use Compatibility, entry into shoreline areas extending 300 ft (91 m) outward on either side of the main runway—including the area in which the onshore portions of the existing and proposed transmission cables are located--is restricted.

3.14 | Visual Resources

With its notable geographic landmarks (e.g., Ulupau Head Crater, Pyramid Rock, Nuupia Ponds complex), Mokapu Peninsula is a visual resource for public views from multiple Windward Oahu communities, hiking trails in the Koolau Mountains, and offshore in Kaneohe Bay, Kailua Bay, and the Pacific Ocean. Views of the northern Mokapu Peninsula coastline and Pacific Ocean from shoreline areas and the Officers' Family Housing area are striking and picturesque. Because of its distance offshore, a WEC device at the existing shallow-water WET berth is almost imperceptible from the Mokapu Peninsula shoreline without the use of magnifying equipment.

Chapter 4

Environmental Consequences

This chapter evaluates the probable direct, indirect, short-term, long-term, and cumulative impacts of the Proposed Action, the HDD Alternative, and the No Action Alternative on relevant environmental resources. For each resource area, the chapter describes direct and indirect impacts of the three alternatives. Potential cumulative impacts, including climate change and greenhouse gases, are discussed in a separate section (Section 4.15).

4.1 | Climate and Air Quality

4.1.1 Proposed Action

Due to its size, non-polluting operations, and temporary nature of the emissions associated with its construction and installation, the Proposed Action would not significantly impact local or regional climatic conditions or air quality. There would be short-term, temporary increases in air emissions during the construction/installation period associated construction vehicles/equipment on land and work boats/equipment in the water.

During the operational period, there would be infrequent use of small boats to transport inspection and maintenance personnel to the WEC devices and mooring system. Decommissioning and removal of the WEC devices and associated infrastructure would utilize similar vessels and equipment as in their installation. No air quality permits are anticipated to be required for operation of these vehicles and equipment.

The Proposed Action would not violate the General Conformity Rule of the Clean Air Act, as it is not expected to cause or contribute to violations of the NAAQS during the construction, operational, or decommissioning periods.

Construction, operational, maintenance, and decommissioning period exhaust emissions from operation of equipment and vessels under the Proposed Action have been estimated for the criteria pollutants.[1] The total aggregate emissions are summarized in Table 4-1, expressed in tons per year. The total exhaust emissions—even aggregated into a single year--are estimated to be well below the de minimis levels used to gauge and minimize air quality impacts in nonattainment areas (i.e., 100 tons per year). The project area is within an attainment area and therefore, not subject to the de minimis levels. The de minimis levels are presented in Table 4-1 in order to compare them with the estimated pollutant emissions levels.

[1] The air emissions that may result from the proposed action are addressed in this study for all criteria pollutants with the exception of lead. Lead emissions have been reduced significantly over years as a result of eliminating the use of lead-containing fuel. Ozone is a regional pollutant that is not normally addressed on a project basis; however, its precursor's emissions (NOx and VOCs) have been calculated for this project.

Table 4-1: Estimated Construction, Operations & Maintenance, and Decommissioning Equipment Exhaust Emissions

Description (a)	Count (c)	Total Hours Operated (c)	Horse-power (hp)	Load Factor (%) (d)	Emission Factor (grams/hp-hour) (e)						Emissions (tons/year) (f)						Notes
					SO_2	CO	PM_{10}	$PM_{2.5}$	NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	NOx	VOC	
Surface Laid Cable Alternative (Preferred)																	
Tugboat	1	456	500	30	140.62	0.78	0.25	0.24	7.92	0.01	10.59	0.06	0.02	0.02	0.60	0.00	(b)
Excavator	1	32	130	43	1.76	2.43	0.59	0.57	5.41	0.56	0.00	0.00	0.00	0.00	0.01	0.00	(g)
Crane, 90-ton	1	48	231	43	1.63	1.30	0.32	0.31	5.14	0.35	0.01	0.01	0.00	0.00	0.03	0.00	(h)
Backhoe loader	1	12	48	21	2.03	6.42	1.31	1.27	6.80	1.47	0.00	0.00	0.00	0.00	0.00	0.00	(i)
									Total Emissions (tons/year)		10.61	0.07	0.02	0.02	0.64	0.00	
									Criteria Pollutant Emissions (tons/year)		10.61	0.07	0.02	0.02	0.64	n/a	
									De minimis Levels (tons/year)		100	100	100	100	100	n/a	(j)
HDD Alternative																	
Tugboat	1	464	500	30	140.62	0.78	0.25	0.24	7.92	0.01	10.78	0.06	0.02	0.02	0.61	0.00	(b)
Excavators	1	32	130	43	1.76	2.43	0.59	0.57	5.41	0.56	0.00	0.00	0.00	0.00	0.01	0.00	(g)
Crane, 90-ton	1	52	231	43	1.63	1.30	0.32	0.31	5.14	0.35	0.01	0.01	0.00	0.00	0.03	0.00	(h)
Water wagon	1	160	420	43	1.74	3.03	0.74	0.72	6.18	0.75	0.06	0.10	0.02	0.02	0.20	0.02	
Drill rig & augers	1	1,080	176	43	1.65	2.36	0.56	0.54	6.68	0.57	0.15	0.21	0.05	0.05	0.60	0.05	
									Total Emissions (tons/year)		11.00	0.38	0.10	0.09	1.44	0.08	
									Criteria Pollutant Emissions (tons/year)		11.00	0.38	0.10	0.09	1.44	n/a	
									De minimis Levels (tons/year)		100	100	100	100	100	n/a	(j)

(a) Equipment grouped into classes; best available emission factors used for representative equipment types

(b) Tugboat category used for all construction, maintenance and decommissioning vessels (including small boats and larger cable/mooring deployment vessels); likely overstates emissions

(c) Because several different vessels/equipment used for varying durations, analysis was simplified by aggregating similar types into total hours operated during all phases (i.e., construction, operations, maintenance, decommissioning)

(d) Navy, Joint Guam Program Office July 2010 and Navy Bureau of Medicine and Surgery July 2010

(e) NONROAD model, USEPA, December 2008, as used in Navy Joint Guam Program Office July 2010 and Navy Bureau of Medicine and Surgery July 2010

(f) Tons/year = Count x Total Hours Operated x hp x Load Factor (%/100) x Emission Factor (grams/hp-hour)/454 grams per pound/2,000 lb per ton

(g) Represents cable-pulling equipment

(h) Represents all winches and cranes

(i) Trench digging equipment

(j) Source: 40 CFR 93 Section 153, as used in Navy Bureau of Medicine and Surgery July 2010. De minimis level for PM-10 is for moderate nonattainment areas.

Miscellaneous:

n/a = not applicable

Where emissions are reported as 0.00, they were calculated at <0.01 ton/year.

There may be insignificant beneficial air quality impacts elsewhere on Oahu during the operational period as electrical power generated at the deep-water WETS entering the MCB Hawaii electrical grid displaces an equivalent amount normally supplied by the local electrical utility's fuel powered sources (see discussion in Section 4.12 Infrastructure). However, based on experience with the wave energy testing at the shallow-water WET berth, the average power generated at the deep-water WETS is expected to be less than the daily fluctuation of power supplied to the base. Therefore, beneficial air quality impacts resulting from reduction in fuel-powered generation would be minimal and difficult to measure.

There may be long term beneficial impacts to climate and air quality as the deep-water WEC device test effort yields technical information to advance the understanding of capturing and converting clean, sustainable renewable energy from ocean waves, replacing fossil fuel consumption. The test effort itself would further the ability to quantify beneficial impacts of wave energy conversion technology on climate and air quality.

4.1.2 HDD Alternative

For reasons similar to the Proposed Action, the HDD Alternative would not significantly impact local or regional climatic conditions or air quality. Though total exhaust emissions through the life of the project for this alternative would be higher than under the Proposed Action, they would also be well below de minimis levels established for criteria pollutants in nonattainment areas (see Table 4-1). As the HDD Alternative would also be implemented within an attainment area, it would not be subject to meeting the de minimis pollutant emissions levels. However, similar to the Proposed Action analysis, these de minimis levels are presented for comparison purposes.

4.1.3 No Action Alternative

There would be no impacts to climate and air quality from the No Action Alternative, as no new temporary or permanent emissions would occur.

4.2 | Geology and Soils

4.2.1 Proposed Action

The Proposed Action would have insignificant short- and long-term impacts to soils and unique geological features at MCB Hawaii. Land disturbance associated with the Proposed Action would be limited to installation of a new onshore utility vault in the vicinity of an existing vault, approximately 3 to 5 new 1-in (2.5-cm) diameter steel reinforcing bars used to support new conduit pedestals, limited subsurface trenching for a new conduit (in a previously disturbed area), and a new above-ground electrical equipment shelter adjacent to the TACAN site. Trench dimensions would be approximately 18 to 36 in (0.46 to 0.9 m) wide by up to 36 in (0.9 m) deep. The installation of these components would result in minimal land disturbance and none would alter existing geologic or topographic features during construction, operation, maintenance or decommissioning activities. There has been no soil erosion associated with the existing pedestals serving the shallow-water WET site and none is expected to result from the three to five new pedestals proposed for installation.

4.2.2 HDD Alternative

The HDD Alternative would have insignificant short- and long-term impacts on soils and unique geological features at MCB Hawaii. Subsurface work for this alternative would include: drilling a 2,000-ft (609-m) long, 10-in (25.4-cm) diameter hole for the transmission cable conduit; construction of an electrical equipment shelter adjacent to Building 614; and possibly installing the cable trench below grade from the bore hole to the equipment shelter. The bore hole drilling process involves industry-standard procedures. Drilling the 2,000-ft (609-m) bore hole would result in approximately 20 to 30 yd^3 (15 to 23 m^3) of dried drill cuttings, which would be disposed of in a landfill. The dried drill cuttings could also be reused as fill material offsite. There would be minimal disturbance of surface soils at the HDD exit point near Building 614. This alternative would not impact unique geological or topographic features during construction, operation, maintenance or decommissioning activities.

4.2.3 No Action Alternative

There would be no impacts to soils or geology from the No Action Alternative because no new infrastructure or facilities would be installed in the project area and no topographic or geologic features would be altered.

4.3 | Shoreline Geomorphology

4.3.1 Proposed Action

The Proposed Action would not have significant short- or long-term impacts to MCB Hawaii shoreline resources. During the construction period, the transmission cable would be landed in the vicinity of the existing transmission cable. A backhoe, winch or other pulling equipment would be used to pull the subsea cables onshore and assist with their placement on land. Heavy equipment would be staged in locations that minimize disturbance to the shoreline (e.g., on existing unpaved roadway near end of runway). No removal of shore revetment material or sand is anticipated. The new split-pipe protected cables would follow a similar path to the new utility vault as an existing transmission cable. The new vault would be a modular unit assembled on-site and installed by small crane onto the concrete bed.

In the operational period, no significant impacts to shoreline geomorphology are expected from the Proposed Action. The existing shallow-water WET berth transmission cable transitions from the ocean over large boulders, traverses a narrow strip of sand to the base of a rock outcrop, and is then routed to the existing utility vault. Its minimal profile does not appear to have altered the underlying shoreline landforms or processes since its installation in 2003. Future conditions, with addition of two similar transmission cables in the same nearshore vicinity, are likely to be similar to the existing conditions, with little impact to the underlying shoreline geomorphology. Maintenance and decommissioning activities are not expected to impact shoreline geomorphology, as these activities would not involve any shoreline alteration.

4.3.2 HDD Alternative

This alternative would result in fewer short- and long-term impacts to shoreline geomorphology than the Proposed Action because the transmission cable would be brought to shore by means of a subsurface hole, and avoid direct impacts to the shoreline. Hand auguring the first 6 to 10 ft (2 to 3 m) of the HDD bore hole would have no impact on shoreline geomorphology because it would not take place along the shoreline. The HDD bore hole would be cased with an HDPE (plastic) pipe to preserve the integrity of the hole. The HDPE conduit would be left in place and each end would be capped and sealed off to prevent water or earth infiltration. The HDPE conduit would be sufficient to preserve the structural integrity of the surrounding earth. This alternative would have similar operations, maintenance and decommissioning effects as the Proposed Action.

4.3.3 No Action Alternative

The No Action Alternative would not impact shoreline geomorphology because no new equipment or infrastructure would be installed that has the potential of altering existing geomorphological conditions.

4.4 | Oceanographic Conditions

4.4.1 Proposed Action

The Proposed Action is not anticipated to significantly impact wave scattering or reflection and energy absorption. The deep-water WEC devices could alter the wave field in its immediate vicinity due to energy absorption and radiation.[2] However, due to the randomness of wave action, the distance between the deep-water WEC devices (>3,000 ft [>914 m]), and their distance from shore (>6,000 ft [>1,800 m]), their impact on the wave environment in the area, waves breaking on shore, or littoral processes inside the surf zone would be minimal.

[2] When a wave encounters an object (floating or otherwise), the wave energy can be blocked (i.e., absorbed) and/or reflected (i.e., radiated) to another direction.

The 2003 WET EA concluded that an array of six WEC devices deployed at the shallow-water WET berth would have negligible effects on wave transmission and reflection. The conclusion was based on analyses of wave height reduction due to wave scattering and wave height reduction due to energy absorption (Sea Engineering, Inc. 2002 in U.S. Navy 2003). A similar analysis was not conducted specifically for the proposed deep-water WETS. However, it is reasonable to conclude that the deep-water WEC devices would have negligible effects on wave transmission and reflection in nearshore waters because the WEC devices at the proposed deep-water berths would be over 2,000 ft (610 m) farther from shore, at much greater distances apart, and in much deeper water than what was considered in the modeled scenario for the shallow-water WET berth. Based on the earlier wave modeling, and taking into account the parameters of the proposed deep-water berths and potential WEC devices, the Proposed Action would have negligible impacts on the wave field or sediment transport.

The Proposed Action would have the beneficial effect of collecting oceanographic data for the deep-water WETS. The oceanographic condition data to be collected by the Waverider© buoys would record up to three years of data on wave direction and height at the deep-water WETS.

4.4.2 HDD Alternative

Because the deep-water WEC devices would be in the same locations as in the Proposed Action, this alternative would have similar impacts on oceanographic conditions (i.e., insignificant and beneficial) as in the Proposed Action.

4.4.3 No Action Alternative

The No Action Alternative would have no impact on oceanographic conditions because no new materials or equipment would be introduced that have the potential to alter existing processes.

4.5 | Water Quality

4.5.1 Proposed Action

The Proposed Action would not significantly impact water quality in the marine waters surrounding Mokapu Peninsula. The Proposed Action would require a Department of the Army Section 10 Rivers and Harbors Act permit for the installation of mooring infrastructure, power and communications transmission lines and WEC devices associated with this alternative. Best management practices would be employed in compliance with these permits to prevent discharges of potential pollutants into surrounding waters resulting from construction equipment and operations, including establishing and using spill containment areas during fueling activities associated with small portable equipment (see Section 2.2.4 for list of BMPs). The WEC devices would not contain fluids that could pose harm to the marine environment during the operational period. If the WEC devices deployed at the WETS use a power take-off system that requires hydraulic fluid, the fluid would typically be non-petroleum and environmentally-safe. Existing storm drainage and runoff control methods would not be altered as a result of the terrestrial installation activities. As noted in Section 4.2, there has been no soil erosion associated with the existing pedestals serving the shallow-water WET site and none is expected to result from the three to five new pedestals proposed for installation. Maintenance and decommissioning activities would not introduce potential pollutants into the marine environment.

Wave energy testing infrastructure and buoys have been deployed at the existing shallow-water WET berth since 2003; there has been no evidence of significant impacts to marine water quality due to their installation and operation. Therefore, because the deployment and operation of infrastructure and WEC devices at the proposed deep-water WETS would be similar to that conducted at the shallow-water WET berth, the Proposed Action is also anticipated to insignificantly impact water quality during the construction and operational periods.

As there are no drinking water sources, streams or wetlands in or adjacent to the terrestrial project area, and because there is little potential for the Proposed Action to leach any pollutants to surrounding terrestrial areas, the Proposed Action would not impact surface or ground water quality.

4.5.2 HDD Alternative

The HDD Alternative would have insignificant but greater impacts to marine water quality than the Proposed Action. Installation of the deep-water WETS anchoring system would be similar to the Proposed Action. However, the process of drilling the 2,000-ft (609-m) long bore hole for routing the transmission cable to shore would result in an estimated 3,000 gal (11.4 cubic meters) of drilling fluid being released to surface waters when the drilling reaches the underwater exit point. The volume of drilling fluid released into the ocean would be minimized as the drill head is pulled back to shore, drawing some of the drilling fluid back to the shoreside exit hole, where it would be dried and disposed of on land. Drilling fluid typically contains around 95% water and 5% bentonite (i.e., montmorillonite clay, which is a naturally-occurring mineral). Some additives may be used in smaller amounts to improve the properties of the fluid. Industry-standard additives known to have no adverse environmental effects would be used in the HDD Alternative. HDD drilling fluid is completely soluble in water and would quickly be dispersed by normal water currents. Turbidity would be temporary, quickly dispersed and not expected to impact marine biota.

With the exception of the discharge of drilling fluid as the drill head exits the bore hole, the drilling fluid system is a closed cycle system where used drilling fluid is pumped from an entrance pit in front of the drill rig to a recycling unit. In the recycling unit, cuttings from the bore are separated from the drilling fluid and stockpiled for disposal. The clean bentonite slurry is recycled back to the HDD drilling rig.

A USACE CWA Section 404/Section 401 WQC permit would be required for the release of drilling fluid into surface waters. The HDD boring process would comply with State of Hawaii DOH NPDES permit requirements to minimize water quality impacts. A drill management plan would be developed and implemented for the HDD Alternative that includes monitoring for fluid loss during operations, a fluid loss response plan, and installation of appropriate spill containment. Other BMPs could include use of drilling fluids that coagulate when coming in contact with ocean water to facilitate cleanup and removal. Because the bore hole would be cased with plastic pipe, no erosion of material from the hole is expected to enter marine waters during the operational period. There are no maintenance activities anticipated for the HDD conduit. Decommissioning activities would be similar to the Proposed Action, with similar insignificant impacts. The HDPE pipe used to case the bore hole would be left in place and each end would be capped and sealed off to prevent water or earth infiltration.

Similar to the Proposed Action, the HDD Alternative would not impact surface water quality due to the lack of wetlands or streams within or adjacent to the project area.

4.5.3 No Action Alternative

The No Action Alternative would have no impacts to marine or surface water quality because no deep-water WEC device moorings, equipment or infrastructure would be installed or operated in the project area marine environment or in or adjacent to Mokapu Peninsula surface waters.

4.6 | Natural Hazards

4.6.1 Proposed Action

The Proposed Action is not expected to affect the risks or potential of natural hazard occurrences such as flooding or tsunami, nor increase the severity of these hazards on life or property during construction, operations, maintenance and decommissioning activities. Building 614 (where Navy and WEC device developer staff would occasionally be present to monitor operations at the WETS berths) is not located in

a tsunami evacuation zone. Building 614 and the proposed electrical equipment facilities are located within FIRM Zone D (undetermined flood hazard) and further evaluation with respect to Federal floodplain management policies is not required.

Short sections of the proposed surface-laid cables would pass through Zones VE and AE. These sections of transmission cable would be protected by split pipe or other protective covering and anchored appropriately along their route.

The Proposed Action would not result in exposure to significant earthquake risks to public safety or property. The new terrestrial electrical infrastructure (e.g., equipment shed, VFI) would be designed to meet current Federal and State standards for the seismic zone in which they are located.

4.6.2 HDD Alternative

The HDD Alternative would have similar insignificant impacts with respect to natural hazards as the Proposed Action during construction, operation, maintenance or decommissioning activities, though under this alternative, no new surface equipment or infrastructure would be located above ground in Zones VE and AE. Similar to the Proposed Action, the HDD Alternative would not significantly impact earthquake risks to public safety or property.

4.6.3 No Action Alternative

The No Action Alternative would not impact the risks or potential of natural hazard occurrences, as no new surface equipment would be installed in Zones VE and AE.

4.7 | Marine Biological Environment

This section is organized by alternative (e.g., Proposed Action, HDD Alternative) and then resource (e.g., Threatened, Endangered and Protected Species, Marine Habitats, etc.). Recommended measures to avoid or minimize adverse impacts are provided after the discussion of each resource, where applicable or relevant.

4.7.1 Proposed Action

Based on the following analysis, the Proposed Action is not expected to significantly impact marine biological resources during construction, operation, maintenance or decommissioning of the deep-water WETS berths or its associated equipment and infrastructure. The Navy initiated informal ESA Section 7 and EFH consultation with NOAA Fisheries on 6 June 2013. The Navy subsequently submitted a revised ESA consultation package and request for concurrence by NOAA Fisheries (21 and 22 November 2013, respectively). The revised package did not contain changes to EFH material. The Navy determined that the Proposed Action may affect, but is not likely to adversely affect any species listed or proposed as Federally threatened or endangered, or their designated or proposed critical habitat. On 4 December 2013, NOAA Fisheries concurred with the Navy's determination[3]. Informal ESA and EFH consultation correspondence is included in Appendix D.

4.7.1.1 Threatened, Endangered and Protected Species

Marine Mammals. The Proposed Action is not likely to significantly impact marine mammals during in-water installation or decommissioning of the deep-water WETS berth infrastructure (due to collision hazard and sound) or operation and maintenance of the deep-water WEC devices (due to electrical

[3] NOAA Fisheries' concurrence addresses ESA compliance for all currently proposed and future WEC devices. ESA consultation must be reinitiated if 1) a take occurs; 2) new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the identified action is subsequently modified in a manner causing effects to listed species or designated critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

leakage, heat, electric and magnetic fields, entanglement). The sources of potential impacts to marine mammals are discussed individually in the following sections.

Although more than 25 species of marine mammals may occur in the U.S. EEZ around the Hawaiian Islands, many of the species are found in deeper water (i.e., greater than 984 ft or 300 m) and are rare visitors to the project area. Because the proposed WETS berths would be in water depths of 262 ft (80 m) or less, there are limited numbers of marine mammal species that utilize this area regularly. The marine mammals that may utilize the area near the deep-water WETS berths are humpback whale (*Megaptera novaeangliae*), spinner dolphin (*Stenella longirostris*), bottlenose dolphin (*Tursiops truncatus*), false killer whale (*Pseudorca crassidens*), short-finned pilot whale (*Globicephala macrorhynchus*) and Hawaiian monk seal (*Monachus schauinslandi*). On rare occasions, pantropical spotted dolphins (*Stenella attenuata*), pygmy killer whales (*Feresa attenuata*), melon-headed whales (*Peponocephala electra*), pygmy sperm whales (*Kogia breviceps*), and dwarf sperm whales (*Kogia sima*) may utilize the area. All marine mammals are protected by the MMPA. The ESA-listed marine mammals that could transit the project site are the Hawaiian monk seal, the humpback whale and the Main Hawaiian Islands insular false killer whale stock. Impacts to marine mammals from the existing shallow-water WET berth were assessed from 2001-2003 and again in 2011, before and after the first shallow-water WEC device was installed. During these surveys, no Federally threatened or endangered species or marine mammals were seen (or heard) within 1,640 ft (500 m) of the anchor base or power cable, although pods of spinner dolphins were sighted during transits through Kaneohe Bay and the Sampan Channel to and from the survey areas. Therefore, the general lack of marine mammals observed in the project area on a regular basis over time indicates a reduced risk of adverse impacts to marine mammals.

A. Collision Hazard

During installation and decommissioning of the new WETS berth infrastructure and scientific measuring devices (i.e., anchoring system, subsea transmission lines and equipment, Waverider© buoys, EMF probes, hydrophones, and ADCP), workboats and divers would conduct operations over a period of several hours to several days. In general, the workboats would be stationary or operate within a small area (e.g., during anchor mooring installation) or move methodically along a prescribed path (i.e., during the cable laying operation). These in-water operations would pose low risk to marine mammals, as vessel speeds would be low and controlled (i.e., 0.5 knots), and they could easily be avoided by any marine mammals in the area. During the operational period, the mooring lines, subsurface buoys, scientific monitoring equipment, and WEC devices would not pose a collision hazard to marine mammals, as these elements would be large enough to be easily detected in the environment and marine mammals are agile within their medium (i.e., under water). Maintenance activities (e.g., annual inspections and periodic maintenance) would also utilize small boats and pose similar low collision risk to marine mammals. There is low potential that the WEC devices would serve as a haul-out platform for Hawaiian monk seals or turtles because the structures are meant to respond to wave motion and do not present a stable surface on which to crawl. Most WEC devices are tall and would be difficult for these species to scale the sides. There has been no evidence of turtle or seal haul-outs onto the WEC devices tested at the shallow-water WET site during its operations.

B. Sound

Underwater noise associated with the Proposed Action has limited potential to affect marine mammals in nearshore waters around the project area. The activity with the noise source of greatest concern would be drilling the substrate for installation of rock bolts to secure the subsea cable to the seafloor. If this is required, it would be limited to the section of cable extending from the shoreline until a depth of approximately 100 ft (30 m). Anchoring and spacing of the rock bolts would be dependent on conditions of the affected substrate.

The sound pressure level (SPL) of the spectrum for hydraulic drills that would likely be used to drill the rock bolt holes in the seafloor range has been measured from about 10 hertz (Hz) to 40 kilohertz (kHz) by several studies. The report referenced for the shallow-water WET EA (Navy 2003) was performed by the Naval Civil Engineering Laboratory (John J. McMullen, Assoc. 1984).

The greatest SPLs occur between 1 kHz and 6.5 kHz. At these frequencies, the mean SPL reported was about 169 decibels (dB) re: 1 μPa at 6 ft from the drill. However, other more recent studies have reported somewhat lower SPLs. A study by Health and Safety Executive noted the sound pressure level from a Stanley hand drill underwater of 159 dB re 1μPa at 1 m (Anthony, Wright, and Evans 2009). Nedwell and Howell (2004) review of offshore wind farm related underwater noise sources reported an average for a variety of hand held tools of 161 dB re 1μPa at the source. A recent environmental impact assessment reported that rock socket drilling and drilling for the installation of large piles showed loudest measurement of 163 dB re 1μPa at the source (Nedwell et al. 2003, Ward 2012). Given the information in these reports, the Navy will assume an approximate level of 163 dB re 1μPa at the source for the hand drills to be used for installing the power cable for the deep water WETS.

The marine mammal species that may utilize the area are cetaceans that are considered to be in either the low-frequency functional hearing group (most sensitive from 7 Hz to 22 kHz, e.g., humpback whales) or the mid-frequency functional hearing group (most sensitive from 150 Hz to 160 kHz) (Southall et al 2007). Pinnipeds are considered a separate functional hearing group that can perceive frequencies between 75 Hz and 75 kHz (Southall et al 2007). The applicable noise criteria would be the general noise criteria that NOAA Fisheries applies for pile driving and other construction activities:

- hearing injury for cetaceans is 180 dB re 1μPa rms (root mean squared) and pinnipeds is 190 dB re 1μPa rms
- behavioral disturbance for marine mammals & pinnipeds is 160 dB re 1μPa rms for impulsive sounds and 120 dB re 1μPa rms for non-impulsive sounds

When these criteria and the criteria and the frequencies that are most important to the species being considered are taken into consideration, the noise impacts from the drills do not reach the level for hearing injury for cetaceans or pinnipeds even at the source. For a drill that has a SPL of 163 dB re 1μPa, the 120 dB re 1μPa isopleth would lie at 141 m from the drilling location. This SPL is calculated using the equation for spherical spreading loss where the received level is the transmission loss (TL) subtracted from the source level ($RL=SL-20\log_{10}(R)$, where RL is received level, SL is source level, TL is $20\log_{10}(R)$, and R is the range in meters from the source.

The rock drill is expected to produce sound that has no physical effects on marine mammal hearing, but can be greater than 120 dB re: 1 μPa. Therefore, the noise could cause behavioral responses in more sensitive marine mammal species. Marine mammal species found around Hawaii that are more likely to respond behaviorally to received SPLs above 120 dB re: 1 μPa are beaked whales, which are found in pelagic waters. The species that could occur in the project area are species that are relatively insensitive to noise (i.e. humpback whales, bottlenose dolphins, and spinner dolphins). The rock drill will be used in the presence of people and operating equipment and vessels. The physical cues of people and equipment are likely to discourage marine mammals from approaching the drill closely. The rock drills would be used for short, punctuated periods of time--several minutes at a time--instead for a sustained period of time. Furthermore, protective zones would be implemented during drilling operations to ensure that no harassment occurs to marine mammals (see BMPs listed in Section 2.2.4 and below). Rock drilling operations would not commence if a marine mammal is sighted within 1,640 ft (500 m) of the drilling site. If a marine mammal enters the zone after drilling has started, operations would cease if the animal approaches within 820 ft (250 m) of the drilling site (i.e., outside the estimated 120 dB re 1μPa isopleth of 141 m described in previous paragraph).

During the operational period, the WEC devices are expected to produce a continuous acoustic output with amplitudes approximately similar to that of light to normal ship traffic (e.g., in the range of 75 to 80 dB re: 1 μPa), with a spectral content shifted to frequencies somewhat higher than shipping (Sound and Sea Technology 2002 in Navy 2003). Thomson et al. (2012) provide the spectrum of 1/7 scale WEC device in Puget Sound. The report shows sound energy peaks at 20, 100, 300, 700, and 1500 Hz. They reported a level of 126 dB re: 1 μPa at 10 m from the device they measured. At close distances, such as 10 m, spherical spreading loss would be the

more appropriate model of sound transmission loss (in this case TL is 20log10(R)) and is more conservative about estimating the SPL. That is, in this case, it estimates the SPL at 1 m to be higher than using practical spreading loss. Using this approach, the SPL of the WEC device recorded by Thomson et al (2012) is estimated to be 151 dB re: 1 μPa at 1 m. The SPLs from the WEC systems are dependent on the conditions in which they are operating. Although no recordings of the sound of operation have been analyzed for the deep-water WEC devices, the maximum SPL is expected to be between 148 and 151 dB re: 1 μPa at 1m from the device. This judgment is based on the SPL that Thomson et al. (2012) report for their smaller scale device and adding 3 to 6 dB to the SPL based on engineers' best judgment about the noise that will be generated by a device that is larger than the one assessed in Thomson et al. The expected SPL of a WEC device is much less than the level required for hearing injury of cetaceans or pinnipeds.

The WEC devices are expected to levels of noise that are lower than the peak levels when average or below-average wave conditions are occurring. During high wave activity, a WEC device might have a SPL of up to 151 dB re: 1 μPa at 1 m, but the sound will occur amidst ambient wave noise, which will mask the sound to some degree. For a WEC device that has a SPL of 151 dB re 1μPa at 1 m, the 120 dB re 1μPa isopleth would lie at 115 ft (35 m) from the source, using spherical spreading loss. Under conditions of high ambient noise, the WEC device may be difficult to detect acoustically at distances greater than the 120 dB isopleth. Any behavioral disturbance, such as avoidance of the area, would occur at less than 115 ft (35 m) from the device. Due to the nature of the sound, its similarity to light vessel traffic, and its association with wave noise, exposed animals are expected to habituate to the sound which would make any behavioral modification or avoidance temporary.

Maintenance activities would be infrequent and involve use of small boats for short periods; they would be typical of those that transit the project area and would produce underwater noise levels common to the area. Specific tools used in decommissioning activities have not been determined, but are unlikely to be significantly different from those used in installation, and would thus generate noise levels similar to that of installation.

In addition, the acoustic monitoring hydrophones, included as part of the Proposed Action, are intended to measure sounds emitted by the deep-water WEC devices at various times throughout the operational period to quantify the project's impacts on the underwater noise environment. The data collected by the hydrophones would inform future WEC device deployments.

C. Electrical Leakage

During operation, there is a potential for the WEC devices to experience an electrical fault or short due to damage to the transmission cables. In the event of an electrical fault, there is a short period of time during which the electrical current generated by the WEC system would leak to seawater. However, the computer-controlled electrical fault detection and circuit interruption system would shunt (redirect) the electrical current to the load resistors within 6 to 20 milliseconds (ms), limiting the duration of the electrical field. If the fault persists, an electric field would develop in the vicinity of the fault. The voltage gradient would depend on the fault current and the distance from the fault.

A series of Navy studies on the effects of electrical fields found that fault durations of less the 20 ms and fault currents of less than 5 millivolts (mV) had only transient effects on marine life or divers (Sound and Sea Technology 2002 in Navy 2003). For divers, effects were generally described as a mild discomfort. The studies found no short or long-term effects from transient fields less than 20 ms and 5 mV; the only effects were transient. No other literature was found directly describing the effects of this type of highly transient electrical field on marine life. It is likely that electroreceptive species (i.e., species that can sense electric fields) would simply detect the field and be diverted away from the vicinity of the fault during the brief period while the ground fault system actuates. With the proposed WEC device system, this period of exposure would be 20 ms or less. To prevent electrical faults or shorts from occurring, the undersea transmission cables would be armored with steel wires and an external jacket that make it highly

resistant to damage. In addition, protection from leakage has been designed into the system. A computer-controlled fault detection and interruption system would divert the electric current from the cable and store it in load resistors in the event of a fault. Therefore, the Proposed Action is unlikely to significantly impact marine mammals due to electrical leakage during operation and maintenance activities. Decommissioning activities would not produce electrical leakage risks as there would be no electrical current running through the cables.

D. Heat

The energy loss from resistance in an undersea cable results in the generation of heat and dissipation of this heat to the surrounding environment. The resistive losses in the subsea transmission cable are calculated to range from 20 milliwatts (mW) per foot (0.3 m) of cable for a single buoy generating 20 kW of power to approximately 1.4 watts per foot of cable (0.3 m) for six buoys generating 250 kW.

Heat losses from the undersea transmission cables would have negligible impacts on seawater temperature in the vicinity of the cable, due to immediate dissipation by the natural flow of seawater. The large volume of seawater around the cable would keep temperature differences less than the natural differences due to solar heating, upwelling, and current-induced mixing. Heat released from the undersea electrical equipment (e.g., umbilical splice boxes) into the surrounding water is anticipated to be similar in nature to heat released from the undersea cable. Therefore, there would be insignificant impacts to marine mammals from heat dissipation from electrical infrastructure associated with the proposed WEC devices during operations and maintenance. Decommissioning would not result in heat loss because the transmission cables would not be energized.

E. Electric and Magnetic Fields

Power transmission cables can generate both electric and magnetic fields. The flow of seawater across the electric field of a power cable generates a weak magnetic field. Species with developed sensory receptors that can detect electric or magnetic fields could be affected by electric or magnetic fields. Electroreception (i.e., the sensing of electric fields by organisms) is not found generally among mammals, including those that are most likely to be present in the project area. There is conflicting evidence for magnetoreception (i.e., the sensing of magnetic fields by organisms) or use of the Earth's magnetic field in marine mammals (Klinowska 1985, 1988; Hui 1994; Brabyn and Frew 1994). But any evidence of marine mammals using geomagnetic information suggests that the information would be used at the landscape level instead of the bathymetric micro-feature level. Therefore, it is unlikely that electric or magnetic fields generated by the proposed subsea transmission cables during the operations and maintenance activities would significantly impact marine mammals. (Note: In addition, the EMF monitoring sensors, included as part of the Proposed Action, are intended to measure the electromagnetic field generated by the WEC devices at various times throughout the operational period to quantify the project's impacts. The data collected by the EMF sensors would inform future WEC device deployments.) No EMF would be generated during decommissioning activities because the cables would not be energized.

F. Entanglement/Entrapment

There has been no evidence that any Hawaiian monk seals or other marine mammals have ever become entangled or entrapped in any of the existing shallow-water WET berth equipment or infrastructure. The deep-water WETS berth power transmission cables would be attached to the seafloor to a depth of approximately 100 ft (30 m); therefore there is almost no likelihood of entanglement. None of the marine mammals that are likely to pass near the site dig or sift substantial amounts of substrate; therefore, it is unlikely that they would interact with the cable in a way that would dislodge the cable from the seafloor. Diver- or ROV-assisted cable laying would reduce risk of entanglement, as careful placement of the cable would ensure that it is flat on the seafloor and no loops in the cable are present to encircle marine mammals.

The elements of the WETS berth that will be present in the water column, such as the mooring chain and the mooring rope, are large, conspicuous, and will be under tension. Not only should these items be avoidable by a marine mammal swimming in the environment, they are also robust enough to resist breaking and entangling an animal if they come in contact with an animal. Both the chain and the rope have a breaking strength of close to 1,000,000 lbs (453,592 kg). The power cable will not be under tension, but is a stiff, large diameter (3.5-in [8.9-cm]) cable. It is not able to form loops, wrap around an object, or cinch tight on a relatively small diameter animal such as a marine mammal. Maintenance and decommissioning activities would pose little entanglement or entrapment risk to marine mammals because the infrastructure would either remain in place or be removed.

There are a series of precautionary BMPs that can be implemented during project installation that would increase stewardship toward marine mammals (see Section 2.2.4).

1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the Proposed Action for ESA-listed marine mammal species.

2. During construction or WEC device installation, surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

3. Personnel shall remain alert for marine mammals before and during drilling. Do not commence hand drilling if a marine mammal is observed within 1,640 ft (500 m) of operation. Wait 30 minutes after the last sighting of the marine mammal before starting to drill. If drilling is already started and a marine mammal is sighted within 1,640 ft (500 m) after drilling has commenced, drilling can continue unless the marine mammal comes within 820 ft (250 m) during drilling; operations should then cease until the animal is seen to leave the area of its own volition or after 30 minutes have passed since the last sighting.

4. All in-water installation and maintenance work shall be postponed or halted when ESA-listed marine species are within 50 yd (46 m) of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species (other than Hawaiian monk seals on land) are noticed within 50 yd (46 m) after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that the activity would not affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

5. All personnel will stay more than 150 ft (46 m) from Hawaiian monk seals that haul out on the beach.

6. Personnel will not perform work on the beach during the time that a Hawaiian monk seal is hauled out if the work would be so loud as to expose them to 100 decibels referenced to 20 μPa in-air.

7. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.

8. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

9. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.

10. When piloting vessels, vessel operators shall alter course to remain at least 100 yd (91 m) from whales, and at least 50 yd (46 m) from other marine mammals.

11. Reduce vessel speed to 10 knots (18.5 kph) or less when piloting vessels at or within the ranges described above from marine mammals.

12. If despite efforts to maintain the distances and speeds described above, a marine mammal approaches the vessel, put the engine in neutral until the animal is at least 50 ft (15 m) away, and then slowly move away to the prescribed distance.

13. Marine mammals shall not be encircled or trapped between multiple vessels or between vessels and the shore.

14. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

No significant impacts would occur to marine mammals from installation, operation, maintenance and decommissioning of the deep water WEC system, including from lighting and reflectors required by the USCG. Based on an assessment of available biological information, the Navy found that installation and operation of the deep-water WETS berths is not likely to adversely affect marine mammals because the effects of collision, sound, electrical leakage, heat, electromagnetic fields, entanglement or entrapment, and general disturbance are discountable or insignificant.[4] The Navy initiated informal consultation under Section 7 of the ESA with NOAA Fisheries on 6 June 2013 and determined that the Proposed Action may affect, but is not likely to adversely affect Federally threatened or endangered marine mammals. NOAA Fisheries concurred with this determination on 4 December 2013 that the Proposed Action would have insignificant impacts, or the likelihood of impacts would be discountable, for marine mammals (see Appendix D.2).

Protection under the MMPA would be provided in accordance with Navy policy documented in OPNAVINST 5090.1D. Considering the proposed project activities, evaluation of potential impacts (presented herein), and the protections afforded by law and Navy policy, the taking of marine mammals under the MMPA is unlikely during the installation and operation of the proposed deep-water WETS berth.

Sea Turtles. The Navy determined that the Proposed Action may affect, but is not likely to adversely affect sea turtles during in-water installation and decommissioning of the deep-water WETS berth infrastructure and associated scientific monitoring equipment (collision hazard and sound), and operation and maintenance of the WEC devices (electrical leakage, heat, electric and magnetic fields, entanglement). NOAA Fisheries concurred with this determination on 4 December 2013 that the Proposed Action would have insignificant impacts, or the likelihood of impacts would be discountable, for sea turtles (see Appendix D.2). The sources of potential impacts are discussed individually in the following sections.

The qualitative and quantitative data gathered by the Navy between 2003 and 2011 for the existing shallow-water WET berth indicate that no endangered hawksbill sea turtles (*Eretmochelys imbricata*) have been sighted at or in the general vicinity of the project site. Also, no threatened green sea turtles (*Chelonia mydas*) were sighted underwater and only one specimen was seen within 1,640 ft (500 m) of the shallow-water WET berth. The low abundance of turtles may be due to the lack of foraging and resting habitat, coupled with the less desirable high energy environment. Due to the low abundance of sea turtles in the general area, it is expected that the Proposed Action will not significantly impact sea turtles. Potential minimal impacts may include noise from securing the cable, avoiding or being attracted to the equipment, and entanglement in the subsea transmission cable during its installation.

[4] When used in ESA Section 7 determinations, “discountable effects” are those extremely unlikely to occur and “insignificant effects” are those that, based on best judgment, would not be able to be meaningfully measured, detected, or evaluated.

A. Collision Hazard

Similar to marine mammals, sea turtles could easily avoid collisions with equipment or vessels during in-water installation and decommissioning operations due to the low vessel speeds (i.e., approximately 0.5 knots) expected and generally discrete work areas involved. During the operational period, sea turtles can easily avoid collisions with mooring lines, subsurface buoys, scientific monitoring equipment, and WEC devices associated with the deep-water WETS. Maintenance activities would not affect or cause an increased collision hazard for sea turtles with the deep-water WETS equipment.

B. Sound

Sea turtles have low-frequency hearing, similar to baleen whales with their greatest sensitivity being below 1 kHz (Ridgway et al. 1969, Martin et al. 2012). Sea turtles are not as sensitive to noise as marine mammals, but the scientific literature does not establish clear criteria for hearing injury or disturbance threshold. Given this basic information, the Navy will use the marine mammal sound criteria as conservative threshold for turtles, but will use higher SPLs for injury and disturbance. The criteria applied for this EA are: the general noise criteria that NOAA Fisheries applies for pile driving and other construction activities:

- hearing injury for turtles is 190 dB re 1μPa rms
- behavioral disturbance turtles is 160 dB re 1μPa rms for impulsive sounds and 120 dB re 1μPa rms for non-impulsive sounds

As described under the discussion of marine mammals, the spectrum for the hydraulic drills that would be used in securing the transmission cable to the seafloor range from 10 Hz to 40 kHz. The spectrum for the hydraulic drills that would be used to drill holes for securing WEC subsea cables is provided in Sound and Sea Technology 2002 in Navy 2003. At a distance of 6 ft (1.8 m) from the drills, the SPL for frequencies below 1 kHz are at least 20 dB re: 1 μPa less than the frequencies with the highest SPLs. This means that salient portion of the sound (to turtles) produced by the hydraulic drills would have less impact to turtles than to mid-frequency cetaceans. The noise levels from the hydraulic drills do not reach the level for hearing injury for turtles, nor is it expected to be at a level that would cause behavioral disturbance. Drilling to anchor the WEC array will be relatively brief and punctuated, therefore sound exposure will be a non-issue for turtles even at the source.

As described in the analysis of sound impacts on marine mammals, the SPL from the WEC device is expected to be 151 dB re 1μPa at 1 m at the highest, typically during high wave activity. This level is greatly below the level of hearing injury for sea turtles, even at the source. There is no clear behavioral disturbance criterion for turtles, and they are much less sensitive to noise than marine mammals (Ridgway et al 1969 and Bartol et al 1999). The WEC device may have more low-frequency peaks in its spectrum than rock drills (energy peaks at 20, 100, 300, 700, and 1500 Hz from Thomson et al. 2012). Therefore, turtles may only react behaviorally to WEC devices, but at distances less than 115 ft (35 m) from the device (see discussion under Marine Mammals).

Maintenance and decommissioning activities would not generate noise levels greater than those contributed by the construction and operation of the WETS or WEC devices.

C. Electrical Leakage

The Proposed Action is unlikely to significantly impact sea turtles during construction, operation, maintenance or decommissioning activities due to electrical leakage (see earlier discussion under Marine Mammals).

D. Heat

The Proposed Action is unlikely to significantly impact sea turtles during construction, operation, maintenance or decommissioning activities due to heat dissipation to sea water (see earlier discussion under Marine Mammals).

E. Electric and Magnetic Fields

Sea turtles are not known to be adept at electroreception, but they are known to be able to detect and use geomagnetic information to navigate, although it may play a limited role in their movement (Lohmann et al. 2008, Sale and Luschi 2009, Benhamou et al. 2011).

Organisms sensitive to magnetic fields may exhibit one of three behaviors: (1) detection and no effect, (2) detection and confusion or avoidance, or (3) attraction. These different behavioral patterns are discussed below.

- *Detection and no effect*. The first scenario is highly probable since the cable would be carrying alternating current rather than polarized direct current. The organism would detect the magnetic field but not exhibit any response.

- *Detection and confusion or avoidance*. In the second scenario, the organism may disrupt its current behavior while it "reanalyzes" the situation. The expected outcome is for the organism to assess the information from other sensory cues, ignore the anomalous magnetic perception, and continue its previous behavior. Avoidance would be the worst-case situation because it would mean that organisms were intimidated or uncomfortable within the magnetic field.

  Studies have demonstrated that sea turtles are capable of following geomagnetic contours along the ocean floor, indicating sensitivity to magnetic sources. Since the cables would occupy a small area of the seafloor, the impact of avoidance behavior that could be potentially exhibited by marine organisms, in response to the presence of the cables, would be minimal. The cables would not cross any known critical migratory paths for Federally threatened or endangered species. Additionally, evidence suggests that green turtles may not use geomagnetic cues when close to familiar landmarks, such as near shore. Instead geomagnetic information may be used for meso-scale movement in the ocean basin landscape (Benhamou et al. 2011). Therefore, small variations in the geomagnetic landscape close to shore may be less likely to confuse a turtle passing the project site.

- *Attraction.* Behavioral attraction of sea turtles to magnetic fields has not been recorded (Sound and Sea Technology 2002 in Navy 2003). The effects of attraction on marine mammals or other marine organisms are not possible to predict due to the lack of knowledge about factors such as the species attracted, number attracted, species behavior in the vicinity of the cable, reactions of other species in response to an aggregation, and numerous other factors.

Based on the available data as described in Chapter 3 and cited in Sound and Sea Technology 2002 in Navy 2003, impacts of electric and magnetic fields on marine organisms can be expected to range from no impact to avoidance of the vicinity of the subsea transmission cables. Organisms sensitive to electric or magnetic fields may detect emissions near the subsea transmission cables; however, the effects would be temporary. Since the cable occupies a narrow area of the seafloor, the impact of avoidance behavior would be minimal. The cable route would not occupy any unique feeding, breeding, birthing, or egg-laying areas. The analysis provided in Sound and Sea Technology 2002 in Navy 2003 found no evidence in the literature of either short- or long-term effects of electric or magnetic fields from cables similar to the WEC cable on marine organisms, other than the possible behaviors described. Although there have been numerous inconclusive studies of the effects of electromagnetic fields on animals in air, no similar studies have been found of the effects of EMR on marine animals in seawater. Maintenance activities would result in the same insignificant impacts as operations because there would be no change in EMF levels. There would be no EMF impacts during decommissioning because the cables would not be energized.

F. Entanglement/Entrapment

There has been no evidence that sea turtles entangled or entrapped in any of the existing shallow-water WET berth equipment or infrastructure. The deep-water WETS power transmission cable would be attached to the seafloor to a depth of approximately 100 ft (30 m); therefore there is almost no likelihood of entanglement at these depths. The sea bottom along the proposed deep-water cable route lacks forage and resting habitat, therefore the likelihood of turtles being on the substrate near the transmission cables is unlikely. Diver and/or ROV survey-assisted cable laying would reduce risk of entanglement, because careful placement of the cable can ensure that it is flat on the seafloor and no loops in the cable are present to encircle sea turtles. Maintenance activities would not affect entanglement/entrapment risk because there would be no alteration in the components or infrastructure. Decommissioning would pose low entanglement/entrapment risk because sea turtles can avoid the activities associated with removal of the infrastructure and components.

The following precautionary BMPs can be implemented during installation of the project that would increase stewardship toward sea turtles.

1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the Proposed Action for ESA-listed sea turtle species.

2. During construction or WEC device installation, surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

3. All in-water installation and maintenance work shall be postponed or halted when ESA-listed marine species are within 50 yd (46 m) of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species (other than monk seals on land) are noticed within 50 yd (46 m) after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that the activity would not affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

4. All personnel will stay more than 150 ft (46 m) from sea turtles that haul out on the beach.

5. Personnel will not perform work on the beach if turtle nesting is known or suspected to be occurring.

6. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.

7. Prior to deployment of the mooring and electrical transmission hardware on the seafloor, conduct ROV video surveys of the proposed hardware locations and routes. Use marine biological expert interpretation to identify marine resources in the area to ensure that no coral or potential suspensions are along the planned route. Actual placement of the hardware and cables could vary from the proposed survey route centerlines by no more than ±10 percent times the water depth. Cable laying will ensure that the cable remains taut so no slack will occur during cable placement.

8. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

9. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task

10. When piloting vessels, vessel operators shall alter course to remain at least 50 yd (46 m) from sea turtles.

11. Reduce vessel speed to 10 knots (18.5 kph) or less when piloting vessels at or within the ranges described above from sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots (9.3 kph) or less.

12. If despite efforts to maintain the distances and speeds described above, a turtle approaches the vessel, put the engine in neutral until the animal is at least 50 ft (15 m) away, and then slowly move away to the prescribed distance.

13. Sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.

14. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

No significant impacts would occur to green and hawksbill turtles from installation and operation of the deep-water WEC system, including from lighting and reflectors required by the USCG. Based on an assessment of available biological information, the Navy found that installation and operation of the deep-water WETS berths is not likely to adversely affect sea turtles because the effects of collision, sound, electrical leakage, heat, electromagnetic fields, entanglement or entrapment, and general disturbance are discountable or insignificant[5]. The Navy initiated informal consultation under Section 7 of the ESA with NOAA Fisheries on 6 June 2013. The Navy determined that the Proposed Action may affect, but is not likely to adversely affect green and hawksbill turtles. NOAA Fisheries concurred with this determination on 4 December 2013 (see Appendix D for consultation correspondence).

Corals. There are no coral reefs[6] at the location where the deep-water WETS would be installed. The Navy has conducted studies to research and manage the coral and any effects that could occur from the Proposed Action. All coral would be avoided to the greatest extent practicable, and ongoing studies would monitor the condition of coral that is at the project site after the WETS is installed and operational. Two ESA proposed coral species, *Montipora flabellate* and *M. patula*, were found in the vicinity of the surveys of the existing shallow-water WET berth conducted by the Navy between 2003-2011. Although proposed ESA listed coral is present, the majority of the project area has very low coral cover that is sparsely scattered, and the occurrence of the proposed coral species is very infrequent, limited to the reef flat zone. Based on an assessment of available biological information, the Navy found that the Proposed Action may affect those corals during construction, operation, maintenance or decommissioning activities through 1) direct physical impact and 2) exposure to elevated turbidity and sedimentation. Potential impacts to non-ESA proposed listed corals are discussed in Sections 4.7.1.2 and 4.7.1.3.

A. Direct Physical Impact

Laying the power cables on the sea floor, divers working to position and secure the cables, and anchors used by support vessels all have the potential to directly strike coral colonies should they

[5] When used in ESA Section 7 determinations, “discountable effects” are those extremely unlikely to occur and “insignificant effects” are those that, based on best judgment, would not be able to be meaningfully measured, detected, or evaluated.
[6] See Section 4.18.5 Executive Order 13089, Protection of Coral Reefs for discussion of the project’s compliance with this Federal policy.

be present when the equipment or divers contact the bottom. The severity of injury to the coral will depend largely on the size and hardness of the impacting object and the intensity of the impact. Injury could range from a small area of soft tissue damage that quickly heals to total obliteration of the colony. The project plan and BMPs require that divers be aware of the identity and status of the ESA proposed corals and to specifically watch for and avoid them completely during work to position and install the power cables, including anchoring support vessels. Based on the sparse distribution of these corals, the limited amount of work to be done where they occur, and the expectation that divers will comply with the BMPs, the Navy determined that the risk of direct impact on colonies of either species is discountable.

B. Exposure to Elevated Turbidity

Securing the power cable would involve the use of handheld drills to install rock bolts over a few days at most. Drilling would briefly mobilize small bursts of fine sediments into the water column. Although this material could settle onto coral colonies, the plumes are expected to be very light and quickly diluted. They would extend no more than a few yards from the work and dissipate within minutes. Therefore, no significant sedimentation would result due to exposure to elevated turbidity.

In addition to the two potential effects discussed above, additional analysis on other potential sources of effects to ESA-proposed corals was conducted:

A. Collision Hazard

During cable laying operations, diver and/or ROV assistance would be employed to avoid placement on ESA proposed listed corals. Installation of the WEC devices, mooring infrastructure, and scientific data gathering equipment would also avoid ESA proposed listed corals. During the operational period, there would be no collision hazard impacts to ESA proposed coral species from the operation or maintenance of the WEC devices, scientific data gathering equipment, and their associated infrastructure. Decommissioning activities would be coordinated with NOAA Fisheries to ensure the protection of ESA proposed listed coral.

B. Sound

Corals can withstand sound thresholds beyond those expected in the Proposed Action; therefore, the Proposed Action would have no effect to proposed ESA corals due to sound. Use of the hydraulic drill will be brief and will not be conducted in close proximity to proposed ESA corals, because they will be avoided by the team laying cable at water depths where the proposed corals could occur. Operation of the WEC device will not occur near coral reef ecosystem where proposed ESA corals could occur. Maintenance and decommissioning activities would contribute similar underwater sound levels as the installation and operational processes, also resulting in insignificant impacts.

C. Electrical Leakage

The Proposed Action would have no effect on proposed ESA corals during construction, operation, maintenance or decommissioning activities due to electrical leakage (see earlier discussion under Marine Mammals).

D. Heat

The Proposed Action would have no effect on proposed ESA corals during construction, operation, maintenance or decommissioning activities due to heat dissipation to sea water (see earlier discussion under Marine Mammals).

E. Electric and Magnetic Fields

Studies have shown that the electro and magnetic fields produced by the cable used for the shallow-water WEC device have shown no adverse effects to the corals. Corals have colonized on the existing cable at a more rapid rate than the nearby substrate. Navy monitoring of the shallow-water WET berth (NAVFAC EXWC 2011) have demonstrated that there is a similar, if not slightly greater, amount of coral growing on the power cable as the surrounding habitat. The

electrical and magnetic profile of the deep-water WETS would be virtually identical to that of the shallow-water WET berth during construction, operation, maintenance or decommissioning activities. This evidence supports the position that the electric and magnetic fields from Proposed Action would have no effect on proposed ESA corals.

F. Entanglement

Entanglement may be used to define the impact of cable being placed on top of a coral colony, resulting in smothering, or for a cable bumping and dislodging a coral head. Diver and/or ROV survey-assisted cable laying would eliminate risk of "entanglement," because careful placement of the cable can ensure avoidance of colonies of proposed ESA listed corals, where applicable. Securing the cable to the substrate will ensure that they do not move across the substrate and damage nearby coral colonies. The Proposed Action would have no effect on proposed ESA coral species during construction, operation, maintenance or decommissioning activities.

The following precautionary BMPs will be implemented during project construction to eliminate concern or risk to ESA proposed corals.

1. Prior to deployment of the mooring and electrical transmission hardware on the seafloor, conduct ROV video surveys of the proposed hardware locations and routes. Use marine biological expert interpretation to identify marine resources in the area to ensure that no coral or potential suspensions are along the planned route. Actual placement of the hardware and cables could vary from the proposed survey route centerlines by no more than ±10 percent times the water depth. Cable laying will ensure that the cable remains taut so no slack will occur during cable placement.

2. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

3. Subsea cables shall be routed to minimize impacts to corals and all structures will be installed to avoid abrasion to corals. Colonies of *Montipora flabellata* and *M. patula* (corals proposed for listing under the ESA) observed along the subsea cable route shall be identified and avoided completely. Other corals shall be avoided to the highest degree practicable. Lay inshore subsea cables by floating and then lowering the cables to the seafloor with diver assistance within 100 ft (30 m) of the shallow-water WET cable, avoiding placing them on top of coral especially in the 33- to 100-ft (10- to 30-m) depth within the reef flat, escarpment and the deep reef platform zones. In depths below 100 ft (30 m) (i.e., beyond SCUBA diving depths), use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated infrastructure to avoid the sparsely scattered corals and formations.

4. Where coral heads are unavoidable and can be easily dislodged from the substrate, divers will attempt to pry the coral head from the substrate and move it an appropriate distance from the impact line of the cable

5. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.

6. Vessel and barge operators will strive to anchor project-related vessels/barges only in sandy substrate or limestone devoid of corals. Installation of a fixed mooring buoy in sandy/non-coral substrate will be considered if vessels visit the WETS berths frequently.

7. Develop a decommissioning plan for the installed structures to include criteria for deciding when to remove elements of the project and when to allow elements that are providing some benefit to the environment to remain in place after the project is completed.

8. Employ industry-standard BMPs to avoid discharge of pollutants into the marine environment.

9. A contingency plan to control toxic materials is required.

10. Appropriate materials to contain and clean potential spills shall be stored at the work site (including aboard project-related vessels), and be readily available.

11. All project-related materials and equipment placed in the water shall be free of pollutants.

12. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.

The Proposed Action would not significantly impact proposed ESA listed species of coral. Based on an assessment of available biological information, the Navy found that Proposed Action may affect, but is not likely to adversely affect ESA proposed threatened coral species and would not jeopardize the existence of those species. NOAA Fisheries concurred with this determination in its letter of 4 December 2013 (see Appendix D for ESA consultation correspondence).

Prey Species. The Proposed Action is expected to have minimal to no impact to prey of protected marine vertebrates. Small odontocetes such as spinner dolphins or bottlenose dolphins are piscivorous and the deep-water WETS would have minimal or no impact on those species. Hawaiian monk seals feed on benthic and demersal prey which would be affected minimally by the placement and decommissioning of the WETS infrastructure and would not be affected by the operation or maintenance of the WEC devices. Some fish may move away or avoid the site on a relatively small distance scale during installation. At the shallow-water WET site, the Navy has found that the anchor base and associated equipment have increased habitat complexity, resulting in an increase in fin fish diversity and biomass. There could be a minor benefit to fish and prey species by having structure added to the environment by the deep-water WETS, but the added benefit is expected to be minimal and should not change the distribution or quality of fish in the area. In the case of false killer whales or pilot whales, they eat pelagic fish and squid or other marine mammals. Their prey species would not be found at the project site.

The two species of sea turtle that could occur at the project site do not feed on resources that would be strongly affected by the installation, operation or maintenance of the deep-water WETS. Green turtles feed on seagrass, macroalgae, and some sessile invertebrates. Seagrass only occurs in very small patches in the Reef Flat Zone and would be minimally affected by installation of the power cable. Macroalgae and sessile invertebrates could occur in the shallow water area of the project site, but a very small area of the environment, less than one foot wide would be affected when the cable is laid. (See Section 4.7.1.4 for potential impacts to marine vegetation, including seagrass and macroalgae.) Hawksbill turtles feed on sponges, which is closely associated with coral reef in Hawaii. Cable laying would avoid coral and coral reef as much as possible, which would minimize any affect to sessile invertebrates and sponges. Some macroalgae could be affected when the cable is laid, but it is expected to reestablish quickly, and the power cable is expected to provide a suitable substrate for macroalgae to grow on. Decommissioning procedures would be established in coordination with NOAA Fisheries to avoid or minimize adverse environmental effects.

4.7.1.2 Marine Habitats

The subsea transmission cables associated with the Proposed Action (including construction, operation, maintenance or decommissioning activities) could impact the following marine habitats: sand-boulder zone, sand channel zone, reef flat zone, escarpment zone, deep reef platform zone, undercut ledges, deep-water site. The cables would be secured to the seafloor in water depths less than 100 ft (30 m), to avoid movement due to the high energy wave and surf zone. Beyond 100 ft (30 m), the lower wave

energy at the seafloor and weight of the cables would keep them relatively stationary. Based on marine surveys conducted between the installation of the shallow-water WET berth transmission cable in 2003 and 2011, there was no evidence that any portion of the existing transmission cable had moved since being installed in 2003 and no evidence that any corals had been damaged due to movement of the cable (see discussion in Section 3.7.3). Therefore, the same is expected for the Proposed Action's subsea cables in corresponding water depths and habitat zones.

The ***sand-boulder zone*** (0-15 ft or 0-4.6 m) consists of unconsolidated materials with high surf making it unsuitable habitat for most organisms. The Proposed Action is expected to have minimal to no impact in this habitat.

The ***sand channel zone*** (12-18 ft or 3.6-5.5 m) exhibits some coral growth on the sides of the channels, mainly *Pocillopora meandrina*. This habitat is high energy with some refuge in the grooves of the channels. The routing of the cable would be directed to avoid areas where corals are growing (i.e., the channels), which would result in minimal to no impact from the Proposed Action.

The ***reef flat zone*** (35-50 ft or 10-15 m) is characterized by fairly flat habitat with algae (*Porolithon*) and sparsely scattered coral heads (*Pocillopora eydouxi*, *Porites lobata*, *Montipora capitata*, *M. flabellata*, and *M. patula*). Marine organisms are more abundant around areas with coral growth. Diver assistance would be employed during installation of the subsea cables at this depth, adhering to the cable route determined using ROV video surveys with marine biological expert interpretation (see Section 2.2.4 for description of BMP). This would minimize impacts to coral in this zone by attempting to avoid areas where corals are growing (i.e., ledges), as well as scattered coral heads. ESA proposed corals would be the first priority during avoidance measures; therefore, the Proposed Action would have minimal to no impact to coral resources.

The ***escarpment zone*** (50-95 ft or 15-29 m) is characterized as a limestone slope with areas of up to 50% coral cover (M*. capitata*), with abundant populations of fish. Because of the greater density of coral cover in this zone, diver or ROV assisted installation of the subsea cables would be employed to minimize impacts to coral in this zone. In instances where laying cable over coral is unavoidable, the area of impact would be minimal (12-in [0.3-m] width of cable over a 3 to 6 ft [1 to 2 m] length of unavoidable coral), and, although adverse, would not jeopardize the overall habitat function. The cable would also be secured to the seafloor within this habitat zone to ensure it doesn't move and damage corals that were avoided during installation, which would result in minimal to no impact from the Proposed Action.

The ***deep reef platform zone*** (100 ft or 30 m) is a flat limestone area with a few inches of sand cover and some turf algae. Scattered corals of *P. meandrina* and encrusting *M. capitata* are present. The coral cover declines from the escarpment zone into this deep reef platform and the cable can be assisted by ROV and divers to avoid impacts to coral. The Proposed Action is expected to have minimal to no impact to this zone.

The ***undercut ledges*** (at depths 93 ft or 28.3 m and 100 ft or 30 m) are important habitat to various species of fish and coral growth. The presence of the ledges is not consistent throughout the project area, and with ROV video surveys conducted to determine an appropriate cable route along with diver assistance, they can be avoided all together (see Section 2.2.4 for description of ROV video survey BMP). The Proposed Action would have no impact to the undercut ledges.

The ***deep-water benthic zone*** (beyond 100 ft or 30 m) is mostly sandy substrate with few topographical features, and does not provide much habitat for marine invertebrates, nor shelter for fish. There is little vegetation and occasional spots of sparsely scattered coral heads. However, the location of the anchoring would be placed away from the sand ribbons and barchans, where presence of vegetation or sparse coral heads is minimal. The potential impact to this area from the Proposed Action would include

disturbance of the substrate. The disturbance of the substrate would be limited to areas where there was minimal to no coral cover. It is expected that the impact of the Proposed Action would have minimal and insignificant effects on the deep-water benthic habitat.

The following precautionary BMPs can be implemented during installation of the project that would increase stewardship over this habitat:

1. Prior to deployment of the mooring and electrical transmission hardware on the seafloor, conduct ROV video surveys of the proposed hardware locations and routes. Use marine biological expert interpretation to identify marine resources in the area to ensure that no coral or potential suspensions are along the planned route. Actual placement of the hardware and cables could vary from the proposed survey route centerlines by no more than ±10 percent times the water depth. Cable laying will ensure that the cable remains taut so no slack will occur during cable placement.

2. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

3. Subsea cables shall be routed to minimize impacts to corals and all structures will be installed to avoid abrasion to corals. Colonies of *Montipora flabellata* and *M. patula* (corals proposed for listing under the ESA) observed along the subsea cable route shall be identified and avoided completely. Other corals shall be avoided to the highest degree practicable. Lay inshore subsea cables by floating and then lowering the cables to the seafloor with diver assistance within 100 ft (30 m) of the shallow-water WET cable, avoiding placing them on top of coral especially in the 33- to 100-ft (10- to 30-m) depth within the reef flat, escarpment and the deep reef platform zones. In depths below 100 ft (30 m) (i.e., beyond SCUBA diving depths), use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated infrastructure to avoid the sparsely scattered corals and formations.

4. Where coral heads are unavoidable and can be easily dislodged from the substrate, divers will attempt to pry the coral head from the substrate and move it an appropriate distance from the impact line of the cable

5. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.

6. Vessel and barge operators will strive to anchor project-related vessels/barges only in sandy substrate or limestone devoid of corals. Installation of a fixed mooring buoy in sandy/non-coral substrate will be considered if vessels visit the WETS berths frequently.

7. Develop a decommissioning plan for the installed structures to include criteria for deciding when to remove elements of the project and when to allow elements that are providing some benefit to the environment to remain in place after the project is completed.

8. Employ industry-standard BMPs to avoid discharge of pollutants into the marine environment.

9. A contingency plan to control toxic materials is required.

10. Appropriate materials to contain and clean potential spills shall be stored at the work site (including aboard project-related vessels), and be readily available.

11. All project-related materials and equipment placed in the water shall be free of pollutants.

12. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.

4.7.1.3 Marine Invertebrates

The Proposed Action would cross multiple habitats that incorporate soft bottom invertebrates, rocky substrate invertebrates, and coral reef habitat. This section addresses marine invertebrates apart from those proposed for ESA listing. It is expected that Proposed Action (including construction, operation, maintenance or decommissioning activities) would have minimal to no impact to marine invertebrates.

The placement of the subsea transmission cables would displace a minimal number of invertebrates and would provide a raised and more complex habitat in comparison to the flat sand or pavement substrate found along the shallow water areas. The cable would cross an area of reef with sparse coral cover. The footprint of the cable will be approximately 12 in (30 cm) wide. Using diver assistance for portions of the cable route in waters up to 100 ft (30 m) deep and a cable route determined using ROV video surveys interpreted by marine biological experts for deeper waters, adjustments while laying the cables would allow for the footprint to be shifted away from any important invertebrate resources, such as coral colonies, to further avoid and minimize impacts. There may be adverse impact from diver presence while laying and securing the cable. Sand may be kicked up, or a coral colony accidentally damaged by a diver assisting the installation. Although the Proposed Action may have an unavoidable adverse effect to some coral colonies during construction, the overall impact will be minimal. The Proposed Action is expected to have minimal to no impact to other marine invertebrate communities, as the sandy substrate in the deep-water WETS berth area does not support a rich sessile invertebrate community. The community structure underlying the subsea transmission cables comprises a small linear area that would affect the underlying community structure. The same precautionary BMPs listed in Section 4.7.1.2 Marine Habitats will be implemented during project construction to increase stewardship over marine invertebrates, including corals.

During the operational period, there would be annual maintenance inspections of the subsea infrastructure, including the transmission cables. These activities would have no impact on marine invertebrates.

An environmental review would be conducted at the time of decommissioning to determine whether the project hardware should be removed upon culmination of the WEC device test period based on minimizing environmental impacts. At the deep-water WETS berths, proposed ESA corals are unlikely to be found due to the underlying sandy substrate and water depth. Only two ESA-proposed coral species, *Montipora flabellata* and *M. patula*, were found in the vicinity of the existing shallow-water WET berth by the Navy between 2003 and 2011. Although coral is present, the majority of the project area has very low coral cover that is sparsely scattered. These corals would grow on the subsea transmission cables, which is likely to be left in place when the project is decommissioned, allowing the corals to persist on the cables. These corals are not expected on the chains and subsea cables in the water column at the deep-water berthing site, where the elements of the WETS are expected to be removed when decommissioned.

4.7.1.4 Marine Vegetation

Marine vegetation is scarce in the area of the deep-water WETS berths and sparse along the path where the subsea transmission cables would be laid from the deep-water berths to shore. Potential impacts include the smothering or removal of vegetation when the subsea transmission cables are installed and secured. There are no marine vegetation species of concern in the project area. Seagrass only occurs in very small patches in the Reef Flat Zone and would be minimally affected by installation of the power cable. The macroalgae and turf algae that were impacted by the installation of the shallow-water WET berth transmission cable and WEC device grew back immediately, and after 18 months the affected algae

had fully recolonized. Therefore, it is expected that a similar situation would occur, with the Proposed Action resulting in temporary and minimal impacts to marine vegetation.

4.7.1.5 Fish and EFH

The footprint of the Proposed Action is within the boundaries of EFH. The project area largely consists of sand, with little bathymetric relief and low coral cover. There is no HAPC identified in the project area. Fish have the potential to be found within all habitats described within the Proposed Action project area. They may avoid the project area during construction activities; however, similar habitat is accessible adjacent to the project area. Potential impacts to the habitats comprising EFH within the project area are described in Sections 4.7.1.2 Marine Habitats. Potential impacts to other marine habitats and resources are described in 4.7.1.3 Marine Invertebrates, and 4.7.1.4 Marine Vegetation.

A. Collision Hazard

Construction and decommissioning vessel movements would be on the water's surface and not affect the seafloor, and it is unlikely that a vessel would impact fish in the water column. During the operational period, vessels would be used only when the WEC devices and scientific data gathering equipment are removed or deployed, and for annual maintenance inspections. Fish would be able to avoid equipment on the seafloor and in the water column. Therefore, the Proposed Action will have no impact to fish or EFH due to collision hazard.

B. Sound

Fish can withstand sound thresholds beyond those of the Proposed Action. Fish may avoid the project area during construction and decommissioning activities, and will have similar habitat accessible adjacent to the area. Therefore the Proposed Action will have temporary/minimal to no impact to fish and no impact to EFH due to sound.

C. Electrical Leakage

The Proposed Action will have no effect on fish or EFH due to electrical leakage (refer earlier discussion in Section 4.7.1.1 under Marine Mammals).

D. Heat

The Proposed Action will have no effect on EFH due to heat dissipation to sea water (refer earlier discussion in Section 4.7.1.1 under Marine Mammals).

E. Electric and Magnetic Fields

The Proposed Action will have no effect on fish or EFH due to electric and magnetic fields of the cable (refer earlier discussion in Section 4.7.1.1 under Corals).

F. Entanglement

The Proposed Action will have no effect on fish or EFH due to entanglement (refer to discussion in Section 4.7.1.1 under Corals). The design of the WEC devices is to avoid entrainment or crushing of objects, including animals and fish. The majority of the motion of WEC devices is to float with the motion of the water. Fish and larvae are unlikely to be in between moving parts, as mobile elements of the WEC devices move with the water instead of in response to mechanical parts. However, a small number of larvae that are moved by the water instead of under their own power may be adversely affected by movement of the WEC device.

The same precautionary BMPs listed in Section 4.7.1.2 Marine Habitats would be implemented during project construction to increase stewardship over and minimize impacts to fish and EFH.

The Navy found that installation of the deep-water WETS berths may adversely affect EFH; however, the impacts would be minimized by implementing BMPs. To summarize the EFH Assessment prepared by the Navy, the proposed project will have no effect on undercut ledges. There is expected to be minimal to no effect on the sand boulder zone, the sand channel zone, the deep reef platform zone, and the deep water benthic zone. There may be adverse effects to the reef flat zone and the escarpment zone, but

application of BMPs listed in this document and recommended by NOAA Fisheries would minimize the effects of installing the deep-water WETS. Operation of the deep-water WETS berths would have no effect on EFH, aside from larvae that interact with the device due to water flow. The Navy initiated informal consultation with NOAA Fisheries on 6 June 2013, which included an EFH assessment and a list of BMPs the Navy expects to implement.[7] Appendix D contains the EFH consultation materials, including the Navy's EFH assessment, NOAA Fisheries' recommendations, and the Navy's response to NOAA Fisheries' recommendations. The project's BMPs listed in Section 2.2.4 include NOAA Fisheries' EFH recommendations as they were accepted and agreed to by the Navy in its 3 October 2013 response letter.

4.7.1.6 Critical Habitat

The Navy determined that Proposed Action is not likely to adversely affect proposed Hawaiian monk seal critical habitat (see ESA correspondence in Appendix D). On 4 December 2013, NOAA Fisheries concurred with this determination. The impacts on habitat resources beyond 500 yd (457 m) from shore, such as changes to water quality and the quality and availability of prey, that may result from the proposed installation of the WETS moorings, cables, associated monitoring equipment, and WEC devices would be temporary and virtually undetectable.

Based on the nature of the planned work along with expected compliance with project BMPs, in-water substrate disturbance would be episodic (limited to the period of construction, and to infrequent actions to install or move monitoring equipment, or to install/remove WEC devices) and small scale resulting in small amounts of temporarily mobilized sediments that would not extend beyond a few yards of the work and would settle out of the water column within a few minutes of the work. Toxic discharges and spills would be unlikely, but if they were to occur, they would be infrequent, small, and quickly cleaned. Therefore, the Navy determined that the Proposed Action would have insignificant effects on water quality.

The planned installations would result in six lengths of mooring chains, each with one large anchor and five large concrete blocks, being place on the seafloor at depths between about 198 and 264 ft (60 and 80 m.

Two power cables would also be laid across the seafloor, one from each berth to the shore, and several small temporary monitoring stations would be installed on the seafloor in the area. These structures would cover about 538 yd^2 (450 m^2) of unconsolidated substrate habitat, which Hawaiian monks seals often use as forage grounds. However, these structures could result in a slight increase in the structural complexity of the benthic habitat in the action area. The added structure could provide shelter habitat for prey organisms such as small eels and octopus that might otherwise not have lingered in the area. Given that the total amount of affected benthos would be a tiny fraction of the total available, and that the increased complexity would likely increase the available prey resources, the Navy determined that the Proposed Action would have insignificant effects on the availability of Hawaiian monk seal prey resources.

The WEC device structures themselves are not expected to hinder Hawaiian monk seal access to or through the area. The WEC devices may have acoustic signatures that may initially deter Hawaiian monk seals from entering the immediate area around the device (less than 50 yd [46 m] around the device), but that would likely not include the seafloor under the device because of the water depth, and Hawaiian monk seals are expected to quickly habituate to the presence of the WEC devices once they are installed. The Navy determined that proposed action may temporarily deter Hawaiian monk seals from entering an insignificantly small area immediately around a deployed WEC device, but given that the devices would

[7] The Navy subsequently submitted a revised consultation package to NOAA Fisheries (21 and 22 November 2013, respectively). The revised package did not contain changes to EFH material.

be over 3,000 ft (914 m) apart, the impacts of the proposed action on the accessibility of the area for Hawaiian monk seals would be insignificant.

Based on the best available information, the Navy determined that the Proposed Action would result in insignificant impacts on the essential features of proposed Hawaiian monk seal critical habitat, and as such is not likely to adversely affect that habitat. Given that the Proposed Action is not expected to adversely affect proposed critical habitat for the reasons described above, it is not likely to result in the destruction or adverse modification of proposed critical habitat. NOAA Fisheries concurred with the Navy's determination on 4 December 2013 (see Appendix D).

4.7.2 HDD Alternative

4.7.2.1 Threatened, Endangered and Protected Species

The HDD Alternative would have similar impacts on threatened, endangered and protected species as the Proposed Action during construction, operation, maintenance or decommissioning activities (i.e., insignificant), with minor differences due to:

- Shorter length of main trunk transmission cable on the seafloor (cable enters the HDD bore hole at a water depth of 33 ft [10 m], approximately 1,500 ft [457 m] off shore)
- Two 3-conductor subsea branch cables leading from the umbilical splice boxes to a J-box where they are connected to one 6-conductor cable (vice two 3-conductor cables being routed directly to shore)
- One 6-conductor cable leading to the HDD bore hole (vice two 3-conductor cables)
- HDD bore hole drilling operations

Marine Mammals and Sea Turtles. The HDD Alternative includes subsurface drilling, which may generate noise levels in the marine environment as the drill head approaches its exit point underwater. There is limited literature available on HDD drilling sound in water. The data, which are qualitative, suggest that the sound from the bore hole drilling would be significantly less than the sound of barges and boats that would carry equipment to the deep-water WETS (Gaboury et al. 2008, Navy 2008). The drilling would exit at a depth of 33 ft (10 m). Animals that would be most sensitive to the sounds (i.e., marine mammals) would not be found waters with those shallow depths on a regular basis, except for monk seals as they approach or depart a beach. Since construction activity would be occurring near the shoreline and monk seals have not been observed hauled out in the area, it is unexpected that monk seals would be nearby to hear the drilling noise. Reports have suggested that cetaceans have been more tolerant of drilling rig sounds than other marine sound sources, including outboard motors (Davis 2008). HDD drilling is not expected to have SPLs that exceed the hydraulic drills for securing the subsea cables, nor is the spectrum of sound expected to be substantially different from the drills. Given these assumptions, the same principles and logic apply to the HDD drilling as to the hydraulic drills. The only substantial difference is that the sound from HDD activities will persist for longer periods than hydraulic drilling to install the subsea cables. If HDD is determined to be a loud process that approaches the highest levels projected for extended periods of time, precautionary BMPs can be implemented that suspend HDD drilling when marine mammals or sea turtles are detected within 1,640 ft (500 m) of HDD operations.

Because the trunk transmission cable for the HDD Alternative would be located below grade from about a depth of approximately 33 ft (10 m), or 1,500 ft (457 m) offshore, there would be less potential for electrical leakage, heat loss and electric and magnetic field generation in the nearshore areas. However, this reduction in subsea cable in the nearshore is offset by two subsea branch cables (totaling approximately 1,000 ft [305 m] in length) near the deep-water WETS berths that are not needed in the Proposed Action.

Similar precautionary BMPs would be employed under the HDD Alternative as in the Proposed Action (e.g., observers to monitor for protected species during in-water work, diver- and ROV survey-assisted cable laying).

Corals. The HDD Alternative would have similar insignificant or discountable impacts to proposed ESA-listed coral as the Proposed Action.

4.7.2.2 Marine Habitats

The HDD Alternative would have similar impacts to the reef flat zone, escarpment zone, deep reef platform zone, undercut ledges, deep-water benthic zones as the Proposed Action (i.e., insignificant), with the exception of the sand-boulder zone and sand channel zone. In the HDD Alternative, the transmission cable would be located below grade within these two zones, thus avoiding any direct impacts.

4.7.2.3 Marine Invertebrates

The HDD Alternative would not impact marine invertebrates in waters inshore of the bore hole exit point (i.e., at a depth of 33 ft or 10 m). In habitats seaward of the bore hole exit point, the impacts of the HDD Alternative would be similar to those of the Proposed Action (i.e., minimal and insignificant), with the exception of the area in the immediate vicinity of the bore hole exit point. Because there is expected to be a minor discharge of drilling mud into surrounding waters as the drill reamer exits the seafloor (estimated at 3,000 gallons [11.4 m^3]), there may be some temporary impacts to marine invertebrates in the area, including non-ESA proposed coral. The release of drilling mud from HDD exiting the seafloor may temporarily cloud the water around the bore hole. The area where the bore hole would exit is expected to be in a featureless area of sand. There would be little coral in the vicinity. About 3,000 gallons (11.4 m^3) of substrate would be released—a volume equivalent to 0.45% of the volume of water contained in an Olympic swimming pool. The area where the WETS would be located is an area of active water movement. Much of the heavier material released, such as sand, would settle quickly near the hole. It is possible that it may settle on coral in the area, given the small amount of material released, the amount settling would be a thin layer that would not bury or crush the coral. Suspended material would cloud the water for no more than a few hours before being dispersed by normal water movements.

A drill management plan would be developed and implemented for the HDD Alternative that would identify BMPs to minimize impacts to marine waters. A CWA Section 404 permit would also be required for this alternative, which would include specific conditions to minimize adverse water quality impacts.

4.7.2.4 Marine Vegetation

The HDD Alternative would have similar impacts to marine vegetation as the Proposed Action, as the deep-water moorings and subsea transmission cable route would be the same in both alternatives. Marine vegetation in the vicinity of the HDD bore hole exit point may be adversely impacted by the release of drilling mud when the drill reamer exits the seafloor. However, the water quality impacts would be temporary in nature and minimized with project-specific BMPs. Because there are no marine vegetation species of concern in the potentially affected area, it is expected that impacts to marine vegetation from the HDD Alternative would be temporary and insignificant.

4.7.2.5 Fish and EFH

The HDD Alternative would have similar impacts to fish and EFH as the Proposed Action (i.e., may adversely affect during installation, but no effects during operations). In nearshore waters, the transmission cable would be located below grade to approximately the 33-ft (10-m) water depth. Because the seafloor in these depths does not support large or abundant coral colonies, the net difference in impacts between the HDD Alternative and the Proposed Action (with transmission cables laid on the seafloor surface) is minimal. The vibrations associated with the HDD drilling would have minimal impacts to EFH due to the lack of large or abundant coral colonies at the bore hole exit. Water quality impacts from the release of drilling mud at the bore hole exit point would be temporary and minor, as described in

Section 4.7.2.3. Project-specific BMPs and conditions would be identified in the CWA Section 404 permit required for this alternative.

4.7.2.6 Critical Habitat

The HDD Alternative would have similar insignificant impacts on the essential features of proposed Hawaiian monk seal critical habitat (i.e., habitat resources such as water quality and availability of prey) as the Proposed Action, and as such is not likely to adversely affect that habitat.

4.7.3 No Action Alternative

The No Action Alternative would not impact the marine biological environment, including Federally threatened, endangered, and protected species, marine habitats, marine invertebrates, marine vegetation, fish and EFH, or proposed Hawaiian monk seal critical habitat because no new subsea cables or other in-water equipment associated with the deep-water WETS berth would be installed or operated.

4.8 | Terrestrial Biological Environment

4.8.1 Proposed Action

4.8.1.1 Flora

There would be temporary impacts to the existing plant community at the cable landing site, route to the proposed electrical equipment facilities (near the TACAN), and route to Building 614. The strip of land where the terrestrial segment of the deep-water WETS transmission line will be placed is a mixture of non-native and native plants. This shore area is comprised of naupaka (*Scaevola sericea*) shrubs, akiaki (*Sporobolus virginicus*) and ohelo kai (*Lycuim sandwicense*) groundcover, and tree heliotrope (*Tournefortia argentea*). Vegetation along the proposed route would be trimmed to accommodate installation of the new conduits on new and existing pedestals, but the area is expected to naturally recover. The site was previously disturbed from the installation of the existing shallow-water WET cable, but has recovered to a point where the conduit is covered by native vegetation. None of the native plants at the site are protected under Federal or State law. Disturbance to the flora near the proposed electrical equipment facilities and Building 614 would have no adverse impacts to native vegetation and the neighboring plant community. The current vegetation community is non-native invasive plants such as Chinese violet (*Asystasia gangetica*), koa haole (*Leuceaena leucocephala*), and guinea grass (*Panicum maximum*). After construction, vegetation in these areas is expected to grow back to its current state.

To ensure recovery of native shoreline vegetation along the cable route, any clearing along the first 160 ft (49 m) would be minimized in such a way that would promote re-growth. This includes clean cutting branches with loppers, maintaining plant stumps, and other methods that would not defoliate plants. Use of a machete to remove vegetation is not an acceptable method. Construction along the planned cable route should begin from the shore and move inland toward Building 614 to prevent the spread of invasive species. According to MCB Hawaii requirements, all plant material that is removed shall be properly disposed of off-site.

As directed by the MCB Hawaii INRMP (MCB Hawaii 2011), areas where native plants are removed or substantially disturbed as a result of project-related construction activities would be revegetated with native plants. If native plants are removed or substantially disturbed during maintenance or decommissioning activities, the areas would be revegetated according to the INRMP; therefore no significant impacts to flora are expected.

4.8.1.2 Fauna

Impacts to terrestrial fauna, especially avian species would be minimal. Species protected by the MBTA would not be affected by the Proposed Action. The proposed site is not prime habitat or nesting grounds for MBTA species. The site may be infrequently visited by birds, but their presence is seasonal and not

common. Iwa or great frigatebird (*Fregataminor palmerstoni*) are present in the area but mostly glide on wind currents and drink from the nearby golf ponds. No impact to this species is expected. Seasonal pacific golden plovers or kolea (*Pluvialis fulva*) would not be impacted by the Proposed Action as they frequent grassy areas and would not be present in the cable or electrical equipment shelter areas. Seasonal Wedge-tailed shearwater (*Puffinus pacificus*) burrows has existed in the vicinity of the proposed cable route; however, this area is not managed for nesting shearwaters and is not a conducive nesting location. If nesting does occur, burrows will be avoided during construction, maintenance and decommissioning. On the shoreline, the new cables would be placed adjacent to the existing cable and not in areas where Wedge-tailed shearwater has nested. There are no Wedge-tailed shearwater burrows near the proposed electrical equipment shelter site. Laysan albatross (*Phoebastria immutabilis*) would not be impacted by the Proposed Action, as they rarely occur in the project area during the winter breeding season.

The narrow shoreline corridor across which the surface-laid cable would be placed would have minimal disturbance to Hawaiian monk seals that may occasionally haul out and rest on the beach areas to the east and west (near the Kaneohe Klipper Golf Course and at Pyramid Rock Beach). As described in Section 2.2.4, BMPs will be implemented to avoid disturbance to Hawaiian monk seals during construction, operation, maintenance or decommissioning activities (e.g., personnel will not perform work on a beach where a Hawaiian monk seal would be exposed to ≥100 dB re to 20 μPa in-air, personnel will at least 150 ft [46 m] from monk seals and sea turtles that haul out on the beach, and personnel will not perform work on a beach if sea turtle nesting is known or suspected to be occurring there). Once the electrical and data transmission infrastructure is installed within the corridor, it would be static and subject to minimal follow-on human activity. An existing cable extends from the nearshore surf zone, across a boulder-strewn section of beach to the vegetated shoreline. The new WETS transmission cables would be located in a similar location.

4.8.2 HDD Alternative

Impacts on terrestrial biota would be minimal and not significant under the HDD Alternative, as described below.

4.8.2.1 Flora

The vegetation around Building 614 is dominated by non-native plants. Vegetation would be cleared to provide access to the HDD drill site and a drill entry pit would be excavated. However, these disturbances would be temporary, with the disturbed vegetation (including the minimal populations of native plants that may be present) expected to grow back. The site has also been previously disturbed by other construction projects. Existing landscaped shrubs at the south side of Building 614 would be removed for construction activities and be replaced according to the base INRMP. No impacts to the natural vegetation are expected during construction, operation, maintenance or decommissioning activities.

4.8.2.2 Fauna

No effects to MBTA species is expected under the HDD Alternative. The site is not prime habitat or nesting grounds for MBTA species. Wedge-tailed shearwater burrows do not exist near the proposed HDD site. Burrows do exist in the vicinity, but would not be impacted by this alternative during construction, operation, maintenance or decommissioning activities.

The HDD Alternative would not adversely impact Hawaiian monk seals as the HDD conduit would be located a minimum of 30 ft (9 m) below grade until its exit point under water, and would avoid any beach areas that could be used by the protected species. Appropriate BMPs (listed in Section 2.2.4) would be implemented to further reduce risk of adverse impacts to Hawaiian monk seals.

4.8.3 No Action Alternative

No impacts to terrestrial biological resources would result from the No Action Alternative as existing conditions would remain unchanged.

4.9 | Land and Water Use Compatibility

4.9.1 Proposed Action

The Proposed Action would not significantly affect land and water uses at MCB Hawaii, either during project construction or during the operational period. Section 2.2.3 describes the construction and installation methodology in greater detail, where known.

Construction Period. During the construction period, the Proposed Action would require that a winch or other pulling equipment (e.g., excavator or backhoe) be positioned onshore in the vicinity of the existing cable utility vault. The winch (or other equipment) would be used to pull the transmission cables ashore from an offshore workboat. The area in which this process would take place is restricted from public access due to the proximity to the airfield runway. Therefore, these land-based and nearshore construction operations would not adversely impact uses within these areas, including airfield runway operations.

The in-water process to install the subsea cables and splice boxes would require one to two days. It would take up to one week for divers to anchor the cables to the seafloor after the cable is installed. Installing the deep-water anchor mooring systems would require three to five days. Along with a Local Notice to Mariners requested through the USCG, the work areas would be monitored and coordinated through radio communications and/or direct communications with other vessels in the area to ensure that they safely detour around the in-water work areas. Because of the temporary nature of the in-water work, it is not anticipated to significantly impact water uses within the project area.

As described in Section 2.2.3.4, during in-water installation operations, the contractor's project manager would coordinate in-water activities with the USCG, MCB Hawaii Waterfront Operations, and the workboat captain to monitor recreational vessel activity around the deep-water WETS work site(s). Prior to deployment of the deep-water WETS mooring infrastructure, the contractor would notify the USCG District 14 office, provide the coordinates and boundaries of the work site, and request issuance of a Local Notice to Mariners, which would be broadcast and available to all mariners until the work is completed. During in-water and diving operations, the contractor would display required maritime signal flags (e.g., International Alpha Code and recreational dive flags) according to USACE EM 385-1-1 regulations. The contractor would monitor Channel 16 (USCG) and Channel 82a (MCB Hawaii Waterfront Operations). The vessel captain or assigned staff would actively monitor the work area and identify any recreational vessels of concern. Vessels that appear as though they may enter the active work area would be contacted via Channel 16 and/or 82a and notified to redirect their course to avoid the work site. If necessary, the contractor would sound a horn or whistle or approach the vessel by small boat to advise them to redirect their course around the work site.

Operational Period. During the operational period, the new onshore equipment associated with the Proposed Action (e.g., additional cables, utility vault, equipment shelter, pedestals) would be compatible with their underlying and surrounding land uses (operational, recreational, constrained open space, and family housing). The proposed utility vault would not protrude into the runway surface height; however, it is located within the runway CZ. As previously noted, the existing NAVAIR temporary airfield safety waiver (KNB-23/K-35[T]) for the existing utility vault was modified by memorandum dated 6 September 2012 into a permanent waiver that also allows for the installation of an additional utility vault in support of the Navy's wave energy program. The proposed electrical equipment facilities near the TACAN relocation site would be consistent with the operational/constrained open space use designations of the area. Airfield safety waivers for the proposed electrical equipment shed and VFI will be obtained prior to their

installation. The Proposed Action has obtained approval from MCB Hawaii airfield operations and would have no impact MCB Hawaii flight operations. Once the terrestrial electrical infrastructure system is installed, no maintenance other than periodic inspections are anticipated. The inspections would be coordinated with MCB Hawaii airfield operations staff to ensure that they do not impact runway operations. The activities that would take place within Building 614 (e.g., monitoring WEC device data and data gathered by the associated scientific equipment) would also be compatible with the surrounding land uses.

The in-water equipment and infrastructure associated with the Proposed Action would be located within DOD-controlled waters (i.e., the NDSA). WEC devices and other surface buoys would be equipped with lighting, signage and reflectors complying with USCG requirements, including approval for Private Aids to Navigation, if required. These markings and navigational aids would provide sufficient safety measures for boaters passing through the NDSA in the vicinity of the deep-water WETS.

4.9.2 HDD Alternative

The HDD Alternative would have similar impacts on land and water use compatibility as the Proposed Action, with the exception of the shore-side construction activities. The in-water coordination process would be similar in both the Proposed Action and HDD Alternative. In this alternative, the onshore staging and construction area would be located adjacent to Building 614, in an area not utilized for MCB Hawaii operations, mission support, or recreation. This alternative would not involve construction activities along the north shoreline of Mokapu Peninsula.

The HDD Alternative would have similar operational period impacts to the Proposed Action, with the exception that, because the transmission cable landing would occur below ground, no additional utility vault would be needed within the runway CZ. In addition, under this alternative, an existing fenceline would be altered (i.e., a small portion would be extended slightly south into the open space fronting the adjacent family housing units) to accommodate the electrical equipment shelter.

4.9.3 No Action Alternative

The No Action Alternative would not impact land or water use compatibility because no new uses would be introduced to MCB Hawaii or its surrounding waters.

4.10 | Cultural Resources

As defined in the implementing regulations for Section 106 of the NHPA, impacts of an undertaking on significant cultural resources are considered adverse if they “diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association” (36 CFR § 800.5(a)(1)). MCB Hawaii consulted with the SHPO regarding the Proposed Action and HDD Alternative (see correspondence in Appendix B). By letter dated 9 October 2012, MCB Hawaii determined that the Proposed Action and HDD Alternative would result in no adverse effect to historic properties in accordance with Section 106 Implementing Regulations at 36 CFR 800.4(d)(1). The discussion in Sections 4.10.1, 4.10.2, and 4.10.3 below provides the basis for MCB Hawaii’s determination. On 5 November 2012, SHPO requested additional information on the proposed undertaking. By email dated 9 November 2012, the State of Hawaii Office of Hawaiian Affairs (OHA) disagreed with MCB Hawaii’s “no adverse effect” determination and requested continuation of the NHPA Section 106 consultation process and review of the Draft EA. On 29 March 2013, MCB Hawaii provided the additional information requested by SHPO and clarified that the HDD Alternative was not being pursued due to higher costs and archaeological concerns. It also described the two alternative terrestrial equipment sites (see Section 2.6.3 for descriptions). No objection or further communication was received from SHPO after MCB Hawaii’s 29 March 2013 letter; therefore, SHPO concurrence is assumed.

On 24 May 2013, OHA requested information on alternatives considered that would result in conduits and equipment placed outside the Mokapu Burial Area. The Navy provided the requested information on

1 October 2013, and conducted a site visit with OHA on 30 October 2013. The site visit was attended by representatives of MCB Hawaii, OHA, and NAVFAC EXWC. OHA concurred with the Navy's determination of no adverse effect in its electronic mail message of 19 December 2013. All NHPA Section 106 consultation correspondence is included in Appendix B. Chapter 5 includes a list of agencies, organizations and individuals included in the consultation.

4.10.1 Proposed Action

4.10.1.1 Archaeological Sites

Under the Proposed Action, ground disturbance would be limited to the installation of approximately three to five additional pedestals to support the new power and fiber optic conduits associated with the deep-water WETS devices, below grade power and fiber optic conduits in a previously disturbed area, and above ground installation of an electrical equipment shelter and VFI. As described in Section 2.2.2.5 and shown in Figure 2-6, the new pedestals would be similar to the existing pedestals, with the exception of a new fiberglass platform to support the three new conduits. Section 2.2.3.5 describes the construction methodology of the new pedestals and utility vault. The only below-grade portion of the new pedestals would be 1-in (2.5-cm) diameter rebar that would extend a maximum of 3 ft (0.9 m) below grade (to provide structural support to the pedestal). There were no discoveries of NAGPRA cultural items made during installation of the existing pedestals that support the terrestrial power cable from the shallow-water WET berth. Because the electrical equipment shelter and associated infrastructure would be installed in a previously disturbed area, there is decreased potential of encountering any archaeological layers or material or human remains; however, there is still a potential to encounter disarticulated human skeletal remains.

Ground disturbing activities (e.g., installation of the new utility vault, electrical equipment shelter, below grade conduits, and new pedestals) would be monitored by a qualified archaeologist as a BMP to mitigate effects to subsurface archaeological remains or isolated human remains should they be encountered. Archaeological monitoring would also ensure that the Proposed Action does not exceed the work that was projected, and that disturbance of affected areas is minimized. In the event that NAGPRA cultural items, including human remains, are discovered during ground disturbing activities, all work in the vicinity would stop and the find would be stabilized and protected. The MCB Hawaii Cultural Resources Manager would then follow requisite NAGPRA procedures for consultation, treatment, and disposition of such cultural items.

During the construction, operational, maintenance and decommissioning periods, the Proposed Action would not impede access to Site 1017 for Native Hawaiian cultural practices. The footprint of the new terrestrial equipment and infrastructure is very small relative to the size of Site 1017 and generally located in previously disturbed areas or adjacent to existing facilities. Site 1017 is accessible from multiple locations in addition to the project area.

4.10.1.2 Historic Buildings/Structures

An historic preservation analysis of Building 614 was conducted by Mason Architects, Inc. (MAI) in 2012 (included as Appendix E). The analysis found that the proposed renovations to Building 614 to support the Proposed Action would comply with the Secretary of the Interior's Standards for Rehabilitation. The addition of electrical conduits and air conditioning equipment is planned in a manner that would allow for their removal with very minimal impact to the concrete structure. Though the air conditioning equipment would be visible in the main corridor of Building 614, this was preferable to locating it on the facility's exterior. All openings in the historic concrete structure would be retained. The Proposed Action would not change the view of Building 614 from either the ocean or the adjacent family housing area.

Building 614 has been vacant for many years (with the exception of two rooms used between 2003 and 2011 by the shallow-water WET berth device developer). Expanding its use for monitoring offices and

storage would improve its security and maintenance and reduce its deterioration by rehabilitating portions of the facility.

4.10.2 HDD Alternative

4.10.2.1 Archaeological Sites

Under the HDD Alternative, ground disturbance to the first 6 to 10 ft (2 to 3 m) of sub-grade would include a 10-in (25-cm) hand-augured drill entry hole and possibly a below-grade cable trench east of Building 614. Hand-auguring would enable the archaeological monitor to inspect for possible presence of cultural material in the drilled material, including human remains or burials. The 2,000-ft (609-m) bore hole would be routed a minimum of 30 ft (9 m) below grade throughout its length, thus avoiding any subsurface archaeological resources. The proposed site for the HDD drilling is in the parking area adjacent to Building 614 (Battery French), an area that has been previously disturbed and modified. An archaeological monitor would be present during the drilling of the HDD bore hole. The archaeologist would be able to evaluate the subsurface conditions for the drilling activity. Identifying cultural remains if any occur in drill cuttings or drill mud would be difficult. If an inadvertent discovery of remains were to occur, all subsurface activity will be stopped within the vicinity of the find and cultural consultation will be performed. Similar to the shallow-water WET berth project, an NHPA Section 106 Consultation Process was initiated and completed during which MCB Hawaii provided the consulting parties with the opportunity to review and comment on the Proposed Action and alternatives.

Mitigation measures for this alternative would be the same as those under the Proposed Action. Ground disturbing activities (e.g., installation of the new pedestals, electrical equipment shelter, and concrete electrical trench) would be monitored by a qualified archaeologist, who would inspect all the excavated sediments for possible cultural material and human skeletal remains. In the event that NAGPRA cultural items, including human remains, are discovered during ground disturbing activities, all work in the vicinity would stop and the find would be stabilized and protected. Archaeological monitoring would also ensure that the Proposed Action does not exceed the work that was projected, and that disturbance of affected areas is minimized.

Similar to the Proposed Action, during the operational period the HDD Alternative would not result in curtailing access to Site 1017 for cultural practices.

4.10.2.2 Historic Buildings/Structures

The impacts of the HDD Alternative on Building 614 would be the same as those of the Proposed Action, with the exception of potential removal of existing pavement on the southeast side of the facility near one of the two former gun emplacement pads for a possible below-grade concrete trench for power and fiber optics cables.

4.10.3 No Action Alternative

The No Action Alternative would not impact cultural resources because no new construction or shore-based equipment would be installed at MCB Hawaii to support a deep-water WETS berth.

4.11 | Recreation

4.11.1 Proposed Action

Impacts on recreation would be minimal and insignificant under the Proposed Action.[8] Short-term construction-related impacts would occur as recreational vessels may be directed outside in-water work areas associated with installation of the deep-water WETS mooring and underwater transmission cable systems and installation of the WEC devices. Work boats and barges used for the in-water installations of

[8] This section incorporates information and findings from “Ocean Recreation and Public Safety Report” (Clark 2013) (see Appendix C).

the deep-water WETS mooring and transmission cable systems and WEC buoy arrays would monitor boating traffic during construction, such that boats would be diverted around the construction area. Potential safety hazards and impacts to the public, including divers, swimmers, snorkelers, etc. are discussed in detail in Section 4.13 Public Safety, which addresses collision hazard, sound, electrical leakage, heat, EMF, and entanglement. In summary, the Proposed Action is likely to have insignificant impacts to public safety, including that of recreational users of the project area during construction, operation, maintenance or decommissioning activities.

During the operational period, there would be minimal impacts to ocean recreational activities. Boaters and fishermen would be prohibited from tying up to, boarding or trespassing on the WEC devices and their associated equipment. The Proposed Action would not impose additional access restrictions to recreational boaters transiting the area; however, boaters would have to navigate around the equipment. The WEC devices and surface buoys would be equipped with warning signs and navigation lights complying with USCG requirements. Locations of surface buoys and WEC devices would be added to navigation charts. All subsurface elements, such as subsurface retrieval buoys, would be located at sufficient depths (i.e., 30 ft [9 m]) so they would not be an obstruction to passing vessels. There would be infrequent, periodic maintenance inspections of the WEC devices and infrastructure. Vessels, equipment and personnel would operate for a few hours a year in the vicinity of the WETS and its infrastructure. These activities are not expected to interfere with recreational activities in the area as the work would occur near marked buoys and be easily avoided by transiting boats. In-water decommissioning activities would be temporary and involve similar assets and procedures as the installation process, with similar in-water protocols; therefore, these activities would not significantly impact recreational use of the area.

No long-term, permanent impacts on coastal recreation activities are expected. Existing access to and use of the beaches and designated recreation areas would not be affected during the operational phase. No coastal recreation areas would be affected by the surface-laid cable, as the transmission cables exiting the ocean and crossing the beach to the new utility vault would be aligned to follow the existing shallow-water WET conduit route located within the restricted shoreline zone (i.e., shoreline areas extending 300 ft [91.4 m] on either side of the main runway). This restricted zone is controlled by flight operations and is off limits to all recreational users. Information on regulations is made available to all residents, employees, and the general public; enforcement is provided by lifeguards, security personnel from Waterfront Operations, and base security personnel. The terrestrial cable route is not within a designated recreational area; therefore, periodic inspections would not impact terrestrial recreation.

4.11.2 HDD Alternative

Impacts on ocean recreation under the HDD Alternative would be similar to the Proposed Action, because the installation and operation of the deep-water WETS mooring systems and WEC devices would be the same under both alternatives, with the exception of the installation of the nearshore portion of the transmission cable (i.e., below grade in the HDD Alternative).

No impacts to coastal recreation areas would occur under the HDD Alternative, as land-side construction activities for the HDD conduit would not involve shoreline areas, construction would be concentrated around Building 614, and the in-water connection would be located at least 400 feet (14 m) from the shore at a water depth of about 33 ft (10 m).

Existing access to and use of the beaches and designated recreation areas would not be affected during the operational phase, since the HDD conduit would bypass the shoreline area and resurface on the ocean floor about 400 feet (14 m) off-shore. No maintenance of the below-grade HDD cable is anticipated. Decommissioning activities would be similar to the Proposed Action and have similar insignificant impacts on recreation.

4.11.3 No Action Alternative

No impacts to recreation would result from the No Action Alternative as existing conditions would remain unchanged.

4.12 | Infrastructure

4.12.1 Proposed Action

The Proposed Action is expected to contribute beneficial impacts to the field of alternative energy generation by providing valuable technical information to advance the understanding of capturing and converting clean, sustainable renewable energy from ocean waves. These data would help to guide the Navy's investments in technology development and supports Executive Orders, DOD Directives, and Secretary of the Navy's Energy Goals. However, the Proposed Action would not significantly impact the existing MCB Hawaii electrical system, including the grid, demand, supply and cost.

The power lines from the deep-water WEC devices would connect to the MCB Hawaii electrical grid at a connection point near the TACAN relocation site (existing manhole). The WEC device developers using the deep-water WETS would be required to condition the 11.5 kV power output of their WEC devices (i.e., buffering the energy fluctuations produced by the wave energy device to transmit power at a constant voltage and frequency) prior to transmission through the subsea trunk cable. This will ensure its compatibility with the existing MCB Hawaii electrical grid, which also transmits power using a voltage of 11.5 kV. Electrical energy generated by the WEC devices would be distributed throughout the MCB Hawaii grid at Substation #3 (Building 5033). Power generated by WEC device would meet HECO interconnection requirements prior to connecting to the grid. If the WEC device developers choose not to connect to the grid, or if HECO does not approve a connection, power generated by the WEC device would be consumed or burned off through a resister bank onboard the device. The resistors (load dissipating devices) would be surrounded by a protective shield or barrier to prevent contact with or damage by or to humans, flora or fauna.

The Proposed Action would have insignificant impacts on power demand because the WEC devices would produce a net positive electrical power during their operation (i.e., more power would be generated than would be used by the shoreside monitoring equipment). If the WEC devices are not producing power (i.e., during periods of low waves), the power required to be supplied by the MCB Hawaii grid for the monitoring equipment would be minimal (e.g., interior office lights and desktop computer).

Impacts on power supply are anticipated to be insignificant. The purpose of the Proposed Action is to determine the maximum and average power output of larger wave energy devices. The duration of these tests would be relatively short (e.g., 4 to 12 months) compared to what one would expect from a commercial installation. Furthermore, since some WEC devices may not be grid connected (either by choice or by design), it would be impractical to consider WEC devices being tested at the WETS site a reliable or a consistence power source for MCBH. Because WEC devices are in development and pre-emergent technologies, it is difficult to quantify in advance the power to be produced by these devices. However, it is expected that no more than 500 kW of power would be produced by each device. Based on experience with the wave energy testing at the shallow-water WET berth, the average power generated is expected to be less than the daily fluctuation of power supplied to the base and, therefore, should have no measurable impact on the amount of power supplied to the base by HECO. A typical large-scale WEC device is expected to produce a very small percentage (five percent or less) of the base load at any one time and therefore should have little or no impact on the grid.

Power generated at the deep-water WETS that enters the MCB Hawaii grid would be provided at no cost to the base, which would represent a beneficial impact. However, because both the net demand (when the WEC devices are not producing power) and supply would represent minimal variations to the MCB

Hawaii electrical usage and supply, the Proposed Action is not expected to significantly impact electrical utility costs to the base or other HECO customers.

4.12.2 HDD Alternative

The HDD Alternative would have similar insignificant effects on the MCB Hawaii electrical system (i.e., distribution, demand, supply and cost) as the Proposed Action.

4.12.3 No Action Alternative

The No Action Alternative would have no impacts to infrastructure, including the MCB Hawaii electrical system because no electrical power would be generated at deep-water wave energy devices in off-shore waters and subsequently transmitted back to the MCB Hawaii electrical grid.

4.13 | Public Safety

4.13.1 Proposed Action

The Proposed Action would have minimal and insignificant impacts on public safety. Other than boats transiting the area to or from Kaneohe Bay, the waters near the proposed deep-water WETS are generally not used for recreational purposes. The WEC devices and their associated mooring infrastructure may be used by fish that would normally transit through the area as a landmark in the environment. Fish are unlikely to take up residence in the vicinity as the devices will move within the water column and the vertical elements would not create a distinct structural element or notable shelter. The anchors, chain and concrete sinkers comprising the anchoring system would create some bathymetric relief on the seafloor, which would benefit some fish and demersal organisms, but are unlikely to provide much benefit to fisheries species. However, if the numbers of fish transiting or utilizing the area increase due to the Proposed Action, it may become attractive for fishing (from boats or spearfishing), and boats may anchor in the vicinity or tie up to the WEC devices or its mooring infrastructure. In spite of the warning signs that would be posted on the WEC devices to deter unauthorized boarding or tying up, individuals may attempt to board the WEC device or vandalize WETS equipment or devices. However, as described below, even if these unauthorized activities take place, there would be little risk to human health and safety from the Proposed Action.

4.13.1.1 Collision Hazard

The primary public safety concern identified by marine recreation user interviews regarding the Proposed Action (documented in Appendix C) was the potential navigation hazard posed by the new WEC devices and associated buoys if they were not equipped with warning lights. As noted in Section 2.2.2, all surface equipment, such as the WEC devices and buoys, would be equipped with navigation lights and reflectors complying with USCG specifications, as well as with warning signs. As a Notice to Mariners, the Waverider© buoys would be equipped with light that emits five yellow, 1-second flashes every 20 seconds. All surface equipment would comply with USCG requirements for lighting and signage.

Other issues raised by marine recreation user interviewees were the need for Local Notice to Mariners of in-water work in the area and the new equipment, ensuring that the new buoys and deep-water WETS berths are added to navigation charts, the need for warning signage on the new equipment, and the potential for the WEC devices' hydraulic fluid to cause adverse effects to human health and the environment in case of a release. A Local Notice to Mariners would be requested from the USCG prior to the in-water work. As noted in Section 2.2.2, the surface buoys and WEC devices would be equipped with appropriate warning signage and lighting. Any hydraulic fluid used in the WEC devices would be non-petroleum based and environmentally-safe fluids.

4.13.1.2 Sound

Underwater noise. Human divers or swimmers exposed to high levels of underwater sound can suffer from dizziness, hearing damage or other injuries, depending on the frequency and intensity of the sound

(Netherlands Organisation for Applied Scientific Research 2008). Guidance for human diver exposure to underwater sound indicates that, in the 100 to 500 Hz frequency range, recreational divers (i.e., bareheaded) and swimmers should not be exposed to SPLs greater than 145 dB re 1µPa (Parvin et al 2002). In the 501 to 2500 Hz frequency range, the same guidance recommends that recreational divers and swimmers should not be exposed to SPLs greater than 155 dB re 1µPa. Because the construction period hand drilling associated with anchoring the subsea cables would be brief and temporary (i.e., approximately one week) and because the drill-related sound (i.e., assumed in the analysis to be 163 dB re 1µPa at the source) would be attenuated to the lower guidance level approximately 50 ft (16 m) from the drilling, the construction related underwater noise is not expected to increase risk to humans in nearshore waters. Furthermore, according to MCB Hawaii Base Order P1710.1, all persons and watercraft are prohibited from recreational water sports and fishing within 500 yards of the shoreline in the approach areas at both ends of Runway 4-22. This includes much of the segments of subsea cable that would be anchored by rock bolts using hand drills; therefore, very few humans are expected to be in radius of the cable anchoring that would be exposed to sound levels above guidance levels.

During the operational period, the SPL from the WEC device is expected to be 151 dB re 1µPa at 1 m at the highest. These sound levels are within the guidance for recreational diver and swimmer exposure (i.e., 145 dB re 1µPa) at 10 ft (3 m) from the source; therefore, the operations of the WEC devices are not expected to adversely affect recreational divers or swimmers in the vicinity.

Maintenance activities would not involve generation of underwater noise levels beyond what is typical in the environment—i.e., small boats and divers in the water. Decommissioning activities may involve removal of the subsea cables and use of hand tools underwater. They are likely to be similar to those used in the installation and thus result in similar insignificant sound impacts to public safety.

Atmospheric noise. During the construction period, land-based construction equipment and vehicles are expected to have the greatest potential for adverse effects on noise sensitive receptors. The nearest noise sensitive receptors to the project area are the family housing units approximately 500 ft (152 m) south of project area. A planning level calculation of the reduction in atmospheric sound level from reference distance to the nearest noise sensitive receptors was conducted. The calculation assumed that the backhoe to be used for subsurface cable trenching near the TACAN facility would be the noisiest shore-based equipment used during the construction period. The backhoe would be used for approximately 12 hours total over a two-day period. For each doubling of distance from the source, there is a six dB decrease in sound level. The calculation indicated that noise from the backhoe would be attenuated to 60 dB at the nearest family housing unit.[9] For the purposes of evaluating funding assistance from Federal agencies (i.e., Housing and Urban Development [HUD]), an exterior noise level of 65 dB (day-night average sound level) or lower is considered acceptable. This assumes that the residential structure provides attenuation of 20 dB, resulting in interior noise levels not exceeding HUD's interior noise goals of 45 dB (day-night average sound level). Therefore, the temporary construction period noise would not adversely impact atmospheric noise levels as experienced by the nearest noise sensitive receptors.

4.13.1.3 Electrical Leakage

The subsea cables would be protected by a high strength steel armor wire jacket, which would protect it from being damaged by anchors inadvertently dropped on it by typical vessels that transit the area. If an anchor from a large boat were to snag and damage the subsea cable or if a diver intentionally vandalized and breached the cable, the transmission circuit's ground fault protection system would immediately shut off power in the circuit. This would prevent any accidental electrical leakage from the system and consequently any effects on humans that may be in the vicinity of the equipment.

[9] Sound loss calculation: $L_2 = L_1 - (20\text{Log}(r^2/r^1))$; where L_1= sound level in dB at reference distance, L_2= sound level at received distance, r^1=reference distance, r^2=received distance.

The onshore infrastructure and equipment (including second utility vault and new transmission conduits) are located within areas that are off-limits to the general population (i.e., shoreline areas extending 300 ft [91 m] outward on either side of the main runway). Similar to breaches of the subsea cable, if electrical equipment is accidentally or intentionally damaged, the ground fault protection system would off power in the circuit.

4.13.1.4 Heat

With the exception of inspection and maintenance personnel, humans are unlikely to be in the immediate vicinity of the subsea cables. The segment of subsea cable that would be at divable depths on the seafloor (i.e., less than 100 ft [30.5 m]) would generally be located within the approach area at the end of Runway 4-22, in which recreational activities—including water recreation--are prohibited by Base Order P1710.1. As described in Section 4.7.1.1, heat losses from the subsea transmission cables would have negligible impacts on seawater temperatures in the vicinity of the cable due to immediate dissipation by the seawater. The large volume of seawater around the cable would keep temperature differences less than the natural differences due to solar heating, upwelling, and current-induced mixing. Because there would be minimal heat loss from the subsea cables and, with the exception of inspection and maintenance divers, no human activity in the immediate vicinity of the cables, no heat-related public safety impacts are expected from the Proposed Action.

4.13.1.5 Electric and Magnetic Fields

The power generation unit for each proposed WEC device would produce electromagnetic emissions that may propagate into the surrounding marine waters. Recent studies predicting the EMF fields emitted from WEC devices and submarine power cables in the marine environment concluded that the electric and magnetic fields decrease rapidly in close proximity to the source (Oregon Wave Energy Trust September 2010a and 2010b). The decay of the electric and magnetic fields generated by WEC devices would depend on the nature of the source and the physical parameters of the surrounding seawater and sediments. Because there is expected to be limited human activity in the immediate vicinities of the WEC devices and subsea transmission cables, EMF resulting from the Proposed Action is not expected to create EMF hazards to public safety. Warning signs would be posted on the WEC devices to alert unauthorized persons from boarding or approaching the buoys, most of the subsea cable would either be at depths not accessible to recreational SCUBA or free divers or within the offshore areas prohibited from recreational activities (see Section 4.13.1.4 for description).

4.13.1.6 Entanglement/Entrapment

Because WEC devices do not generally have entanglement or entrapment points and move slowly with the frequency of passing waves, they pose minimal risk to inspection and maintenance personnel (or unauthorized individuals who approach or board the devices). WEC devices that have components that move relative to each other (e.g., float and spar) would present negligible entanglement hazards to individuals in their immediate vicinity because the spacing between moving parts would be minimal (e.g., less than 1 in [2.5 cm]). Mooring lines that secure the WEC devices to surface buoys would be under constant tension (i.e., without slack), which would present little entanglement hazard to any recreational swimmers or divers in the area.

4.13.2 HDD Alternative

The HDD Alternative would have similar minimal and insignificant impacts to public safety from collision hazard, sound, electrical leakage, heat, EMF, and entanglement/entrapment as the Proposed Action for the same reasons. The same warning signs and safety equipment would be installed on the WEC devices and surface buoys as in the Proposed Action. Most of the subsea cable would be located at depths not accessible to recreational SCUBA or free divers or within offshore areas prohibited from recreational activities, thus would not be exposed to EMF. Noise impacts of the HDD Alternative would differ from that of the Proposed Action in the following ways.

Unlike the Proposed Action, the HDD Alternative requires subsurface drilling from Building 614 to a point approximately 400 ft (122 m) offshore in about 33 ft (10 m) of water. Noise levels from HDD bore hole drilling is expected to be significantly lower than the levels from barges and boats installing the WEC devices, and therefore not pose a public safety threat to recreational users of the nearshore area.

The HDD drill rig is expected to generate the highest sound levels of the land-based equipment. The analysis assumed HDD drill rig sound levels of 82 dB at 45 ft (15 m) from the source (Arcadis 2011 in Montana Department of Natural Resources and Conservation 2011).The nearest noise sensitive receptor (family housing) is located approximately 250 ft (76 m) south of the proposed drill rig location. A planning level calculation of the reduction in atmospheric sound level from the drill rig to the nearest noise sensitive receptors was conducted. The drill rig would be used for approximately 12 hours per day over a 30-day period. The calculation indicated that noise from the drill rig would be attenuated to approximately 67 dB at the nearest family housing unit. Although the calculated sound level is higher than HUD, acceptable exterior noise level of 65 dB (day-night average sound level), typical sound level reductions of buildings are estimated at 24 dB in warm climates with closed windows (USEPA 1978). Because the adjacent family housing units are equipped with central air conditioning systems, the USEPA typical sound level reductions of buildings (i.e., 24 dB) was applied to the calculation, resulting in sound levels of 43 dB in the interiors of the family housing units. This would achieve HUD's interior noise goals of 45 dB. Therefore, the temporary construction period noise would not adversely impact atmospheric noise levels as experienced by the nearest noise sensitive receptors.

4.13.3 No Action Alternative

The No Action Alternative would not impact public safety as existing conditions would remain the same.

4.14 | Visual Resources

4.14.1 Proposed Action

Visual effects of the Proposed Action would be minimal from shore. WEC devices at the shallow-water WET berth are almost imperceptible when viewed from the Mokapu Peninsula shoreline. At approximately twice the distance from shore, WEC devices at the deep-water WETS berths—though they may be larger than those at the shallow-water site—would be less visible. Lights and navigational aids associated with the new deep-water berths would be visible at some distance, but are necessary for maritime safety.

The new electrical equipment shelter and VFI would be located near the TACAN facilities (i.e., antenna and supporting electrical equipment), in an operational area associated with the runway. The new facilities would be similar in scale to the existing TACAN electrical equipment shed and much lower than the antenna. They may be visible from some points along the perimeter of the nearby residential areas. However, they would not be visible from areas accessible to the general public or affect significant views of the shoreline or important landmarks.

The additional pedestals needed for the terrestrial cable route under this alternative would be similar to the existing pedestals in height and profile. Along most of its route, the existing pedestal-mounted conduit is obscured by natural vegetation growth, making it indistinguishable from the surrounding environment. It is expected that, after the additional conduits and pedestals are installed, the surrounding vegetation would obscure most of its route from view.

The Proposed Action would not affect significant views of Building 614 from either the ocean or adjacent housing area.

4.14.2 HDD Alternative

The HDD Alternative would have similar effects on visual resources as the Proposed Action, with the exception of the terrestrial cable segment and the location of the electrical equipment shelter and VFI. In this alternative, the transmission cable and associated infrastructure would not be visible until it emerges from the HDD bore hole on the east side of Building 614. If the concrete cable trench is constructed below grade, the only visible portion of the transmission cable system would be the short distance where it is routed on pedestals from the concrete trench to the electrical equipment shelter behind Building 614. These pedestals would be similar in design and size to those included in the Proposed Action. If the cable trench is above ground, it would have a low profile and width (approximately 12 in [30 cm] high and approximately 12 in [30 cm] wide), and would not obscure significant views of Building 614. Alteration of the existing fenceline that screens Building 614 from the adjacent family housing area would not result in significant adverse effects to the view plane. Fencing material and height would be consistent with the existing fence.

4.14.3 No Action Alternative

The No Action Alternative would have no impacts on existing visual resources from or of MCB Hawaii.

4.15 | Cumulative Impacts

Cumulative impacts to environmental resources result from incremental effects of an action evaluated in conjunction with the effects of other government and private past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions that take place over a period of time.

There would be short-term, temporary impacts related to construction; however, the cumulative impact discussion is restricted to potential impacts that persist beyond construction-phase impacts of short duration. Based on the discussion of potential impacts earlier in this chapter, climate, air quality, water quality, marine and terrestrial biological resources, land and water use compatibility, cultural resources, recreation, and infrastructure have the potential to be adversely impacted by the Proposed Action and HDD Alternative, and are relevant to the discussion of cumulative impacts. Section 4.15.1 provides summaries of past, present and reasonably foreseeable future projects considered in the cumulative impacts analysis and Section 4.15.2 contains the cumulative impact analysis organized by resource area. The analysis shows that the aggregate impacts of the past, present, and reasonably foreseeable future actions--including incremental contributions of the Proposed Action and HDD Alternative--would not result in cumulative impacts on relevant resource areas.

4.15.1 Projects Considered in the Cumulative Impacts Analysis

This section summarizes the past, present and reasonably foreseeable future actions considered in the analysis of cumulative impacts. Although there are a large number of projects planned for MCB Hawaii to address existing facility shortfalls or planned initiatives, the projects included in the analysis of cumulative impacts were selected because of their location, timing, and anticipated effects having the potential to collectively result in cumulative impacts when considered with those of the Proposed Action and HDD Alternative. Table 4-2 lists the projects considered in the analysis.

Table 4-2: Construction Projects Considered in the Cumulative Impact Analysis

Project Name (Proponent)	Timeframe	Purpose and Scope	Resource Areas with Potential for Cumulative Impacts
WET shallow-water berth (Navy)	constructed and operational	Install and test up to six WEC devices off the north shore of Mokapu Peninsula, MCB Hawaii in waters up to 100 ft (30 m) deep. Only one berth for WEC devices has been established and utilized. No additional	Climate, water quality, marine biological resources, land and water use compatibility, cultural resources, recreation, infrastructure

		shallow-water berths are planned for construction. A maximum of one WEC device can be installed and operated at the shallow-water WET berth at a time. The continued use of the shallow-water berth is the subject of a separate NEPA document because that action could be undertaken with or without the Proposed Action or HDD Alternative.	
TACAN relocation (Navy)	ongoing	Relocate existing TACAN antenna tower and supporting facilities from temporary site near airfield to site that meets Federal Aviation Administration (FAA) flight requirements.	Terrestrial biological resources, land and water use compatibility, cultural resources, infrastructure
Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii (USMC)	personnel increases: 2012 to 2018 (construction over 6 to 10 years)	Base and operate up to two Marine Medium Tiltrotor squadrons and one Marine Light Attack Helicopter squadron at MCB Hawaii, and construct required supporting facilities. Facilities to be located on south side of airfield runway.	Climate, water quality, cultural resources, infrastructure
Ulupau Crater Explosives Training Range (USMC)	under construction (2014 completion of construction)	Construct and operate explosives training range on northwestern side of Ulupau Crater at MCB Hawaii for training in safe handling and use of explosives.	Climate, water quality, marine biological resources

WET Shallow-Water Berth

As described in Section 1.2, in 2004, the Navy established a shallow-water WET berth to test WEC devices in waters approximately 100 ft (30 m) deep, approximately 3,300 ft (1,000 m) offshore of Mokapu Peninsula, MCB Hawaii. This test site includes a surface floating WEC device (when operational), one mooring site with a 3-point anchoring system, equipment canister, an onshore utility vault, undersea and onshore power and data/communications cables, shoreside control room with monitoring equipment (Building 614), and a connection to the MCB Hawaii electrical grid in Building 614 (see Figure 1-2 for vicinity map). While the shallow-water WET test site was intended to establish six WEC device test berths at the shallow-water test site, as of 2013, only one test berth has been established at the site, with three different WEC devices tested at the site since 2004. The WEC devices were installed and tested starting in May 2004, July 2007, and December 2009, respectively. The last WEC device was removed in January 2012.

The shallow-water WET berth is planned for continued operation, including installation of a fourth WEC device, the "NWEI Wave Energy Demonstration Project," which is proposed for installation and testing beginning in Fiscal Year 2014.[10] The proposed NWEI WEC device would utilize the existing shallow-water WET mooring/anchoring system, subsea/terrestrial power transmission cables, and Building 614 infrastructure/facilities. The proposed NWEI WEC device would be similar in physical appearance, size, profile, dimensions, and mooring configuration as earlier WEC devices at the shallow-water WET, and would be installed using methods similar to the earlier WEC devices. Its power conversion system would be different from the earlier three shallow-water WEC devices. The NWEI WEC device would use a multi-mode point absorber, which extracts energy from both the heave (vertical) and surge (horizontal) components of a wave (vice other WEC devices that extract energy from only the heave motion of waves). It would be tested over a 12-month period then removed. Other shallow-water WEC device developers may seek to test other point absorber devices at the shallow-water WET berth. After Fiscal Year 2016 decommissioning recommendations are generated, all three wave energy test berths (i.e., two deep-water and one shallow-water) would be decommissioned.

[10] The NWEI WEC is addressed under a separate NEPA Record of Categorical Exclusion, as it is an action that would be implemented with or without the Proposed Action covered in this EA. Likewise, the Proposed Action covered in this EA is not dependent on the continued operation of and installation/operation of WEC devices and related scientific monitoring equipment at the shallow-water berth.

TACAN Relocation

A tactical air navigation system (TACAN) is currently located south of a taxiway for Runway 4/22; however, this is considered a temporary location because it does not meet FAA requirements or provide ideal navigation coverage. The system consists of an antenna and supporting electrical equipment (e.g., transformer, generator and electrical utilities). A site closer to the north coastline of Mokapu Peninsula was identified as the permanent site for the TACAN. The facilities are in the process of being relocated to the permanent site, which is approximately 150 ft (46 m) southeast of the proposed utility vault and in the vicinity of the proposed electrical equipment shelter under the Proposed Action (see Figure 2-6).

MV-22 and H-1 Aircraft Basing

The Navy proposes to base MV-22 Osprey tiltrotor aircraft and H-1 Cobra and Huey attack and utility helicopters in Hawaii, including up to 22 MV-22 aircraft (i.e., two 12-aircraft squadrons) and 15 AH-1 Cobra and 12 UH-1 Huey helicopters (i.e., one Marine Light Attack Helicopter squadron) at MCB Hawaii. The proposed basing would support operational training for ground troops in Hawaii that is currently limited by the lack of specific aviation assets for troop transport and offensive air support, Several projects are proposed to support the basing: demolition, renovation and/or construction of new facilities, including hangars, taxiway and parking apron improvements; additional bachelor enlisted quarters; headquarters and parking structure; and expansion of aircraft maintenance facilities. The planning horizon is 2018, with personnel increases occurring from 2012 through 2018, phased with the delivery of aircraft. Approximately 1,000 active duty personnel, 22 civilian personnel (contractors and government employees), and 1,100 dependents would be associated with the new aircraft basing. Construction will be phased over six to ten years.

Ulupau Crater Explosives Training

The USMC must provide realistic training opportunities that simulate current and future battle environments. Existing MCB Hawaii facilities cannot fully support unit requirements for explosives and demolition training. Therefore, MCB Hawaii is in the process of developing an explosives training range on the northwestern side of Ulupau Crater on Mokapu Peninsula (to the west of the deep-water WETS shoreside project area). The training range will support levels of training in the safe handling and use of explosives, which were not previously available at MCB Hawaii and impractical or costly to conduct at other facilities in Hawaii. The facility will consist of a bermed range enclosing three sand demolition pits, a safety bunker, parking, and access road. Training would take place in the sand demolition pits as well as within the bunker. The facility will be used by up to 50 Marine personnel at a time, an average of one to two days a week (or 100 days per year), in combination with classroom training. The size and type of explosive materials used would vary (e.g., amatol, ammonium nitrate, black powder, Composition A3, B4, C4, TNT, etc.) and individual charges would not exceed 7.1 lb (3.2 kg) of net explosive weight (MCB Hawaii January 2012). The zone of influence for most of the project's environmental impacts would be limited to the land areas directly affected by the training range, with the exception of potential impacts to water quality and marine biological resources in nearshore waters downslope and offshore of the range and local climatic conditions.

4.15.2 Analysis of Cumulative Impacts

The following analysis of cumulative impacts is organized by resource area in the same order presented in Chapters 3 and 4. Only the resource areas that have the potential to have cumulative impacts resulting from the incremental effects of the Proposed Action or HDD Alternative are addressed. The analyses show that, when considered with relevant past, present and reasonably foreseeable projects, the incremental effects of the Proposed Action and HDD Alternative would not contribute to cumulative impacts on pertinent resource areas. Because it would not contribute any incremental effects, the No Action Alternative would not result in cumulative impacts on the relevant resource areas during the

construction, operational, maintenance and decommissioning periods.

Climate and Air Quality

The earth's climate is affected by energy entering and leaving its atmosphere, which can be affected by both natural and human factors, including variations in the sun's energy reaching the planet, changes in the reflectivity of its atmosphere and surface, and changes in the amount of heat retained by its atmosphere. When energy from the sun reaches the earth's surface, it can either be reflected back into space or absorbed by the earth. After it is absorbed, the energy can be released back into the atmosphere as heat (i.e., infrared radiation) (EPA 28 June 2012). Greenhouse gas (GHG) emissions absorb energy, resulting in the slowing or prevention of heat loss back into space. The key GHGs emitted by human activities include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases. In 2004, energy supply (i.e., the burning of coal, natural gas, and oil for electricity and heat) was the largest source of global GHG emissions (26%), followed by industry (19%), land use change and forestry (17%), agriculture (14%), transportation (13%), commercial and residential buildings (8%), and waste/wastewater (3%) (EPA 13 June 2012).

For each GHG, a global warming potential (GWP) has been calculated to represent the average length of time it remains in the atmosphere, along with how well it absorbs energy, relative to CO_2. A higher GWP indicates greater ability to absorb energy per pound. The unit of measure is expressed as million metric tons of carbon dioxide equivalent ($MMTCO_2Eq$).

Though individual projects are unlikely to have significant impacts on global climate change, they collectively may have cumulative effects when their individual GHG emissions are combined over time. The Proposed Action would generate GHG emissions in the manufacturing, assembly, transportation and deployment/installation of the WEC devices, scientific measurement equipment, anchor moorings, transmission cables, utility vault, and ancillary electrical transmission and monitoring equipment. However, most of the GHG emissions associated with the Proposed Action would be temporary in nature. Once they are installed, the operation of the WEC devices is not expected to generate incremental levels of GHGs that would significantly impact global, regional or local climate conditions when considered together with other relevant past, present or reasonably foreseeable projects. The HDD Alternative would have similar, but slightly higher GHG emissions as the Proposed Action, due to the energy required to drill the HDD bore hole. However, like the Proposed Action, its cumulative impacts to global, regional or local climate conditions would be insignificant.

The GHG emissions associated with the Proposed Action should be considered in light of its purpose and intent: to advance the development of a non-polluting, scalable power source for future Navy and USMC applications that would replace GHG-emitting energy supplies. A recent study by the Electric Power Research Institute (EPRI) (EPRI 2011) assessed the potential for generating energy through wave energy along the U.S. coasts. In total, the recoverable electric generation from wave energy along U.S. coasts could amount to more than 1,170 terawatt-hours[11] (TWh) per year, which is almost one third of the 4,000 TWh of electricity used in the United States each year. Hawaii's share of the total recoverable electric generation was estimated at 80 TWh/year. This is equivalent to over 47 million barrels of oil[12] or 56.444 $MMTCO_2Eq$[13]. Therefore, the Proposed Action and HDD Alternative have the potential to ultimately contribute to the reduction of regional and overall GHG emissions (and Clean Air Act criteria pollutants) in the future by advancing wave energy conversion technology.

Water Quality

The Proposed Action and HDD Alternative would be located in marine waters off the north shore of Mokapu Peninsula. Ground disturbance due to construction of other projects within watersheds feeding

[11] 1 terawatt hour = 1,000,000,000 kilowatt hours.
[12] Assumes 1 terawatt hour = 588,440.748397 barrels of oil equivalent.
[13] Assumes 7.0555×10^{-4} metric tons CO_2/kilowatt hour.

into Kaneohe Bay and marine waters offshore of Mokapu Peninsula have the potential to affect water quality. Cumulative adverse water quality impacts during construction and operations would be avoided through USACE permit conditions and drilling management plan (for the HDD Alternative), project-specific NPDES permit conditions, BMPs, and monitoring (for the Ulupau Crater Explosives Training Range), and standard operating procedures. Installation of the existing shallow-water WET infrastructure in 2003 and the subsequent installation and operation of three shallow-water WEC devices (beginning in 2004) have not adversely affected water quality, and the proposed installation of a fourth shallow-water WEC device can be expected to have similar minimal effects. When considered together with other relevant past, present or reasonably foreseeable projects, the incremental effects of the Proposed Action and HDD Alternative would not contribute to significant cumulative effects on water quality in marine waters offshore of Mokapu Peninsula or in Kaneohe Bay.

Marine Biological Environment

Water quality impacts, underwater construction noise, and disturbance or removal of existing habitats could result in adverse cumulative impacts to protected species or sensitive habitats, including coral reef resources. The follow-on monitoring surveys of the existing shallow-water WET berth and its related infrastructure over an eight-year period (2003-2011) indicate that its construction and operation have not resulted in increased stress, disease, or abnormalities in any of the marine organisms present within its project area. There is no evidence that protected species such as sea turtles or marine mammals have become entangled or entrapped in equipment associated with the installation and operation of the shallow-water WET berth. Similar marine biological impacts (i.e., not significant) are expected from construction, operation, maintenance and decommissioning of the Proposed Action and HDD Alternative.

The Proposed Action and HDD Alternative may contribute to an increase in biomass and biodiversity in the affected area by providing suitable substrate for recruitment. Best management practices during construction (e.g., biological monitors during in-water work, diver- or ROV survey-assisted cable-laying, drill management plan) would avoid or minimize adverse impacts of the Proposed Action and HDD Alternative, which would, in any case, be limited in geographic scope. The Proposed Action and HDD Alternative would result in insignificant or discountable impacts to proposed listed coral species and proposed Hawaiian monk seal critical habitat. They would not jeopardize the existence of proposed listed coral species or result in the destruction or adverse modification of proposed critical habitat. Though other projects at MCB Hawaii and the surrounding community have the potential to adversely impact marine biological resources, those impacts are expected to be minor and, though overlapping in timeframe, are geographically dispersed. Therefore, the Proposed Action and HDD Alternative, when considered together with other relevant past, present and reasonably foreseeable projects (including the continued operation of the shallow-water WET berth) are not expected to incrementally contribute to collectively significant cumulative adverse impacts to the marine biological environment, including marine protected species and sensitive habitats.

Terrestrial Biological Resources

The Proposed Action and HDD Alternative were determined to have temporary and minimal impacts to terrestrial flora and fauna. No protected species are expected to be impacted by the Proposed Action or HDD Alternative. Both the Proposed Action and the ongoing project to relocate the TACAN facilities to the area near the proposed electrical equipment shed would occur on previously disturbed land that lacks sensitive habitats. Native plant vegetation trimmed as part of the Proposed Action would be undertaken in a manner that promotes regrowth. Vegetation that was trimmed down to install the shallow-water WET terrestrial cable has regrown. Vegetation planned for removal in other areas necessary to implement the Proposed Action (e.g., near the TACAN site and near Building 614) would affect only non-native plants, which are expected to grow back to their current state. Project BMPs would reduce risks to sea turtles and Hawaiian monk seals by ensuring that personnel remain outside a protective radius from animals that haul out on the beach, no work would be performed on a beach if a monk seal would be exposed to 100 dB re 20 μPa in air, and no work would be performed on a beach if sea turtle nesting is known or suspected. Therefore, the incremental effects of the Proposed Action and HDD Alternative are not

expected to result in cumulative impacts to terrestrial biological resources, when considered together with other relevant past, present and reasonably foreseeable projects, including the continued operation of the shallow-water WET berth.

Land and Water Use Compatibility

The Proposed Action and HDD Alternative are compatible with existing land and water uses in their respective project areas and surrounding vicinities. The projects considered in this analysis of cumulative impacts are also compatible with land and water uses in their respective vicinities. Therefore the incremental effects of the Proposed Action and HDD Alternative are not expected to contribute to significant impacts on land and water use compatibility when considered together with relevant past, present and reasonably foreseeable projects.

Cultural Resources

The Proposed Action and HDD Alternative were determined to have no adverse effects on historic properties. Neither alternative would alter or damage those features of the Mokapu Burial Area or Building 614 that make them eligible for listing on the NRHP. Construction activities would be carried out in a way to properly treat and respect the sites (e.g., rubber-tired vehicles would be used and remain on existing access roads, ground-disturbing activities will be observed by an archaeological monitor). Potential cumulative impacts on archaeological resources and traditional cultural resources were identified for the basing of MV-22 and H-1 Aircraft in support of III MEF Elements in Hawaii (Navy 2012a). Implementation of stipulations included in an executed Programmatic Agreement will mitigate unavoidable adverse effects associated with the MV-22/H-1 basing undertaking that cannot be avoided. Previous disturbance and deposition of imported fill material at the TACAN site (where the electrical equipment shelter, VFI, and subsurface conduits would be located) reduce the potential for encountering archaeological layers or materials or human remains during activities associated with the Proposed Action. The State SHPO concurred with the Navy's determination of "no historic properties affected" for implementation of the existing shallow-water WET project. No cultural remains were inadvertently discovered during implementation of the shallow-water WET project. MCB Hawaii determined that the Proposed Action and HDD Alternative would result in no adverse effect to historic properties and initiated NHPA Section 106 consultation with the SHPO (see Appendix B). SHPO did not object to the determination and its concurrence is assumed. OHA concurred with the Navy's determination in its electronic mail message of 19 December 2013 (see Appendix B for correspondence). Therefore, it is unlikely that incremental effects of the Proposed Action or HDD Alternative would result in significant cumulative impacts to cultural resources when considered together with relevant past, present and reasonably foreseeable projects.

Recreation

The Proposed Action and HDD Alternative were determined to have minimal and insignificant impacts on recreation. Construction period impacts would be temporary as recreational vessels may be directed outside the in-water work areas. During the operational period, there would be minimal impacts to ocean recreational activities because project implementation would not preclude public access through the NDSA. The WEC devices and surface buoys would be equipped with warning lights and navigation lights complying with USCG requirements. No ongoing adverse impacts to ocean recreation were identified as resulting from the existing shallow-water WET berth or WEC devices that were operated there. The NWEI WEC device and associated scientific data gathering equipment proposed for the shallow-water WET berth are expected to have minimal impacts on recreation, similar to the earlier WEC devices at the shallow-water WET berth. Because individually, both the shallow-water WET and proposed deep-water WETS berths are unlikely to adversely affect ocean recreation, and because of the distance between them (approximately 4,500 ft [1,372 m] apart), it is unlikely that the incremental effects of the Proposed Action and HDD Alternative would contribute to significant impacts on recreation.

On land, the shore landing site of the Proposed Action's transmission cables would be near the existing shallow-water WET transmission cable. This area is within the restricted shoreline zone (i.e., shoreline areas extending 300 ft [91.4 m] on either side of the main runway), which is controlled by MCB Hawaii

flight operations and off limits to all recreational users. Likewise, the terrestrial cable route and supporting electrical facilities for the Proposed Action and HDD Alternative are not within any areas designated for recreational use. Installation and operation of the existing shallow-water WET infrastructure and WEC devices have not impacted terrestrial recreation, and the proposed NWEI WEC device is expected to have the same impact. Therefore, the Proposed Action and HDD Alternative would not have cumulative impacts on terrestrial recreational uses, when considered with other relevant past, present and reasonably foreseeable projects.

Infrastructure

The Proposed Action and HDD Alternative would not contribute cumulative impacts on MCB Hawaii infrastructure, including the electrical grid, demand, supply, and cost to MCB Hawaii customers when considered cumulatively with the operation of the shallow-water WET berth. Power generated at the deep-water and shallow-water test sites would meet the requirements of MCB Hawaii and HECO prior to grid connection. Operation of both test sites would not significantly increase net electrical demand from the MCB Hawaii or HECO grids or sources when no WEC devices are operational or connected to the grid. The power generated at the deep-water and shallow-water sites would be within the normal fluctuations of power supplied to the base. Therefore, the incremental effects of the Proposed Action and HDD Alternative are not expected to contribute to significant impacts on infrastructure when considered together with relevant past, present and reasonably foreseeable projects.

4.16 | Possible Conflicts Between Proposed Action and the Objectives of Federal Land Use Plans, Policies and Controls

4.16.1 MCB Hawaii Master Plan

The MCB Hawaii Master Plan (NAVFAC Hawaii 2006a and 2006b) provides land use and facility development guidelines for MCB Hawaii. The Plan indicates that the project area (including electrical transmission and equipment infrastructure) is located in operational, recreational, and constrained open space areas. The Proposed Action and HDD Alternative would be consistent with the land uses included in the MCB Hawaii Master Plan.

4.16.2 INRMP

The INRMP (MCB Hawaii 2011) guides implementation of MCB Hawaii's integrated natural resources management program on MCB Hawaii properties and was prepared in accordance with the Sikes Act Improvement Act of 1997. It is an update of the original 2001 MCB Hawaii INRMP/EA (MCB Hawaii 2001) and follows an ecosystem management approach involving a suite of management actions within seven different Course of Action areas of concern representing a full array of natural resources and concerns. As discussed below, the Proposed Action and HDD Alternative would be consistent with the INRMP's relevant goals, objectives, approaches, and projects/actions for coastal and marine resources management.

Goal 7.1: Fish and Wildlife Management

Objective 7.1.1: Implement species and habitat enhancement by controlling invasive species.

Discussion: Under the Proposed Action and HDD Alternative, where native plants are removed or substantially disturbed as a result of project-related construction activities, the affected areas would be revegetated with native plants.

Goal 7.4: Coastal and Marine Resources Management

Objective 7.4.1: Improve inventory and conditions of biological and geophysical processes and features in MCB Hawaii littoral areas.

Discussion: In preparation for the in-water construction and activities, multiple surveys of MCB Hawaii nearshore marine waters have been conducted, including both biological and bathymetric surveys. An ROV survey of the specific seafloor areas where WETS-related infrastructure will be conducted prior to final routing and placement. Along with operational period scientific data gathering of environmental conditions (e.g., waves, currents, acoustic, and EMF effects) and follow up biological surveys, these data contribute to a greater understanding of the biological and geophysical processes and features in MCB Hawaii littoral areas.

Goal 7.4: Coastal and Marine Resources Management

Objective 7.1.1 Implement species and habitat enhancement by controlling invasive species.

Discussion: Under the Proposed Action and HDD Alternative, where native plants are removed or substantially disturbed as a result of project-related construction activities, the affected areas would be revegetated with native plants.

Goal 7.5: Grounds Maintenance and Landscape Management

Objective 7.5.1: Take a sustainable landscape approach to improve grounds maintenance and landscape management.

Discussion: Under HDD Alternative, existing landscaped shrubs at the south side of Building 614 would be removed for construction activities and be replaced according to the base INRMP (i.e., adhering to approved regionally indigenous plants and avoiding invasive, high maintenance plants).

4.16.3 CZMA

By the exchange of letters dated June 1, 2009 and July 9, 2009, the Navy and the State of Hawaii's Department of Business, Economic Development and Tourism, Office of Planning respectively proposed and concurred that those activities listed on the "Navy/Marine Corps De Minimis Activities under CZMA" (De Minimis Activity List) were not subject to further review by the Hawaii CZM Program when such an activity was conducted in compliance with the corresponding "Project Mitigation/General Conditions" (see Appendix F for correspondence).

The Proposed Action and HDD Alternative fall within the following four De Minimis Activity List items:

Item	Proposed Action	Description
1	New Construction	Construction of new facilities and structures wholly within Navy/Marine Corps controlled areas (including land and water) that is similar to present use and, when completed, the use or operation of which complies with existing regulatory requirements.
2	Utility Line Activities	Acquisition, installation, operation, construction, maintenance, or repair of utility or communication systems that uses rights of way, easements, distribution systems, or facilities on Navy/Marine Corps controlled property. This also includes the associated excavation, backfill, or bedding for the utility lines, provided there is no change in preconstruction contours.
9	Scientific Measuring Devices	The installation of devices which record scientific data (staff gages, tide gages, water recording devices, water quality testing and improvement devices and similar structures) on Navy/Marine Corps controlled property. Devices must not transmit acoustics (certain frequencies) that will adversely affect marine life.
18	Alternative Energy Research	Installation, operation, replacement, and removal of alternative energy research structures/equipment taking place within Navy/Marine Corps controlled areas.

The relevant project mitigation/general conditions from the De Minimis Activity List are as follows:

1, 2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16

- Navy/Marine Corps controlled property refers to land areas, rights of way, easements, roads, safety zones, danger zones, ocean and naval defensive sea areas under active Navy/Marine Corps control.
- If any listed species enters the area during conduct of construction activities, all activities will cease until the animal(s) voluntarily depart the area.
- Turbidity and siltation from project related work will be minimized and contained to within the vicinity of the site through appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.
- All project related materials and equipment to be placed in the water will be cleaned of pollutants prior to use.
- No project-related materials (fill, revetment, rock, pipe, etc.) will be stockpiled in the water.
- No contamination (trash or debris disposal, alien species introductions, etc.) of adjacent marine/aquatic environments shall result from project-related activities.
- Fueling of project-related vehicles and equipment will take place away from the water, and a contingency plan will be developed to control accidental petroleum releases during project construction. Absorbent pads and containment booms will be stored on-site, if appropriate, to facilitate clean-up of accidental petroleum releases.
- Under-layer fill material used in the project will be protected from erosion as soon as practicable
- Any soil exposed near water as part of the project will be protected from erosion and stabilized as soon as practicable.
- Consultation pursuant to Section 106 of the NHPA has been completed (see Appendix B).
- Informal consultation with NOAA Fisheries for the project's possible impacts on ESA-protected species has been completed (see Appendix D).
- This EA is being prepared in compliance with NEPA.
- Navy or Marine Corps staff shall notify the State CZM of *de minimis* list usage for projects which require an EA.

The State CZM office was advised by electronic mail on 11 July 2013 of the Navy's usage of the De Minimis Activity List and the preparation of this EA; by electronic mail, it acknowledged receipt of the Navy's notification on 12 July 2013 (see Appendix F for CZMA correspondence).

4.17 | Relationship Between Short-Term Uses and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term use of the environment and the effects that these uses may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of

particular concern. For the purposes of this EA, "short-term" refers to the construction and WEC device operational periods and "long-term" refers to the period after the WEC device testing concludes. Potential trade-offs between short- and long-term gains and losses include:

- Short-term, construction period impacts of the Proposed Action and HDD Alternative on terrestrial and marine biological resources during construction and installation of surface-laid cable (for Proposed Action only) and installation of subsea cable(s). As evidenced by the qualitative and quantitative data gathered during post-construction monitoring surveys of the existing shallow-water WET berth infrastructure, over time, the deep-water WETS subsea transmission cables may contribute to an increase in biomass and biodiversity in the affected area by providing suitable substrate for coral and macroalgae recruitment and growth.
- Short-term gains to fin fish and invertebrate biomass through the provision of stable hard substrate and increased habitat complexity and vertical relief.
- Long-term gains in accelerating development of wave energy conversion technology to reduce dependence on fossil fuels.

4.18 | Compliance with Executive Orders

This section describes how the Proposed Action and HDD Alternative comply with relevant EOs.

4.18.1 Executive Order 12898, Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (11 February 1994) and the Secretary of the Navy Notice 5090 (27 May 1994) require the Navy to identify and address the potential for disproportionately high and adverse human health and environmental effects of their actions on minority and low-income populations.

The on- and offshore components of the Proposed Action and HDD Alternative infrastructure and equipment are located in areas controlled by the DOD. There are no known significant or adverse environmental impacts, including human health, economic, or social effects that would disproportionately affect minority or low-income communities resulting from the Proposed Action, HDD Alternative, or No Action Alternative.

The Mokapu Burial Area (Site 1017), in which the terrestrial components of the Proposed Action and HDD Alternative would be located, is listed in the NRHP and protected under the NHPA. Although not currently used as a burial area for Native Hawaiians, it is used for cultural activities. The project-related electrical and communications components proposed to be installed within the Mokapu Burial Area are very small in scale relative to the site and located in previously disturbed areas or adjacent to existing facilities. Once they are installed, the only project-related activities that would take place would be occasional maintenance inspections. Neither the Proposed Action nor HDD Alternative would impede current access to the site or existing cultural activities practiced by Native Hawaiian cultural claimants that take place within its boundaries.

4.18.2 Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045 (21 April 1997) requires Federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children; and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health or safety risks.

Children do not frequent the onshore project area and are unlikely to be affected by any of the alternatives. Much of the nearshore subsea cable routes are located within the Runway 4/22 restricted land area (300 ft [91 m] outward on either side of the main runway) and/or security buffer zone extending from the shoreline to 500-yd (457-m) offshore, where children are not expected to enter. The in-water

components located outside the 500-yd (457-m) buffer zone (e.g., WEC devices, surface buoys) are not in areas where children would be disproportionately present or affected.

4.18.3 Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (24 January 2007)

Executive Order 13423 (24 January 2007) consolidates and strengthens a number of prior EOs (13101, 13123, 13134, 13148 and 13149) by establishing new and updated goals, practices, and reporting requirements for environmental, energy and transportation performance and accountability. EO 13423 establishes goals for Federal agencies to implement the policy of conducting environmental, transportation, and energy-related activities in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient and sustainable manner. Goals relevant to the Proposed Action and HDD Alternative include:

- Improving baseline energy efficiency and reducing greenhouse gas emissions by certain numerical targets and timelines; and
- Ensuring that at least half of the statutorily required renewable energy consumed by the agency in a fiscal year comes from new renewable sources, and to the extent feasible, implements renewable energy generation projects on agency property for agency use.

The Proposed Action and HDD Alternative would increase opportunities for generating renewable energy off-shore of existing Navy and USMC installations by advancing wave energy technology through the WEC device testing at the deep-water WETS berths.

4.18.4 Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance (5 October 2009)

Executive Order 13514 (5 October 2009) builds on and expands the energy reduction and environmental requirements of EO 13423 by making reductions of greenhouse gas emissions a priority of the Federal government, and by requiring Federal agencies to develop sustainability plans focused on cost-effective projects and programs. Its goal is to establish an integrated strategy towards sustainability in the Federal Government and to make reduction of greenhouse gas emissions a priority for Federal agencies. Under this EO, agencies are required to measure, manage, and reduce greenhouse gas emissions toward agency-defined targets, and meet a number of energy, water, and waste reduction targets and sustainability requirements.

The Proposed Action and HDD Alternative would accelerate wave energy device developers' technology to a commercial level by providing deeper water sites in which to test WEC devices that can produce higher levels of electrical power. By contributing to the advancement of wave energy conversion technology, the Navy can move more rapidly toward meeting the goals of this executive order.

4.18.5 Executive Order 13089, Protection of Coral Reefs

Executive Order 13089 (11 June 1998) directs all Federal agencies whose actions may affect U.S. coral reef ecosystems to:

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

There are no coral reefs at the location where the deep-water WETS will be installed. In both the Proposed Action and HDD Alternative, measures would be employed during subsea cable-laying activities to avoid areas of live coral or to relocate coral heads where they are unavoidable. In shallower waters (i.e., less than 100 ft [30 m]), the transmission cables would be secured to the seafloor to ensure

they do not move across the substrate and jeopardize a coral colony. All coral will be avoided to the greatest extent practicable, and ongoing studies will monitor the condition of coral that is at the project site after the WETS is installed and operational.

4.19 | Means of Mitigating Potential Impacts

4.19.1 Biological and Water Quality Resources

The Proposed Action and HDD Alternative are not expected to result in significant impacts to marine biological resources or water quality. However, to avoid or reduce adverse impacts of construction and operational activities, BMPs would be employed, such as the following:

A. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the proposed action, particularly in-water activities such as boat operations, diving, and deployment of anchors and mooring lines.

   1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the Proposed Action for ESA-listed marine species.

   2. During construction or WEC device installation, surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

   3. Personnel shall remain alert for marine mammals before and during drilling. Do not commence hand drilling if a marine mammal is observed within 1,640 ft (500 m) of operation. Wait 30 minutes after the last sighting of the marine mammal before starting to drill. If drilling is already started and a marine mammal is sighted within 1,640 ft (500 m) after drilling has commenced, drilling can continue unless the marine mammal comes within 820 ft (250 m) during drilling; operations should then cease until the animal is seen to leave the area of its own volition or after 30 minutes have passed since the last sighting.

   4. All in-water installation and maintenance work shall be postponed or halted when ESA-listed marine species are within 50 yards (yd) (46 m) of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species (other than Hawaiian monk seals on land) are noticed within 50 yd (46 m) after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that the activity would not affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

   5. All personnel will stay more than 150 ft (46 m) from Hawaiian monk seals and sea turtles that haul out on the beach.

   6. Personnel will not perform work on the beach during the time that a Hawaiian monk seal is hauled out if the work would be so loud as to expose them to 100 decibels referenced to 20 μPa in-air.

   7. Personnel will not perform work on the beach if turtle nesting is known or suspected to be occurring.

   8. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.

   9. Prior to deployment of the mooring and electrical transmission hardware on the seafloor, conduct ROV video surveys of the proposed hardware locations and routes. Use marine biological expert interpretation to identify marine resources in the area to ensure that no coral or potential

suspensions are along the planned route. Actual placement of the hardware and cables could vary from the proposed survey route centerlines by no more than ±10 percent times the water depth. Cable laying will ensure that the cable remains taut so no slack will occur during cable placement.

10. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.

11. Subsea cables shall be routed to minimize impacts to corals and all structures will be installed to avoid abrasion to corals. Colonies of *Montipora flabellata* and *M. patula* (corals proposed for listing under the ESA) observed along the subsea cable route shall be identified and avoided completely. Other corals shall be avoided to the highest degree practicable. Lay inshore subsea cables by floating and then lowering the cables to the seafloor with diver assistance within 100 ft (30 m) of the shallow-water WET cable, avoiding placing them on top of coral especially in the 33- to 100-ft (10- to 30-m) depth within the reef flat, escarpment and the deep reef platform zones. In depths below 100 ft (30 m) (i.e., beyond SCUBA diving depths), use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated infrastructure to avoid the sparsely scattered corals and formations.

12. Where coral heads are unavoidable and can be easily dislodged from the substrate, divers will attempt to pry the coral head from the substrate and move it an appropriate distance from the impact line of the cable

13. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.

14. When piloting vessels, vessel operators shall alter course to remain at least 100 yd (91 m) from whales, and at least 50 yd (46 m) from other marine mammals and sea turtles.

15. Reduce vessel speed to 10 knots (18.5 kph) or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots (9.3 kph) or less.

16. If despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 ft (15 m) away, and then slowly move away to the prescribed distance.

17. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.

18. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

19. Vessel and barge operators will strive to anchor project-related vessels/barges only in sandy substrate or limestone devoid of corals. Installation of a fixed mooring buoy in sandy/non-coral substrate will be considered if vessels visit the WETS berths frequently.

20. Develop a decommissioning plan for the installed structures to include criteria for deciding when to remove elements of the project and when to allow elements that are providing some benefit to the environment to remain in place after the project is completed.

B. Effects to the marine and terrestrial environment from project-related activities would be minimized.

21. Employ industry-standard BMPs to avoid discharge of pollutants into the marine environment.

22. A contingency plan to control toxic materials is required.

23. Appropriate materials to contain and clean potential spills shall be stored at the work site (including aboard project-related vessels), and be readily available.

24. All project-related materials and equipment placed in the water shall be free of pollutants.

25. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.

26. Fueling of land-based vehicles and equipment shall take place at least 50 ft (15 m) away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.

27. Spill containment areas would be established and used for refueling of small portable equipment.

4.19.2 Cultural Resources

The Proposed Action and HDD Alternative are not expected to result in significant impacts to cultural resources. BMPs would be employed during construction and operational activities, such as the following:

- Archaeological monitoring throughout all ground-disturbing activities

- Hand-augur the first 6 to 10 ft (2 to 3 m) of the HDD bore hole

- Ensure all construction and operational period vehicles accessing the project area are rubber-wheeled and remain on existing access roads

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Chapter 5

List of Agencies, Organizations and Individuals Consulted

Federal Agencies

NOAA Fisheries

State Agencies

State of Hawaii, Department of Land and Natural Resources (DLNR), State Historic Preservation Division
Office of Hawaiian Affairs

Organizations and Individuals

Diamond Ohana
Olds Ohana
Ortiz Ohana
Keohokalole Ohana
Ka Lahui Hawaii
Paguyo Ohana
Prince Kuhio Hawaiian Civic Club
Boyd Ohana
Paoa Kea Lono Ohana
Kekumano Ohana
Kekoolani Ohana
Oahu Island Burial Council
Koolauloa Hawaiian Civic Club
Hui Malama I Na Kupuna O Hawaii Nei
Temple of Lono
Emil Wolfgramm
Historic Hawaii Foundation
Kaleo Paik

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Chapter 6

References

Anthony, T. G., N. A. Wright, and M. A. Evans. Review of Diver Noise Exposure. Prepared for Health and Safety Executive by QinetiQ. 2009.

Arcadis. Environmental Assessment of ExxonMobil Pipeline, Yellowstone HDD Project. 1 August 2011.

BAE Systems Sensor Solutions Identification & Surveillance. Mapping of Benthic Habitats for the Main Eight Hawaiian Islands, Task Order I Project Completion Report. Prepared for U.S. Department of Commerce, NOAA National Ocean Service, NCCOS, Center for Coastal Monitoring and Assessment. 1 August 2007.

Bartol, S.M., J.A. Musick, and M.L. Lenhardt. Auditory Evoked Potentials of the Loggerhead Sea Turtle (Caretta caretta). Copeia, Vol. No. 3. August 2, 1999. pp. 836-840. 1999.

Battista, T.A., B.M. Costa, and S.M. Anderson. Shallow-Water Benthic Habitats of the Main Eight Hawaiian Islands (DVD). NOAA Technical Memorandum NOS NCCOS 61, Biogeography Branch. Silver Spring, MD. http://ccma.nos.noaa.gov/products/biogeography/hawaii_cd_07/. 2007.

Benhamou, S., J. Sudre, J. Bourjea, S. Ciccione, A. De Santis, and P. Luschi. "The Role of Geomagnetic Cues in Green Turtle Open Sea Navigation." Plos One 6(10). 2011.

Brabyn, M. and R.V.C. Frew. “New Zealand Herd Stranding Sites Do Not Relate to Geomagnetic Topography” in Marine Mammal Science 10: 195-207. 1994.

CALTRANS. Final Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Prepared by ICF Jones & Stokes and Illingworth and Rodkin, Inc. 2009.

City and County of Honolulu. Tsunami Evacuation Map, Map 7: Kailua (Inset 1). http://www1.honolulu.gov/dem/map7kailuatokaneohebayinset1.pdf (accessed 12 August 2011). 2010.

Clark, John. Marine Public Safety and Recreational Uses Report for the Wave Energy Technology (WET) Test Environmental Assessment. Prepared for Belt Collins Hawaii Ltd. May 2002.

Clark, John. Wave Energy Technology Buoy Marine Public Safety and Recreational Uses Report. January 2013.

Davis, R. A. Assessment of the Effects of Underwater Noise from the Proposed Port Dolphin Energy LNG Deep Water Port Project. Prepared for CSA International, Inc. by LGL Limited. 2008.

EPA. “Causes of Climate Change.” http://www.epa.gov/climatechange/science/causes.html. Updated 28 June 2012.

EPA. “Global Emissions.” http://www.epa.gov/climatechange/ghgemissions/global.html. Updated 13 June 2012.

EPA. “Greenhouse Gas Emissions.” http://www.epa.gov/climatechange/ghgemissions/gases.html. Updated 31 August 2012.

Electric Power Research Institute. Mapping and Assessment of the United States Ocean Wave Energy Resource. Technical Report. 2011.

Gaboury, I., R. Gaboury, M Zykov, and S. Carr. Port Dolphin Energy LLC Deep Water Port: Assessment of Underwater Noise. Prepared for CSA International, Inc. by JASCO Research Ltd. 2008.

Henderson, S. The Geology of Mokapu Peninsula, Oahu. 1994.

Hui, C.A. “Lack of Association Between Magnetic Patterns and the Distribution of Free-Ranging Dolphins” in Journal of Mammalogy 75: 399-405. 1994.

John J. McMullen Associates, Inc. Evaluation of three Stanley Hydraulic Rock Drills for Use by Divers. Prepared for Naval Civil Engineering Laboratory, Report No. CR 84.020. 1984.

Juvik, Sonia P. and James O. Juvik, Editors. Atlas of Hawaii. Third Edition. 1998.

Klinowska, M. Cetacean Live Stranding Sites Relate to Geomagnetic Topography. Aquatic Mammals 1, 27-32. 1985.

Klinowska, M. Cetacean Navigation and the Geomagnetic Field. Journal of Navigation 41, 52-71. 1988.

Lohmann, K. J., N. F. Putman, and C. M. F. Lohmann. "Geomagnetic imprinting: A unifying hypothesis of long-distance natal homing in salmon and sea turtles." Proceedings of the National Academy of Sciences of the United States of America. 105(49):19096-101. 2008.

McAllister, J. Gilbert. Archaeology of Oahu. B.P. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu. 1933.

MCB Hawaii. Final Marine Corps Base Hawaii Integrated Natural Resources Management Plan Update (2012-2016). Prepared by MCB Hawaii Environmental Compliance and Protection Department and Sustainable Resources Group International, Inc. November 2011.

MCB Hawaii. MCB Hawaii Integrated Natural Resources Management Plan/Environmental Assessment (2002-2006). Prepared by Diane C. Drigot, Environmental Department, MCB Hawaii and Bruce A. Wilcox and Kristin N. Duin, Sustainable Resources Group International, Inc. November 2001.

MCB Hawaii. Environmental Assessment and Finding of No Significant Impact Construction and Use of an Explosives Training Range at Ulupau Crater, Marine Corps Base Hawaii, Kaneohe Bay. January 2012.

MCB Hawaii. Base Order P1710.1, Base Recreational Activities. 12 June 2012.

Marine Research Consultants. Draft Wave Energy Technology (WET) Marine Corps Base Hawaii Marine Environmental Assessment. Prepared for Belt Collins Hawaii. May 2002.

Mason Architects, Inc. “Battery French: Wave Energy Test Site Historic Preservation Analysis.” Prepared for Sound & Sea Technology. November 2012.

Montana Department of Natural Resources and Conservation. Checklist Environmental Assessment for ExxonMobil Silvertip Pipeline Temporary Construction License and Easement. 2011.

NAVFAC EXWC (formerly Naval Facilities Engineering Command Engineering Service Center). Site Specific Report SSR-3671-ENV Marine Ecological Assessment of Proposed Wave Energy Project Area Offshore Marine Corps Base Hawaii. Prepared by Stephen H. Smith. September 2011.

NAVFAC EXWC Scientific Diving Services. “Reconnaissance Level Observations on the Proposed Power Cable Corridor and Adjacent Areas - March 2013”. April 2013.

NAVFAC Hawaii. MCB Hawaii Master Plan Volume I—Land Use Plan. December 2006a.

NAVFAC Hawaii. MCB Hawaii Master Plan Volume II—Capital Improvements Plan. December 2006b.

Navy. Proposed Wave Energy Technology Project Marine Corps Base Hawaii Environmental Assessment. January 2003.

Navy. Barking Sands Underwater Range Expansion Refurbishment; Final Record of Categorical Exclusion/Overseas Environmental Assessment. 2008.

Navy. Final Environmental Impact Statement for the Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii. Volume 1. 2012a.

Navy. Pacific Navy Marine Species Density Database. Pearl Harbor, Hawaii: Commander United States Pacific Fleet. Prepared by Hanser, S.F., E.A. Becker, and A. Kumar. 2012b.

Navy Bureau of Medicine and Surgery. Final Environmental Assessment Construction of the Naval Hospital Replacement, Naval Hospital Complex, Agana Heights, Guam. 30 July 2010.

Navy Joint Guam Program Office. Final Environmental Impact Statement Guam and CNMI Military Relocation, Appendix I Air Impact Study. July 2010.

Nedwell, J and T. Howell. A Review of Offshore Windfarm Related Underwater Noise Sources. Prepared for Collaborative Offshore Wind Energy Research Into the Environment by Subacoustech, Ltd. 2004.

Nedwell, J., J. Langworthy, and D. Howell. Assessment of Sub-sea Acoustic Noise and Vibration from Offshore Wind Turbines and its Impact on Marine Wildlife; Initial Measurements of Underwater Noise During Construction of Offshore Windfarms, and Comparison with Background Noise. Prepared for Collaborative Offshore Wind Energy Research Into the Environment by Subacoustech, Ltd. 2003.

Netherlands Organisation for Applied Scientific Research. Review of Published Safety Thresholds for Human Divers Exposed to Underwater Sound. TNO Report TNO-DV 2007 A598. April 2008.

Oregon Wave Energy Trust. Electromagnetic Field Study. The Prediction of Electromagnetic Fields Generated by Wave Energy Converters. Prepared by Michael Slater, Adam Schultz, and Richard Jones. 0905-00-003 September 2010a.

Oregon Wave Energy Trust. Electromagnetic Field Study. The Prediction of Electromagnetic Fields Generated by Submarine Power Cables. Prepared by Michael Slater, Adam Schultz, and Richard Jones. 0905-00-007 September 2010b.

Parvin, S.J., E.A. Cudahy and D.M. Fothergill. “Guidance for Diver Exposure to Underwater Sound in the Frequency Range from 500 to 2500 Hz. Proceedings of Undersea Defence Technology, La Spezia, Italy. 2002.

Prishmont, Laura Ann and Lisa Anderson. Archaeological Subsurface Testing in Conjunction with the Airfield Runway Repairs Project in the Mokapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii. Ogden Environmental and Energy Services Company, Inc. Honolulu. 2000.

Ridgway, S. H., E.G. Wever, J.G. McCormick, J. Palin, and J.H. Anderson. Hearing in the Giant Sea Turtle, Chelonia mydas. PNAS, 64, 884-890. 1969.

Sale, A., and P. Luschi. "Navigational challenges in the oceanic migrations of leatherback sea turtles." Proceedings of the Royal Society B-Biological Sciences. 276(1674):3737-45. 2009.

Sound and Sea Technology. Wave Energy Technology Project (WET) Environmental Impacts of Selected Components. Prepared for Belt Collins Hawaii. 2002.

State of Hawaii, Department of Health. Office of Environmental Planning. Water Quality Standards Map of the Island of Oahu. October 1987.

State of Hawaii, Department of Health. Annual Summary 2011 Air Quality Data. September 2012.

Sustainable Resources Group International, Inc. MCB Hawaii Coral Reef Ecosystem Management Study, Final Report. December 2002.

Thomson J., B. Polagye, C. Bassett. Noise Measurements of Columbia Power Technologies, 1/7 Scale Prototype (SeaRay). Report prepared by Northwest National Marine Renewable Energy Center, University of Washington for Columbia Power Technologies, Inc. 2012.

Tuggle, H. David and Robert J. Hommon. Historic Property Inventory, Marine Corps Air Station, Kaneohe Bay: History, Survey, and Site Descriptions. 1986.

Tuggle, H. David. A Preliminary Summary of the Bowles Records Concerning Mokapu Excavations, Oahu. 2002.

U.S. Department of Agriculture Soil Conservation Service. Soil Survey of Islands of Kauai, Oahu, Molokai and Lanai, State of Hawaii. Sheet 64, August 1972.

U.S. Federal Emergency Management Agency (FEMA). National Flood Rate Map, Flood Insurance Rate Map. Map No. 15003C0280F. Revised September 30, 2004 (accessed August 12, 2011).

USEPA. Protective Noise Levels. Condensed Version of EPA Levels Document. November 1978.

USGS. Earthquake Hazards and Zoning in Hawaii website. <http://hvo.wr.usgs.gov/earthquakes/hazards/> accessed 19 September 2013.

USFWS, USGS, NOAA Pacific Islands Regional Office, Bishop Museum, UH Manoa Botany Department, and State of Hawaii DLNR Division of Aquatic Resources. Final Report Inventory of Coastal and Marine Resources, Marine Corps Base Hawaii-Kaneohe Bay. INRMP Project HI 20009. May 2008.

Ward, P. Underwater Noise Impact Study in Support of the Oyster Wave Energy Project, Isle of Lewis, Technical Report. Prepared for Aquamarine Power, Edinburgh, Scotland for Kongsburg Maritime, Aberdeen, Scotland. 2012.

Western Pacific Regional Fishery Management Council. Fishery Ecosystem Plan for the Hawaii Archipelago. September 2009.

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Chapter 7

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APPENDICES

Appendix A
Marine Ecological Assessment

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Site Specific Report
SSR-3671-ENV

MARINE ECOLOGICAL ASSESSMENT OF PROPOSED WAVE ENERGY PROJECT AREA OFFSHORE MARINE CORPS BASE HAWAII

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14. ABSTRACT

The Office of Naval Research has been conducting tests of wave energy conversion buoys offshore Marine Corps Base Hawaii since 2003. Currently, the Naval Facilities Engineering Command (NAVFAC) is interested in deploying new buoy designs in the same (approved) project area, but at greater depths and further offshore.

NAVFAC Engineering Service Center's (ESC) Scientific Diving Services group conducted marine ecological monitoring of the wave energy facility from October 2003 through October 2004. No adverse impacts to any marine natural resources were detected during the first year of monitoring. Nevertheless, periodic monitoring was continued between 2005 and 2007 and an updated survey was performed in May 2011.

The key findings and conclusions of these investigations were: 1) no detectable adverse impacts to any threatened or endangered species, 2) no detectable adverse impacts to corals or coral reefs, 3) no detectable adverse impacts to fishery target species or to EFH, 4) no alien species have been detected on or adjacent to any of the equipment associated with the wave energy project, the equipment has not been an attractant to any alien species,5) the anchor base and associated equipment have increased habitat complexity and vertical relief, resulting in an increase in fin fish diversity and biomass, 6) the power cable supported greater densities of coral in May 2011 than the adjacent seafloor areas, 7) the findings from the Navy studies are compatible with the findings from two separate studies performed by personnel from USFWS, NOAA and other agencies.

The anchor base, power cable and associated equipment should be left in place and should not be removed. This equipment is benefiting marine natural resources and serving as a modest artificial reef. Removal of the equipment would result in adverse impacts.

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EXECUTIVE SUMMARY

The Office of Naval Research has been conducting tests of wave energy conversion buoys offshore Marine Corps Base Hawaii since 2003. Currently, the Naval Facilities Engineering Command (NAVFAC) is interested in deploying new buoy designs in the same (approved) project area, but at greater depths and further offshore.

NAVFAC Engineering Service Center's (ESC) Scientific Diving Service group conducted marine ecological monitoring of the wave energy facility from October 2003 through October 2004. No adverse impacts to any marine natural resources were detected during the first year of monitoring. Nevertheless, periodic monitoring was continued between 2005 and 2007 and an updated survey was performed in May 2011. All the surveys were focused upon the resources over which the regulatory agencies had expressed concern. These resources were: threatened and endangered species, corals and coral reefs, fishery target species and Essential Fish Habitat (EFH) and alien species.

In addition to the Navy's marine ecological surveys, multi-agency marine ecological surveys were performed at or near the project site in 2002, and 2004. This current report analyzed data from the 2005 to 2007 time period and the May 2011 surveys and then compared those findings with the initial first year monitoring effort and with the multi-agency surveys.

The key conclusions are as follows:

- The findings of the Navy surveys are fully compatible with the findings of the multi-agency surveys.
- There have been no detectable adverse impacts to any threatened or endangered species.
- There have been no detectable adverse impacts to corals or coral reefs. In fact, the power cable supported greater densities of coral in May 2011 than the adjacent seafloor areas.
- There have been no detectable adverse impacts to fishery target species or to EFH. The anchor base and associated equipment have increased habitat complexity and vertical relief, resulting in an increase in fin fish diversity and biomass.
- No alien species have been detected on or adjacent to any of the equipment associated with the wave energy project. The equipment has not been an attractant to any alien species.
- The anchor base, power cable and associated equipment should be left in place and should not be removed. This equipment is benefiting marine natural resources and serving as a modest artificial reef. Removal of the equipment would result in adverse impacts.

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ACRONYMS AND ABBREVIATIONS

COE	Corps of Engineers
COTS	Crown-of-thorns starfish
DLNR	Department of Land and Natural Resources
EA	Environmental Assessment
ESC	Engineering Service Center
EFH	Essential Fish Habitat
HAPC	Habitat Areas of Particular concern
LPI	Line Point Intercept
MCBH	Marine Corps Base Hawaii
MDSU-1	Mobile Diving Salvage Unit 1
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NAVFAC	Naval Facilities Engineering Command
ROV	Remotely Operated Vehicle
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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1.0 INTRODUCTION

1.1 General

The Office of Naval Research has been conducting tests of wave energy conversion buoys offshore Marine Corps Base Hawaii since 2003. Figures 1 and 2 depict the general project area. The Navy worked closely with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), Hawaii Department of Land and Natural Resources (DLNR) and the U.S. Army Corps of Engineers (COE) to select an appropriate project location. The site chosen was approximately 1,190 m (3,900 ft) offshore North Beach at Marine Corps Base Hawaii (MCBH) at a water depth of 33 m (100 ft). The wave energy buoy was installed in the fall of 2003.

A marine biological monitoring program of the wave energy buoy, mooring equipment and power cable was initiated in October 2003. During the October 2003 to October 2004 timeframe, the first year of monitoring, the biological data collection was performed by S.H. Smith (Navy marine ecologist) using open circuit compressed air scuba. He completed 25 dives at the site. The results of the first year's monitoring program were presented in the *Wave Energy Technology Project, Offshore Marine Corps Base Hawaii Year 1 Biological Monitoring Report October 2003 Through October 2004* (Smith 2004). This report is included as Appendix A.

Between October 2004 and June 2007 an additional 27 dives were completed by Smith. The most recent assessment was completed by Smith and Donald Marx (Navy marine ecologist) in May 2011; they made 28 dives. All diving activities were supported by Mobile Diving Salvage Unit 1 (MDSU 1); the total number of person dives completed (2003 – 2011) was 151 dives. There were no accidents, injuries or incidents. Figures 3 and 4 show the anchor base.

Currently, the Naval Facilities Engineering Command (NAVFAC) is interested in deploying new buoy designs in the same (approved) project area, but in deeper water further offshore. The tentative water depths at the proposed new buoy locations would range from 46 to 83 m (150 to 270 ft) and would be located approximately 2,523 m (8,200 ft) from shore. The power transmission cable corridor would run from these deeper buoys to the existing sea floor equipment complex at 33 m (100 ft) and then parallel the existing cable route to shore.

The methods for assessing marine natural resources within the 33 to 83 m (100 to 270 ft) depth portion of the proposed project area are currently being determined. It is expected that they will involve multi-beam bathymetry, side scan sonar and ROV photography. This report is restricted to marine natural resource data collected at depths of 33 m (100 ft) or less. Note, initial side scan sonar surveys conducted in May 2011 indicate that the deeper portions of the project area appear to be predominantly flat, to gently sloping limestone, with a thin veneer of sand.

1.2 Biological Background and Regulatory Concerns

In April 2002 Marine Research Consultants, with the assistance of personnel from Sea

Engineering, NMFS and USFWS, completed a Rapid Ecological Assessment of the project area. The results of this assessment are presented in *Wave Energy Technology (WET) Marine Corps Base Hawaii Kaneohe Bay Marine Environmental Assessment* (U.S. Department of Navy 2003). As a result of the 2002 assessment, the marine community within the project area was divided into six basic habitat types or zones. These six zones have remained basically unchanged and the descriptions from 2002 were still accurate in May 2011. The following description of the six zones was taken directly from the EA.

1.2.1 Sand-Boulder Zone

"The ocean bottom just seaward of the beach, from a depth of zero to approximately 12 to 15 feet…, consists of a bed of coarse-grained carbonate sand that is kept in a state of continual re-suspension by wave energy. Interspersed on the sand bed are boulders that are continually swept by re-suspended sand. Some of the boulder riprap that was used to construct the revetment securing the end of the runway has separated from the structure and is submerged in the near shore area….As a result of the continuous re-suspension of sand with passing waves, the substrate from the shoreline through the sand-boulder zone contains little marine vegetation or coral…No fish or other marine vertebrates were observed residing in the sand-boulder zone during the underwater site assessment…"

1.2.2 Sand Channel Zone

"Farther offshore from the sand-boulder zone, the ocean bottom consists of consolidated limestone bisected by small channels, which vary in width and eventually end in ridge formations. These spur and groove formations are generally oriented perpendicular to the bottom contours and the shoreline. Generally 3 to 4 ft…of relief is present between the bottom of the channels and the adjacent ridges. While the channel bottoms typically consist of flat and scoured limestone with a thin veneer of sand, some live coral is present on the ridges. The sand channel zone transitions from the sand-boulder zone at approximately 12 to 18 feet…and extends to a depth of 30 to 35 feet…""The constant state of re-suspension in the sand channel zone restricts settlement of bottom dwelling organisms on both the sand and limestone surfaces. Macrobiota in this zone were scattered heads of the branching coral *Pocillopora meandrina,* which grow along the vertical sides of the reef channels…."

1.2.3 Reef Flat Zone

"Offshore from the sand channel zone, the emergent reef platform becomes more solid as sand cover decreases. The spur and groove formations end around the 30 to 35 ft…water depth, and the bottom from that point to approximately 50 feet is a wide plateau of relatively solid, flat limestone. Some scattered areas of vertical relief exist, generally due to potholing, coral growth or the presence of small limestone ridges and ledges."

"The surface of the limestone reef flat consists of a short algal turf that binds a thin layer of carbonate sediment. Macrobiota in this zone includes sporadic heads of coral *P. meandrina* and flat encrustations of *Porites lobata, Montipora capitata, Montipora patula, Montipora*

flabellata…The dominant algae on the platform are clumps of the genera *Porolithon.* Coral growth is greater along the edge of the ledges than in the flat areas, and fish are more likely to frequent the areas of coral growth…"

1.2.4 Escarpment Zone

"The escarpment zone can be defined from… the 50 ft…contour to approximately the 90 to 95 ft…depth contour…The primary macrobiota on the escarpment is the flat encrusting coral *M. capitata.* In some localized areas, this species covers up to 50% of the substrate…"

1.2.5 Deep Reef Platform Zone

"From the bottom of the escarpment zone, the bottom gradually slopes to a depth of approximately 100 ft….where it becomes almost featureless. There is a thin veneer of sand 1 to 2 in…thick bound to the pitted, flat limestone surface by a thin veneer of algal turf in some areas. The bottom topography remains relatively constant and barren through the depth range of the zone."

"The predominant macrobiota are scattered heads of the coral *P. meandrina* and flat encrustations of the coral *M. capitata.* Macrobiotic composition varies from relatively high coral cover above the 95 ft…depth contour to relatively little cover below this boundary. Other species known to transit the area at this depth include humpback whales, green sea turtles, and Hawaiian monk seals. Fish and turtle species tend to aggregate in areas of higher relief than that found in the proposed project area."

1.2.6 Undercut Ledge Zone

"At several locations at the eastern end of the deep reef platform, a system of small undercut ledges run parallel to the depth contours…Increased populations of fish and coral occur around the ledges…Undercut ledges can be designated as HAPC [Habitat Areas of Particular Concern]; however, based on the relatively small size of these ledges, they would not fall under this classification…"

1.2.7 Regulatory Concerns

It is important to note that after the initial 2002 surveys, the NMFS, USFWS and DLNR concluded that the project was not likely to adversely impact any of the resources under their jurisdiction. Nevertheless, some individuals, within those agencies expressed concern regarding the following issues:

1. Sea turtles might be attracted to the structure and become entangled or trapped.
2. Monk seals might be attracted to the structure and become entangled or trapped.
3. The structure might promote the growth and/or spread of alien species.

It has been the author's understanding that these three issues have continued to be the primary concern of the stakeholder agencies. Therefore, the surveys performed since 2004 have focused on those three issues while simultaneously gathering information of corals/coral reefs and EFH.

1.3 Review of Findings of 2003 to 2004 Monitoring Effort

The report of the first year monitoring effort is included as Appendix A. Fifty person dives (25 by Smith) were completed during the first year of monitoring. The six habitats described above remained unchanged between 2002 and 2004. In fact, the descriptions of those habitats were still accurate at the time of the May 2011 survey.

During the first year of monitoring seven important observations were made. These observations were:

1) No endangered hawksbill sea turtles (*Eretmochelys imbricata*) were sighted underwater or from the boat.

2) No threatened green sea turtles (*Chelonia mydas*) were sighted underwater. No significant quantities of preferred green sea turtle forage were sighted on any of the dives. No surface sightings (from the dive boat) of green sea turtles were made within approximately 500 m (1,625 ft) of either the buoy or the transmission cable. Four green sea turtle sightings were made from the dive boat during transits between the dive sites and Waterfront Operations at MCBH. The green sea turtles sighted all had a carapace length of approximately two feet.

3) No endangered Hawaiian monk seals (*Monachus schauinslandi*) were sighted underwater, or from the dive boat.

4) No endangered humpback whales (*Megaptera novaeangliae*) were seen underwater, or from the dive boat. No marine mammals sounds of any kind were heard during any of the dives.

5) No alien invertebrates were sighted on any of the dives.

6) No alien algae were sighted on any of the dives.

7) No changes in the behavior, distribution or concentration of mollusks, echinoderms or arthropods was observed along the transmission cable.

2.0 OBJECTIVES

The objectives of the present effort were to: 1) review the *Wave Energy Technology Project, Offshore Marine Corps Base Hawaii Year 1 Biological Monitoring Report October 2003 Through October 2004*; 2) review and present the findings of monitoring efforts conducted

between October 2004 and June 2007; 3) complete an updated assessment (diving survey) of selected marine natural resources at the existing mooring location (33 m [100 ft]) and along the power transmission cable corridor and 4) qualitatively compare present conditions with those found during the 2003 to 2007 time period. The marine natural resources assessed were:

- Threatened and endangered species
- Essential Fish Habitat (EFH)
- Corals / coral reefs
- Alien and invasive species

3.0 METHODS (2005 – 2007 AND 2011)

As previously noted, open circuit compressed air scuba dives were made to facilitate direct observations and data collection. In addition, all sea turtle and marine mammal sightings made from the dive boat were recorded. The methods used during the 2005 – 2007 time period were comparable to those used during the 2003 – 2004 period. Some of the methods used during the May 2011 survey were slightly different; all methods are described below.

3.1 Replicate Quadrats

These were performed at four points on the anchor base between 2003 – 2004 and during the 2005 – 2007 monitoring period. Guide pins had been welded onto the anchor base frame. A 50 X 50 cm (19.5 X 19.5 in) quadrat was place over the guide pins and the area within the quadrat was examined and photographed to determine what, if any, flora or fauna had settled there. At the time of the 2011 surveys, only the placement pin for quadrat number 2 remained. Figures 5 – 7 show representative photos of that quadrat taken in October 2006, June 2007 and May 2011. The areas at which the other three quadrats had been located appeared to have comparable fouling to the one quadrat that was precisely relocated.

3.2 Coral Recruitment in Chain Lockers

Two rectangular boxes filled with anchor chain provided additional ballast for the anchor base. Scleractinian coral recruitment to the chain and to the sides of the boxes was monitored by counting the number of colonies and photographing them. Zip ties were placed adjacent to selected coral recruits to facilitate re-locating them. Figures 3 and 4 and 8 – 13 depict the chain, chain lockers and coral recruitment.

3.3 Replicate Belt Transects

These were performed between the Escarpment Zone and the Reef Flat Zone. Two transects, each 50 m (165 ft) in length, were placed over the transmission cable. Zip tie tags on the rock bolt anchors and stainless steel pins driven into the sea floor, were used as the base point for the replicate transects. Each transect included an assessment of the transmission cable itself and flora

and fauna within 1 m (3.25 ft) on each side of the cable. Still photographs were taken at 5 m (16 ft) intervals along the transect. Figures 14 – 19 show representative cable sections in March 2005 and May 2011. By 2011, all the replicate transect markers had been lost or moved. Therefore, it was not possible to accurately relocate the previous transects.

3.4 Line Point Intercept

The previously established transects along and adjacent to the power cable could not be precisely relocated. All the zip ties marking power cable anchor bolts and all the steel transect pins were gone, or had become dislodged and rolled down slope. Instead, the transmission cable from the anchor base to a depth of 4.6 m (15 ft) was visually assessed and 16 Line Point Intercept (LPI) transects were completed on the power transmission cable, and parallel to the cable (at a distance of 5 m (16 ft) away on the eastern side of the cable). Each LPI transect was 10 m (33 ft) long and data was collected at intervals of 50 cm (19.5 in). The LPI transects were performed at three different depth zones 33 – 27.7 m (100 – 90 ft), 24.6 – 21.5 m (80 – 70 ft), 12.3 – 10.8 m (40 – 35 ft).

The categories of organisms recorded were: 1) turf algae, 2) crustose coralline algae, 3) other algae, 4) sponge, 5) scleractinian corals (identified to lowest taxa) and 6) all other organisms. Algae are classified into four major phyla: Cyanophyta/Cyanobacteria (Blue-green algae), Chlorophyta (Green algae), Phaeophyta (Brown algae) and Rhodophyta (Red algae). Tropical algae are also often placed into one of three functional groups: turf algae (also known as algal turf), crustose coralline algae and macro algae. Turf algae, as used in this report, are defined as the multi-species assemblage of diminutive, generally filamentous algal species with heights of less than 10 cm. The crustose coralline group contains species which are heavily calcified and have encrusting and/or hard lumpy growth patterns. Macro-algae includes all remaining species, including heavily calcified upright branching genera, like the Green algae *Halimeda sp.*

3.5 Invertebrate Assessment

This activity was primarily intended to record the condition of scleractinian (stony) corals. The observations of corals included visually evaluating the colonies for:

1.) Physical damage (e.g., cracks and broken branches)
2.) Complete or partial mortality of individual colonies
3.) Mucus production
4.) Disease
5.) Predation
6.) Bleaching

The physical damage component was intended to determine if movement of the power cable had occurred and damaged any corals. Partial mortality as used in these studies refers to surface lesions/dead areas on stony corals. Hughes and Jackson (1980), Riegl (1995) and others have shown partial mortality on the surface of stony corals can be effective indicators of stress. Stony coral mucus production is another indicator of stress from pollutants, sedimentation, etc (Stafford-Smith and Ormond, 1992; Stafford-Smith, 1993 and Wild et al. 2005). Bruno et al.

(2003) and Sutherland et al. (2004) have shown that corals are more susceptible to disease when they are stressed by changes in the environment. All apparent visual evidence of disease was recorded. The author's assessment of predation included action by Crown-of-thorns-starfish also known as COTS (*Acanthaster planci*), parrotfishes and macro-bioeroders (e.g., boring sponges). Cooper et al. (2008) have correlated high densities of macro-bioeroders with diminished water quality. Bleaching refers to the loss or reduction of symbiotic zooxanthellae which reside within the coral.

A semi-quantitative record was kept of the numbers of octopus, lobsters, COTS, and sea urchins. The presence/absence and/or numbers of individuals sighted on, under or within 10 m (33 ft) of any project equipment was recorded.

3.6 Fish Assessment

This activity involved recording every species of finfish, which could be identified in the field, or by photographs taken in the field. Photographs were also taken of the anchor base and used to estimate the total numbers of the numerically dominant fish species which frequent the anchor base. An effort was made to determine if any of the fishes exhibited unusual behavior and/or showed any signs of abnormalities, such as lesions. The fish assessments also included conducting meandering swims around the anchor base and estimating the total number of selected species within five numeric categories. The numeric categories used were: <10, >10 < 25, >25 <50, >50 <100, >100 <200. For some species, which were not abundant, like the moray eel *Gymnothorax meleagris* an exact number was recorded. Fish further than 10 m (33 ft) from the anchor base or associated equipment were not counted. Figures 20-22 illustrate fishes commonly sighted.

3.7 Alien Assessment

During the Marine Aliens Workshop at the University of Hawaii (May 18, 2001) five invasive alien algae, and 21 alien invertebrates were listed as being present within Kaneohe Bay. The *Marine Corps Base Hawaii Coral Reef Ecosystem Management Study* (December 2002) lists 1 alga, 47 invertebrates and 8 fishes. Some of these alien organisms can be quite confidently identified in the field, e.g., the snowflake coral *Carijoa riisei* and the sea frost worm *Salmacina dysteri.* Most, however, must be collected and identified in a laboratory. No sampling was conducted, but all field identifiable alien species were recorded.

3.8 Threatened and Endangered Species Assessment

The threatened green sea turtle *Chelonia mydas,* and the endangered hawksbill sea turtle (*Eretmochelys imbricata*), the endangered Hawaiian monk seal (*Monachus schauinslandi*) and the endangered humpback whale (*Megaptera novaeanglia*) have all been reported within the project area. Field identification of each of these animals is relatively easy. The MDSU 1 divers were instructed in how to identify each of these species and, in the case of the turtles, to also

estimate the size and sex. Whales can often be heard, but not seen. Care was taken during the dives to listen for whales and dolphins. All members of the team kept a lookout for these species during the dives and on the surface from the dive boat.

4.0 RESULTS

There were no detectable adverse changes to marine natural resources in any of the six habitat zones that could be reasonably attributed to the presence of the wave energy buoy or to the associated equipment. No threatened or endangered species or marine mammals were seen (or heard) within 500 m (1,625 ft) of the anchor base or power cable. There was no evidence that any sea turtles or monk seals had ever become entangled or entrapped in any of the equipment. Only one surface sighting of a green sea turtle was made within 500 m (1,625 ft) of the project sight. Sightings of green sea turtles and spinner dolphins (*Stenella longirostris*) were made during transits through Kaneohe Bay and the Main Channel to and from the project location. In fact at least one green sea turtle was sighted within Kaneohe Bay during every transit to the project site. The largest number of green sea turtles sighted on a single day, within Kaneohe Bay was six. Pods of Spinner dolphins were seen on five separate occasions during the transit, but none were ever seen or heard at the project site. Pod size was estimated to range from 10 to 15 individuals and included juveniles and adults. No alien or invasive species were observed.

Additional results and discussion are presented below. It is recommended that the reader review all the Figures included in this report

4.1 Replicate Quadrats

Prior to installation, the steel frame of the anchor base had been coated with an anti-fouling compound, at the direction of the stakeholder agencies. This coating proved to be very effective. At the end of 2004 only a thin film of bacteria was detectable within each quadrat. That condition did not change between 2004 and 2007. However, by 2011 the substrate under/adjacent to the four quadrats supported a mix of turf algae, crustose calcareous algae and some small encrusting sponges. No samples were taken, but the species observed appeared to be organisms commonly observed in the Main Hawaiian Islands. No scleractinian corals were observed in any of the quadrats.

4.2 Coral Recruitment in Chain Lockers and Adjacent Equipment

The first coral detected on the chains was (*Pocillopora meandrina*) sighted in February 2005 (see Table 1 for representative data). More coral recruitment has been observed on the anchor chains than on any other portion of the equipment complex. *Pocillopora meandrina* was the overwhelmingly dominant recruit (>90%) of all recruits observed. The other species which were observed recruiting to/growing on the anchor chains were *Pocillopora damicornis*, *Montipora capitata*, and *Porites lobata*. During the March 2005 survey, many of the corals were showing signs of predation by parrotfish. In spite of the parrotfish predation the number and size of the

colonies steadily increased through 2007. By 2011 the subjectively estimated biomass of corals growing on the anchor chains was greater than in 2007, but the total number of colonies was less. Note, that by May of 2011 several moderate sized colonies of *Pocillopora eydouxi* had successfully recruited to other portions of the anchor base complex and small (< 8 cm [3 inches]) specimens of *Leptastrea purpurea* were also sighted. Between 2003 and 2011 none of the corals observed on or immediately adjacent to the anchor base complex showed any signs of disease or stress (e.g., lesions, excessive mucus production, abnormal densities of macro-bioeroders or predation by COTS), with the exception of some moderate bleaching on *Pocillopora meandrina* and *Montipora capitata* (on the seafloor).

Table 1. Representative Coral Recruitment Data From Ballast Chains in Chain Lockers and Locker Walls*

Location & Date	*Pocillopora sp.* (sizes in cm)	*Porites lobata*(?)	*Montipora capitata***
W Locker Mar 05	0	0	0
W Locker June 05	1 @ 1.5 cm	0	0
W Locker Feb 06	3 w/largest spec 3.5 x 5.0 x 2.0 cm	0	0
W Chains Mar 05	2 both < 1 cm	0	3 ranging from 1 to 1.5 cm max dim.
W Chains June 05	4 ranging from 1.5- 3 cm max dim.	1@1cm	1 @ 1.5 cm
W Chains Feb 06	5 w/ largest spec 6.5 x 6.5 x 2.0 cm	0	0
E Locker Mar 05	1 @ 0.5	0	0
E Locker June 05	3 ranging from 1 to 2 cm max dim	0	0
E Locker Feb 06	1 @ 2 cm	0	0
E Chains Mar 05	0	0	0
E Chains June 05	7 ranging from 1 & 3 cm	0	0
E Chains Feb 06	7w/ largest spec 5.5 x 4.0 x 2.0	0	0

*In May 2011 no zip ties were detectable. Coral colony counts were not performed in the chain lockers or on the ballast chains due to time/weather constraints.
***Montipora capitata* colonies were only sighted during March 2005.

Coral bleaching is the phenomenon in which zooxanthellae (the symbiotic dinoflagellates which live within the coral tissue) either lose some of their pigments or when the zooxanthellae are actually expelled by the coral. The most common causes of bleaching are increased water temperatures and increased light levels. Between 2003 and 2011 mild bleaching has been present within various coral species around Oahu. No major bleaching events have occurred during that time period around Oahu. The bleaching observed on some of the corals within the study areas was not considered to be significant, based upon the low percentage of colonies exhibiting bleaching (< 10 percent) and the degree to which those colonies were bleached. Fewer than 10 colonies were observed to have been bleached to the point of complete colony mortality during the observation periods covered by this report.

There was no evidence that any portion of the power cable had moved since being installed in 2003. And, there was no evidence that any corals had been damaged due to movement of the power cable. None of the coral colonies sighted between 2003 and 2011 exhibited signs of increased mucus production, abnormal densities of macro-bioeroders, higher than normal degrees of algal overgrowth or predation by COTS.

4.3 Replicate Belt Transects and Line Point Intercept (LPI) Transects

Within less than 18 months of the cable's installation, the flora and fauna on the power transmission cable closely matched the flora and fauna adjacent to the cable and within 25 m (81 ft) of either side. At the time of the May 2011 survey, the cable supported a healthy cover of turf algae, crustose coralline algae, other algae, and scleractinian corals. Tables 2 and 3 summarize the LPI data.

Macroscopic biotic cover was greater on the power cable than on the seafloor at all depths. This was to be expected, because much of the seafloor is covered with unstable sand and rubble, while the power cable provides a stable, hard surface and one which is slightly elevated and thus less vulnerable to sand scour. While species such as the calcareous Green algae *Halimeda sp.* and the Brown algae *Padina sanctae-crucis* were well represented and abundant in some areas, the majority of the algal cover was contributed by turf algae. This was true of both the power cable and the seafloor.

It was not within the scope of this project to perform a rigorous statistical analysis of the data. However, the Chi-square test was used to evaluate what appeared (subjectively) to be significant differences in coral densities on and off the power cable. The null hypothesis was that the distribution of the two dominant species (*Pocillopora meandrina* and *Montipora capitata*) would be equal on and off the power cable after approximately eight years. Nine different comparisons were made with the following results:

- Pooling LPI points from all depth zones for all scleractinian coral species showed there was a significant difference (P = 0.0002) between coral on and off the power cable. That is, more coral was present on the cable vs. the seafloor than would be expected.
- Pooling LPI points from all depth zones for just *Pocillopora meandrina* also showed a significant difference (P=0.0001), with many more specimens on the power cable than on the seafloor.
- Pooling LPI points from all depth zones for *Montipora capitata* showed a significant difference (P=0.0046). However, in this case, the difference was opposite that for *Pocillopora meandrina;* significantly more *Montipora capitata* colonies were present on the seafloor than on the cable.
- Within the discrete LPI sampling depths, there were statistically significant differences for *Pocillopora meandrina* in the 24.6 – 21.5 m (80-70 ft) and 12.3 – 10.8 m (40-35ft) zones with P values of 0.0016 and 0.0001, respectively. In the 33 – 27.7 m (100 - 90 ft) zone the 'expected' value was only three; Chi-square calculations are only reliable when the expected values are five or higher. Therefore, the P value of 0.0143, which would normally be considered statistically significant, may not be a meaningful value due to the small expected value.
- The statistical significance was less dramatic for *Montipora capitata*; in the 33 – 27.7 m (100-90 ft) zone the P value was 0.0253. As in the preceding case the 'expected value' was less than five at this depth, so the previously described caveats also apply. In the 24.6 – 21.5 m (80-70 ft) and 12.3 – 10.8 m (40-30 ft) zones the differences in occurrence of *Montipora capitata* on and off the pipe were not statistically significant, with P values of 0.1655 and 0.0833, respectively.

It appears then, that *Pocillopora meandrina* either has a greater recruitment survival rate on the power cable versus the seafloor and/or the planula are preferentially attracted to the cable. In any case, the result is that the cable supports more *Pocillopora meandrina* than equivalent areas of adjacent seafloor. This coral species provides important micro habitat for many small invertebrate species and as well certain fin fish. Its presence, therefore, increased overall biomass and biodiversity.

Fenner (2005) notes that the taxonomy of *Pocillopora meandrina, Pocillopora verrucosa, Pocillopora elegans* and *Pocillopora ankeli* is unclear and that they may actually represent only a single species. *Pocillopora meandrina* is the most widely recognized. Based upon field level identifications only three Pocilloporid species were positively identified in the project area: *P. meandrina, P. eydouxi,* and *P. ligulata.* The Hawaiian members of this genus, particularly *Pocillopora meandrina* are regarded as pioneering species and would be expected to be among the first to colonize the cable as well as the mooring equipment. All the coral species observed on the cable were also observed on the seafloor adjacent to the cable.

Based upon the LPI surveys and upon our subjective evaluation, scleractinian coral cover was denser on the power cable, than on the adjacent sea floor and the greatest densities for both the power cable and the seafloor were between 13.8 – 26.1 m (45 - 85 ft) deep.

Table 2. Line Point Intercept Summary
(Points taken at 50 cm intervals on 10 m transects)

Species Category	Cable 100 to 90' Depth	Seafloor 100 to 90' Depth	Cable 80 to 70' Depth	Seafloor 80 to 70' Depth	Cable 40 to 35' Depth	Seafloor 40 to 35' Depth
	Total Points Taken-61	Total Points Taken-62	Total Points Taken-42	Total Points Taken-42	Total Points Taken-63	Total Points Taken-63
PM	6		10		18	
P sp.	3		1			
MC			4	16		3
M sp.	1	5	1			
PLO			6	1	5	4
Coral Other	8	1				
CCA		1	2		6	
A	43	29	18	19	34	50
SR		26		6		6
Other		1				
% Pts w/ coral	18/61 29.5%	6/62 9.7%	22/42 52.3%	17/42 40.5%	23/63 36.5%	7/63 11.1%
% Pts w/ CCA	0 0%	1/62 1.6%	2/42 4.8%	0 0%	6/63 9.5%	0 0%
% Pts w/ A	43/61 70.5%	29/62 46.8%	18/42 42.9%	19/42 45.2%	34/63 54.0%	50/63 79.4%
% Pts w/ SR	NA	26/62 41.9%	NA	6/42 14.3%	NA	6/63 9.5%

PM = Pocillopora meandrina
MC = Montipora capitata
PLO = Porites lobata
CCA = crustose coralline algae
SR = sand and/or rubble
P sp. = other Pocillopora species
M sp. = other Montipora species
Coral Other = other species of scleractinian corals
A = all other algal species

Table 3. Size Frequency Distribution of Selected Corals from Line Point Intercept Transects (Points taken at 50 cm intervals on 10 m transects)

Species Category	Cable 100 to 90' Depth	Seafloor 100 to 90' Depth	Cable 80 to 70' Depth	Seafloor 80 to 70' Depth	Cable 40 to 35' Depth	Seafloor 40 to 35' Depth
	Total Points Taken-61	Total Points Taken-62	Total Points Taken-42	Total Points Taken-42	Total Points Taken-63	Total Points Taken-63
PM < 5 cm	0	0	0	0	0	0
PM ≥5 cm < 10 cm	1	0	3	0	3	0
PM > 10 cm	5	0	7	0	15	0
P sp. < 5 cm	1	0	0	0	0	0
P sp. ≥5 < 10cm	1	0	0	0	0	0
P sp. >10 cm	1	0	1	0	0	0
MC < 5 cm	0	1	0	0	0	0
MC≥5 cm < 10 cm	0	1	1	0	0	1
MC > 10 cm	0	3	3	9	0	2
M sp. <5 cm	0	0	0	0	0	0
M sp. ≥5<10 cm	0	0	1	0	0	0
M sp. >10 cm	1	0	0	0	0	0
PLO<5 cm	0	0	3	0	0	2
PLO ≥5<10 cm	0	0	3	0	2	2
PLO >10 cm	0	0	0	1	3	0

PM = *Pocillopora meandrina*
MC = *Montipora capitata*
PLO = *Porites lobata*
P sp. = other Pocillopora species
M sp. = other Montipora species

4.4 Invertebrate Assessment

There were no subjectively detectable changes in the macro invertebrate population between 2003 and 2007. During the May 2011 survey there appeared to be substantial increase in the number of sea urchins (particularly *Echinothrix calamaris*). The increased number of urchins has also been observed by the author at other Oahu locations during 2011. No coral eating Crown-of-Thorns starfish have ever been sighted during the 2003 – 2011 surveys.

4.5 Fish Assessment

Table 4 summarizes selected fin fish sightings during the 2005 – 2007 and May 2011 surveys. No statistical comparisons were made. Between 2003 and 2007 the Bluestriped snapper – Ta'ape (*Lutjanus kasmira*), the Yellowfin goatfish – Weke a (*Mulloidichthys vanicolensis*) and the Threespot Chromis (*Chromis verater*) were the most abundant species during most survey periods; their numbers ranged from >50 < 500 and >50 <200 for the latter two species, respectively. During the May 2011 surveys the estimated number of individuals for first two species were the same and ranged from >25 < 50. The Threespot Chromis estimates ranged from >25 < 100. Estimates for schooling reef fish species vary dramatically both spatially and temporally. Changes in the number of fishes sighted are probably within the normal range of fluctuations that are typical of reef fishes, although they could also be related to fishing pressure from both spear and hook and line fishermen, both of which are known to utilize the site.

As noted in the first year monitoring report three species of intentionally introduced fish species (Peacock grouper – *Cephalopholis argus*, Blacktail snapper – *Lutjanus fulvus* and Bluestriped snapper - *Lutjanus kasmira*) were present. The later was the most numerically abundant species during the May 2011 surveys and ranked between first and third on all previous surveys.

Table 4. Summary of Fish Abundance Estimates for Selected Species and/or Groups

Species	Range 10/03- 9/04	Range 10/04-6/07	Range 5/11
Bigeyes-Priacanthidae *Priancanthus meeki*	<10<25	<10<50	<10
Butterflyfishes-Chaetodontidae All species	>25<50	>25<100	>25<50
Damselfishes-Pomacentridae *Chromis verater*	>25<200	>50<200	>25<100
Dameslfishes All other species	>25<100	>25<100	>25<50
Moray Eels-Muraenidae All species	0 - 1	0 - 4	1
Goatfishes-Mullidae *Mulloidichthys vanicolensis*	<25~100	>50<200	>25<50
Goatfishes All other species	<10<100	>25<200	>10<25
Groupers-Serranidae *Cephalopholis argus*	0 -3	0 - 6	0
Jacks, Trevallies, Mackerel Scad-Carangidae *Caranx melampygus*	0 - <10	0 - <25	<10
Jacks, Trevallies, Mackerel Scad *Decapterus macarellus & Selar crumenopthalmus*	0<100	0 - <200	<25
Jacks, Trevallies, Mackerel Scad All other Jacks & Trevallies	0-5	0-<25	0
Parrotfishes-Scaridae All species including juveniles	>25<50	>25<50	>25<50
Puffers & Porcupinefishes-Tetraodontidae & Diodontidae All Species	<10 to <10	<10	<10
Snappers-Lutjanidae *Lutjanus kasmira*	0~500	>50<500	>25<50
Snappers (Jobfish) Aprion virescens	0<10	0<10	0
Snapper All other species	<10<25	>10<100	>10<25
Emperors-Lethrinidae *Monotaxis grandoculis*	>10<25	>10<50	<10
Squirrelfishes-Holocentridae All species	>10<50	>10<50	>10<25
Soldierfishes-Holocentridae All species	>10<25	>10<25	>10<25
Surgeonfishes-Acanthuridae All Species	<10<25	>10<50	>10<25
Unicornfishes-Acanthuridae All Species	0<25	0<25	0
Triggerfishes-Balistidae All species	<10 to <10	<10 - <25	<10
Moorish Idol-Zanclidae *Zanclus cornutus*	>10<25	>10<25	>10<25

Notes: The signs > and < indicate that the number of fish present was estimated to be within that range. All counts represent fishes which were on, in, or within 30 feet of the anchor base or its associated equipment. In 2011 fish counts were made on two separate dives at the anchor base; however, "0s" indicate that no members of that group were seen on any of the May 2011 dives.

4.6 Alien Species

With the exception of the three fin fish species discussed above, no alien or invasive flora or fauna have been detected at the anchor base, on the power transmission cable or in any of the adjacent areas surveyed. During the multi-agency marine ecological assessment performed in 2004, no alien species were reported from their study sites closest to the project area. Concerns that the project equipment might attract alien or invasive species appear to be unwarranted.

4.7 Threatened and Endangered Species Assessment

No threatened or endangered species were observed directly on-site during this assessment. However, Green sea turtles (listed as threatened) were observed during transit to and from the survey site.

5.0 DISCUSSION

Between April and August 2004 a multi-agency effort headed by the USFWS and including personnel from the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), Bishop Museum, University of Hawaii and Hawaii DLNR was completed. That survey team assessed marine natural resources at 11 Study Areas within the 461 m (500 yd) buffer zone around MCBH; that is, the surveys were conducted between the shoreline and the 461 m (500 yd) seaward boundary. Study Area 6 was located immediately to the west of the Wave Energy project location. Study Area 7 was located directly inshore from the project location. Note, one of the transects (7C) was located approximately 46 m (50 yd) seaward of the buffer line. Of course, the shoreward portion of the power transmission cable passes through Study Area 7.

USFWS et al. (2008) highlighted 16 survey findings and "…Related Conservation Recommendations." Four of those recommendations involved resources within Study Area 6 and 7. They are summarized below:

- Recommendation 8. This recommendation applied to Study Areas 1, 2, 5, 6 and 7. The marine algae *Dictyopteris australis*, also known as Limu Lipoa is an important cultural resource in native Hawaiian food gathering. The recommendation states: "Manage military and base activities in a manner that avoids degrading these algae beds."
- Recommendation 12. This recommendation applied to Study Areas 7, 9, 10 and 11. The recommendation is intended to help protect corals and macroinvertebrates from anchors and vessel groundings. It states: "Designate anchoring zones and/or moorings within the 500 yd security zone and in areas that would avoid impacts to coral reef resources."
- Recommendation 15. The recommendation was for Study Area 7, with an emphasis on Station 7C, and relates to coral disease. USFWS et al. (2008) suggest that a large number of bleached corals are present at MCBH. The recommendation states: "Monitor coral bleaching events and develop strategies for understanding bleaching-related impacts.

Cooperate with resource agencies to evaluate coral anomalies within the 500 yd security zone in a manner that is consistent with conservation plans."

- Recommendation 16. This general recommendation was applied to all 11 Study Areas and suggests additional future inventories; specifically "Continue to monitor coastal resources and coral health conditions in relation to base operations and continue to collect anecdotal observations of Hawaiian monk seal sightings." The specific recommendation states: "Repeat the inventory every 6 years to provide updated biological data and conservation recommendations. Also, evaluate shorelines at survey stations 2, 7 and 8 as potential haul-out sites for the Hawaiian monk seal."

As noted, the USFWS et al. (2008) Study Area 7 included the power transmission cable portion of the project area, and was inshore from the existing and proposed mooring sites and buoys. Three transects were completed by the USFWS team at depths of 7.7 m (25 ft) (7A), 10.8 m (35 ft) (7B) and 12.0 m (39 ft) (7C).

There were no discrepancies between the USFWS findings and those of the present study. Station 7C most closely matched the location of the Navy's mid-depth surveys. Notable similarities include, but are not limited to the following:

- Seafloor is a low relief carbonate pavement with occasional sand channels and overhangs and a thin veneer of sand and rubble.
- No invasive macroalgae were observed.
- No coral species rare to the Hawaiian Islands were sighted. The dominant coral (based upon percentage of the seafloor covered) was *Montipora capitata.* The USFWS team estimated coverage of this species was only 1percent (USFWS et al. 2008). The Navy team's subjective estimate of overall habitat cover by *Montipora capitata* in the 39 foot depth range was 2- 5 percent. For the LPI seafloor transects parallel to the cable at that depth range 11.1 percent of the points were coral of all species.
- Macroinvertebrates observed included many of the same species, such as octopus (*Octopus sp.*), cone shells (yellow cone - *Conus flavidus,* spiteful cone - *C. lividus,* marbled cone – *C.marmoreus*), and common sea urchins (banded sea urchin – *Echinothrix calamaris,* blue-black urchin – *E. diadema,* rock-boring urchin – *Echinometra mathaei*).

6.0 CONCLUSIONS

Algae, sessile and mobile invertebrates, fin fish, protected species and alien species have been evaluated by Navy marine ecologists as well as marine ecologists from NOAA, USFWS, Hawaii DLNR and the University of Hawaii over a period of nine years. The project location was originally chosen based upon the low probability that there would be any significant adverse impacts to marine natural resources. Based upon standard techniques and criteria there have been no significant changes to any of the marine natural resources assessed between 2002 and 2011.

The qualitative and quantitative data gathered by the Navy between 2003 and 2011 have shown no detectable adverse impacts to any marine natural resources, including any Threatened or Endangered species, Essential Fish Habitat or any fishery target species. Specifically, the survey data have shown the following:

- No endangered hawksbill sea turtles (*Eretmochelys imbricata*) have been sighted at or in the vicinity of the project site. This finding was expected.
- No threatened green sea turtles (*Chelonia mydas*) were sighted underwater and only one specimen was seen within 500 m (1,625 ft) of the project location.
- Installation of the wave energy equipment has not resulted in increased forage/food sources for hawksbill or green sea turtles. Therefore, the equipment has not served as an attractant for these protected species, based upon increased food sources.
- No endangered Hawaiian monk seals (*Monachus schauinslandia*) were sighted underwater or from the dive boat. This finding was expected.
- The wave energy equipment has not been an entanglement or entrapment hazard for any threatened or endangered species.
- The wave energy equipment has had a modest beneficial impact relative to Essential Fish Habitat and fishery target species. The equipment has provided stable hard substrate and increased habitat complexity and vertical relief. This has resulted in increased biomass and diversity of fin fish and invertebrates.
- No alien species have been attracted to or detected at the project site or on any of the project equipment.
- Scleractinian corals have successfully recruited to and grown on project equipment. The density of corals on the power cable is, in fact, greater than the density of corals on the adjacent seafloor areas. Those corals provide significant habitat for a variety of invertebrates and even some fin fish.
- There was no evidence that the project has resulted in increased disease, abnormalities or stress to any of the marine organisms present within the project area.
- The present wave energy conversion project and the proposed modifications to the project are compatible with all the recommendations made by the multi-agency survey team (USFWS, NOAA, USGS, Bishop Museum, University of Hawaii and Hawaii DLNR) for the marine natural resources offshore MCBH (USFWS et al. 2008).

7.0 RECOMMENDATIONS

The mooring base, power cable and associated equipment should be left in place and should not be removed. This equipment provides increased habitat complexity, vertical relief and stable hard substrate to which scleractinian corals have recruited and grown. The density of scleractinian corals on the power cable is greater than on the adjacent seafloor. Fin fish diversity and biomass were greater at the anchor base than in adjacent seafloor areas. The project components are, in fact, serving as a modest artificial reef which benefits a wide range of marine life. Removal of the equipment would not only eliminate those beneficial impacts, but would also introduce adverse impacts during the equipment recovery process.

Removal of the mooring equipment and power cable would require a lift barge and would necessitate the use of a multi-point mooring over the project site. Placement of the anchors and the re-positioning of the barge for multiple lifts would result in anchor/chain impacts to the seafloor. This equipment poses no risk to marine natural resources and its removal would have adverse impacts to the organisms associated with and growing on the equipment.

A post-construction survey should be completed after the new equipment is installed; to be followed by annual surveys for three years on the new and existing equipment.

Figure 1. Project location map

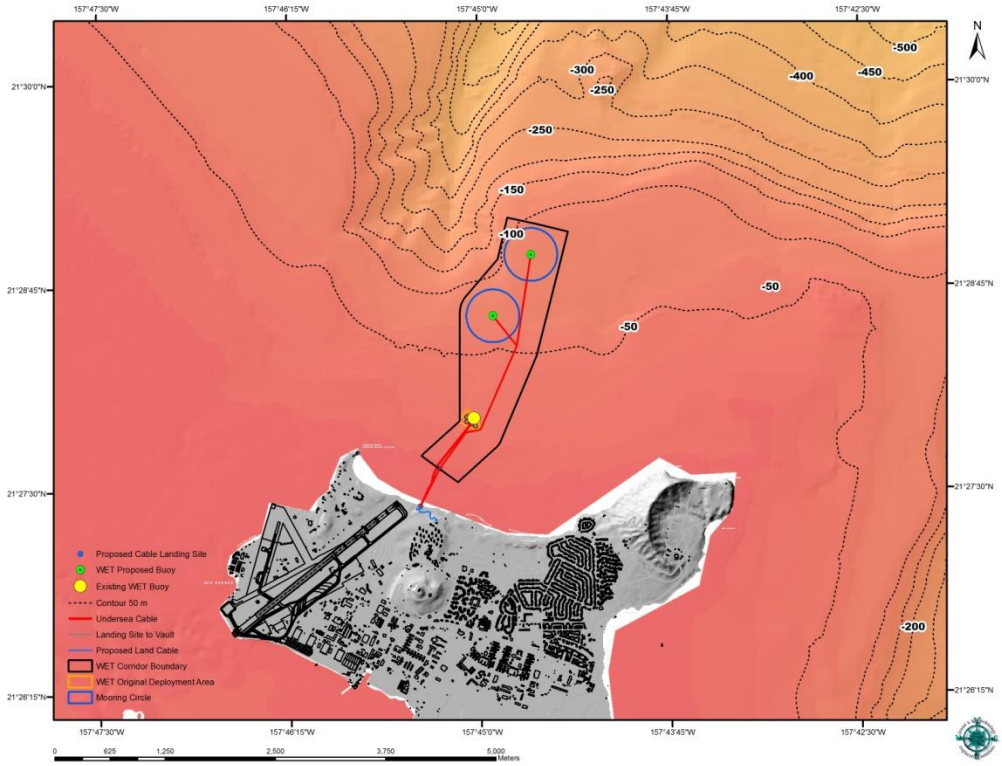

Figure 2. Existing and proposed buoy locations

Figure 3. Anchor/mooring base being installed (Fall 2003). Note ballast chain to the right

Figure 4. Anchoring/mooring base after installation (Winter 2004)

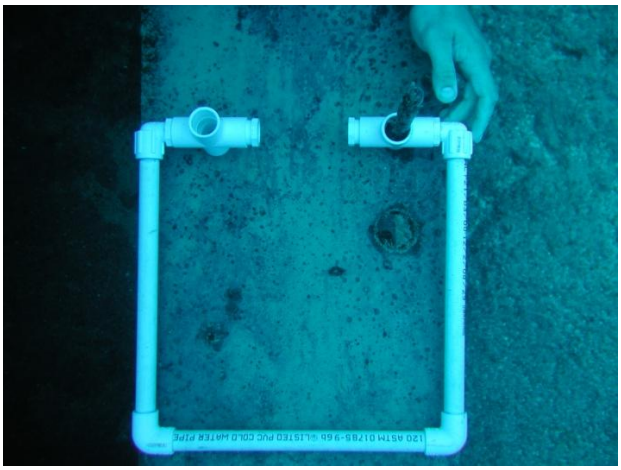

Figure 5. Quadrat No. 2 on anchor base Oct. 2006

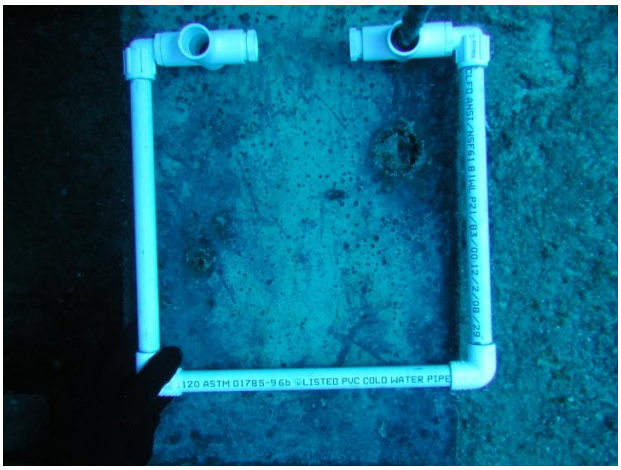

Figure 6. Quadrat No. 2 on anchor base June 2007. Note near complete absence of fouling organisms through June 2007

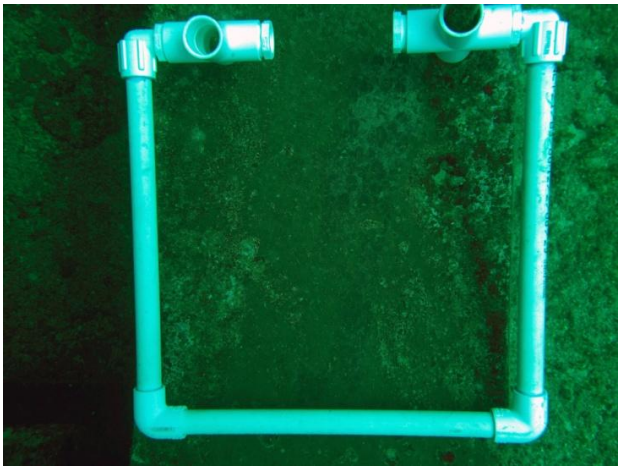

Figure 7. Quadrat No. 2 on anchor base May 2011. Fouling was still very limited

Figure 8. Ballast chain in chain locker in early 2004. Note the minimal fouling

Figure 9. Mooring base in early 2004. Note the minimal fouling

Figure 10. Coral recruitment (*Pocillopora sp*.) on ballast chain June 05. Note crustose calcareous algae and turf algae on chains

Figure 11. Same colony in Oct 06 showing considerable growth, but also predation by parrotfish (see bite scars)

Figure 12 May 2011 *Pocillopora meandrina* on ballast chain (knife = 32 cm). Note, dense cover of turf algae on chains vs. crustose calcareous algae in Figure 8

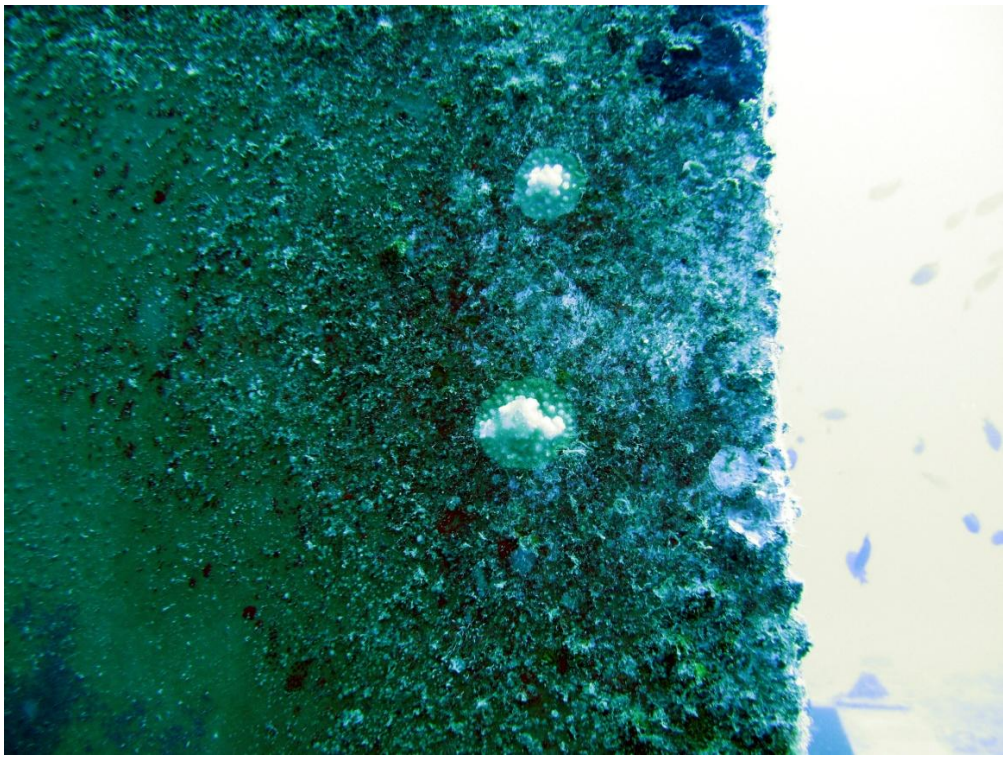

Figure 13. *Pocillopora sp.* recruit on side of chain locker

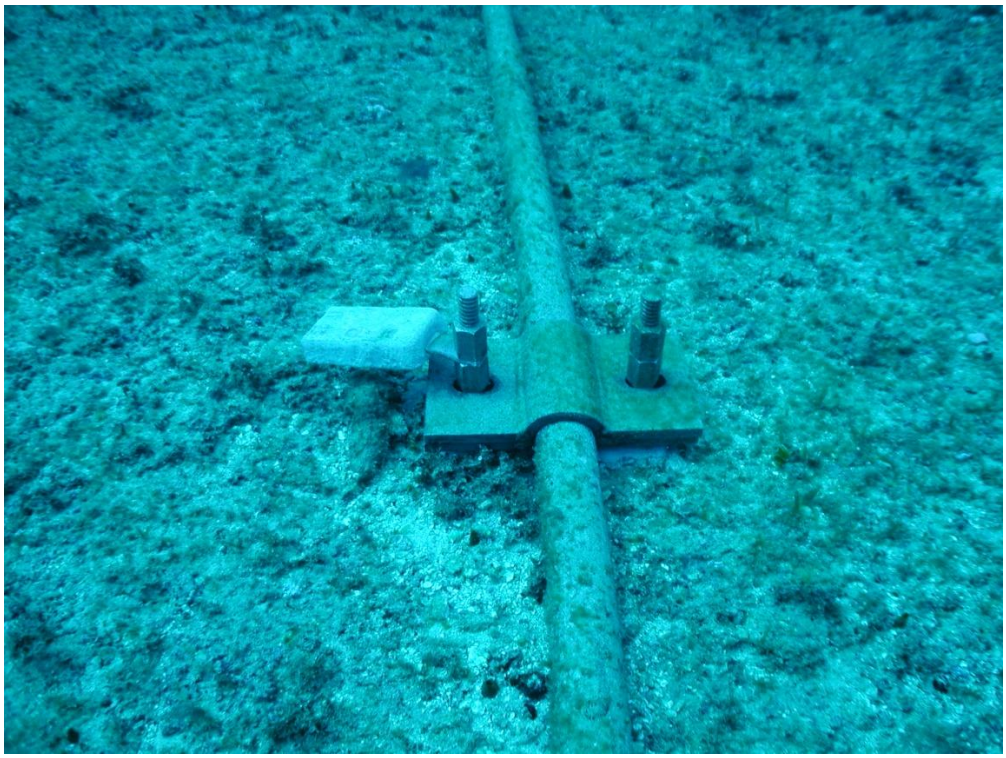

Figure 14. Power cable with anchor bolt at 50 ft in March 2005

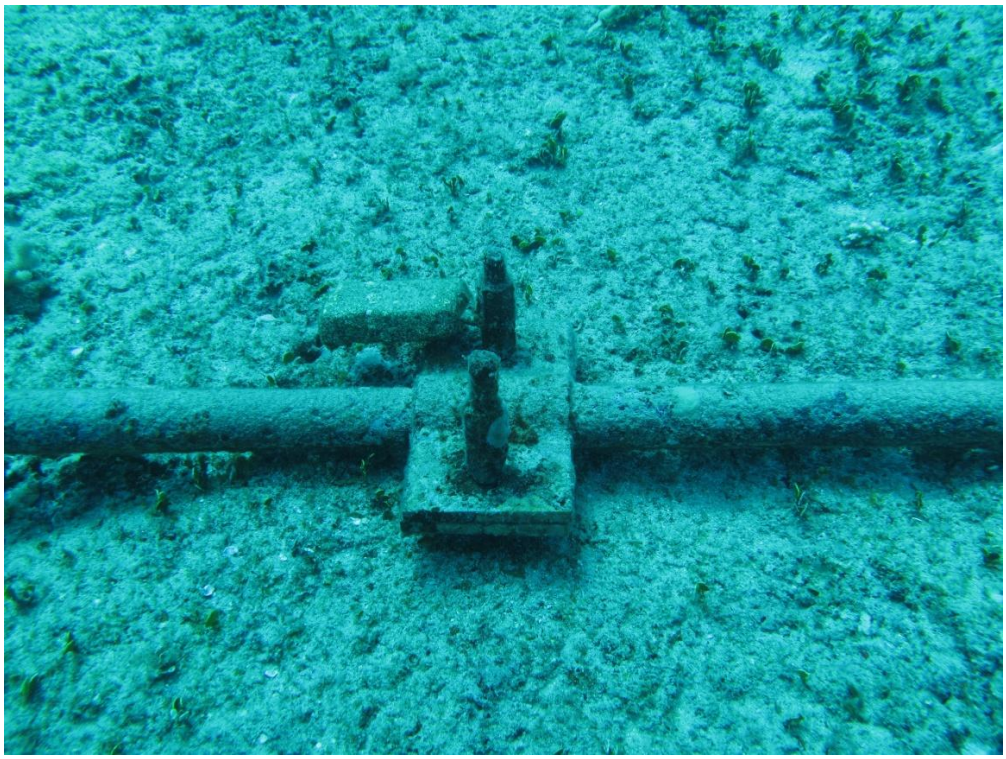

Figure 15. Power cable at approximately right angle in the same location in May 2011. Note, greater abundance of *Halimeda sp*. in 2011 and coral growing on anchor bolt

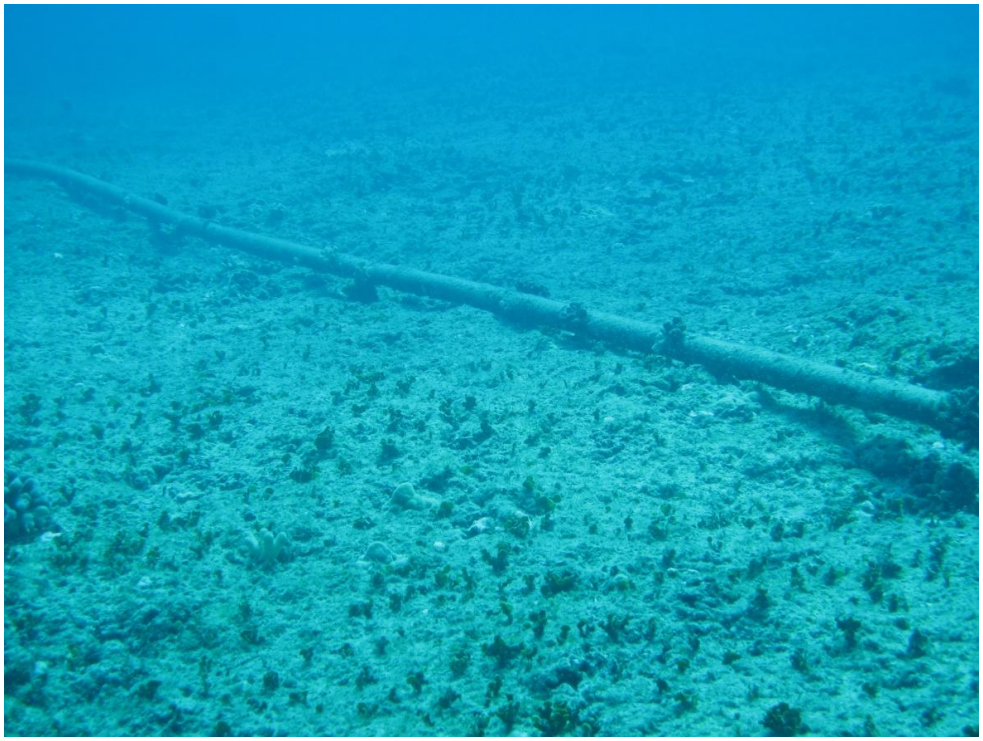

Figure 16. Power cable in 2011 at approximately 50 ft. Note, the large number of coral colonies on the cable

Figure 17. Power cable in 2011 at approximately 50 ft

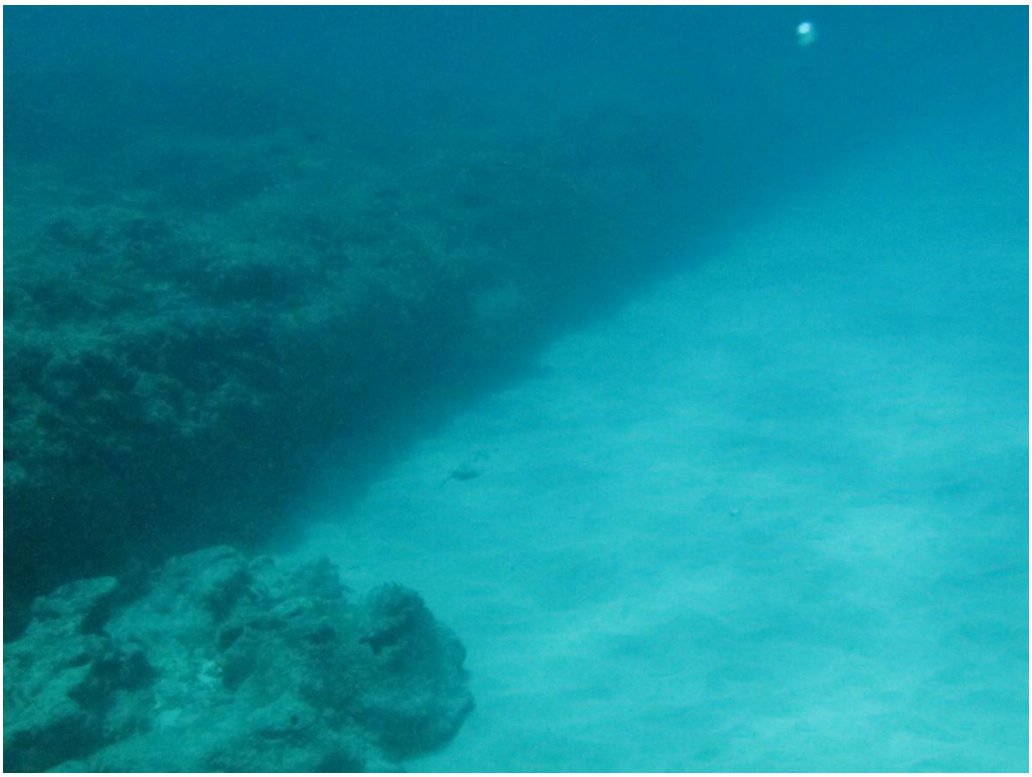

Figure 18. Sand-Channel Zone, note suspended sand in the water column due to surge and absence of coral on rock outcrops

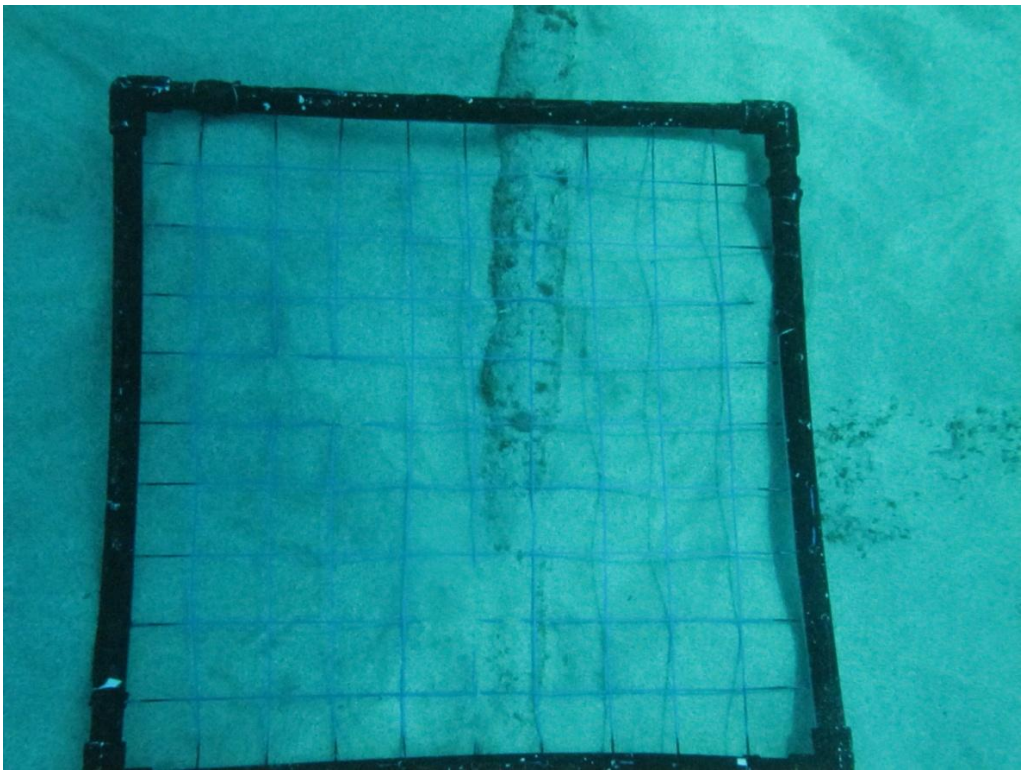

Figure 19. Power cable disappearing under the sand

Figure 20. Bluestriped snapper, one of the most common fishes from 2003 to 2011

Figure 21. Moorish Idols were common. Note 'barren' seafloor adjacent to anchor base.

Figure 22. Hawaiian Bigeye (Aweoweo) *Priacanthus meeki* with Bluestriped snapper (Ta'ape) *Lutjanus kasmira* in the background. Photo taken immediately adjacent to anchor base. Within project area, these species were closely associated with the anchor base

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SOURCES

- Bruno, J.F., L.E. Petes, D. Harvell, and A. Hettinger. "Nutrient enrichment can increase the severity of coral disease" *Ecology Letters* Vol. 6 (2003) p. 1056-1061.

- Coles, S.L., R. C. DeFelice, and L.G. Eldredge. "Nonindigenous Marine Species in Kane`ohe Bay, Oahu, Hawai`i. Final Report prepared for the David and Lucile Packard Foundation and the State of Hawai`i Department of Land and Natural Resources, Division of Aquatic Resources. Bernice Pauahi Bishop Museum, Hawai`i Biological Survey." (2002).

- Cooper, T.F. et al. "Temporal Dynamics in Coral Bioindicators for Water quality on Coastal Reefs of the Great Barrier Reef" *Mar Freshw Res* Vol. 59 (2008) p. 703-716.

- Fenner, D. *Corals of Hawaii: A Field Guide to the Hard, Black and Soft Corals of Hawaii and the Northwest Hawaiian Islands, Including Midway*, Honolulu, HI: Mutual Publishing, 2005.

- Hughes, T.P. and Jackson, J.B.C. "Do Corals Lie about their Age? Some Demographic Consequences of Partial Mortality, Fission and Fusion" *Science* Vol. 209 (1980) p. 713-715.

- Riegl, B.M. "Effects of Sand Deposition on Scleractinian and Alcyonacean Corals" *Marine Biology* Vol. 121 (1995) p. 517-526.

- Shafer, J.L., D.J. Shafer, K.N. Duin, and H.M. Reed. "Marine Corps Base Hawai`i Coral Reef Ecosystem Management Study Final Report" 2002.

- Smith, S.H. "Wave Energy Technology Project, Offshore Marine Corps Base Hawaii: Year 1 Biological Monitoring Report, October 2003 through October 2004" 2005.

- Stafford-Smith, M.G. "Sediment-Rejection Mechanisms of 22 Species of Australian Scleractinian Corals" *Marine Biology* Vol. 115 (1993) p. 229-243.

- Stafford-Smith MG, and R.F.G. Ormond. "Sediment rejection mechanisms of 42 species of Australian Scleractinian Corals" *Aust J Mar Freshw Res* Vol. 43 (1992) p. 683-705.

- Sutherland K.P., T.W. Porter, and C. Torres. "Disease and Immunity in Caribbean and Indo-Pacific Zooxanthellate Corals" *Marine Ecology Progress Series* Vol. 2*66 (*2004) p. 273-302.

- U.S. Department of Navy. *Environmental Assessment, Proposed Wave Energy Technology Project, Marine Corps Base Hawaii, Kaneohe Bay, Hawaii* 2003.

- U.S. Fish and Wildlife Service et al. *Inventory of Coastal and Marine Resources, MCB Hawaii-Kaneohe Bay, Mokapu Peninsula, O'ahu Island, Hawai'i, Final Report.* 2008.

- Wild C., H. Woyt, and M. Huettel. "Influence of Coral Mucus on Nutrient Fluxes in Carbonate Sands" *Marine Ecology Progress Series* Vol. 287 (2005) p. 87-98.

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APPENDIX A

WAVE ENERGY TECHNOLOGY PROJECT, OFFSHORE MARINE CORPS BASE HAWAII

YEAR 1 BIOLOGICAL MONITORING REPORT OCTOBER 2003 THROUGH OCTOBER 2004

Prepared by Stephen H. Smith
Marine Ecologist
Naval Facilities Engineering Service Center

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Introduction

The Office of Naval Research (ONR) has begun the phased installation and operational testing of a wave energy conversion buoy off Marine Corps Base Hawaii, Kaneohe Bay, Oahu, Hawaii. A key objective of the ONR project is to determine if coastal Department of Defense facilities could obtain supplemental electric power from ocean waves in an efficient, reliable and non-polluting manner. Figure 1 illustrates the project area.

The Navy, working closely with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), Hawaii Department of Lands and Natural Resources (DLNR) and the U.S. Army Corps of Engineers, selected a location approximately 3,900 feet offshore North Beach, at Marine Corps Base Hawaii (MCBH). The water depth at the site is 100 feet.

Selection of this site was based in part upon a marine biological survey, jointly performed with a Navy contract biologist, and biologists from the NMFS and the USFWS. The results of this survey, as well as detailed project information are presented in the *Environmental Assessment Proposed Wave Energy Technology Project Marine Corps Base Hawaii, Kaneohe Bay, Hawaii* by Department of the Navy (January, 2003), hereafter referred to as the EA.

The wave energy conversion buoy, commonly known as the WET buoy, has three primary components: 1) a large buoy/piston assembly that moves up and down in the waves, 2) an anchor base and power conversion system, and 3) a power cable that transmits the electrical power to shore. Figures 2 and 3 and Plate 1 illustrate the system. The buoy is approximately 50 feet long and 15 feet in diameter; the anchor base measures approximately 21 feet by 31 feet; and the power cable is 2.4 inches in diameter. Appendix 1 lists the dates on which the various components were deployed, recovered and redeployed.

The NMFS, USFWS and DLNR concurred that this project is not likely to adversely impact marine natural resources under their jurisdiction. Nevertheless, one of the conditions of the project permit issued by the U.S. Army Corps of Engineers required the Navy to design and conduct a biological monitoring program to assess the possible effects upon selected species. Continuation of the monitoring program is contingent upon continued Congressional funding and the availability of Navy dive assets. The monitoring described in this report was conducted by a Navy marine ecologist (the author) with dive support from Mobile Diving Salvage Unit 1 (MDSU 1). Twenty-six dives (55 person dives) have been completed. Appendix 2 lists the date and depths of the dives. As of the date of this writing, the monitoring is continuing.

The monitoring plan was developed with the informal assistance of senior marine biology faculty at the University of Hawaii. Modifications were made to the original study design, due primarily to persistent adverse sea conditions that coincided with the availability of Navy dive assets.

This report summarizes the findings made on dives conducted between October 2003 and September 2004. It is presented in five sections: 1) Introduction, 2) Biological Background and Regulatory Concerns, 3) Methods, 4) Results and Discussion, and 5) Conclusions and Recommendations.

Biological Background and Regulatory Concerns

Biological Background.

In April 2002 Marine Research Consultants, with the assistance of personnel from Sea Engineering, NMFS and USFWS completed a Rapid Ecological Assessment of the project area. The results of this assessment are presented in *Wave Energy Technology (WET) Marine Corps Base Hawaii Kaneohe Bay Marine Environmental Assessment* (EA). That report is included as Appendix H in the EA.

As a result of the 2002 assessment, the marine community within the project area was divided into six basic habitat types or zones. The following description of the five zones is taken from the EA.

Sand-Boulder Zone. "The ocean bottom just seaward of the beach, from a depth of zero to approximately 12 to 15 feet…, consists of a bed of coarse-grained carbonate sand that is kept in a state of continual resuspension by wave energy. Interspersed on the sand bed are boulders that are continually swept by resuspended sand. Some of the boulder riprap that was used to construct the revetment securing the end of the runway has separated from the structure and is submerged in the nearshore area….As a result of the continuous resuspension of sand with passing waves, the substrate from the shoreline through the sand-boulder zone contains little marine vegetation or coral."

"No fish or other marine vertebrates were observed residing in the sand-boulder zone during the underwater site assessment…"

Sand Channel Zone. "Farther offshore from the sand-boulder zone, the ocean bottom consists of consolidated limestone bisected by small channels, which vary in width and eventually end in ridge formations. These spur and groove formations are generally oriented perpendicular to the bottom contours and the shoreline. Generally 3 to 4 ft…of relief is present between the bottom of the channels and the adjacent ridges. While the channel bottoms typically consist of flat and scoured limestone with a thin veneer of sand, some live coral is present on the ridges. The sand channel zone transitions from the sand-boulder zone at approximately 12 to 18 feet…and extends to a depth of 30 to 35 feet…"

"The constant state of resuspension in the sand channel zone restricts settlement of bottom dwelling organisms on both the sand and limestone surfaces. Macrobiota in this zone were scattered heads of the branching coral *Pocillopora meandrina*, which grow along the vertical sides of the reef channels…."

Reef Flat Zone. "Offshore from the sand channel zone, the emergent reef platform becomes more solid as sand cover decreases. The spur and groove formations end around the 30 to 35 ft…water depth, and the bottom from that point to approximately 50 ft is a wide plateau of relatively solid, flat limestone. Some scattered areas of vertical relief exist, generally due to potholing, coral growth or the presence of small limestone ridges and ledges."

"The surface of the limestone reef flat consists of a short algal turf that binds a thin layer of carbonate sediment. Macrobiota in this zone includes sporadic heads of coral *P. meandrina* and flat encrustations of *Porites lobata*, *Montipora capitata*, *Montipora patula*, *Montipora flabellata*…The dominant algae on the platform are clumps of the genera *Porolithon*. Coral growth is greater along the edge of the ledges than in the flat areas, and fish are more likely to frequent the areas of coral growth…"

Escarpment Zone. "The escarpment zone can be defined from… the 50 ft…contour to approximately the 90 to 95 ft…depth contour…The primary macrobiota on the escarpment is the flat encrusting coral *M. capitata*. In some localized areas, this species covers up to 50% of the substrate…"

Deep Reef Platform Zone. "From the bottom of the escarpment zone, the bottom gradually slopes to a depth of approximately 100 ft…where it becomes almost featureless. There is a thin veneer of sand 1 to 2 in…thick bound to the pitted, flat limestone surface by a thin veneer of algal turf in some areas. The bottom topography remains relatively constant and barren through the depth range of the zone."

"The predominant macrobiota are scattered heads of the coral *P. meandrina* and flat encrustations of the coral *M. capitata*. Macrobiotic composition varies from relatively high coral cover above the 95 ft…depth contour to relatively little cover below this boundary. Other species known to transit the area at this depth include humpback whales, green sea turtles, and Hawaiian monk seals. Fish and turtle species tend to aggregate in areas of higher relief than that found in the proposed project area."

Undercut Ledge Zone. "At several locations at the eastern end of the deep reef platform, a system of small undercut ledges run parallel to the depth contours…Increased populations of fish and coral occur around the ledges…Undercut ledges can be designated as HAPC [Habitat Areas of Particular Concern]; however, based on the relatively small size of these ledges, they would not fall under this classification…"

Regulatory Concerns.

It is important to note, the NMFS, USFWS and DLNR concluded that the project was not likely to adversely impact any of the resources under their jurisdiction. Nevertheless, some individuals, within those agencies expressed concern regarding the following issues:

1. Sea turtles might be attracted to the structure and become entangled or trapped.
2. Monk seals might be attracted to the structure and become entangled or trapped.
3. The structure might promote the growth and/or spread of alien species.

Methods

A variety of methods were utilized to obtain information regarding the areas of concern (listed above) and on the general status of selected marine natural resources in the vicinity of the project. Open circuit compressed air scuba dives were made to facilitate direct observations and data collection. All the dives were made by the author, with the support of MDSU 1. Appendix 1 lists the dates and depths of each of the dives. Table 1 shows the locations assessed and the activities performed.

Table 1
Areas Assessed and Activities Performed

Location	Replicate Quadrats	Replicate Transects	Invertebrate Assessment	Fish Assess.	Alien Assess.	T & E Species Assess.
Buoy/Buoy Couplings Depth 10 – 60 ft	No	No	Yes	Yes	Yes	Yes
Anchor Base & Associated Structures 85 – 100 ft	Yes	No	Yes	Yes	Yes	Yes
Deep Reef Platform Zone Depth 100 ft	No	No	Yes	Yes	Yes	Yes
Undercut Ledges Depth 100 ft	No	No	Yes	Yes	Yes	Yes
Transmission Cable from Anchor Base to Escarpment Zone Depth 100 – 70 ft	No	No	Yes	Yes	Yes	Yes
Transmission Cable from Escarpment Zone to Reef Flat Zone Depth 70 – 50 ft	No	Yes	Yes	Yes	Yes	Yes

The six data gathering activities performed are briefly described below.

Replicate quadrats. These were performed at four points on the anchor base. Guide pins had been welded onto the anchor base frame. A quadrat was place over the guide pins and the area within the quadrat was examined and photographed to determine what, if any, flora or fauna had settled there.

Replicate transects. These were performed between the Escarpment Zone and the Reef Flat Zone. Two transects, each 165 ft. in length, were run over the transmission cable. Tagged rock bolt anchors, used to secure the transmission cable, were used as the base point for the replicate transects. Each transect included an assessment of the transmission cable itself and flora and fauna within three feet on each side of the cable. Still photographs were taken at intervals along the transect.

Invertebrate Assessment. This activity was primarily intended to record the condition of stony corals (live, dead, partially bleached, 100% bleached, over grown with filamentous algae, or diseased). The number of individual mollusks (e.g. cowry shells, oysters, octopus), echinoderms (e.g. sea urchins, sea cucumbers, sea stars), and arthropods (e.g. spiny lobsters, slipper lobsters and crabs) was also recorded. Invertebrate assessments were performed by completing a meandering swim around, over and when possible under each of the six study locations listed in Table 1.

Fish Assessment. This activity involved recording every species of finfish, which could be identified in the field, or by photographs taken in the field. Photographs were also taken of the anchor base and used to estimate the total numbers of the two numerically dominant fish species which frequent the anchor base. An effort was also made to determine if any of the fishes exhibited unusual behavior and/or showed any signs of abnormalities, such as lesions. Fish assessments were performed by completing a meandering swim over, around, and under, when possible, each of the six study locations listed in Table 1.

Alien Assessment. During the Marine Aliens Workshop at the University of Hawaii (May 18, 2001) five invasive alien algae, and 21 alien invertebrates were listed as being present within Kaneohe Bay. The *Marine Corps Base Hawaii Coral Reef Ecosystem Management Study* (December 2002) lists, one algae, 47 invertebrates and eight fishes. Some of these alien organisms can be quite confidently identified in the field, e.g. the snowflake coral *Carijoa riisei* and the sea frost worm *Salmacina dysteri*. Most, however, must be collected and identified in a laboratory. Suspicious specimens were noted and sampled and/or photographed. Large-scale sampling was not within the scope of this project. Appendix 3 lists the alien species recorded from the workshop and the report. It is important to note, that most of these records listed in Appendix 3 are from inside Kaneohe Bay, and none were from the actual project site itself. Alien assessments were performed during the Replicate Quadrats and Replicate Transects, and also by completing a meandering swim over, around, and under, when possible, each of the six study locations listed in Table 1.

Threatened and Endangered Species Assessment. The threatened green sea turtle *Chelonia mydas*, and the endangered hawksbill sea turtle (*Eretmochelys imbricata*), the endangered Hawaiian monk seal (*Monachus schauinslandi*) and the endangered humpback whale (*Megaptera novaeanglia*) have all been reported within the project area. Field identification of each of these animals is relatively easy. The MDSU 1 divers were instructed in how to identify each of these species and, in the case of the turtles, to also estimate the size and sex. Whales can often be heard, but not seen. Care was taken during the dives to listen for whales. Each member of the team kept a look out for these four species during the dives and on the surface from the dive boat.

Results and Discussion

The information in this section is present in two segments; null observations are presented first, followed by affirmative findings.

Null Observations. Six important null observations were made. These observations are listed below.

1) No endangered hawksbill sea turtles (*Eretmochelys imbricata*) were sighted underwater or from the boat.
2) No threatened green sea turtles (*Chelonia mydas*) were sighted underwater. No significant quantities of preferred green sea turtle forage were sighted on any of the dives. No surface sightings (from the dive boat) of green sea turtles were made within approximately 500 yards of either the buoy or the transmission cable. Four green sea turtle sightings were made from the dive boat during transits between the dive sites and Waterfront Operations at MCBH. The green sea turtles sighted all had a carapace length of approximately two feet.
3) No endangered Hawaiian monk seals (*Monachus schauinslandi*) were sighted underwater, or from the dive boat.
4) No endangered humpback whales (*Megaptera novaeangliae*) were seen underwater, or from the dive boat. No marine mammals sounds of any kind were heard during any of the dives.
5) No alien invertebrates were sighted on any of the dives. 6) No alien algae were sighted on any of the dives. 7) No changes in the behavior, distribution or concentration of mollusks, echinoderms or arthropods was observed along the transmission cable.

Replicate Quadrats. The four areas encompassed by each quadrat were carefully examined during each site visit. There was no visible evidence of macroscopic algae or invertebrate growth or settlement. Plates 2 and 3 illustrate this fact. Likewise, the other segments of the anchor base frame showed no signs of macroscopic algae or invertebrate growth. A very thin dusty gray coating was present on some portions of the anchor base frame. This film could be easily wiped off with a bare hand. This film was present when the first observations were made on October 7, 2003 and has remained visually unchanged through the last observation period on September 23, 2004. Dr. Richard Brock (University of Hawaii marine ecologist) has suggested that this film is most likely produced by bacteria (personal communication September 2003 and February 2004). No attempt was made to sample this film.

Replicate Transects. As noted under point 6 in the Null Observations section, no changes in the behavior, distribution or concentration of mollusks, echinoderms or arthropods was observed along the transmission cable. All species seen within the transect corridor, and on or under the transmission cable itself, were also sighted in comparable concentrations outside the transect corridor.

Small mollusks were routinely seen and included the following species: Trembling Nudibranch (*Risbecia imperialis*), Hawaiian Turban Shell (*Turbo sandwicensis*), Knobby Spindle Shell (*Latirus nodatus*), Episcopal Miter Shell (*Mitra mitra*) and the Reticulated Cowry (*Cypraea maculifera*). One octopus (*Octopus ornatus* tentative) was sighted outside the transect corridor. No squid were sighted during the transects, or on any other dives. No bivalve mollusks were sighted growing on the transmission cable or rock bolt assemblies.

Echinoderms were not abundant at any of the locations, including the transect corridors. The species sighted were all common Hawaiian specimens and included: Cushion Star (*Culcita novaeguineae*), Green Linkia (*Linkia guildingi*), Collector Urchin (*Tripneustes gratilla*) Plate 10, Banded Urchin (*Echinothrix calamaris*) Plate 11 and the Rough Spined Urchin (*Chondrocidaris gigantea*). No coral eating Crown-of-Thorns Starfish (*Acanthaster planci*) were sighted on any of the dives.

No large arthropods (shrimp, crab, lobster, etc) were sighted during any of the transects, although three lobsters were sighted under the anchor base. Unidentified hermit crabs were commonly observed, as well as small (less than four inches) shrimps in the family Penaeidae. Banded Coral Shrimp (*Stenopus hispidus*) were sighted in natural potholes/depression adjacent to the transmission cable. During the survey period covered by this report, no barnacles were sighted growing on any portion of the transmission cable or on the rock bolt assemblies anchoring the cable.

During the course of the study, changes in the macroscopic marine plants growing on the transmission cable roughly seemed to parallel changes in the immediately adjacent area. For example, during May of 2003 there was an increase in green algae *Caulerpa sp*. followed in June by an increase in brown algae *Padina sp*. These changes on the sea floor, also occurred on many segments of the transmission cable (see Plates 4 and 5). As of September 2004, algal cover on the transmission cable was becoming increasingly dominated by encrusting calcareous red algae, probably of the genus *Porolithon*.

Invertebrate Assessment. All corals belong to the Phylum Cnidaria (Coelenterata). The key coral groups which occur in Hawaii, and which might be expected within the project area are: Class Hydrozoa (Order Milleporina – fire corals, Order Stylasterina – lace corals), Class Anthozoa - Sub Class Zooantharia (Order Scleractinia – stony corals, Order Antipatheria – black corals), Sub Class Octocorallia (Order Alcyonacea – soft corals, Order Gorgonacea – sea fans/horny corals).

No fire corals, lace corals, black corals, soft corals or sea fans were sighted on any of the dives within the project area; and, none of these corals were reported in the *Wave Energy Technology (WET) Marine Corps Base Hawaii Kaneohe Bay Marine Environmental Assessment*. However, stony corals are present throughout the project area, and in the Escarpment Zone, cover up to 50% of the sea floor in substantial areas.

The variety of stony corals within the project area is low, and the species present and growth forms assumed are typical of a very high energy environment. The most common species sighted were: *Montipora capitata*, *M. patula*, *M. flabellata*, *Porites lobata*, *Pocillopora meandrina* (see Plates 4 - 6). The three species of *Montipora* and were all found exclusively in flat, encrusting growth forms. Most of the specimens of *Porites lobata* were also growing as flat, encrusting sheets, although a few rounded heads were observed. *Pocillopora meandrina* is common in Hawaiian high-energy environments. Although it is a branching coral, the branches are very stout and generally short.

No stony corals were sighted growing on the anchor base or any of its associated equipment, or on the transmission cable or the rock bolt assemblies. No stony corals growing within three feet of these project related structures showed any signs of bleaching or disease. A very limited number of corals were found underneath these project related structures, and they were, of course, crushed. None of the crushed specimens were unusually large or rare.

A few specimens of *Pocillopora meandrina*, in the Escarpment and Reef Flat Zone were bleached on approximately 20% of their surface area. The bleached portion of two of these bleached specimens were being overgrown with filamentous algae. The total number of partially bleached specimens of *Pocillopora meandrina* sighted during all the dives was eight, representing less than one percent of the total number of specimens sighted. This is not an unusual finding and there is no reason to suspect that it is in any way related to project activities.

The areas underneath the anchor base provides potentially good habitat for spiny lobsters and even octopus. No octopus were sighted; however, up to three spiny lobsters (*Panulirus marginatus*) were sighted on some dives.

For additional information on invertebrates, please see the 'Replicate Transect' section, beginning on page 7.

Fish Assessment. Appendix 4 lists the fish species which were sighted and the general locations where the sightings took place. All the fish species sighted at the buoy, anchor base, power conversion system, and along the transmission cable were commonly occurring Hawaiian species. No rare or unusual fish were sighted. None of the fishes sighted appeared to be diseased or to be behaving in an abnormal manner. The author had expected that large numbers of baitfish and sharks might be attracted to the buoy assembly. However, no large schools of baitfish and no sharks were sighted during any of the dives.

Between the first observations in October 2003 and the last observations covered by this report (September 2004) there were changes or shifts in the fish population around the anchor base. Parallel, or similar shifts were not observed along the transmission cable, in the areas surrounding the anchor base or in any of the other zones. Table 2 below, summarizes the observations at, or within 30 feet of the anchor base.

Table 2
Fish Observations at the Anchor Base

Species	Oct. 03	Dec 03	Feb. 04	May 04	June 04	Sept 04
Big Eyes *Priacanthus meeki*	< 10	>10<25	>10<25	>10<25	>10<25	>10<25
Butterflyfishes Various species	>25<50	>25<50	>25<50	>25<50	>25<50	>25<50
Damselfishes ***Chromis verater***	>50<100	>25<50	>25<50	>100 <200	>100 <200	>25<50
Damselfishes All other species	>25<50	>25<50	>25<50	>50<100	>50<100	>25<50
Moray Eels All species	0	0	1	1		
Goatfishes ***Mulloidichthys vanicolensis***	<25	~100	~100	~100	~100	~50
Goatfishes All other species	<10	>10 <25	>10 <25	>50 <100	>10 <25	>10 <25
Groupers ***Cephalopholis argus***	0	3	2	1	0	0
Jacks, Trevallies, Mackerel Scad ***Caranx melampygus***	<10	<10	0	<10	4	0
Jacks, Trevallies, Mackerel Scad All Other Jacks & Trevallies	0	2	0	2	5	1
Jacks, Trevallies, Mackerel Scad ***Decapterus macarellus & Selar crumenopthalmus***	0	<10	<10	>50<100	>50<100	0
Parrotfishes All species	>25<50	>25<50	>25<50	>25<50	>25<50	>25<50
Puffers & Porcupinefishes All Species	<10	<10	<10	<10	<10	<10
Snappers ***Lutjanus kasmira***	0	~500	~500	~300	~300	~150
Snappers (Jobfish) Aprion virescens	<10	0	2	1	0	0
Snapper All other species	<10	>10<25	>10<25	>10<25	>10<25	>10<25
Emperors ***Monotaxis grandoculis***	>10 <25	>10<25	>10<25	>10<25	>10<25	>10<25
Squirrelfishes All Species	>10<25	>25<50	>25<50	>25<50	>25<50	>25<50
Soldierfishes All Species	>10<25	>10<25	>10<25	>10<25	>10<25	>10<25
Surgeonfishes All Species	<10	>10<25	>10<25	>10<25	>10<25	>10<25
Unicornfishes All Species	0	<10	0	<10	<10	>10<25
Triggerfishes All Species	<10	<10	<10	<10	<10	<10
Moorish Idol ***Xanclus cornutus***	>10<25	>10<25	>10<25	>10<25	>10<25	>10<25

Notes: 1) Numerals alone, indicate that exact number of fish were sighted. 2) The signs > and < indicate that the number of fish present was estimated to be within that range. 3) The ~ symbol indicates an actual count of fishes, from photographs was made and the total number was estimated to be the number in the table. 4) All counts represent fishes which were on, in, or within 30 feet of the anchor base or its associated equipment.

Numerically, three species of fishes clearly dominated the anchor base area. With the exception of the first monitoring period the intentionally introduced Bluestripe Snapper or Ta'ape (*Lutjanus kasmira*) was the single most abundant species. This species also appears to be numerically dominant in the Undercut Ledge Zone near the anchor base. The endemic Hawaiian Threespot Chromis (*Chromis verater*) was the most abundant member of the damselfish family. However, after installation of the buoy, the number of other damselfish species became better represented. The Oval Chromis (*Chromis ovalis*) appeared to be the second most common damselfish at the project site. Goatfishes were commonly sighted on every dive at the anchor base, but the Hawaiian Yellowfin Goatfish or Weke 'ula (*Mulloidichthys vanicolensis*) was more abundant than all the other

goatfishes combined. The second most common goatfish was the Manybar Goatfish or Moano (*Parupeneus multifasciatus*).

Two moderate sized species, which appeared to maintain a very close physical association with the anchor base where the Hawaiian Bigey or aweweo (*Priacanthus meeki*) and the intentionally introduced Peacock or Argus Grouper, also known as Roi (*Cephalopholis argus*).

Among the moderate to large sized Jacks and Trevallies (Family Carangidae) Bluefin Trevally or Omilu (*Caranx melampygus*) was the most common, but Rainbow Runners or Kamanu (*Elagatis bipinnulatus*), Golden Trevally or Ulua Pa'opa' o (*Gnathanodon speciosus*) and Amberjack or Kahala (*Seriola dumerili*) were also sighted. The largest fish sighted during any of the observations were Amberjack; two specimens were estimated to be four (4) feet long. Among the small members of the Carangidae, moderate schools of Mackerel Scad or Opelu (*Decapterus macarellus*) and Bigeye Scad or Akule (*Selar crumenopthalmus*) were sighted after the buoy was installed.

As noted in Table 2, other commonly sighted fishes included Parrotfishes (mostly juveniles), the Bigeyed Emperor or mu (*Monotaxis grandoculis*), Squirrelfishes, Soldierfishes, Surgeonfishes, Unicornfishes, Triggerfishes and the Moorish Idol or Kihikihi (*Zanclus cornutus*). Triggerfishes appear to be the dominant group on the Deep Reef Platform Zone (adjacent to the anchor base) with the Lei Triggerfish or Humuhumu
– Lei (*Sufflamen bursa*) and Bridled Triggerfish or Humuhumu-mimi (*Sufflamen fraenatus*) being the most common species.

All the fish species observed at the anchor base and along the transmission cable were species that one would expect to see. As noted previously, there was nothing unusual about the species present, their individual appearances, behavior, numbers or size.

Alien Assessment. No alien invertebrate species were sighted, as noted under the Null Observations section. A member of the regulatory community had expressed concern about two invertebrate species in particular, the Snowflake Coral (*Carijoa riisei*) and the Sea Frost Worm (*Salmacina dysteri*). No sightings of either of these species were made, either on the WET equipment or in the adjacent areas. Three introduced fish species, the Peacock Grouper (*Cephalopholis argus*) and the Blacktail Snapper and Bluestripped Snapper (*Lutjanus fulvus* and *L. kasmira*) were present, and the latter was the single most abundant fish species. These findings are comparable to observations made around steel ship wrecks sunk in 100 feet of water off Waikiki.

The pantropical sea grass *Halophila decipiens* was present on the Reef Flat Zone, but only in small patches. Some members of the local scientific community consider this species an alien. In any case, it is a commonly encountered species throughout the Main Hawaiian Islands and has been known to be widely distributed for many years. A second species of sea grass was also sighted, the native *Halophila hawaiiana*.

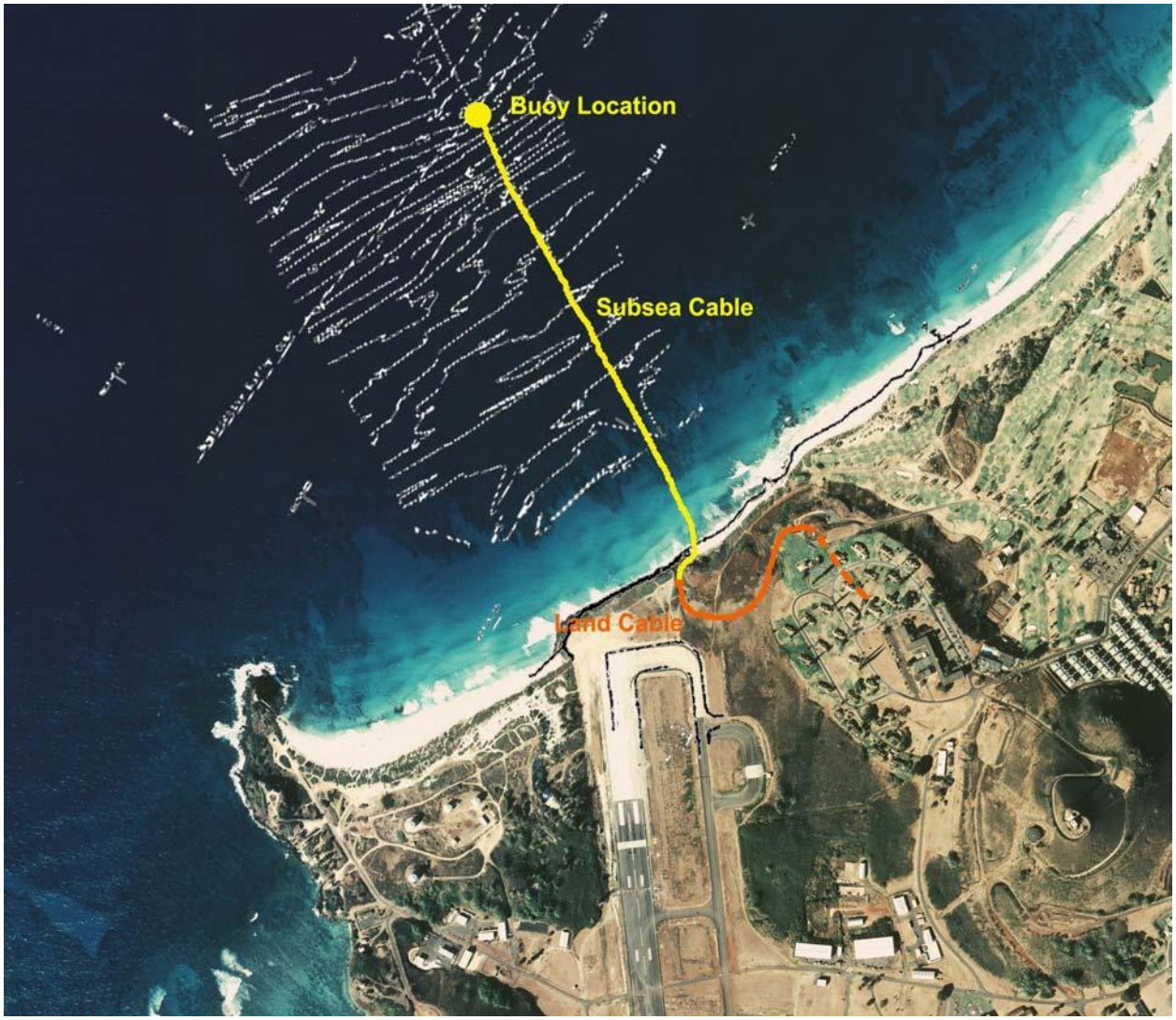
Conclusions and Recommendations

Based upon the observations made, there is no reason to suspect that the Wave Energy Technology Project off MCBH has had any adverse impacts to any marine natural resources. The anchor base, power conversion system, and buoy appear, in fact, to be serving as a Fish Attracting Devise (FAD).

None of the threatened or endangered species known to occur in the area appear to be attracted to, or affected by the structures. Furthermore, there is no evidence that the project has had, or is likely to have any impact on alien species.

The results of the first year of monitoring support the Navy's theory that the installation of the WET equipment, and the operation of that equipment, have not had any significant adverse impacts upon marine natural resources within the project area. Nevertheless, it is recommended that the current low level of quarterly monitoring be continued for the duration of the project in order to accurately document the condition of marine natural resources, and the biologically benign nature of the wave energy technology concept.

FIGURE 1
Project Area With Sea Floor Contours Superimposed



This is an aerial view of MCBH and the project site. The promontory on the left side of the photo is Pyramid Rock with Pyramid Beach also know as North Beach, immediately to the right. Kaneohe Bay is located in the lower left portion of the photo.

FIGURE 2
Schematic Diagram of WET Equipment and Anchor Base

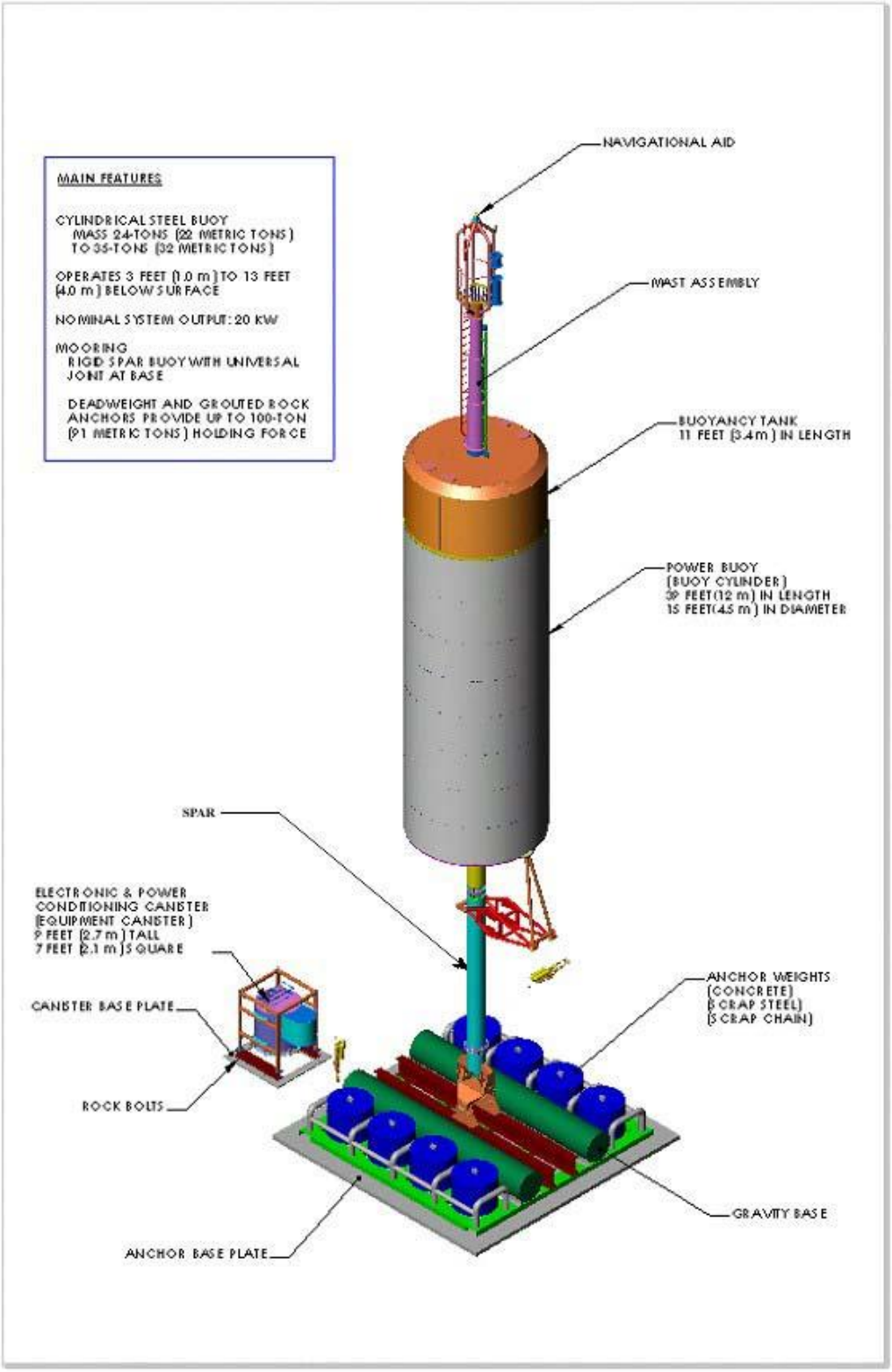
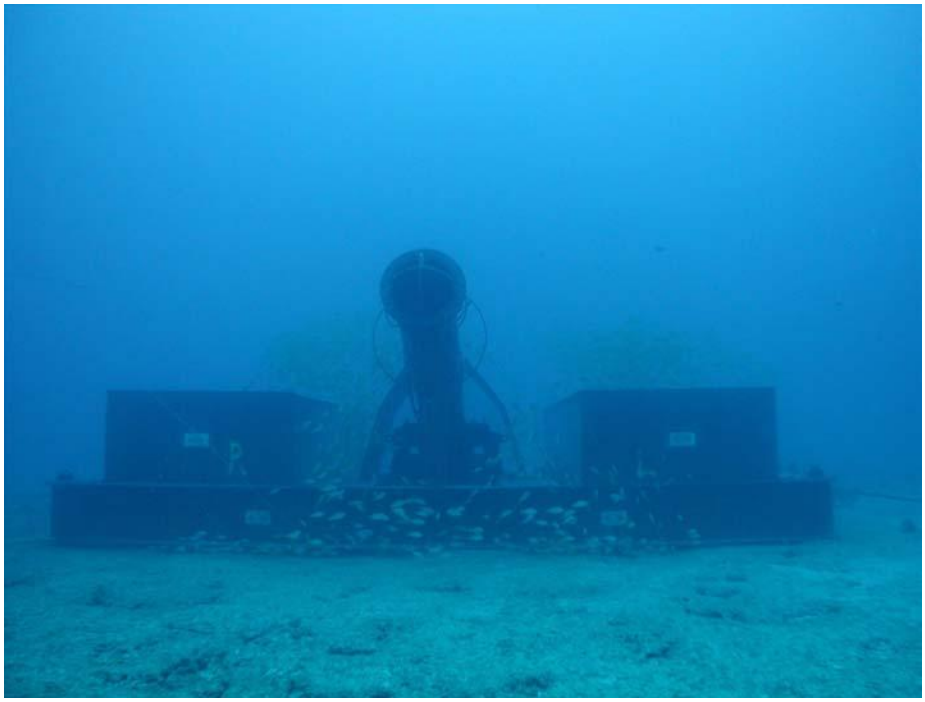


PLATE 1
Photos of Anchor Base Prior to Buoy Attachment and with

The Spar in the Down Position



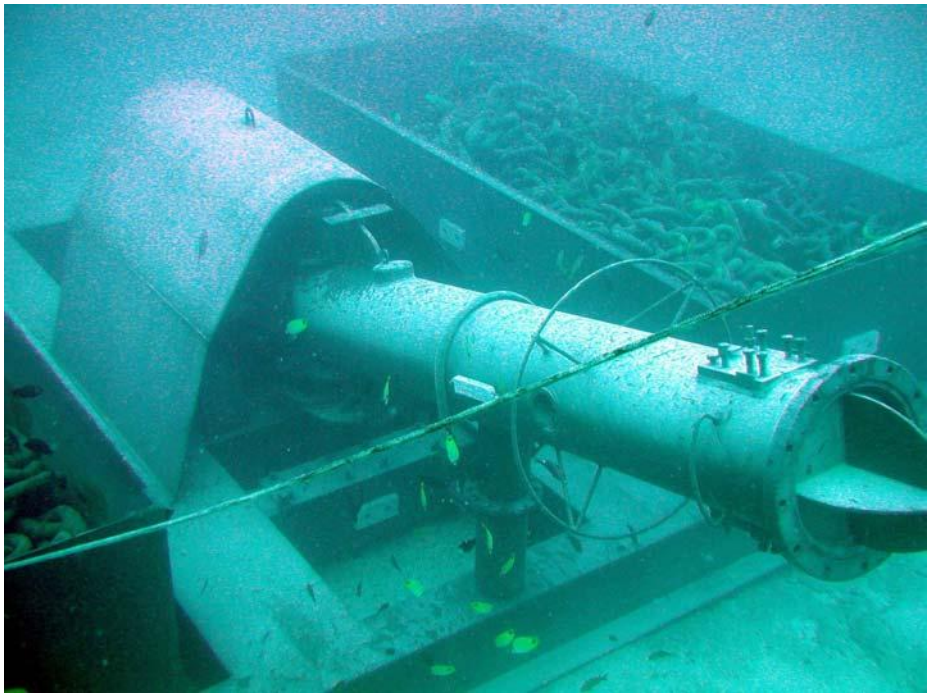
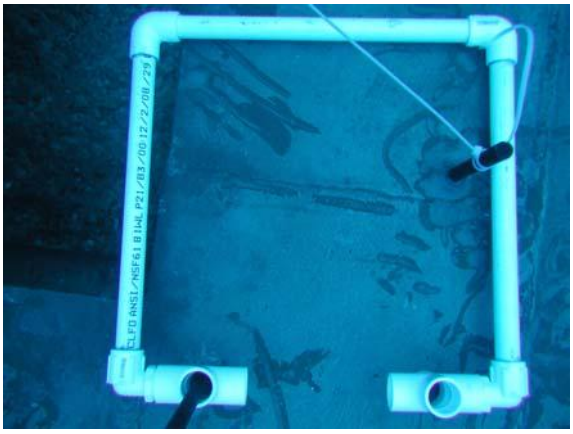
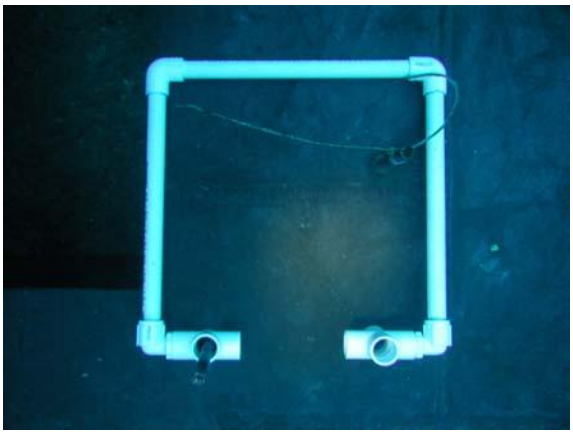


PLATE 2
Quadrat 1 on Anchor Base



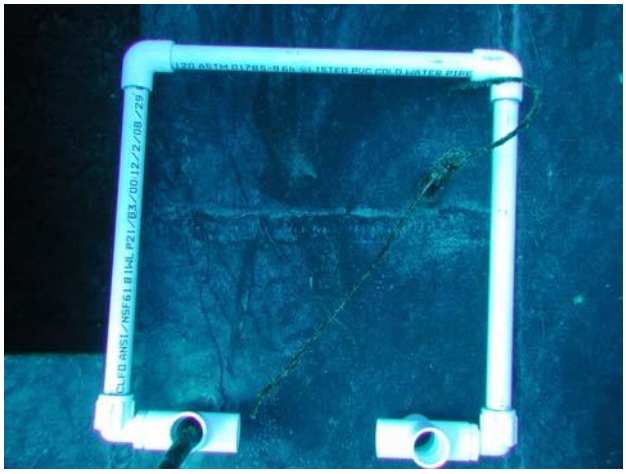
October 2003



December 2003

February 2004

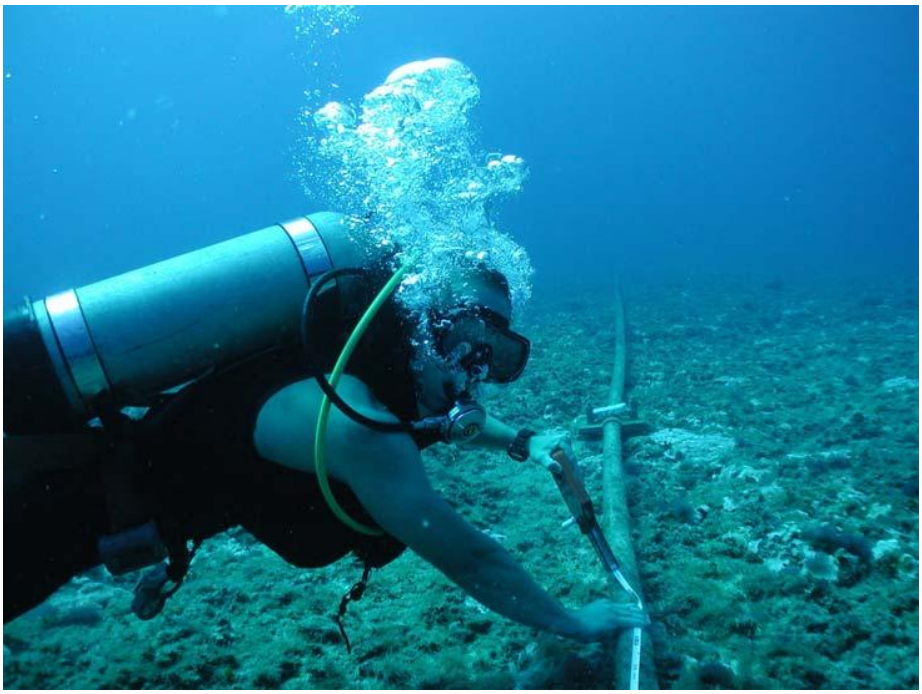
PLATE 3
Quadrat 1 on Anchor Base



May 2004

September 2004

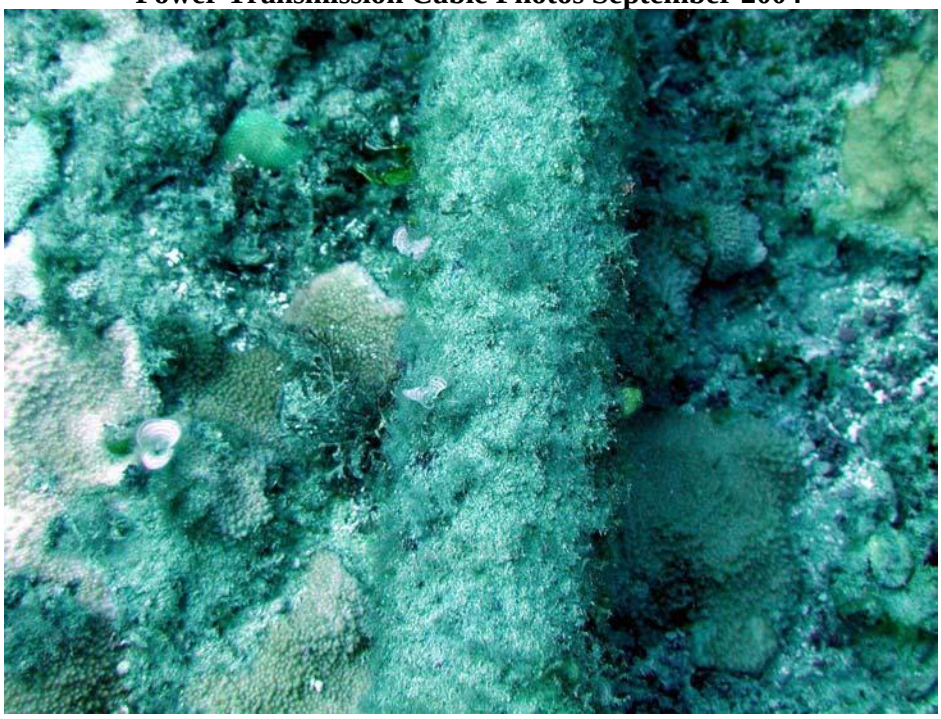
PLATE 4
Power Transmission Cable Photographed in May 2004



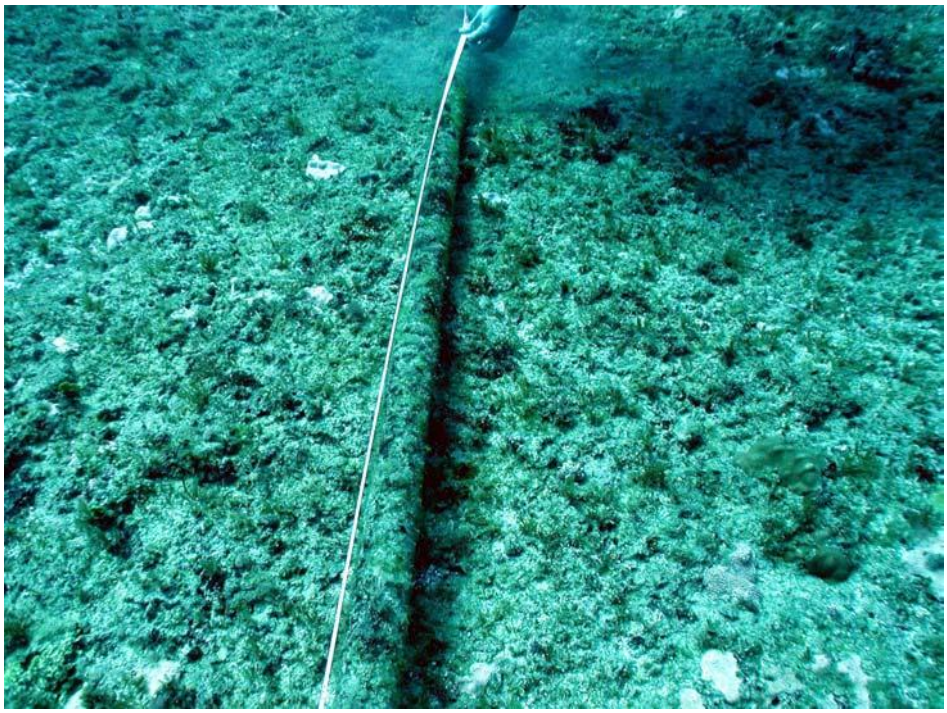
MDSU 1 diver laying out transect line along transmission cable.

Transmission cable in the Escarpment Zone. The rounded corals are *Pocillopora meandrina*, the encrusting corals are *Montipora* sp. Note, the similarity between algal cover on the cable and the adjacent sea floor.

PLATE 5
Power Transmission Cable Photos September 2004



This segment is in the Escarpment Zone. Algal species composition appears to be comparable on the sea floor and the cable, e.g., the round white specimens of *Padina sp*. and the calcareous green *Halimeda opuntia*.



This segment is in the seaward portion of the Reef Flat Zone. The cable has become nearly indistinguishable from the sea floor.

PLATE 6
Marine Life Commonly Sighted Adjacent to Transmission Cable

Cushion Stars (*Culcita novaeguineae*), like the one in the center of this photo, were frequently sighted in the Escarpment and Reef Flat Zones.

Triggerfishes were the most common medium sized fish in the Escarpment Zone.
The Lei Triggerfish (humhumu-lei) *Sufflamen bursa*.

PLATE 7
Fish Adjacent to the Anchor Base

Bluestripe Snapper (Ta'ape) *Lutjanus kasmira* were the most abundant fish species, followed by Yellowfin Goatfish (Weke a) *Mulloidichthys vanicolensis*. The goatfish are above the snappers in this photo.

Estimates of the number of Bluestripe Snapper were made by counting fish in photos. During the December 03 and February 04 observation periods, it was estimated that 500 individuals were present.

PLATE 8
Fishes Commonly Sighted Around the Anchor Base

From top to bottom: Moorish Idol *Xanclus cornutus*, Domino Damselfish *Dascyllus albisella*, Three Spot Chromis *Chromis verater*

The bullet shaped fish, both light and dark blue are Sleek Unicornfish *Naso hexacanthus*. Moorish Idols, Bluestripe Snappers and Butterflyfishes are also present.

The dark fishes next to the power conversion pod are Bigeyes *Priacanthus meeki*.

PLATE 9

Fishes Common to the Anchor Base

Hawaiian Bigeye (Aweoweo) *Priacanthus meeki* by the edge of the anchor base. Note, the absence of growth on the structure.

This Bigeye Emperor (*Monotaxis grandoculis*) is at the edge of the anchor base. Note the absence of sediment on the rock bottom.

PLATE 10
Other Commonly Observed Fishes

Common Longnose Butterflyfish (*Forcipiger flavissimus*)

Hawaiian Hogfish (*Bodianus bilunulatus*)

Manybar Goatfish (*Parupeneus multifasciatus*)

PLATE 11

Dominant Fish Species at Anchor Base

The three dominant species of fishes at the anchor base are shown in this photo. They are swimming over the chain ballast in the anchor lockers. The fishes in the top left are Yellowfin Goatfish (weke-‘ula) *Mulloidichthys vanicolensis*, the dark oval shaped Damselfish are Threespot Chromis *Chromis verater* and the remaining fishes are Bluestripe Snapper (ta’ape) *Lutjanus kasmira*. The later, were intentionally introduced from Tahiti by DLNR.

APPENDIX 1
Calendar of Installation Activities

Activity	Date of Activity
Anchor Base Deployed	22 September 2003
Power Transmission Cable Deployed	23 September 2003
Buoy Attached to Anchor Base	20 May 2004
Buoy Removed for Upgrades	15 October 2004

APPENDIX 2
Summary of Dives

Dive No.	Date	Depth	Dive No.	Date	Depth
1	7 Oct 03	100	15	13 May 04	100
2	7 Oct 03	100	16	13 May 04	70
3	8 Oct 03	70	17	13 May 04	40
4	8 Oct 03	70	18	14 May 04	100
5	9 Oct 03	100	19	14 May 04	60
6	9 Oct 03	70	20	20 May	80 Observe Buoy Instal.
7	15 Dec 03	100	21	9 June 04	100
8	15 Dec 03	70	22	9 June 04	50
9	3 Feb 04	100	23	21 Sept 04	100
10	3 Feb 04	70	24	21 Sept 04	50
11	3 Feb 04	40	25	23 Sept 04	100
12	4 Feb 04	100	26	23 Sept 04	50
13	4 Feb 04	50			
14	5 Feb 04	100			

APPENDIX 3
Alien and Introduced Species Recorded From Kaneohe Bay and/or Offshore MCBH

Species	Common Name	Species	Common Name
ALGAE & SEA GRASS		Hydroides elegans	Polychaete
Acanthophora spicifera	Sea Weed	Leucothoe micronesiae	Amphipod
Gracillaria salicornia	Sea Weed	Ligia sp.	Wharf Roach
Hypnea musciformis	Sea Weed	Martesia striata	Boring Clam
Kappaphycus alvarezii	Sea Weed	Microcosmus exasperatus	Sea Squirt
Kappaphycus striatum	Sea Weed	Mycale armata	Sponge
INVERTEBRATES		Mycale Cecilia & M. parishii	Sponges
Amathia distans	White Bushy Bryozoan	Obelia dichotoma	Hydrozoan
Anomia nobilis	Saddle Oyster	Paraleucothoe flindersi	Amphipod
Ascidia sp.	Ascidian	Pennaria disticha	Hydrozoan
Ascidia sydneienis	Yellow Green Sea Squirt	Phallusai nigra	Ascidian
Balanus amphitrite	Rock Barnacle	Phyllorhiza punctata	White Spotted Jelly
Balanus ebumeus	Barnacle	Pilumnus oahuensis	Crab
Bugula neritina	Bryozoan	Polyandrocarpa sagamiensis	Tunicate
Bugula robusta	Bryozoan	Polyclinum constellatum	Tunicate
Carijoa riisei	Snowflake Coral	Pomatoleios kraussii	Polychaete
Cassieopea andromeda	Upside-down Jelly	Sabellastarte spectabilis	Featherduster Worm
Chaetopterus sp.	Polychaete Worm	Salmacina dysteri	Sea Frost Worm
Chthamolus proteus	Barnacle	Schizoporella errata	Erratic Bryozoan
Crassostrea gigas	Japanese Oyster	Scylla serrota	Samoan Crab
Crepidula aculeata	Spiny Slipper Snail	Sigmadocia caerulea Suberites zeteki	Sponges
Crucibulum spinosum	Spiny Cup & Saucer Shell	Teredo clappi & Stenothoe gallensis	Shipworm & Amphipod
Diadumene lineata	Sea Anemone	Venerupis philippinarum	Edible Bay Clam
Didemnum perlucidum & D. candidum	Didemnid tunicates	Watersipora edmondsoni	Bryozoan
Diplosoma listerianum	Didemnid tunicate	**FISH**	
Dysidea sp.	Sponge	Cephalopholis argus	Peacock Grouper
Elasmopus rapax	Amphipod	Gambusia affinis	Mosquitofish
Eualetes tulipa	Vermetid Snail	Lutjanus fulvus	Blacktail Snapper
Eulalia sanguinea	Polychaete	Lutjanus kasmira	Bluestripe Snapper
Gelliodes fibrosa	Sponge	Omobranchus rotundiceps	Mangrove Blenny
Gonadodactylaceus falcatus	Mantis Shrimp	Oreochromis mossambicus	Mozambique Tilapia
Halocordyle disticha	Christmas Tree Hydroid	Sardinella marquesensis	Marquesan Sardine
Herdmania pallida	Sea Squirt	Sarotheradon mossambicus	Blackjaw Tilapia

APPENDIX 4

Fishes Identified Within the WET Project Area

Note: Species within the families Blenniidae and Gobiidae were sighted, but not recorded.

F. Muraenidae Moray Eels	**F. Malacanthidai Tilefishes**	Chaetodon quadrimaculatus Fourspot Butterflyfish	Naso brevirosstris Spotted Unicornfish
Echnida nebulosa Snowflake eel	Malacanthus brevirostris Flagtail Tilefish	Forcipiger flavissimus Common Longnose Butterflyfish	**F. Xanclidae** Zanclus cornutus Moorish Idol
Gymnothorax meleagris Whitemouth moray	**F. Carangidae Jacks, Trevallies, Etc**	Heniochus diphreutes Pennant Butterflyfish/ Bannerfish	**F. Balistidae Triggerfishes**
Gymnothorax sp.	Caranx melampygus Bluefin Trevally	**F. Pomacentridae Damselfishes**	Sufflamen bursa Lei Triggerfish
F. Synodontidae Lizardfishes	Caranx sexfasciatus Bigeye Jack	Chromis ovalis Oval Chromis	Sufflamen fraenatus Bridled Triggerfish
Synodus sp.	Elagatis bipinnulatus Rainbow Runner	Chromis verater Threespot Chromis	Rhinecanthus aculeatus Lagoon Triggerfish
F. Belonidae Needlefishes	Gnathanodon speciosus Golden Trevally	Abudefduf abdominalis Hawaiian Sergeant	Rhinecanthus rectangulus Picasso Triggerfish
Platybelone argalus Flat-Tailed Needlefish	Seriola dumerili Amberjack	Dascyllus albisella Domino Damselfish	Melichthys niger Black Triggerfish
Tylosurus crocodiles Crocodile Needlefish	Decapterus macarellus Mackerel Scad	Stegastes fasciolatus Pacific Gregory	**F. Monocanthidae Filefishes**
F. Holocentridae Squirrel/Soldierfishes	Selar crumenophthalmus Bigeye Scad	**F. Labridae Wrasses**	Aluterus scriptus Scribbled Filefish
Sargocentron ensiferum Yellowstripe Squirrelfish	**F. Lutjanidae Snappers**	Bodianus bilunulatus Hawaiian Hogfish	Cantherhines dumerili Barred Filefish
Sargocentron spiniferum Longjaw Squirrelfish	Lutjanus kasmira Bluestripe Snappers	Coris ballieui Lined Coris	**F. Diodontidae Porcupinefishes**
Sargocentron sp.	Lutjanus fulvus Blacktail Snapper	Coris gaimard Yellowtail Coris	Diodon histrix Porcupinefish
Myripristis berndti Big Scale Soldierfish	Aprion virescens Jobfish/Gray Snapper	Gomphorus varius Bird Wrasse	**F. Tetraodontidae Puffers**
F. Aulostomidae Trumpetfishes	**F. Lethrinidae Emperors**	Labroides phthirophagus Cleaner Wrasse	Arothron meleagris Spotted puffer
Aulostomus chinensis Trumpetfish	Monotaxis grandoculis Bigeye Emperor	Thalassoma duperrey Saddle Wrasse	**F. Ostraciidae Trunkfishes**
F. Fistulariidae Cornetfishes	**F. Mullidae Goatfishes**	**F. Scaridae Parrotfishes**	Canthigaster epilampra Lantern Toby
Fistularia commersonii Cornetfish	Mulloidichthys vanicolensis Yellowfin Goatfish	Calotomus carolinus Star-Eye Parrotfish	Canthigaster coronata Crowned Toby
F. Serranidae Groupers	Parupeneus bifasciatus Doublebar Goatfish	Scarus perspicillatus Spectacled Parrotfish	
Cephalopholis argus Peacock Grouper	Parupeneus cyclostomus Blue Goatfish	Scarus sp.	
F. Cirrhitidae Hawkfishes	Parupeneus multifasciatus Manybar Goatfish	**F. Acanthuridae Surgeonfishes**	
Paracirrhites forsteri Blackside Hawkfish	Parupeneus porphyreus Whitesaddle Goatfish	Acanthurus blochii Ringtail Surgeonfish	
Paracirrhites arcatus Arc-Eye Hawkfish	**F. Chaetodontidae Butterflyfishes**	Acnathurus xanthopterus Yellowfin Surgeonfish	
F. Priacanthidae Bigeyes	Chaetodon miliaris Milletseed Butterflyfish	Acanthurus olivaceus Orangeband Surgeonfish	
Priacanthus meeki Hawaiian Bigeye	Chaetodon auriga Threadfin Butterflyfish	Acanthurus nigroris Blueline Surgeonfish	
		Naso hexacanthus Sleek Unicornfish	

Appendix B
NHPA Section 106 Correspondence

UNITED STATES MARINE CORPS
MARINE CORPS BASE HAWAII
BOX 63002 KANEOHE BAY, HAWAII 96863-3002

IN REPLY REFER TO:
5090
LE/379-12
October 9, 2012

CERTIFIED MAIL NO.: 7008 2810 0002 1216 1555

Mr. William Aila
State Historic Preservation Officer
Department of Land and Natural Resources
Kakuihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

RE: EXPANSION OF THE WAVE ENERGY TESTING SITE (WETS) PROJECT ABOARD MCB HAWAII, DISTRICT OF KO'OLAUPOKO, AHUPUA'A OF KĀNE'OHE, ON THE ISLAND OF O'AHU, TMK 1-4-4-08:001.

Dear Mr. Aila:

Marine Corps Base (MCB) Hawaii is consulting with your office in compliance with Section 106 of the National Historic Preservation Act regarding the proposed project to expand the Wave Energy Testing Site (WETS) aboard MCB Hawaii. This letter initiates our Section 106 consultation for this project.

PROJECT DESCRIPTION

The proposed project is to expand the 2003 Wave Energy Technology single buoy test site at MCB Hawaii into a multi-buoy test site, called the Wave Energy Test Site (WETS). The project is located on the north side of Mōkapu Peninsula, east of the flight line [Enclosure 1]. Wave energy conversion (WEC) devices would be placed at pre-determined distances offshore with connecting data and power cables routed underwater towards shore. As the cables make landfall, they must traverse across North Beach before connecting to a new onshore utility vault and then to Facility 614, Battery French, which would contain the data collection/power distribution equipment.

Two methodologies have been suggested for the placement of the terrestrial segment of data and power cables. Each method would use different locations to route the cables to Facility 614. The preferred approach is to install the cable underground near Battery French using horizontal directional drilling (HDD) methods. Using this trenchless directional boring technique, the cable would be routed 30 feet (10 m) below ground level, passing beneath the shoreline, and resurfacing underwater at a location greater than 400 feet from the shoreline. To initially begin installation of the cable, a 10-inch/25 centimeter boring would be hand augered near Battery French to a depth of 6 to 10 feet (2-3 meters) before implementing the directional drilling stem to bore/tunnel out to the location where the cable would emerge underwater. The subsurface cable route is a direct route from the deep water mooring area to Battery French [see Enclosure 2]. The HDD methodology would enable multiple WEC technologies to utilize the WETS area.

Alternatively, a surface laid option would install the cables over the same land route used during the 2003 WET project [see Enclosure 3]. The existing stanchions would be modified to attach the additional conduits with likely additional pedestals being added [Enclosure 4]. A new cable vault would be constructed in the vicinity of the existing WET vault with about six new stanchions also being installed to support the cables as they exit the new vault. Additionally, another six pedestals would be placed near Battery

French as the cables connect to the equipment at the facility. Should other WEC technologies be tested at the site, the over land scheme would need to be continuously be augmented.

Facility 614, Battery French, would be rehabilitated for office and storage, which will require electrical restoration and upgrades to meet current code requirements, replacement of electrical light fixtures, new doors, and a new air conditioning system to ensure proper air flow for equipment and occupants [Enclosure 5].

IDENTIFICATION OF HISTORIC PROPERTY

Facility 614, known as Battery French, was constructed in 1943 by the U.S. Army. It was one of eight batteries constructed for coastal defense. The battery was named in honor of Colonel Forrest J. French who died in March 1944 during a campaign in the southwest Pacific (Fung & Associates w/ Mason Architects 2005). It is located along the northern coastline of Mōkapu Peninsula on a rocky bluff. The construction at that time was highly standardized and designed to withstand naval and aerial bombardment. Facility 614 is considered an intermediate seacoast weapon defense post since it was intended to support two 6-inch guns (that are no longer present). The facility retains integrity of design as a coastal defense fortification during World War II and is considered eligible for listing in the National Register of Historic Places (NRHP) based on Criteria A (associated with events that have made a significant contribution to the broad patterns of history) and C (distinctive characteristics/design).

This structure has been vacant, for the most part, since the 1990s. The proposed modifications for Battery French would affect only the interior of the structure, which has been previously modified. The integrity of the existing concrete structure that holds the possibly distinctive architectural features will not be altered. In addition, installation of the associated WEC data and power collection equipment will occur in an area of high archaeological sensitivity (U.S. Army Corps of Engineers 2006) [see Enclosure 1]. As the collection cable segues from the ocean to the land, it will cross through Site 1017, the Mōkapu Burial Area, to then connect to a new utility vault and power conversion and distribution system.

The Mōkapu Burial Area (MBA), Site-1017, extends for 1.5 kilometers (km) along the northern coastline of Mōkapu Peninsula, from the base of Ulupa'u Crater on the east to near Pyramid Rock on the west. The site has an average width of about 750 meters (m) from the shoreline up into the sand dunes. Although there had been numerous reports of human skeletal remains eroding from the Mōkapu Dunes since the 1880s, the actual documentation of an intact burial was not made until 1915 by Stokes, with McAllister (1933) establishing it as an archaeological site (Prishmont and Anderson 2000; Tuggle and Bowen 1986). Subsequent studies have gathered an abundance of data regarding Hawaiian burials and mortuary practices (Athens 1985; Bowen 1961, 1974; Collins et al. 1994; Emory n.d.; Schilz 1996a, 1996b, 1999; Tuggle 2002; Williams and Patolo 1998;). More than 1,500 individuals have been found with a majority being traditional pre-Contact burials. Site-1017 is listed on the NRHP under criteria A and D.

AREA OF POTENTIAL EFFECT

The area of potential effect (APE) has been determined to include only the footprint of the proposed WETS project, which includes the installation of the cables and rehabilitation of Battery French aboard MCB Hawaii.

5090
LE/375-12
October 9, 2012

DETERMINATION OF AFFECT

MCB Hawaii has determined that the proposed project to expand the Wave Energy Testing Site (WETS) will result in no adverse effect to historic properties in accordance with Section 106 Implementing Regulations at 36 CFR 800.4(d)(1) based on the following: 1) the rehabilitation of Battery French will follow the Secretary of Interior's Standards and Guidelines for Rehabilitating Historic Buildings and will not adversely affect any defining characteristics of Facility 614, Battery French; 2) should the proposed project utilize the HDD methodology, larger scale disturbance to the first few feet of the sub-grade (subsurface ground) would be avoided as the conduit would be routed 30 ft underground thus avoiding any subsurface cultural material (a small amount of subsurface ground disturbance would be limited to the 10-inch diameter drill entry location); 3) if the overland route is selected, any ground disturbing activities along the coastline would be monitored for the possible inadvertent discovery of archaeologically significant material, and 4) in the event that Native American Graves Protection and Repatriation Act (NAGPRA) cultural items, including human remains, are discovered during ground disturbing activities, all work in the vicinity will stop and the remains will be stabilized and protected. Treatment will proceed under the authority of NAGPRA.

We request your review and concurrence within 30 days of receipt of this letter. As defined in 36 CFR 800.5(c) we will assume your concurrence if no objection is received from your office within 30 days of receipt of this letter. Should you or your staff have any questions or concerns please contact the MCB Hawaii Cultural Resources Management staff, Ms. June Cleghorn at 257-7126 or via email at june.cleghorn@usmc.mil or Coral Rasmussen at 257-7134 or via email at coral.rasmussen@usmc.mil.

Sincerely,

D. R. GEORGE
Captain, U. S. Marine Corps
Director, Environmental Compliance and Protection Department
By direction of the Commanding Officer

Enclosures:
(1) Location of the proposed WETS project overlaid on an archaeological sensitivity map.
(2) USGS map showing route for HDD option for the WETS data/power transmission conduit.
(3) USGS map showing overland route option for the WETS data/power transmission conduit.
(4) Modified stanchion for additional surface laid power and fiber conduits.
(5) Plan view drawing showing rooms within Battery French that would be utilized by the WETS project for housing the additional equipment.

Copy to:
Mr. Van Horn Diamond; Diamond 'Ohana
Ms. Nalani Olds; Olds 'Ohana
Ms. Delilah Ortiz; Ortiz 'Ohana
Ms. Emalia Keohokalole, Keohokalole 'Ohana
Ms. Clara Sweets Matthews; Ka Lahui Hawaii
Ms. Ella Pagauyo; Paguyo 'Ohana
Ms. Chasmin Sokoloski; Prince Kuhio Hawaiian CC
Ms. Nau Kamalii; Boyd 'Ohana
Ms. Donna Ann Camvel; Paoa Kea Lono 'Ohana
Mr. Kamana'opono Crabbe; Office of Hawaiian Affairs
Mr. Cy Harris; Kekumano 'Ohana
Ms. Terrilee Napua Kekoolani Raymond; Kekoolani 'Ohana
Chairperson; Oahu Island Burial Council
Ms. Cathleen Mattoon; Koolauloa Hawaiian Civic Club
Mr. Edward Ayau; Hui Malama I Na Kupuna O Hawai'i Nei
Mr. Clive Cabral; Temple of Lono
Mr. Emil Wolfgramm
Ms. Kiersten Faulkner, Historic Hawaii Foundation

References:

Athens, J. Stephen
1985 *Archaeological Reconnaissance at the Mokapu Burial Area, Marine Corps Air Station, Kaneohe Bay, Hawaii.* Prepared for M&E Pacific, Inc. Honolulu. J. Stephens Athens, Ph.D. Archaeological Consultant, Honolulu.

Berhow, Mark A.
2011 Modern American Seacoast Defenses: A List of Military Reservations and Concrete Gun Batteries, 1890-1950. Prepared for Army Corps of Engineers, Washington, D.C. Coast Defense Study Group, Inc., Bel Air, MD.

Bowen, Robert N.
1961 Hawaiian Disposal of the Dead. M.A. Thesis, University of Hawaii, Honolulu.

1974 Mōkapu: Its Historical and Archaeological Past. In *Early Hawaiians: An Initial Study of Skeletal Remains from Mōkapu, Oahu.* By Charles E. Snow. pp. 129-148 (Appendix A). University Press of Kentucky, Lexington.

Collins, Sara, Toni Han, and Lisa Armstrong
1994 *Inventory of Human Skeletal Remains from Mōkapu Peninsula, Ko'olauPoko District, Kāne'ohe and He'eia Ahupua'a, O'ahu Island, Hawai'i.* Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Anthropology Department, Bishop Museum, Honolulu.

Cubbison, Douglas R., and Travis Beckwith
2006 *Project 05-239, Stabilization and Preservation of DoD-owned Military Fortifications.* Prepared for the Department of Defense Legacy Resource Management Program. United States Military Academy, West Point, New York.

Emory, Kenneth P.
n.d. Field Notes of Mōkapu Burial Excavations. Department of Anthropology, BPBM, Honolulu.

Fung and Associates w/ Mason Architects
2005 *Historic Buildiing Inventory for U.S. Marine Corps Base Hawaii, Kāne'ohe Bay, Kāne'ohe, O'ahu, Hawai'i (DACA 83-00-C-0037).* Prepared for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii. Fung and Associates, Honolulu, Hawaii.

McAllister, J. Gilbert
1933 *Archaeology of Oahu.* B.P. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu.

Prishmont, Laura Ann and Lisa Anderson
2000 *Archaeological Subsurface Testing in Conjunction with the Airfield Runway Repairs Project (ARRP) in the Mōkapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii.* Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Ogden Environmental and Energy Services Company, Inc., Honolulu.

Schilz, Allan J.
1996a *Final Report: Cultural Resources Management Plan, Marine Corps Base Hawaii Kaneohe Bay, Island of O'ahu, Hawai'i.* Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawai'i. Ogden Environmental and Energy Services Co., Inc., Honolulu.

1996b *Archaeological Emergency Data Recovery, Mōkapu Burial Area at Marine Corps Base Hawaii (MCBH) Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawai'i. Ogden Environmental and Energy Services Co., Inc., Honolulu.

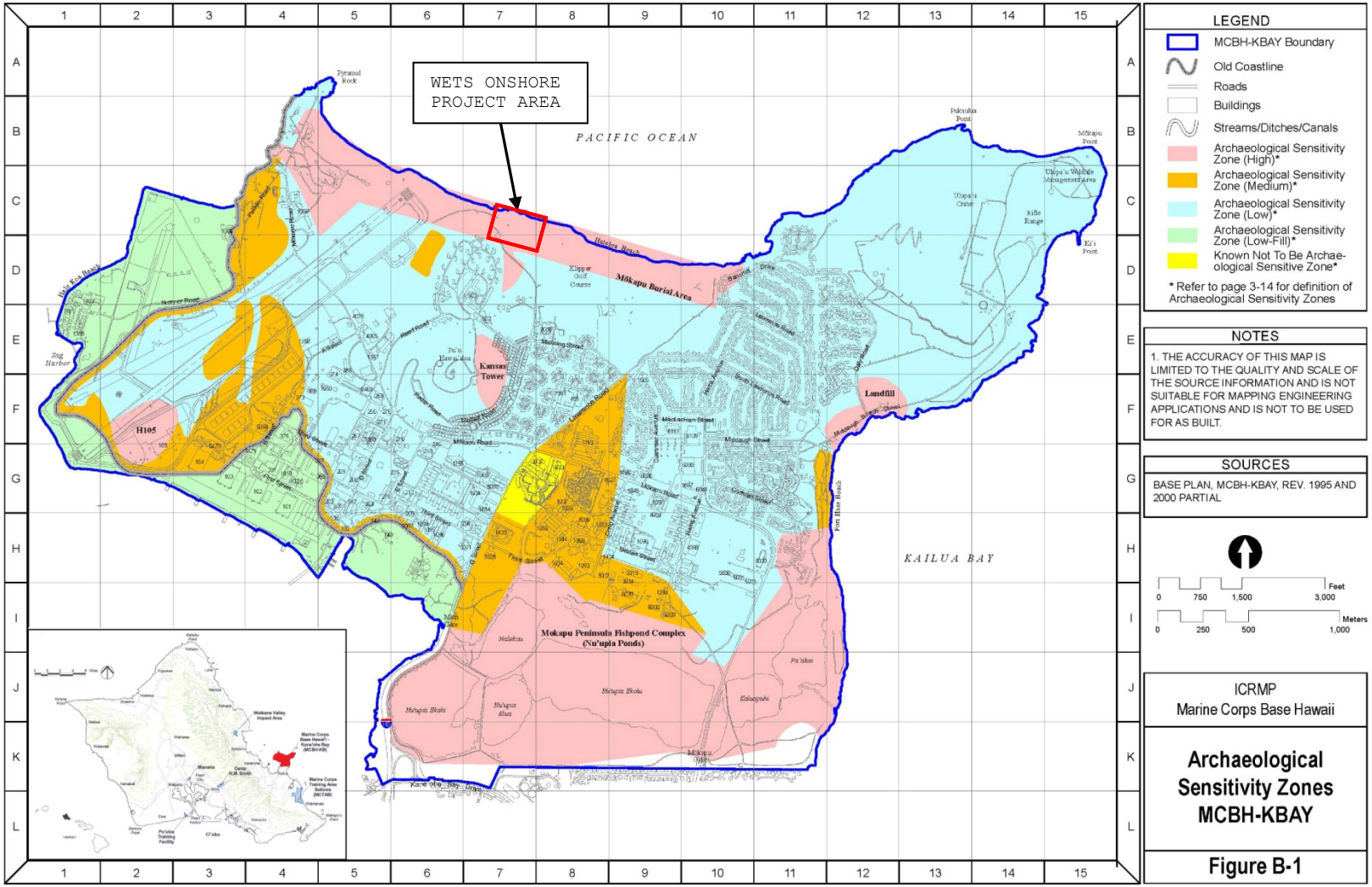
1999 *Investigations for Emergency Recovery of Human Bone Remains and Monitoring for Family Housing Construction, Marine Corps Air Station, Kaneohe Bay, O'ahu Island, Hawai'i.* Prepared for U.S. Army Corps of Engineers, Fort Shafter. Ogden Environmental and Energy Service Co., Inc., Honolulu.

Tuggle, H. David
2002 *A Preliminary Summary of the Bowles Records Concerning Mōkapu Excavations, O'ahu.* Prepared for U.S. Army Engineer District, Fort Shafter, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

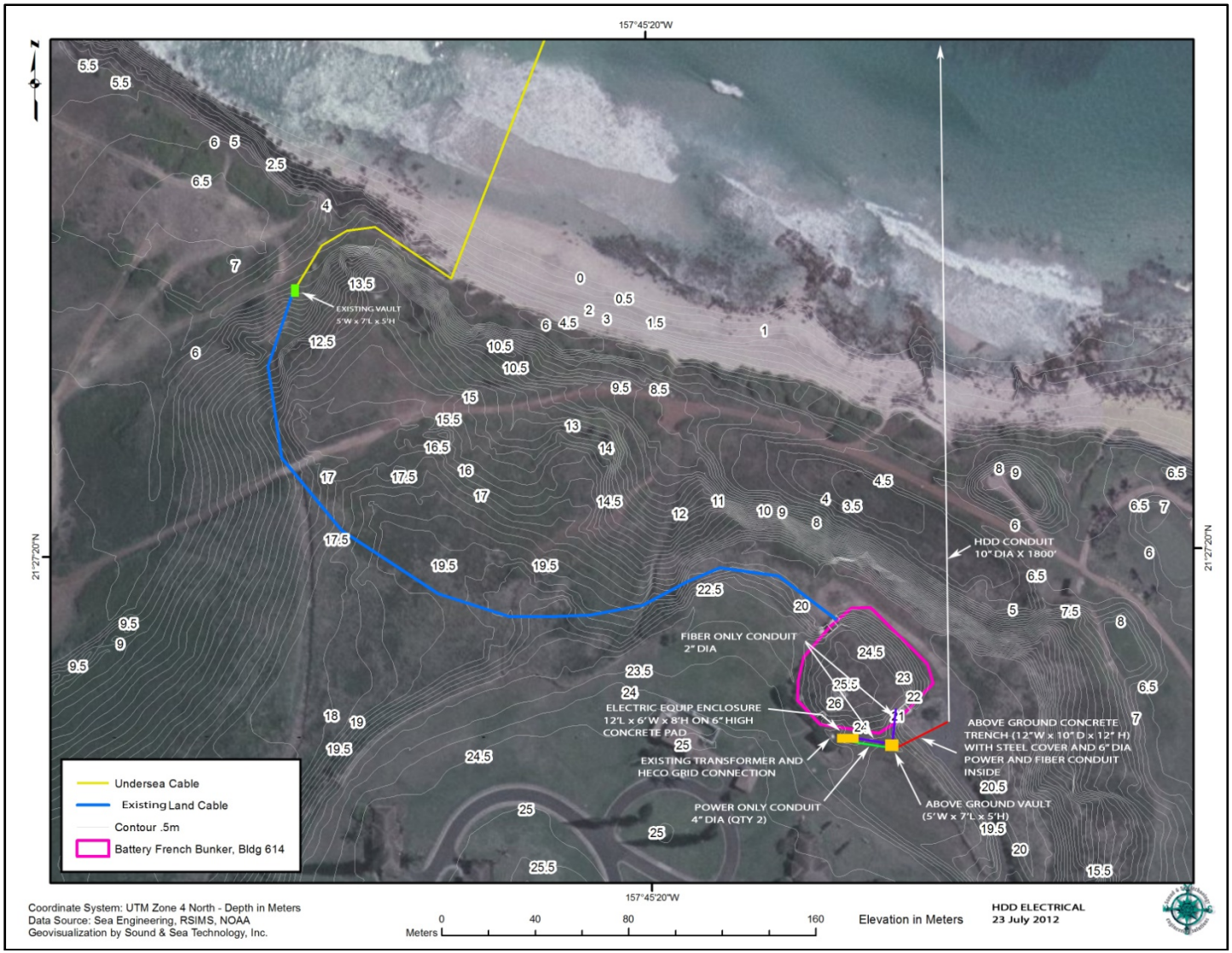
Tuggle, H. David and Robert J. Hommon
1986 *Historic Property Inventory, Marine Corps Air Station, Kaneohe Bay: History, Survey, and Site Descriptions.* U.S. Naval Facilities Engineering Command, Pacific Division, Pearl Harbor.

U.S. Army Corps of Engineers
2006 *Integrated Cultural Resources Management Plan (ICRMP), Marine Corps Base Hawaii, O'ahu, Hawai'i.* Prepared for Installation Commander, Marine Corps Base Hawaii. U.S. Army Corps of Engineers, Honolulu Engineer District, Fort Shafter, Hawai'i. Wil - Chee Planning and Mason Architect, Inc.

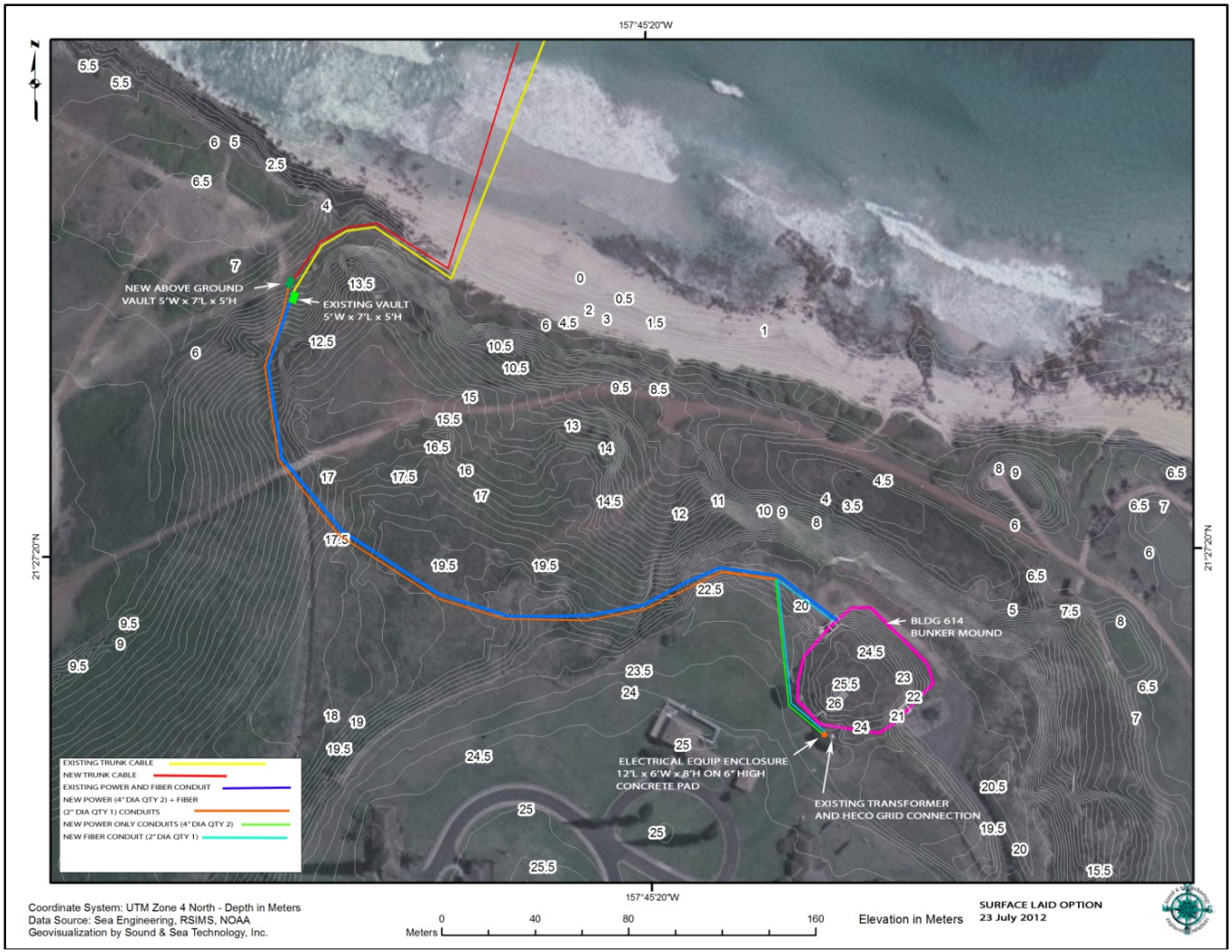
Williams, Scott and Tomasi Patolo
1998 *Final Report Subsurface Survey and Boundary Delimitation of the Mōkapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i. In Conjunction with the Legacy Resource Management Program.* Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Ogden Environmental and Energy Services Co., Inc., Honolulu, Hawaii.



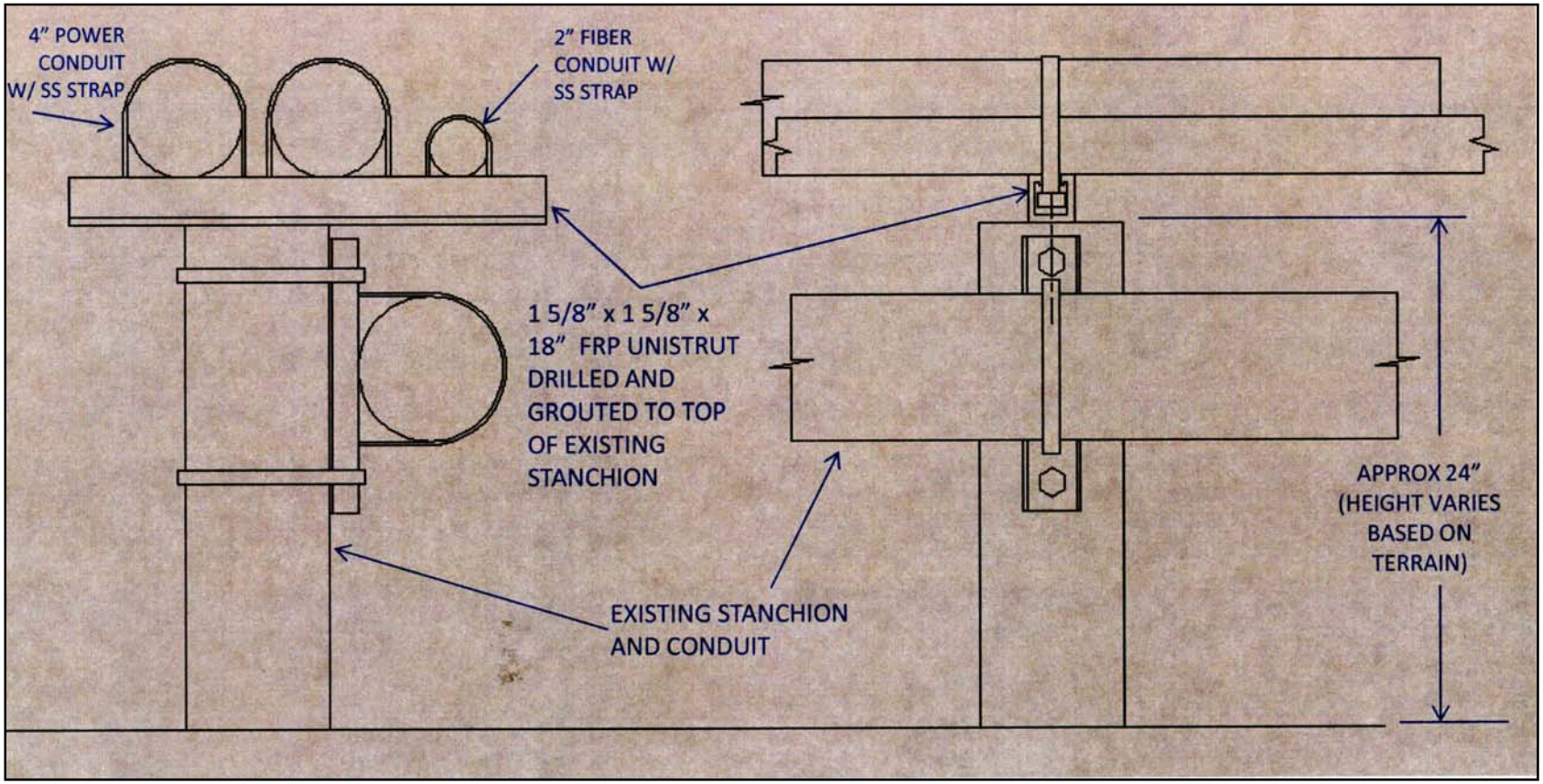
Enclosure 1. Location of the proposed WETS project overlaid on an archaeological sensitivity map w/ inset showing location of MCB Hawaii on O'ahu Island (U.S. Army Corps of Engineers 2006:Fig B-1).



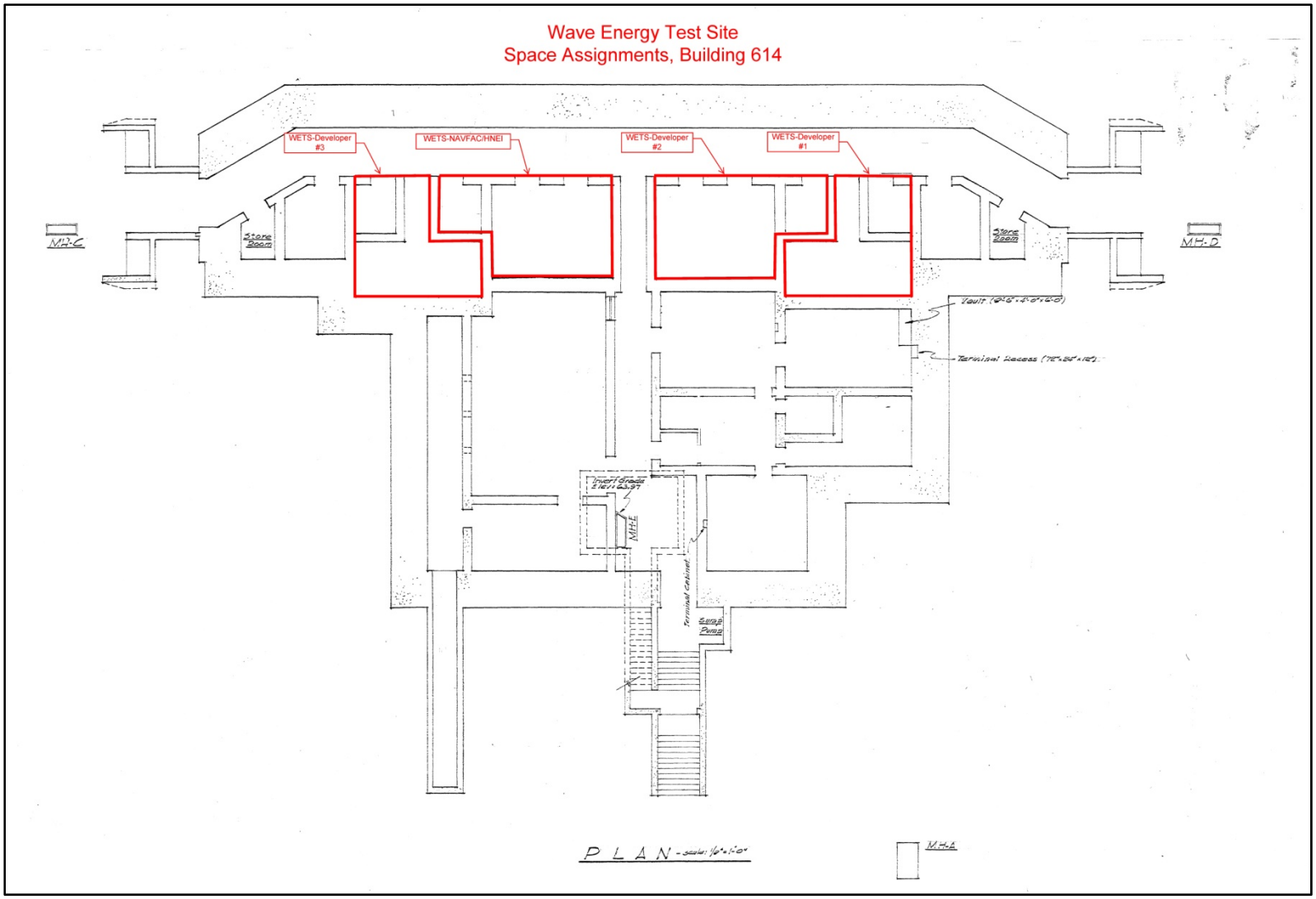
Enclosure 2. Section of 1998 U.S. Geological Survey map, 7.5-minute series, for Mōkapu Point showing the route for the horizontal directional drilling option for the WETS data/power transmission conduit.



Enclosure 3. Section of 1998 U.S. Geological Survey map, 7.5-minute series, for Mōkapu Point showing the route for the overland option for the WETS data/power transmission conduit.



Enclosure 4. Modified stanchion for additional surface laid power and fiber conduits



Enclosure 5. Plan view drawing showing rooms within Battery French that would be utilized by the WETS project for housing the additional equipment.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ESTHER KIA'AINA
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 5, 2012

Captain D. R. George
Environmental Compliance and Protection Department
Marine Corps Base Hawaii
BOX 63002 Kaneohe Bay, HI 96863-3002

LOG NO: 2010.2966
DOC NO: 1211NN02
Archaeology
Architecture

Dear Captain George:

SUBJECT: National Historic Preservation Act (NHPA) Section 106 Consultation – United States Marine Corps, Expansion of the Wave Energy Testing Site (WETS) Kaneohe Ahupua'a, Ko'olaupoko District, Island of O'ahu TMK: (1) 4-4-008:001

This is in response to your letter dated October 9, 2012 requesting consultation in connection with the proposed expansion of the 2003 Wave Energy Technology single buoy test site (WETS), which is located on the north side of Mokapu Peninsula, east of the flight line.

Wave energy conversion devices (WEC) will be placed at pre-determined distances offshore with connecting data and power cables routed underwater towards shore. As the cables make landfall, they will transverse across North Beach before connecting to a new on shore utility vault and then to Facility 614 – Battery French, which would contain the data collection/power distribution equipment. As the collection cable segues from the ocean to the land, it will cross through Site 1017- The Mōkapu Burial Area to then connect to a new utility vault and power conversion and distribution system. You have determined that the area of potential effect (APE) includes only the footprint of the proposed WETS project, which includes the installation of the cables and rehabilitation of Battery French.

The Battery French Building was built in 1943, and is eligible for listing on the National Register of Historic Places (based on Criteria A-associated events that have made a significant contribution to the broad patterns of historic and Criteria C – distinctive characteristics/design. The undertaking proposes to rehabilitate the structure which has been vacant for a number of years, into offices and storage. Work will include electrical upgrades, new doors, various code upgrades and a new air-conditioning system. Cables for the WETS project will be connected to the facility.

The Mōkapu Burial Area extends 1.5 kilometers along the northern coastline of Mōkapu Peninsula, from the base of Ulupa`u Crater on the east to near Pyramid Rock on the west, and has an average width of about 750 meters from the shoreline up into the sand dunes. More than 1,500 Native Hawaiian burials have been discovered in this area. The Mōkapu Burial Area is listed on the National Register of Historic Places under Criteria A (associated events that have made a significant contribution to the broad patterns of historic) and D (information potential).

At this time, we do not have sufficient information to concur with your determination that the proposed undertaking will have no adverse effect on historic properties. SHPD Architecture Branch requests additional information regarding the proposed upgrades to the building, any proposed site work (including sitting of mechanical equipment) and the connection of the cables to the structure. Please provide existing photos of the building (interior and exterior); site photos; and architectural and mechanical plans that better describe the scope of the work (Enclosure 5 is insufficient).

SHPD Archaeology Branch requests additional information regarding the surface-laid option that would install the cables over the same land route used during the 2003 WET project. In 2003, was the near shore submerged APE surveyed for archaeological features, including human remains? If not, please include justification as to whether a survey should or should not occur. In addition, Native Hawaiian Organizations should be consulted to aid in the

identification of additional historic properties pursuant to 36 CFR 800.4 (a) (4), and provide information on alternatives to mitigate potential adverse effects. Please contact Deona Naboa at (808) 692-8019 if you have any questions regarding archaeological concerns and contact Angie Westfall at (808) 692-8032 if you have any questions regarding the architecture concerns.

Aloha,

Theresa K. Donham
Deputy State Historic Preservation Officer
Historic Preservation Division

cc: Angie Westfall, Architecture Branch Chief

-----Origi nal Message-----
From: Keola Lindsey [mailto:keolal@oha.org]
Sent: Friday, November 09, 2012 6:23 PM
To: George Capt Derek R
Cc: Cleghorn CIV June N; Rasmussen CIV Coral M; william.j.aila@hawaii.gov; Pua.Aiu@hawaii.gov; Theresa.K.Donham@hawaii.gov
Subject: National Historic Preservation Act consultation- proposed expansion of the Wave Energy Testing Site

Aloha Captain George:

The Office of Hawaiian Affairs (OHA) is in receipt of your October 9, 2012 letter that initiates National Historic Preservation Act consultation for the proposed expansion of the Wave Energy Testing Site aboard Marine Corps Base Hawaii (the undertaking).

Your letter provides the United States Marine Corps (USMC) determination that this undertaking will result in "no adverse effect" to historic properties and seeks concurrence of this determination from the State of Hawaii Historic Preservation Officer.

Pursuant to NHPA implementing regulations 36 CFR Part 800.5(c)(2)(i), please accept this email as OHA's formal notification to the USMC that at this time we disagree with your determination of "no adverse" effect and request that the USMC consult with OHA and other Native Hawaiian organizations (NHO) affiliated with the Mokapu Peninsula as necessary to resolve our disagreement.

As your letter describes, certain undertaking activities are proposed to extend through, or beneath (via horizontal directional drilling) the defined boundaries of the Mokapu Burial Area (MBA), a historic property listed on the National Register of Historic Places as Site 1017. As the USMC is well aware, any activity or undertaking proposed within the MBA are of elevated concern to OHA and certain NHO affiliated with the Mokapu Peninsula and/or recognized as Native American Graves Protection and Repatriation Act claimants to iwi kupuna removed from the MBA.

At a meeting held aboard Marine Corps Base Hawaii on November 7, 2012, a presentation conducted by Ms. Caroleen Toyama of the Naval Facilities Engineering Command confirmed that a draft environmental assessment (EA) for this action will be prepared to support this undertaking pursuant to the requirements of the National Environmental Policy Act (NEPA). The release date for public review and comment of this draft EA is forthcoming and unknown at this time.

OHA sees the information that will be contained within this draft EA as essential to our ability to assess alternatives that could avoid undertaking activities within or beneath the MBA. 36 CFR Part 800.8 encourages Federal agencies to coordinate NHPA and NEPA compliance. 36 CFR Part 800.8(a)(3) directs Federal agency officials to ensure that a draft EA includes appropriate scoping to identify historic properties, assess effects and consultation to resolve any adverse effects. Furthermore, 36 CFR Part 800.8(c)(2) directs Federal agency officials to submit the draft EA to NHO that may attach significance to affected historic properties.

Since the draft EA for this undertaking has not been released for public review and comment, it is unclear to OHA whether the requirements of 36 CFR Part 800.8(a)(3) will be met and as previously mentioned or ability to review the information within draft EA (the reason why the locations of undertaking activities were selected i.e. buoy and cable placement) to consider alternatives that will avoid activities within or beneath the MBA is impacted.

Thus, we respectfully request that NHPA consultation for this undertaking be continued until such time that the public comment period for the draft EA closes.

Your anticipated consideration of and written response to this request is sincerely appreciated.

Mahalo
Keola Lindsey
Office of Hawaiian Affairs
Compliance Program
711 Kapiolani Boulevard
Honolulu, Hawai'i 96813
Phone: (808) 594-0244
Email: keolal@oha.org

UNITED STATES MARINE CORPS
MARINE CORPS BASE HAWAII
BOX 63002 KANEOHE BAY, HAWAII 96863-3002

IN REPLY REFER TO:
5090
LE/379-12
March 29, 2013

CERTIFIED MAIL NO.: 7008 2810 0002 1216 3917

Mr. William Aila
State Historic Preservation Officer
Department of Land and Natural Resources
Kakuihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

RE: ADDITIONAL INFORMATION REGARDING SECTION 106 CONSULTATION FOR THE EXPANSION OF THE WAVE ENERGY TESTING SITE (WETS) PROJECT ABOARD MCB HAWAII, DISTRICT OF KO'OLAUPOKO, AHUPUA'A OF KĀNE'OHE, ON THE ISLAND OF O'AHU, TMK 1-4-4-08:001.

Dear William Aila:

Thank you for your letter dated November 5, 2012 requesting more information about the proposed Wave Energy Testing Site (WETS) project. We also received email correspondence, dated 9 November 2012, from the Office of Hawaiian Affairs (OHA) [Enclosure 1] expressing concerns about the proposed action. Since that time, the MCB Hawaii Cultural Resources Managers (CRMs) consulted with Native Hawaiian organizations (NHOs) regarding the WETS project in a face-to-face meeting held on 7 November 2012. Additionally, members of MCB Hawaii, the Navy, and Sound and Sea Technology, Inc. provided a site tour to State of Hawaii Historic Preservation Office (SHPO) Architectural Branch Chief, Angie Westfall, on March 13, 2013.

DATA and POWER CABLE INSTALLATION METHODOLOGY

In our previous letter, we explained that two methods to install the power and data cables required for the project were under consideration. These included horizontal directional drilling (HDD) and re-use of existing surface infrastructure. The HDD option is no longer being pursued as a viable option due to higher costs and archaeological concerns although it will be included as part of the Alternatives Analysis conducted for the Environmental Assessment (EA).

The project intends to pursue the option that utilizes the existing aboveground system installed for the 2003 Wave Energy Technology (WET) project. In response to the archaeological concerns, a nominal amount of ground disturbance may occur, as some of the equipment or utilities needed to support the new wave energy conversion (WEC) technologies may be located below ground. Archaeological monitoring would be a requirement as the project is located within the boundary of archaeological Site-1017, the Mōkapu Burial Area, [Enclosure 2].

During the design of the project, three (3) possible locations, or 'alternatives', were suggested for placement of an electrical equipment shelter, a utility vault, and a vacuum fault interrupter (VFI) enclosure. These would all be located above ground with no excavation necessary for their placement. These alternatives for the new equipment locations were suggested after taking into consideration the existing conditions, locations of connections to utilities, environmental impacts, and access to the area.

Alternative 1 is to place the equipment shelter and VFI enclosure just southwest of Building (Bldg) 614, Battery French [Enclosure 3]. From an archaeological standpoint, the area around Bldg 614 and the planned area for the equipment shelter have been heavily impacted by base modernization. The equipment would be placed next to the above grade transformer and below grade equipment vault from the initial WET project, which are still present. This alternative would result in minimal construction impacts as it is on a level area with remnants of an asphalt road. A barrier (e.g., relocating and modifying the existing fence and/or using native vegetation) would be placed around the equipment to conceal them [Enclosure 4].

This alternative would utilize the existing pedestals designed to lift the cable lines off the ground with modifications made to support the additional power and fiber optic cables needed for the new WEC technologies (Enclosure 5, left). However, approximately 15-20 new pedestals are needed to provide support for the new above ground conduits as they branch off from the existing cable route to connect with the new equipment (Enclosure 6, above). The new five-inch diameter by 24-inch high (10.2-cm by 10.2-cm by 30-cm high) pedestals are composed of concrete-filled conduit piping [see Enclosure 5], right). No excavation work would occur in the placement of the pedestals as they would be set on the ground surface then anchored in place with steel rebar that would extend a maximum of 3 ft (0.9 m) below the ground surface.

Alternative 2 would have the equipment shelter and VFI enclosure set up on a previously leveled hilltop area just above the existing concrete utility vault [Enclosure 7]. Both pieces of equipment would be situated next to the existing TACAN antenna equipment. The location, which is about 1/3 of the distance to Bldg 614, has seen considerable ground modification, including the deposition of imported fill and grading of the ground surface. The main attraction to this location is the ability to connect to an existing electrical power grid connection that was installed during the construction of the TACAN antenna. In effect, this connection would eliminate the need to install additional power cable leading up to Building 614. Only a small fiber optic cable would be routed up the remaining way using the existing cable and conduit route. Therefore, no new pedestals or equipment would need to be installed around the exterior of Bldg 614. The existing pedestals would be modified to support a 2-inch PVC conduit for the fiber optic line [see Enclosure 5, left].

Alternative 3 would locate the new equipment adjacent to the existing concrete equipment vault that is situated near the shoreline [Enclosure 8]. The equipment would be placed along the existing unimproved roadway, which has very little use. Although the locale is near the shore and within the sand dunes, it has already been subjected to a moderate to high amount of ground disturbance due to the construction of the airfield and the continued development of the nearby facilities. As with Alternative 2, this location enables the new WEC power lines to connect to an existing power grid connection located near the airfield. This would limit the amount of additional cable to be installed up to Bldg 614 to just the fiber optic line that would be routed along with the existing conduit by modifying the (existing) pedestals [as seen in Enclosure 5, left].

Regardless of which alternative is performed, a new concrete utility vault would be placed next to the existing equipment vault near the shoreline with three new pedestals being installed next to it [as seen on Enclosures 3, 7, and 8]. The new vault would be placed on an aboveground pad that would be composed of either crushed gravel or concrete that would not require excavation or grading. The pedestals, which would be the same as those

described in Alternative 1, are needed to provide support for the new above ground conduits as they emerge from the new utility vault [see Enclosure 6, below].

Ground disturbance for all options would be limited to rubber wheeled vehicles delivering materials and the placement of the new pedestals and equipment on the ground surface. Trench excavation for a few subsurface electrical lines may occur, however the possibility of this occurring is low. As installation of the new wave energy conversion (WEC) data and power collection equipment will occur in an area of high archaeological sensitivity, a qualified archaeological monitor shall be present during all work in this area to ensure that no human skeletal remains or archaeological deposits are inadvertently exposed. (U.S. Army Corps of Engineers 2006) [see Enclosure 2].

SHPD concurred with MCB Hawaii regarding the 2003 WET project, in the determination that the project would not adversely affect historic properties provided that archaeological monitoring was conducted during all ground disturbing activities. No archaeological survey of the near shore APE was conducted during the 2003 WET project as no ground disturbance activities were planned. As the same measures for installing the equipment will be exercised for the current undertaking would be similar to that of its predecessor, a survey is not required. All vehicles will use only existing access roads to the staging and project areas with a professional archaeologist monitoring all activities to ensure that there is no unnecessary ground disturbance.

BATTERY FRENCH

As requested, we have provided additional detail regarding the proposed rehabilitation of Facility 614, Battery French to Ms Westfall during the March 13, 2013 site visit. The proposed project will be rehabilitated for use as the monitoring and data collection shore station for the WETS project. This will require electrical restoration and upgrades to meet current code requirements, replacement of electrical light fixtures, new doors, and a new air conditioning system to ensure proper air flow for equipment and occupants (schematic plans shown as Enclosures 9 through 12]. This work will not affect character defining features of the battery and will not be visible from the exterior [Enclosure 4].

Although the battery has been vacant since the 1990's, it still retains integrity of design as a coastal defense fortification during World War II and is considered eligible for listing in the NRHP based on Criterion A (associated with events that have made a significant contribution to the broad patterns of history) and C (distinctive characteristics/design). Its exterior maintains integrity due to its massive structural components and features that are fairly visible from the ocean side and neighborhood. Electrical equipment will be placed on the south side of the battery to avoid any visual impacts. The interior of the facility and its non-structural components (e.g. doors, fixtures, cabinets, etc…) have been modified over the years and do not retain any historical architectural features. Enclosure 13 provides a historic preservation analysis of Battery French and outlines the character-defining features of this facility to assure appropriate rehabilitation of this NRHP resource. A local architectural firm was contracted during the design phase of the project to perform a study on the batteries integrity and historical context. This structure has been vacant,

In considering all of the alternatives suggested, the preferred alternative is Alternative 2, near the TACAN antenna site, as it provides a previously leveled area to install the equipment, has an adjacent connection to the base power grid, and is easily accessibility by vehicles. As stated previously, the area has been moderately impacted hence decreasing the potential of encountering any archaeological layers or material as well as human skeletal remains. Should this alternative be implemented, archaeological monitoring shall be performed during all possible ground disturbance activities. The location would also eliminate the need to route additional power conduit lines up and into Battery French, thereby negating any impacts to the historic structure. The new 2-inch PVC conduit for the fiber optic cable would be routed alongside the existing above ground conduit as it proceeds up and into the building.

The draft EA is currently being prepared and not available for public comment. However an advance version of this draft can be provided to SHPO and OHA for informational use only. As the results of this consultation will aide in how the WETS project will proceed, its design has not been finalized. Following the completion of the Section 106 consultation, the design may be modified accordingly.

We hope that we have adequately addressed your questions. As we stated in our previous letter, MCB Hawaii finds that the proposed project will have no adverse affect on historic properties. We request your review of the additional information and concurrence of our affect determination. In accordance with 36 CFR 800.5(c) we will assume your concurrence if no objection is received from your office within 30 days of receipt of this letter. Although site visits of the project area was conducted on February 12 and March 13, 2013 additional meetings and site visits can be facilitated. If you have any questions about the proposed project in regards to this Section 106 consultation or scheduling a site visit, please contact the MCB Hawaii Cultural Resources Management staff, Ms. June Cleghorn at 257-7126 or via email at june.cleghorn@usmc.mil or Coral Rasmussen at 257-7134 or via email at coral.rasmussen@usmc.mil.

Sincerely,

D. R. GEORGE
Captain, U. S. Marine Corps
Director, Environmental Compliance and Protection Department
By direction of the Commanding Officer

Enclosures:
(1) Office of Hawaiian Affairs correspondence email reply regarding October 9, 2012 WETS Section 106 consultation letter.
(2) Location of the proposed WETS project overlaid on MCB Hawaii archaeological sensitivity map.
(3) Aerial photo detailing 'Alternative 1' including the locations of the new electric equipment shelter, VFI cable juncture enclosure, equipment vault, and routing of conduits.

(4) Detailed diagram showing layout of conduit routing, equipment setup, and placement of barrier near Building 614, Battery French, using 'Alternative 1'.
(5) Drawings detailing the modifications to be made on the existing pedestals and the construction of the new pedestals.
(6) CAD drawing showing the locations of new pedestals and equipment to be installed by Building 614, Battery French, and adjacent to existing utility vault.
(7) Aerial photo detailing 'Alternative 2' including the locations of the new electric equipment shelter, VFI cable juncture enclosure, equipment vault, and routing of conduits.
(8) Aerial photo detailing 'Alternative 3' including the locations of the new equipment shelter, VFI cable juncture enclosure, equipment vault, and routing of conduits.
(9) Plan view drawing showing rooms within Building 614 that would be utilized by the WETS project for housing the additional equipment.
(10) Design drawings showing preliminary schematic layout of the air-conditioning equipment to be installed within Building 614.
(11) Design drawings showing preliminary schematic layout of the lighting to be installed within Building 614.
(12) Design drawings showing preliminary schematic layout of the electrical power supply to be installed within Building 614.
(13) 2012 Battery French - Historic Preservation Analysis Report (Mason Architects, Inc., November 2012)

Copy to:
Mr. Van Horn Diamond; Diamond 'Ohana
Ms. Nalani Olds; Olds 'Ohana
Ms. Delilah Ortiz; Ortiz 'Ohana
Ms. Emalia Keohokalole, Keohokalole 'Ohana
Ms. Clara Sweets Matthews; Ka Lahui Hawaii
Ms. Ella Pagauyo; Paguyo 'Ohana
Ms. Chasmin Sokoloski; Prince Kuhio Hawaiian CC
Ms. Nau Kamalii; Boyd 'Ohana
Ms. Donna Ann Camvel; Paoa Kea Lono 'Ohana
Dr. Kamana'opono Crabbe; Office of Hawaiian Affairs
Mr. Cy Harris; Kekumano 'Ohana
Ms. Terrilee Napua Kekoolani Raymond; Kekoolani 'Ohana
Chairperson; Oahu Island Burial Council
Ms. Cathleen Mattoon; Koolauloa Hawaiian Civic Club
Mr. Edward Ayau; Hui Malama I Na Kupuna O Hawai'i Nei
Mr. Clive Cabral; Temple of Lono
Mr. Emil Wolfgramm
Ms. Kiersten Faulkner, Historic Hawaii Foundation

References:

Athens, J. Stephen
1985 *Archaeological Reconnaissance at the Mokapu Burial Area, Marine Corps Air Station, Kaneohe Bay, Hawaii.* Prepared for M&E Pacific,

Inc. Honolulu. J. Stephens Athens, Ph.D. Archaeological Consultant, Honolulu.

Berhow, Mark A.
2011 Modern American Seacoast Defenses: A List of Military Reservations and Concrete Gun Batteries, 1890-1950. Prepared for Army Corps of Engineers, Washington, D.C. Coast Defense Study Group, Inc., Bel Air, MD.

Bowen, Robert N.
1961 Hawaiian Disposal of the Dead. M.A. Thesis, University of Hawaii, Honolulu.

1974 Mōkapu: Its Historical and Archaeological Past. In *Early Hawaiians: An Initial Study of Skeletal Remains from Mōkapu, Oahu*. By Charles E. Snow. pp. 129-148 (Appendix A). University Press of Kentucky, Lexington.

Collins, Sara, Toni Han, and Lisa Armstrong
1994 *Inventory of Human Skeletal Remains from Mōkapu Peninsula, Ko'olauPoko District, Kāne'ohe and He'eia Ahupua'a, O'ahu Island, Hawai'i*. Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Anthropology Department, Bishop Museum, Honolulu.

Cubbison, Douglas R., and Travis Beckwith
2006 *Project 05-239, Stabilization and Preservation of DoD-owned Military Fortifications*. Prepared for the Department of Defense Legacy Resource Management Program. United States Military Academy, West Point, New York.

Emory, Kenneth P.
n.d. Field Notes of Mōkapu Burial Excavations. Department of Anthropology, BPBM, Honolulu.

Fung and Associates w/ Mason Architects
2005 *Historic Buildiing Inventory for U.S. Marine Corps Base Hawaii, Kāne'ohe Bay, Kāne'ohe, O'ahu, Hawai'i (DACA 83-00-C-0037)*. Prepared for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii. Fung and Associates, Honolulu, Hawaii.

McAllister, J. Gilbert
1933 *Archaeology of Oahu*. B.P. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu.

Prishmont, Laura Ann and Lisa Anderson
2000 *Archaeological Subsurface Testing in Conjunction with the Airfield Runway Repairs Project (ARRP) in the Mōkapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii*. Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Ogden Environmental and Energy Services Company, Inc., Honolulu.

Schilz, Allan J.
1996a *Final Report: Cultural Resources Management Plan, Marine Corps Base Hawaii Kaneohe Bay, Island of O'ahu, Hawai'i*. Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl

Harbor, Hawai'i. Ogden Environmental and Energy Services Co., Inc., Honolulu.

1996b *Archaeological Emergency Data Recovery, Mōkapu Burial Area at Marine Corps Base Hawaii (MCBH) Kaneohe Bay, O'ahu, Hawai'i.* Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawai'i. Ogden Environmental and Energy Services Co., Inc., Honolulu.

1999 *Investigations for Emergency Recovery of Human Bone Remains and Monitoring for Family Housing Construction, Marine Corps Air Station, Kaneohe Bay, O'ahu Island, Hawai'i.* Prepared for U.S. Army Corps of Engineers, Fort Shafter. Ogden Environmental and Energy Service Co., Inc., Honolulu.

Tuggle, H. David
2002 *A Preliminary Summary of the Bowles Records Concerning Mōkapu Excavations, O'ahu.* Prepared for U.S. Army Engineer District, Fort Shafter, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

Tuggle, H. David and Robert J. Hommon
1986 *Historic Property Inventory, Marine Corps Air Station, Kaneohe Bay: History, Survey, and Site Descriptions.* U.S. Naval Facilities Engineering Command, Pacific Division, Pearl Harbor.

U.S. Army Corps of Engineers
2006 *Integrated Cultural Resources Management Plan (ICRMP), Marine Corps Base Hawaii, O'ahu, Hawai'i.* Prepared for Installation Commander, Marine Corps Base Hawaii. U.S. Army Corps of Engineers, Honolulu Engineer District, Fort Shafter, Hawai'i. Wil - Chee Planning and Mason Architect, Inc.

Williams, Scott and Tomasi Patolo
1998 *Final Report Subsurface Survey and Boundary Delimitation of the Mōkapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i. In Conjunction with the Legacy Resource Management Program.* Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Ogden Environmental and Energy Services Co., Inc., Honolulu, Hawaii.

Enclosure 1. Office of Hawaiian Affairs correspondence email reply regarding October 9, 2012 WETS Section 106 consultation letter.

From: Keola Lindsey [mailto:keolal@oha.org]
Sent: Friday, November 09, 2012 18:23
To: George Capt Derek R
Cc: Cleghorn CIV June N; Rasmussen CIV Coral M; william.j.aila@hawaii.gov; Pua.Aiu@hawaii.gov; Theresa.K.Donham@hawaii.gov
Subject: National Historic Preservation Act consultation- proposed expansion of the Wave Energy Testing Site

Aloha Captain George:

The Office of Hawaiian Affairs (OHA) is in receipt of your October 9, 2012 letter that initiates National Historic Preservation Act consultation for the proposed expansion of the Wave Energy Testing Site aboard Marine Corps Base Hawaii (the undertaking).

Your letter provides the United States Marine Corps (USMC) determination that this undertaking will result in "no adverse effect" to historic properties and seeks concurrence of this determination from the State of Hawaii Historic Preservation Officer.

Pursuant to NHPA implementing regulations 36 CFR Part 800.5(c)(2)(i), please accept this email as OHA's formal notification to the USMC that at this time we disagree with your determination of "no adverse" effect and request that the USMC consult with OHA and other Native Hawaiian organizations (NHO) affiliated with the Mokapu Peninsula as necessary to resolve our disagreement.

As your letter describes, certain undertaking activities are proposed to extend through, or beneath (via horizontal directional drilling) the defined boundaries of the Mokapu Burial Area (MBA), a historic property listed on the National Register of Historic Places as Site 1017. As the USMC is well aware, any activity or undertaking proposed within the MBA are of elevated concern to OHA and certain NHO

affiliated with the Mokapu Peninsula and/or recognized as Native American Graves Protection and Repatriation Act claimants to iwi kupuna removed from the MBA.

At a meeting held aboard Marine Corps Base Hawaii on November 7, 2012, a presentation conducted by Ms. Caroleen Toyama of the Naval Facilities Engineering Command confirmed that a draft environmental assessment (EA) for this action will be prepared to support this undertaking pursuant to the requirements of the National Environmental Policy Act (NEPA). The release date for public review and comment of this draft EA is forthcoming and unknown at this time.

OHA sees the information that will be contained within this draft EA as essential to our ability to assess

Enclosure 1 (cont'd).

alternatives that could avoid undertaking activities within or beneath the MBA. 36 CFR Part 800.8 encourages Federal agencies to coordinate NHPA and NEPA compliance. 36 CFR Part 800.8(a)(3) directs Federal agency officials to ensure that a draft EA includes appropriate scoping to identify historic properties, assess effects and consultation to resolve any adverse effects. Furthermore, 36 CFR Part 800.8(c)(2) directs Federal agency officials to submit the draft EA to NHO that may attach significance to affected historic properties.

Since the draft EA for this undertaking has not been released for public review and comment, it is unclear to OHA whether the requirements of 36 CFR Part 800.8(a)(3) will be met and as previously mentioned or ability to review the information within draft EA (the reason why the locations of undertaking activities were selected i.e. buoy and cable placement) to consider alternatives that will avoid activities within or beneath the MBA is impacted.

Thus, we respectfully request that NHPA consultation for this undertaking be continued until such time that the public comment period for the draft EA closes.

Your anticipated consideration of and written response to this request is sincerely appreciated.

Mahalo

Keola Lindsey

Office of Hawaiian Affairs

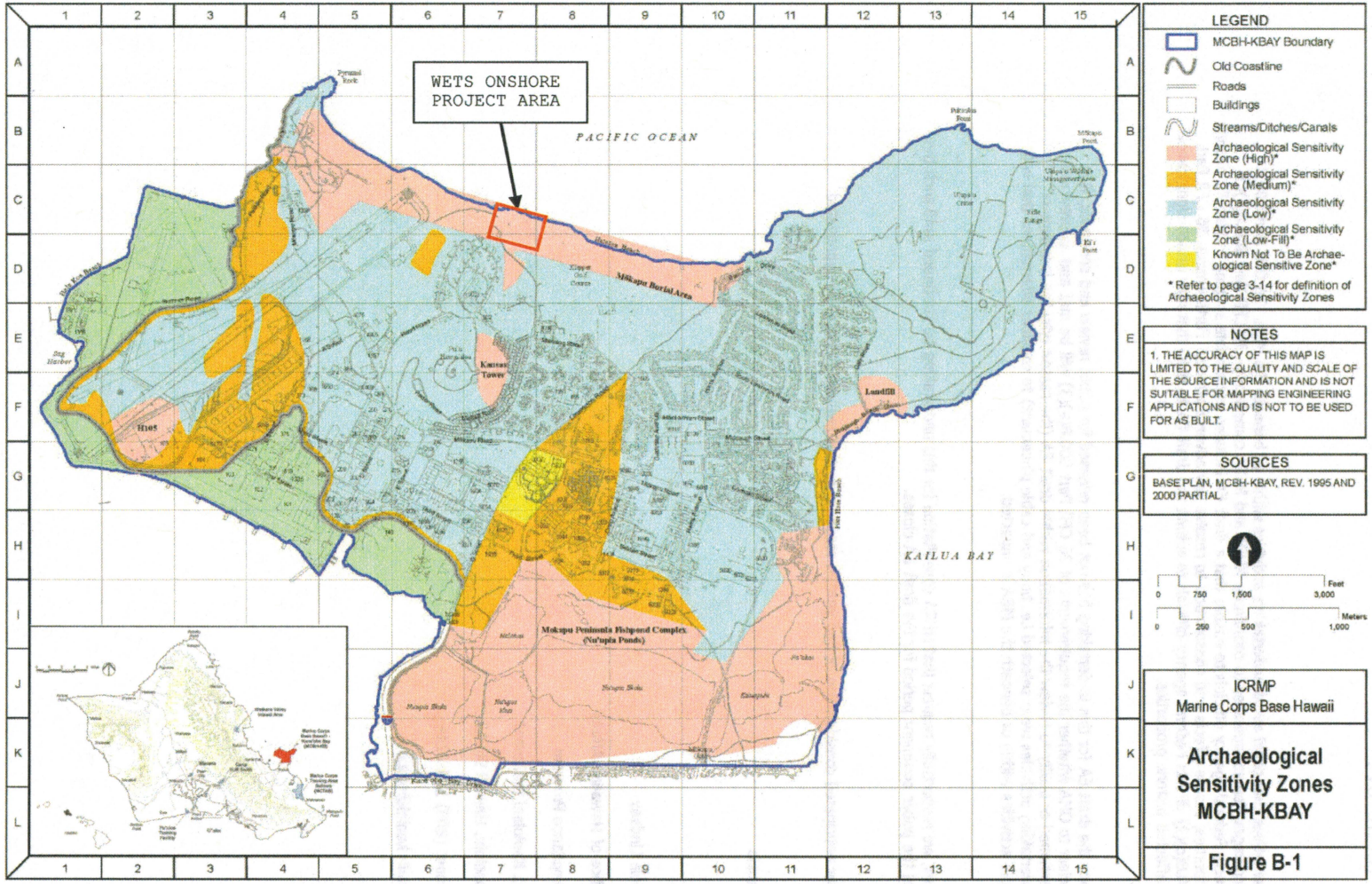
Compliance Program

711 Kapiolani Boulevard

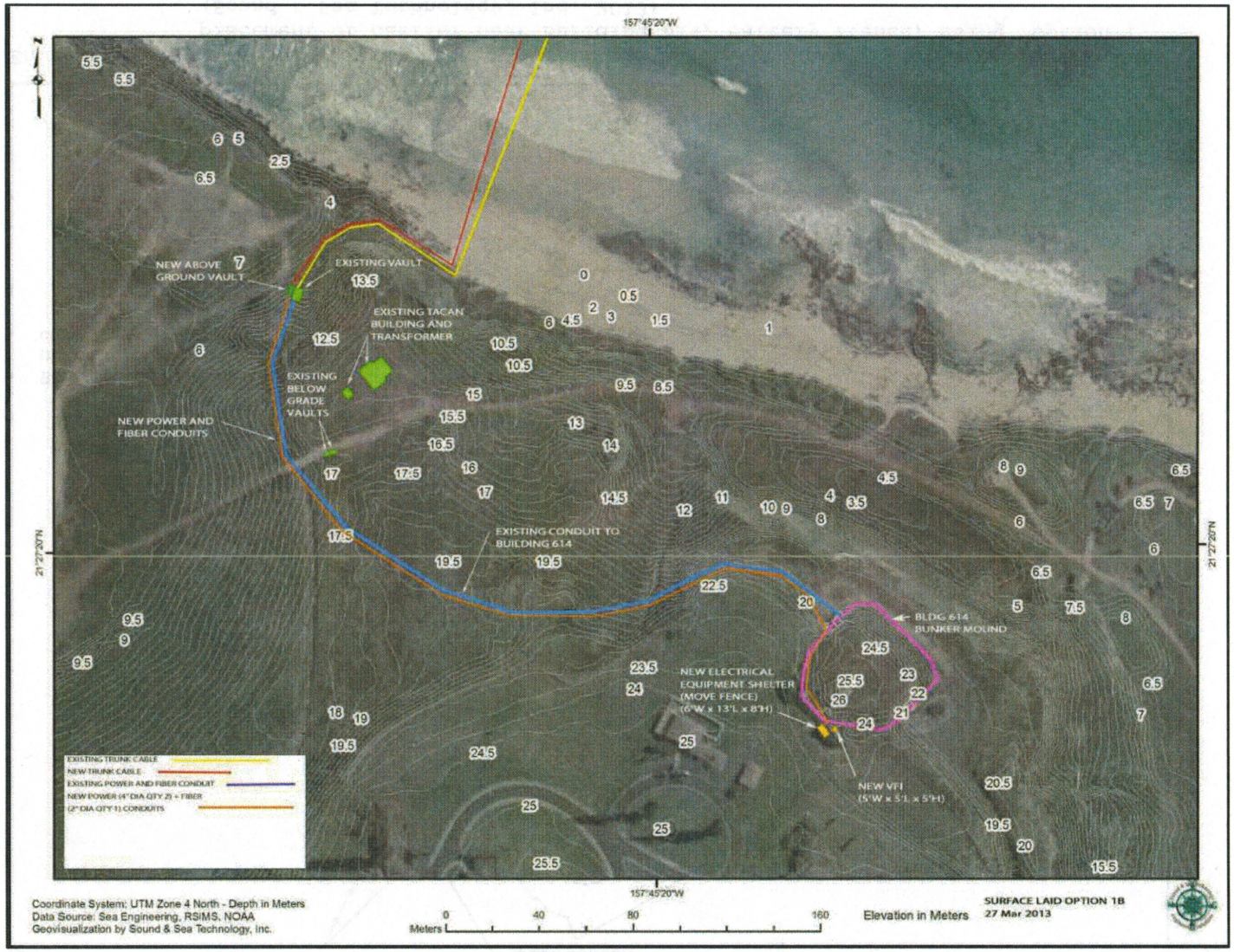
Honolulu, Hawai'i 96813

Phone: (808) 594-0244

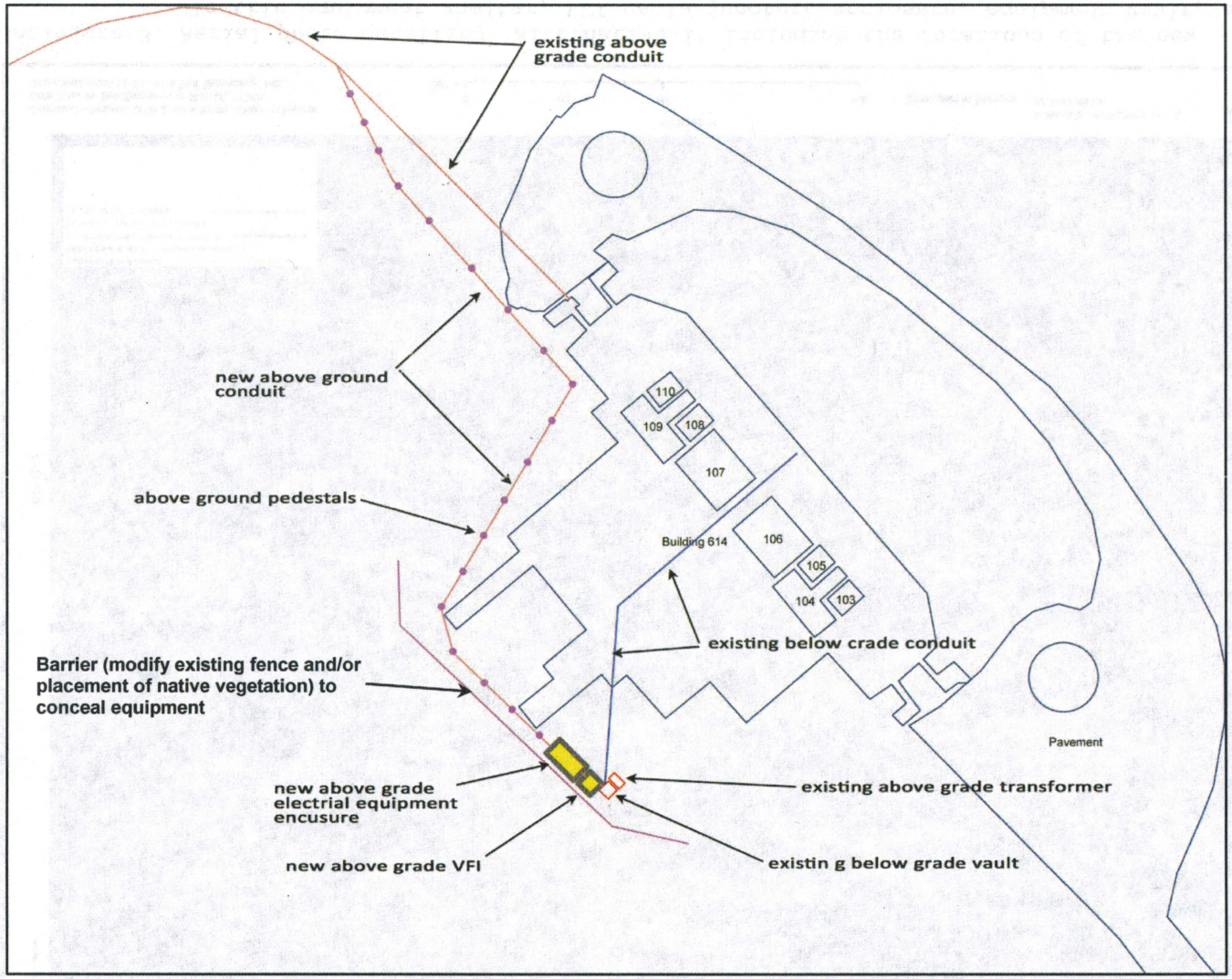
Email: keolal@oha.org



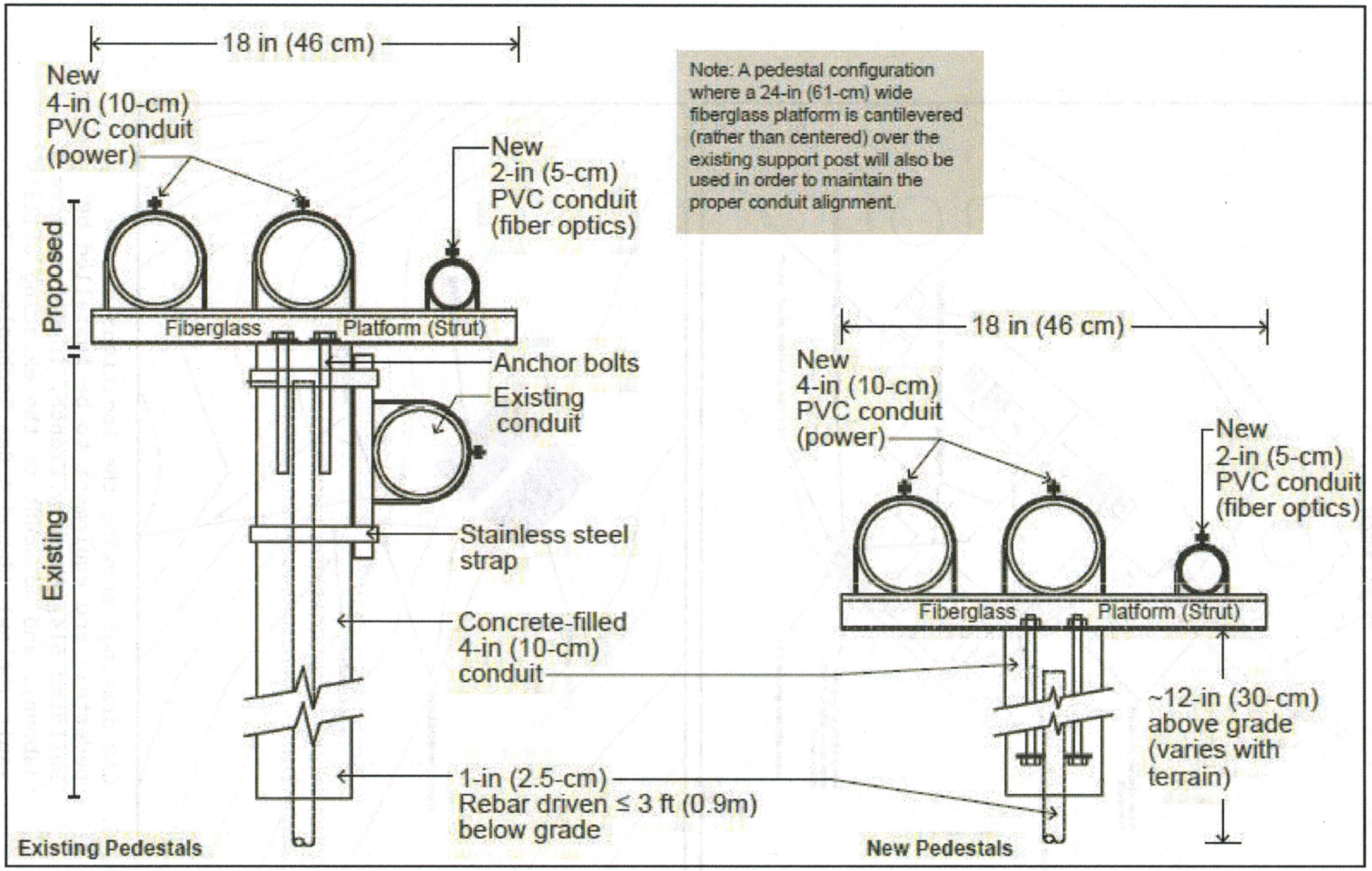
Enclosure 2. Location of the proposed WETS project overlaid on an archaeological sensitivity map w/ inset showing location of MCB Hawaii on O'ahu Island (U.S. Army Corps of Engineers 2006:Fig B-1).



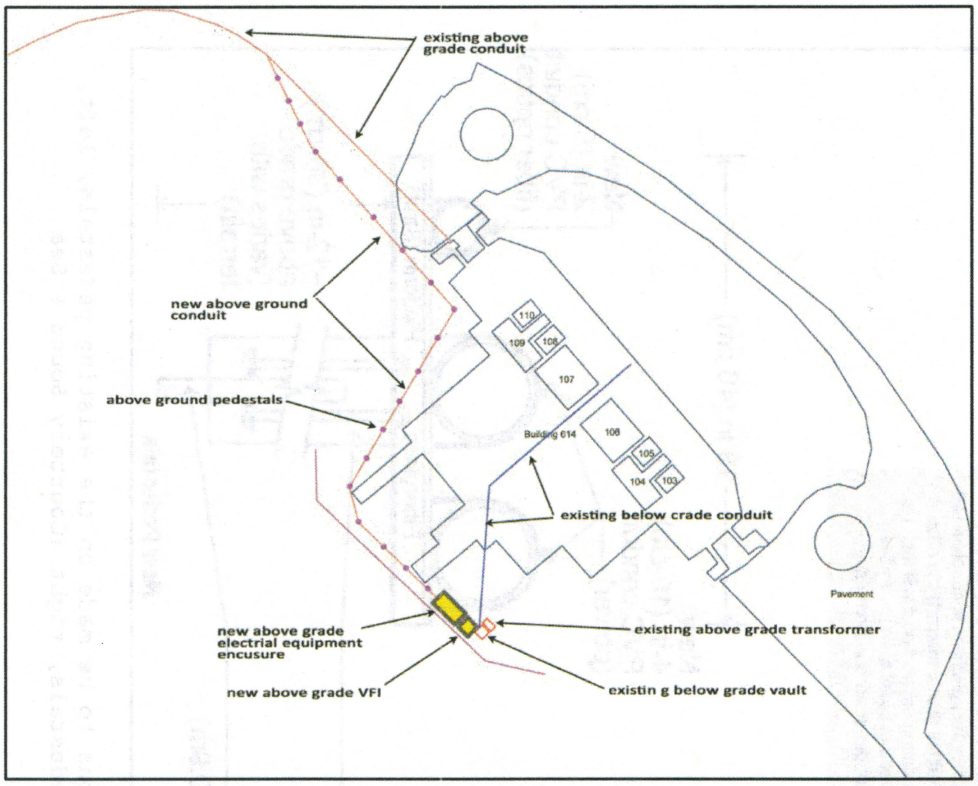
Enclosure 3. Aerial photo detailing 'Alternative 1' including the locations of the new electric equipment shelter, VFI cable juncture enclosure, equipment vault, and routing of conduits (Sound & Sea Technology, Inc. 2013).

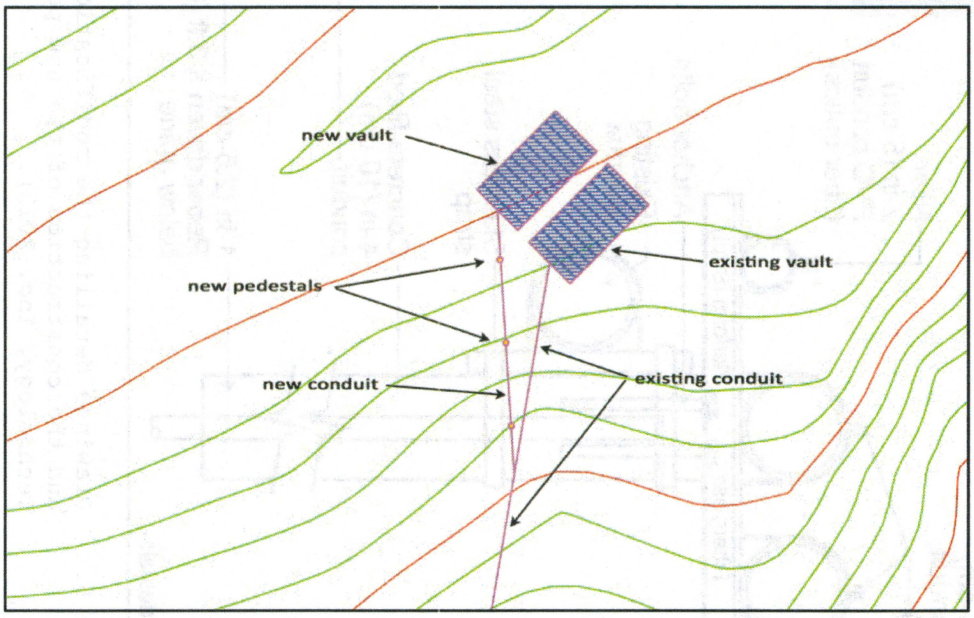


Enclosure 4. Detailed diagram showing layout of conduit routing, equipment setup, and placement of barrier near Building 614, Battery French, using 'Option 1' (Sound & Sea Technology, Inc. 2013).

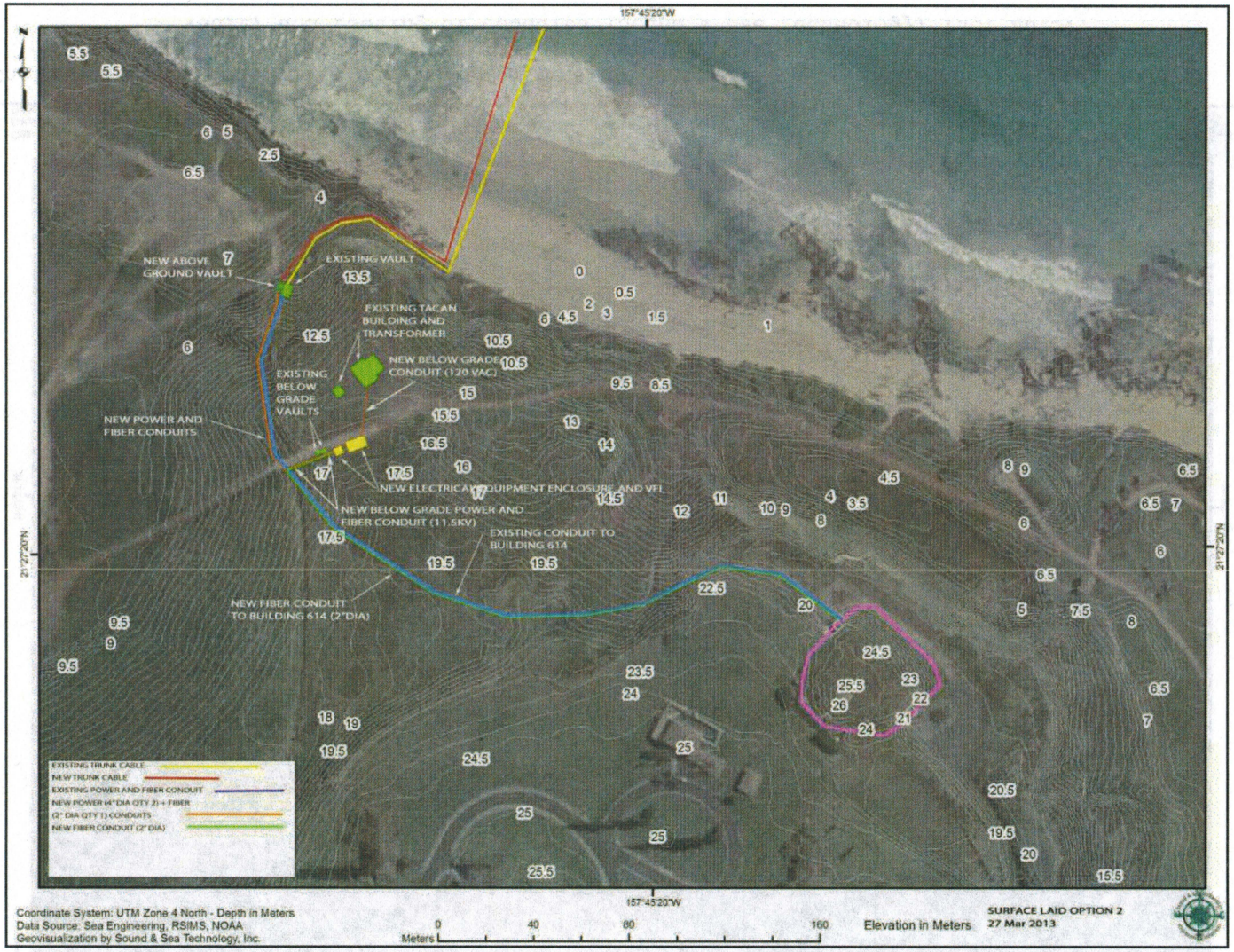


Enclosure 5. Drawings detailing the modifications to be made on the existing pedestals, left, and the construction of the new pedestals, right (Courtesy Sound & Sea Technology, Inc. 2013).

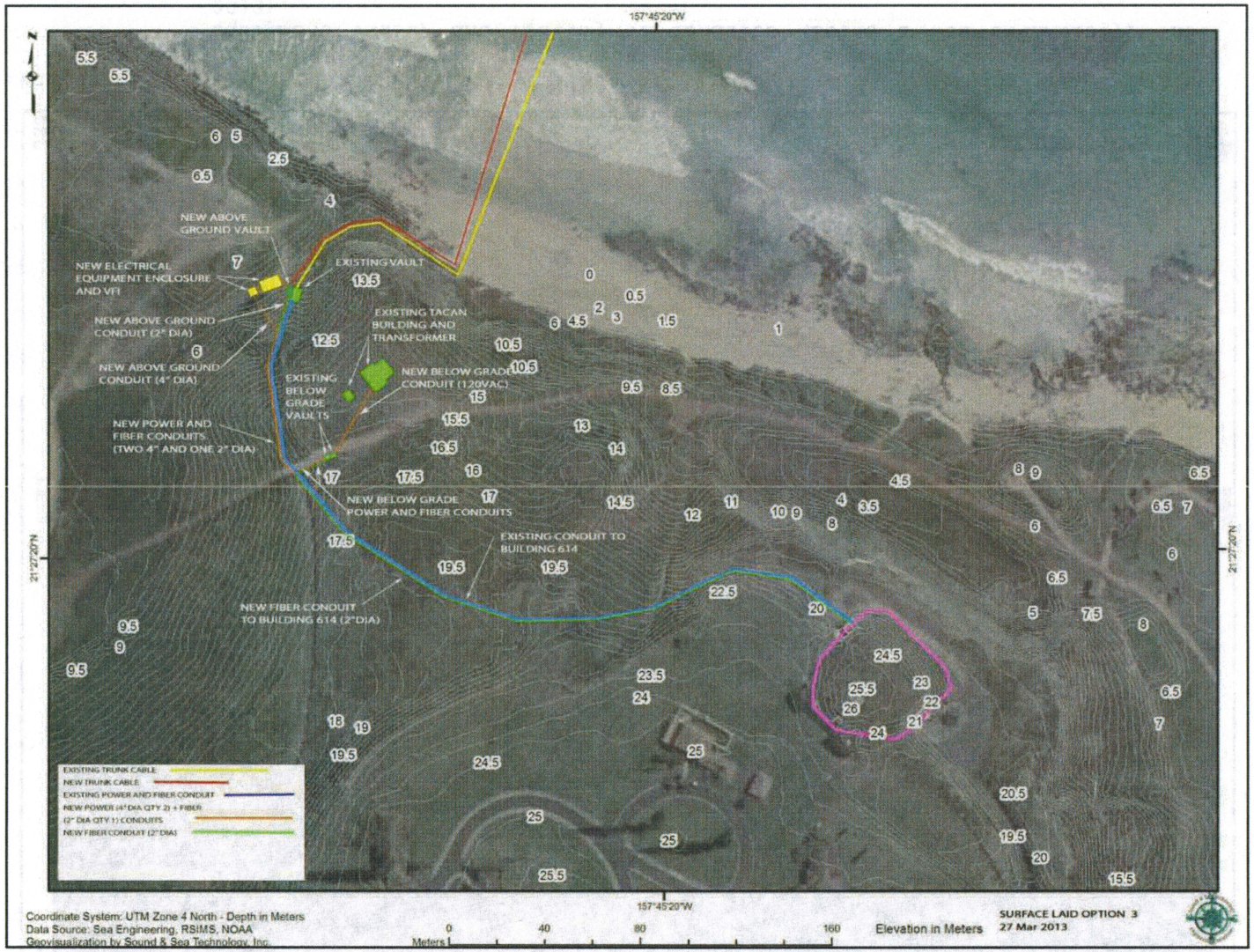




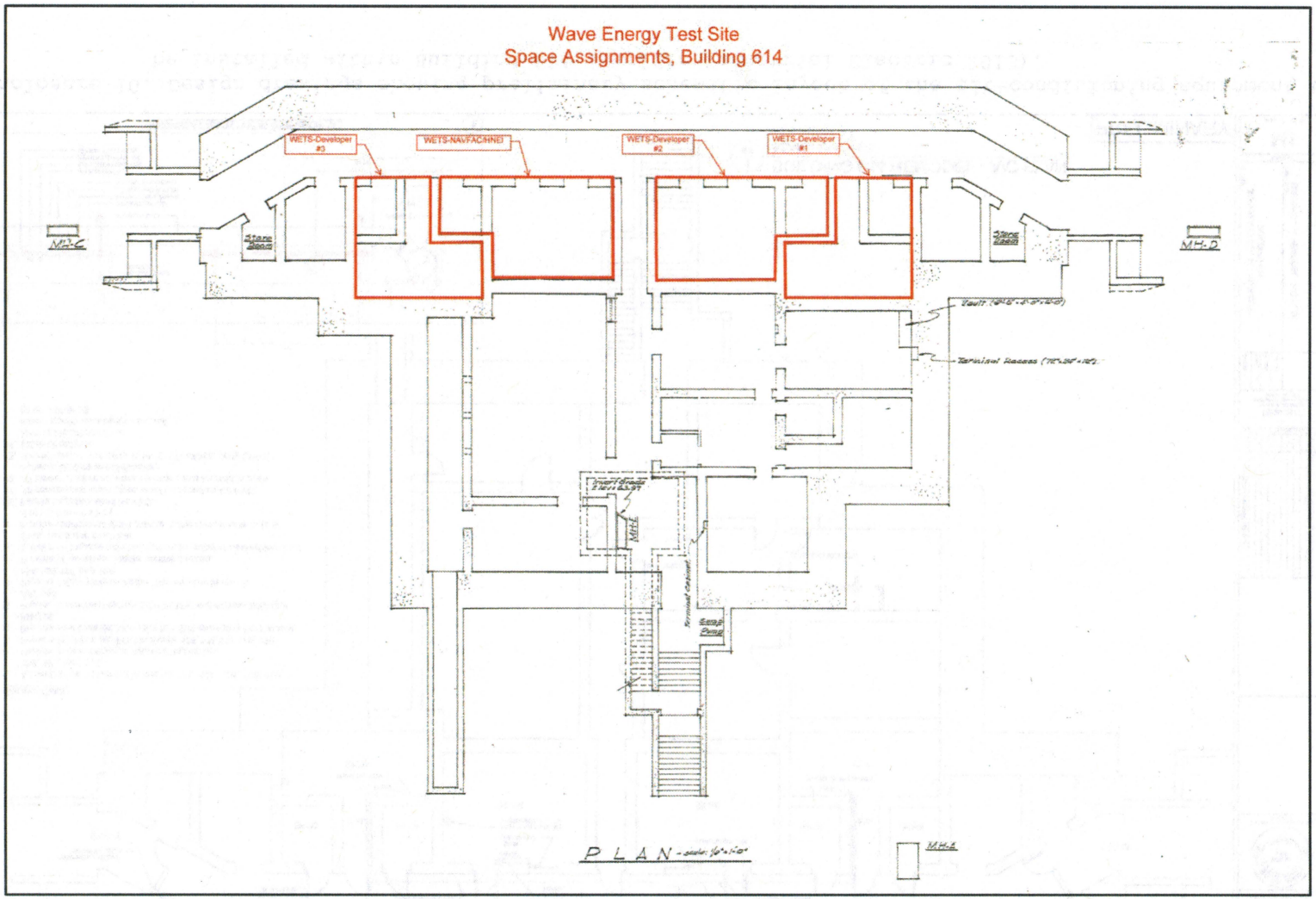
Enclosure 6. CAD drawings showing the locations of new pedestals and equipment to be installed by Building 614, Battery French, in Alternative 1 (above), and adjacent to the existing utility vault (below) (Sound & Sea Technology, Inc. 2013).



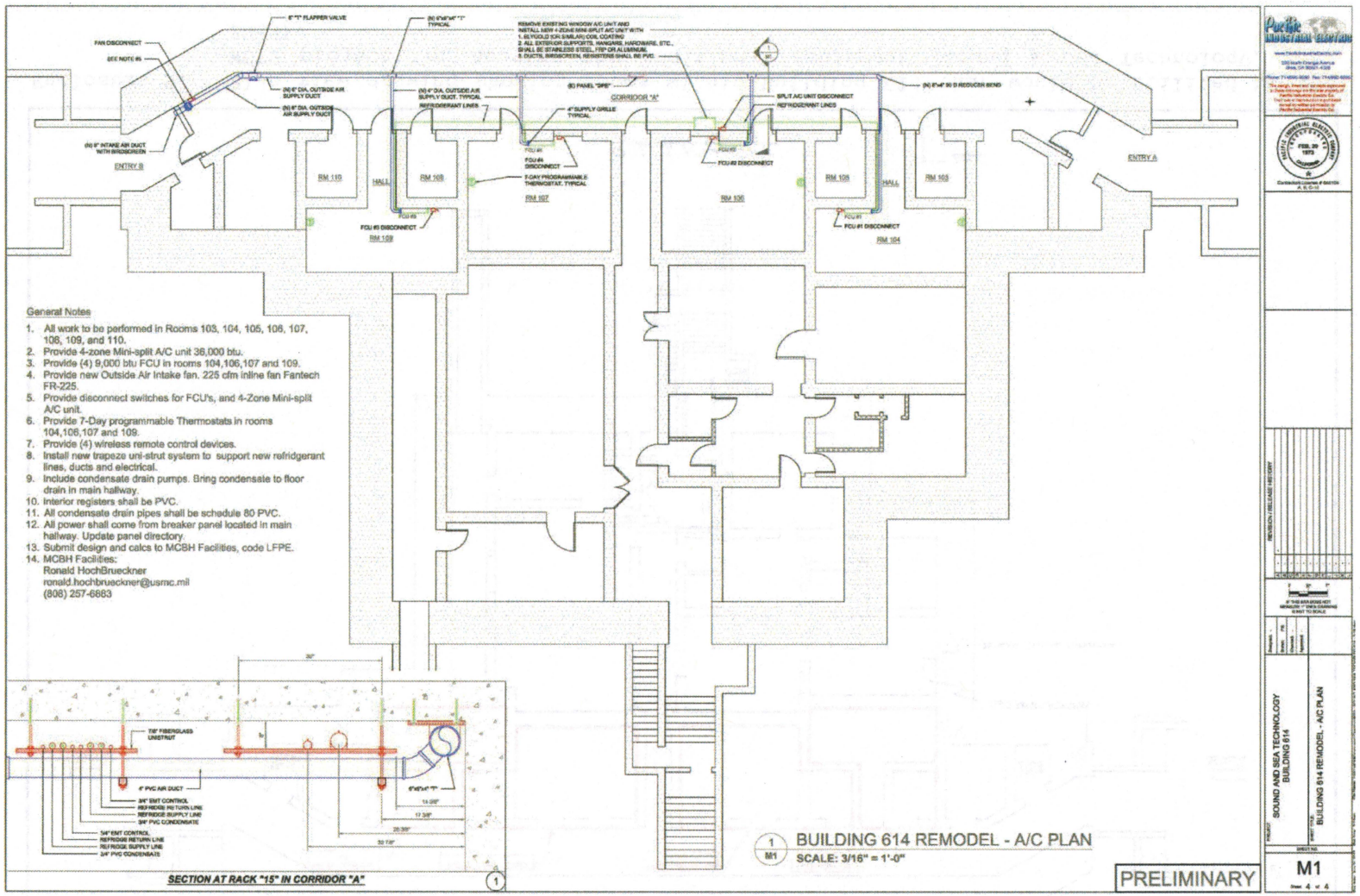
Enclosure 7. Aerial photo showing specifics of 'Alternative 2' including the locations of the new electric equipment shelter, VFI cable juncture enclosure, equipment vault, and routing of conduits (Sound & Sea Technology, Inc. 2013).



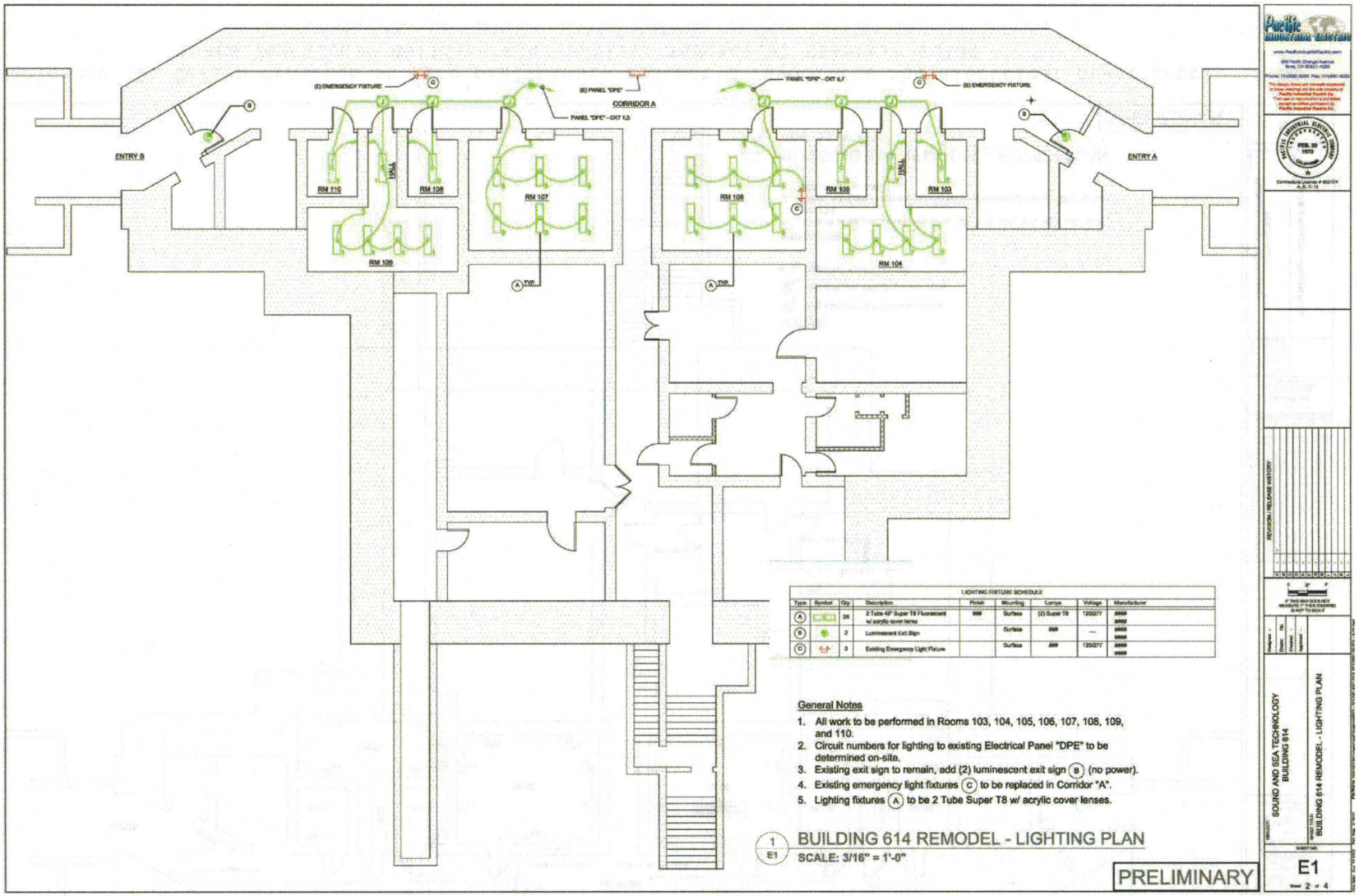
Enclosure 8. Aerial photo showing specifics of 'Alternative 3' including the locations of the new electric equipment shelter, VFI cable juncture enclosure, equipment vault, and routing of conduits (Sound & Sea Technology, Inc. 2013).



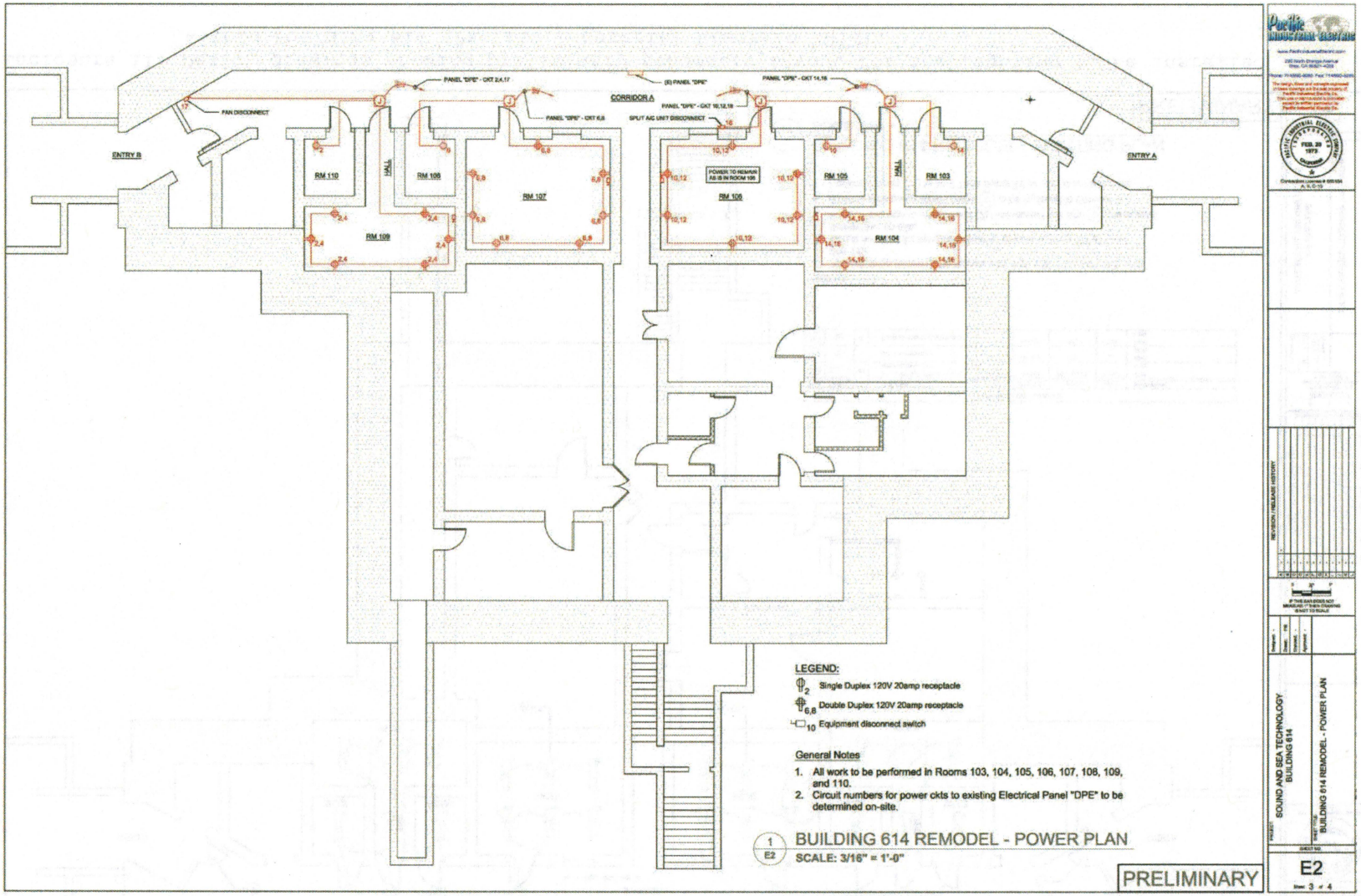
Enclosure 9. Plan view drawing showing rooms within Building 614 that would be utilized by the WETS project for housing the additional equipment (Sound & Sea Technology, Inc. 2013).



Enclosure 10. Design drawings showing preliminary schematic layout of the air-conditioning equipment to be installed within Building 614 (Pacific Industrial Electric 2013).



Enclosure 11. Design drawings showing preliminary schematic layout for the lighting to be installed within Building 614 (Pacific Industrial Electric 2013).



Enclosure 12. Design drawings showing preliminary schematic layout for the electrical power supply to be installed within Building 614 (Pacific Industrial Electric 2013).

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD13_2636C

May 24, 2013

D.R. George
Captain, U.S. Marine Corps
Director, Environmental Compliance and Protection Department
Marine Corps Base Hawai'i
Box 63002 Kāne'ohe Bay, Hawai'i 96863-3002

Re: National Historic Preservation Act consultation
Expansion of Wave Energy Testing Site
Marine Corps Base Hawai'i, Island of O'ahu

Dear Captain George:

The Office of Hawaiian Affairs (OHA) is in receipt of your March 29, 2013 letter with enclosures that continues National Historic Preservation Act (NHPA) consultation for the proposed expansion of the Wave Energy Testing Site (the undertaking) aboard Marine Corps Base Hawai'i (MCBH) on the Island of O'ahu. As detailed in Enclosure 2 of your letter, the area of potential effect for this proposed undertaking is within and immediately off-shore of Site 1017- the Mōkapu Burial Area.

NHPA consultation for this undertaking was initiated with OHA via a letter from you dated October 9, 2012. Your March 29, 2013 letter correctly notes that by email dated November 9, 2012, OHA provided a response to MCBH and the initiation of the NHPA consultation process for this undertaking. Your letter incorrectly summarizes the content of our email response as "expressing concerns".

Our email response formally transmitted the following to you:

1. OHA's disagreement with MCBH's initial "no adverse effect" determination;

2. A request that MCBH continue NHPA consultation with OHA and other Native Hawaiian organizations affiliated with the Mōkapu Peninsula to resolve this disagreement pursuant to the authority set forth in NHPA regulations at 36 CFR Part §800.5(C)(2)(i);

3. A request that NHPA consultation for this undertaking be continued until such time that the public comment period for the draft environmental assessment (that is being prepared pursuant to the requirements of the National Environmental Policy Act) for this undertaking closes; and

4. A request for a written response from MCBH.

In the nearly five (5) full months that have passed since our email response was transmitted and receipt of your March 29, 2013 letter, OHA has no record of any effort by MCBH to continue NHPA consultation directly with OHA and other Native Hawaiian organizations (NHO) affiliated with the Mōkapu Peninsula to specifically resolve our disagreement, or a written response from MCBH to the specific requests within our November 9, 2012 email.

Thus, it is rather surprising to see that in your March 29, 2013 letter, MCBH has once again offered your determination that this proposed undertaking will result in "no adverse effect". OHA notes that in your March 29, 2013 letter (page 4, paragraph 2), MCBH states that the draft environmental assessment (DEA) for this undertaking is not available for public comment, but an advance version of the DEA can be provided to the SHPO and OHA *...for informational use only.* OHA appreciates this offer and would like an advance hardcopy of the DEA for review. Please send a hardcopy to OHA attn.: Keola Lindsey. Any other NHO or consulting party representative who also requires an advance copy of the DEA should also be provided one.

Based on our review of your March 29, 2013 letter, it is our understanding that the horizontal directional drilling methodology originally proposed for this undertaking is no longer a *...viable option due to higher costs and archaeological concerns although it will be included as part of the Alternatives Analysis conducted for the Environmental Assessment.*

Your letter and enclosures summarize and depict three alternatives for the actual locations of and construction methodologies of the "surface" installation of the equipment and conduits required for the Wave Energy Testing Site expansion. While OHA acknowledges that in the development of each of the three alternatives discussed, consideration has been afforded to avoiding ground disturbance to the maximum extent possible, all three alternatives still place the proposed undertaking within the boundaries of the Mōkapu Burial Area.

Your letter (page 3, paragraph 1) proposes that in the event this proposed undertaking does move forward within the boundaries of the Mōkapu Burial Area, a *...qualified archaeological monitor shall be present during all work in this area to ensure no human skeletal remains or archaeological deposits are inadvertently exposed.* OHA does not believe that archaeological monitors have any ability to prevent the inadvertent discovery of subsurface iwi

kūpuna or cultural deposits. Instead, archaeological monitors serve to ensure that all work in the vicinity of such inadvertent discoveries immediately stops so that the requirements of applicable laws can be implemented in the aftermath of these unfortunate situations.

An important point raised in our November 9, 2012 email response to you was that our interest in reviewing the DEA for this undertaking was partially based on our need to receive information on what alternatives were considered (other than "no-action") that would avoid all activities within the Mōkapu Burial Area (i.e. alternative buoy locations off-shore of MCBH that would result in conduits and equipment being located outside of the Mōkapu Burial Area). We look forward to receiving the "advance' copy of the DEA to review it for this specific discussion on the range of alternatives considered.

Since the Mōkapu Burial Area was included on the National Register of Historic Places in 1972, how the "significance" of historic properties is described by the Hawaiian people today has been elevated to a level that eluded the consciousness of those involved with developing the eligibility criterion for inclusion on National Register of Historic Places, that from OHA's perspective, are in obvious need for updates. The significance of the Mōkapu Burial Area has little to do with the tangible elements associated with an "archaeological district" and is much more aligned with the qualities and characteristics described in the National Park Service's National Register Bulletin 38: *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. Thus, in regards to the effect determination for this proposed undertaking, OHA believes that it is thru this "Traditional Cultural Property lens" that also considers the cumulative impacts of all activities that affect the Mōkapu Burial Area, that an accurate determination will be made and as a result, any appropriate mitigation measures developed.

OHA maintains our position that NHPA consultation for this undertaking should be continued until such time that the public comment period for the draft environmental assessment for this undertaking closes and all relevant comments received considered and adequately addressed by MCBH.

Thank you for providing an opportunity to comment. We look forward to continuing NHPA consultation and the receiving the advance copy of the DEA. Should you have any questions, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KM:kl

C: William Aila, Jr., Hawai'i State Historic Preservation Officer
Pua Aiu, State Historic Preservation Division Administrator (via email)
Theresa Donham, Deputy Hawai'i State Historic Preservation Officer (via email)
Susan Lebo, State Historic Preservation Division-O'ahu Island Archaeologist (via email)
Deona Naboa, State Historic Preservation Division Archaeologist (via email)
June Cleghorn, MCBH-Cultural Resources Manager (via email)
Coral Rasmussen, MCBH-Cultural Resources Manager (via email)

UNITED STATES MARINE CORPS
MARINE CORPS BASE HAWAII
BOX 63002 KANEOHE BAY, HAWAII 96863-3002

IN REPLY REFER TO:
5090
LE/210-13
October 1, 2013

CERTIFIED MAIL NO.: 7010 1870 0002 7901 2555

Dr. Kamana'opono M. Crabbe
Ka Pouhana, Chief Executive Officer
State of Hawai'i
Office of Hawaiian Affairs
711 Kapi'olani Boulevard, Room 555
Honolulu, Hawai'i 96813

RE: NATIONAL HISTORIC PRESERVATION ACT (NHPA) SECTION 106 CONSULTATION FOR EXPANSION OF WAVE ENERGY TEST SITE AT MARINE CORPS BASE HAWAII, ISLAND OF O'AHU.

Dear Dr. Crabbe:

Thank you for your letter dated May 24, 2013 regarding the proposed Wave Energy Test Site (WETS) project (hereinafter proposed undertaking) to install data collection/power distribution cables and equipment for a deep water wave energy conversion device. We apologize for the delay in responding and we would like to directly respond to the four (4) bulleted items at the start of your letter as follows:

1. Marine Corps Base (MCB) Hawaii acknowledges that the Office of Hawaiian Affairs (OHA) does not agree with our finding of "no adverse effect" for the proposed undertaking.

2. MCB Hawaii looks forward to continuing Section 106 consultation with OHA and other Native Hawaiian organizations (NHO), if requested, to resolve OHA's disagreement with our no adverse effect determination.

3. MCB Hawaii will provide OHA with a copy of the Draft Environmental Assessment (EA) once it is completed; to reiterate what was stated in our March 29, 2013 letter, rather than a formal public review period for the Draft EA, MCB Hawaii is distributing it to other regulatory agencies as well as to OHA for informational use. MCB Hawaii can provide copies of the Draft EA to other NHO upon request. To reiterate from above, MCB Hawaii will continue consultation with OHA to resolve the disagreement with our no adverse effect determination.

4. We again apologize for the delay in responding to your May 24, 2013 letter and we hope this letter provides written responses that addressed the issues raised.

ALTERNATIVES

The proposed undertaking is intended to minimize excavation and maximize the reuse of the existing infrastructure. Excavation would be minimized to the greatest extent possible, and limited to a previously disturbed area for the purpose of connecting to the MCB Hawaii electrical grid. In our letter dated October 9, 2012 in which we initiated consultation for the proposed undertaking, only two alternatives had been under consideration including the

proposed action [Enclosure (1)]. Since our initial letter, new alternatives were developed to avoid the utilization of horizontal directional drilling (HDD). The preferred alternative calls for the installation of three new conduits that would follow the same route as the existing pedestal-supported conduit system and would be mounted using the existing pedestals [Enclosure (2)]. Only three to five new pedestals would be needed to support the new conduits. In two locations, conduits would be placed in underground ducts. Electrical equipment vaults and enclosures similar to those existing on site will also be placed on the ground surface, which would not require excavation.

For your current use while waiting our finalizing of the Draft EA, we are providing in Enclosure (3) additional details on the range of alternatives considered that will be included in the Draft EA. Enclosure (3) includes summary descriptions of the proposed alternatives that are under consideration for implementation and summaries of the alternatives considered but eliminated from detailed study. For instance, among others you will see a summary of the alternative cable landing route that would locate the cable landing in the vicinity of Pyramid Rock Beach outside of the Mokapu Burial Area. Additionally, you will see a summary of the reasons why this alternative cable landing route was considered but ultimately eliminated.

EFFECT DETERMINATION AND THE MŌKAPU BURIAL AREA

The area of potential effect (APE) is partially located within the boundaries of the Mōkapu Burial Area Site (50-80-11-1017), which is listed on the National Register of Historic Places. Your letter explains OHA's objection to our finding of "no adverse effect" as the undertaking infringes upon the cultural and spiritual aspect of the site. Specifically you state that the significance of the MBA has less to do with the "…tangible elements associated with an 'archaeological district'…" and that its significance is more aligned with the qualities and characteristics described by the National Park Service for traditional cultural properties (TCP).

We acknowledge the traditional cultural significance of the Mōkapu Burial Area to the Native Hawaiian people, and have made planning efforts to avoid, minimize, and mitigate impacts to this important resource. Furthermore, MCB Hawaii believes that the proposed undertaking will result in no adverse effects to what NHOs have reported to MCB Hawaii regarding the traditional cultural significance of the Mōkapu Burial Area (MBA) because, pursuant to the NHPA regulations regarding the assessment of adverse effects at 36 CFR 800.5(a), the proposed undertaking:

(1) Will not alter the characteristics that qualify the MBA for inclusion in the National Register and it will not diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association;
(2) Will not cause physical destruction or damage to the MBA or to the traditional cultural significance of it to NHOs;
(3) The MBA and its traditional cultural significance to NHOs is not being altered and to the contrary, MCB Hawaii has fully accepted and acknowledged the traditional cultural significance of the MBA to NHOs;
(4) The MBA is not being removed from its historic location;
(5) The character and setting of the MBA, including its traditional cultural significance to NHO, is not being changed;

(6) There is no introduction of new visual, atmospheric or audible elements that diminish the integrity of the MBA or its traditional cultural significance to NHO (the visual element of the original WET cable has existed within the MBA for a decade); and
(7) The MBA is not being leased or sold.

Our current proposed action involves the reuse of the existing first generation Wave Energy Technology (WET) project equipment and conduit that was installed in 2003. This first WET project was consulted on with Native Hawaiian Organizations (NHOs), and the result of those consultations was a compromise to install pedestals to elevate the electrical line conduit above ground rather than use trenching or HDD. SHPO concurred with our determination of "no adverse effect" for the 2003 project after consulting with OHA and NHOs to minimize excavation work [Enclosures (4-6)].

As stated in our previous letter, archaeological monitoring will be conducted for all ground disturbing activities associated with the proposed undertaking. Any excavations needed would be shallow and within an area of previous disturbance. Our finding of "no adverse effect" for the current project is therefore based, in addition to that stated above regarding the traditional cultural significance of the MBA to NHO, on reuse of existing pedestals, minimal ground disturbance caused by installation of additional electrical infrastructure in areas that were previously disturbed and that currently support similar infrastructure and equipment.

Any excavations that take place would cross beneath an existing roadway and to install a power conduit to connect to the MCB Hawaii electrical grid. The location of this is shown on Enclosures (7-9). The trench for the conduit connection to the electrical grid would be approximately 38.10 meters (125 feet) long. The excavation for the road crossing would be about 6.10 meters (20 feet). The trench depths would not exceed 1 meter (3 feet). This segment of the Site 1017 is capped with a 2-foot thick layer of fill material composed of sand mixed with basalt gravel, pebbles, cobbles, and boulders. The APE is situated within vicinity of the relocated tactical air navigation (TACAN) facilities, whereupon considerable ground disturbance had taken place including the deposition of imported fill and grading of the ground surface. During archaeological monitoring of the TACAN facilities, no archaeological or cultural materials were found. Taking these factors into consideration, we believe there is a very low potential for any inadvertent discoveries, and archaeological monitoring would be conducted as a precautionary measure.

CONTINUING CONSULTATION

To reiterate from above, we acknowledge OHA's request for a copy of the draft Environmental Assessment (EA), which we will provide for informational use once it is completed. To continue consultation, we would like to plan both a site visit and a consultation meeting on Friday October 11, 2013. The base's Cultural Resources Managers will follow up with sending email invitations detailing the logistics of this site visit and meeting to OHA and other NHO. If you have additional questions please contact Ms. June Cleghorn (ph. 257-7126; email at june.cleghorn@usmc.mil) or Ms. Coral Rasmussen (ph. 257-7134; email at coral.rasmussen@usmc.mil).

Sincerely,

D. R. GEORGE
Captain, U. S. Marine Corps
Director, Environmental Compliance and
Protection Department
By direction of the Commanding Officer

Copy to:
Mr. William Aila, Jr., Hawaii State Historic Preservation Officer

Enclosures:

(1) Aerial view of Undertaking showing Proposed Action
(2) Modified pedestal for additional surface laid power and fiber conduits
(3) WETS Description of Proposed Actions and Alternatives
(4) 2002 WET Section 106 Letter initiating consultation
(5) 2002 WET Section 106 SHPO concurrence letter
(6) 2002 WET Section 106 NHO response letters
(7) Site Plan showing locations of new WETS equipment as well as existing WET equipment
(8) Detailed plan view of WETS equipment vault placement and electrical grid connection at re-located TACAN site
(9) Plan view drawing showing detail of WETS conduit road crossing near TACAN site

References:

Athens, J. Stephen
1985 *Archaeological Reconnaissance at the Mokapu Burial Area, Marine Corps Air Station, Kaneohe Bay, Hawaii.* Prepared for M&E Pacific, Inc. Honolulu. J. Stephens Athens, Ph.D. Archaeological Consultant, Honolulu.

Berhow, Mark A.
2011 Modern American Seacoast Defenses: A List of Military Reservations and Concrete Gun Batteries, 1890-1950. Prepared for Army Corps of Engineers, Washington, D.C. Coast Defense Study Group, Inc., Bel Air, MD.

Bowen, Robert N.
1961 Hawaiian Disposal of the Dead. M.A. Thesis, University of Hawaii, Honolulu.

1974 Mōkapu: Its Historical and Archaeological Past. In *Early Hawaiians: An Initial Study of Skeletal Remains from Mōkapu, Oahu.* By Charles E. Snow. pp. 129-148 (Appendix A). University Press of Kentucky, Lexington.

Collins, Sara, Toni Han, and Lisa Armstrong
1994 *Inventory of Human Skeletal Remains from Mōkapu Peninsula, Koʻolau Poko District, Kāneʻohe and Heʻeia Ahupuaʻa, Oʻahu Island, Hawaiʻi.* Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Anthropology Department, Bishop Museum, Honolulu.

Cubbison, Douglas R., and Travis Beckwith
2006 *Project 05-239, Stabilization and Preservation of DoD-owned Military Fortifications*. Prepared for the Department of Defense Legacy Resource Management Program. United States Military Academy, West Point, New York.

Emory, Kenneth P.
n.d. Field Notes of Mōkapu Burial Excavations. Department of Anthropology, BPBM, Honolulu.

Fung and Associates w/ Mason Architects
2005 *Historic Building Inventory for U.S. Marine Corps Base Hawaii, Kāneʻohe Bay, Kāneʻohe, Oʻahu, Hawaiʻi (DACA 83-00-C-0037)*. Prepared for Marine Corps Base Hawaii, Kaneohe Bay, Hawaii. Fung and Associates, Honolulu, Hawaii.

McAllister, J. Gilbert
1933 *Archaeology of Oahu*. B.P. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu.

Prishmont, Laura Ann and Lisa Anderson
2000 *Archaeological Subsurface Testing in Conjunction with the Airfield Runway Repairs Project (ARRP) in the Mōkapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii*. Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Ogden Environmental and Energy Services Company, Inc., Honolulu.

Schilz, Allan J.
1996a *Final Report: Cultural Resources Management Plan, Marine Corps Base Hawaii Kaneohe Bay, Island of Oʻahu, Hawaiʻi*. Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawaiʻi. Ogden Environmental and Energy Services Co., Inc., Honolulu.

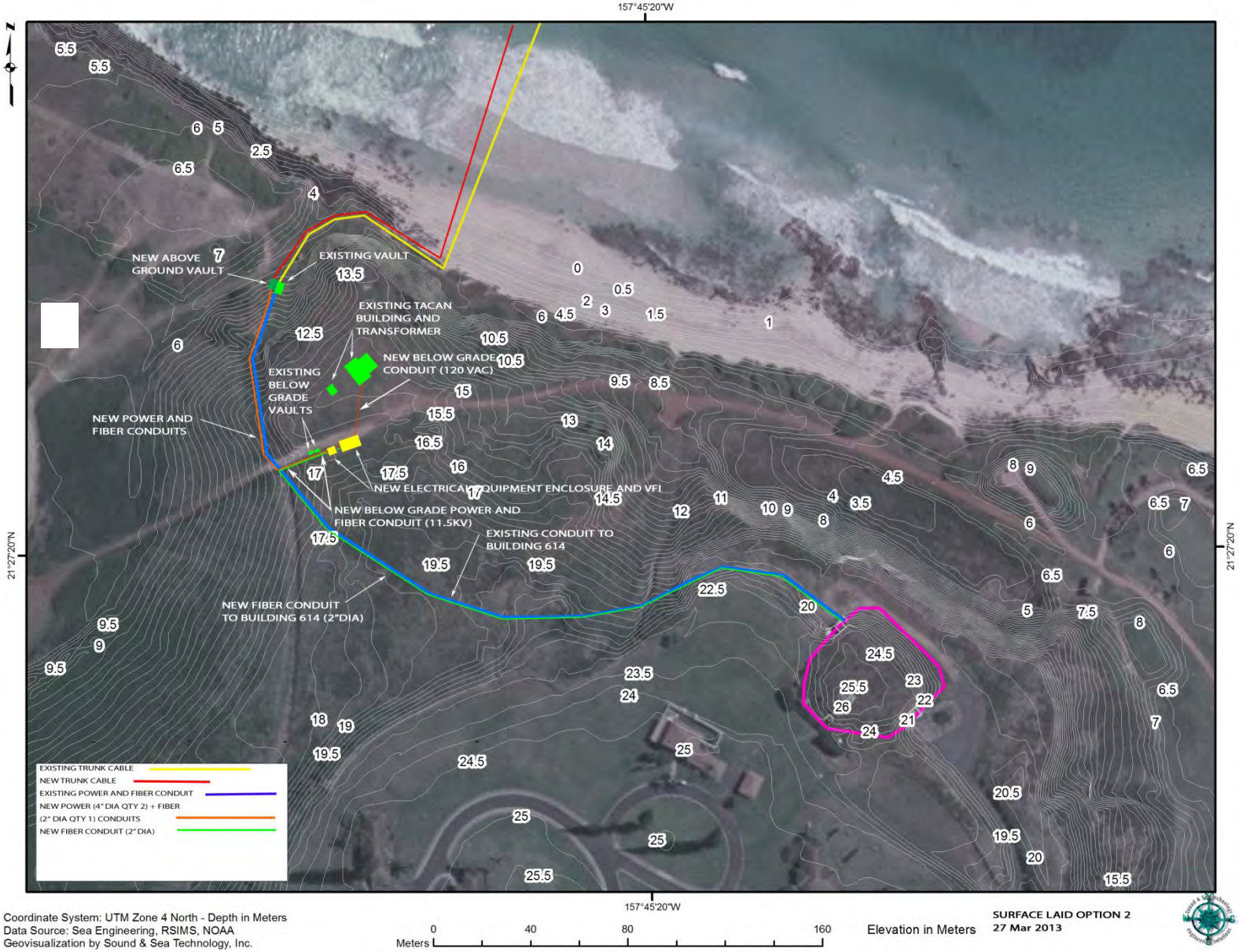
1996b *Archaeological Emergency Data Recovery, Mōkapu Burial Area at Marine Corps Base Hawaii (MCBH) Kaneohe Bay, O'ahu, Hawai'i*. Prepared for U.S. Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawai'i. Ogden Environmental and Energy Services Co., Inc., Honolulu.

1999 *Investigations for Emergency Recovery of Human Bone Remains and Monitoring for Family Housing Construction, Marine Corps Air Station, Kaneohe Bay, O'ahu Island, Hawai'i*. Prepared for U.S. Army Corps of Engineers, Fort Shafter. Ogden Environmental and Energy Service Co., Inc., Honolulu.

Tuggle, H. David
2002 *A Preliminary Summary of the Bowles Records Concerning Mōkapu Excavations, O'ahu*. Prepared for U.S. Army Engineer District, Fort Shafter, Honolulu. International Archaeological Research Institute, Inc., Honolulu.

U.S. Army Corps of Engineers
2006 *Integrated Cultural Resources Management Plan (ICRMP), Marine Corps Base Hawaii, O'ahu, Hawai'i.* Prepared for Installation Commander, Marine Corps Base Hawaii U.S. Army Corps of Engineers, Honolulu Engineer District, Fort Shafter, Hawai'i. Wil-Chee Planning and Mason Architect, Inc.

Williams, Scott and Tomasi Patolo
1998 *Final Report Subsurface Survey and Boundary Delimitation of the Mōkapu Burial Area, Marine Corps Base Hawaii Kaneohe Bay, O'ahu, Hawai'i. In Conjunction with the Legacy Resource Management Program*. Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor. Ogden Environmental and Energy Services Co., Inc., Honolulu, Hawaii.



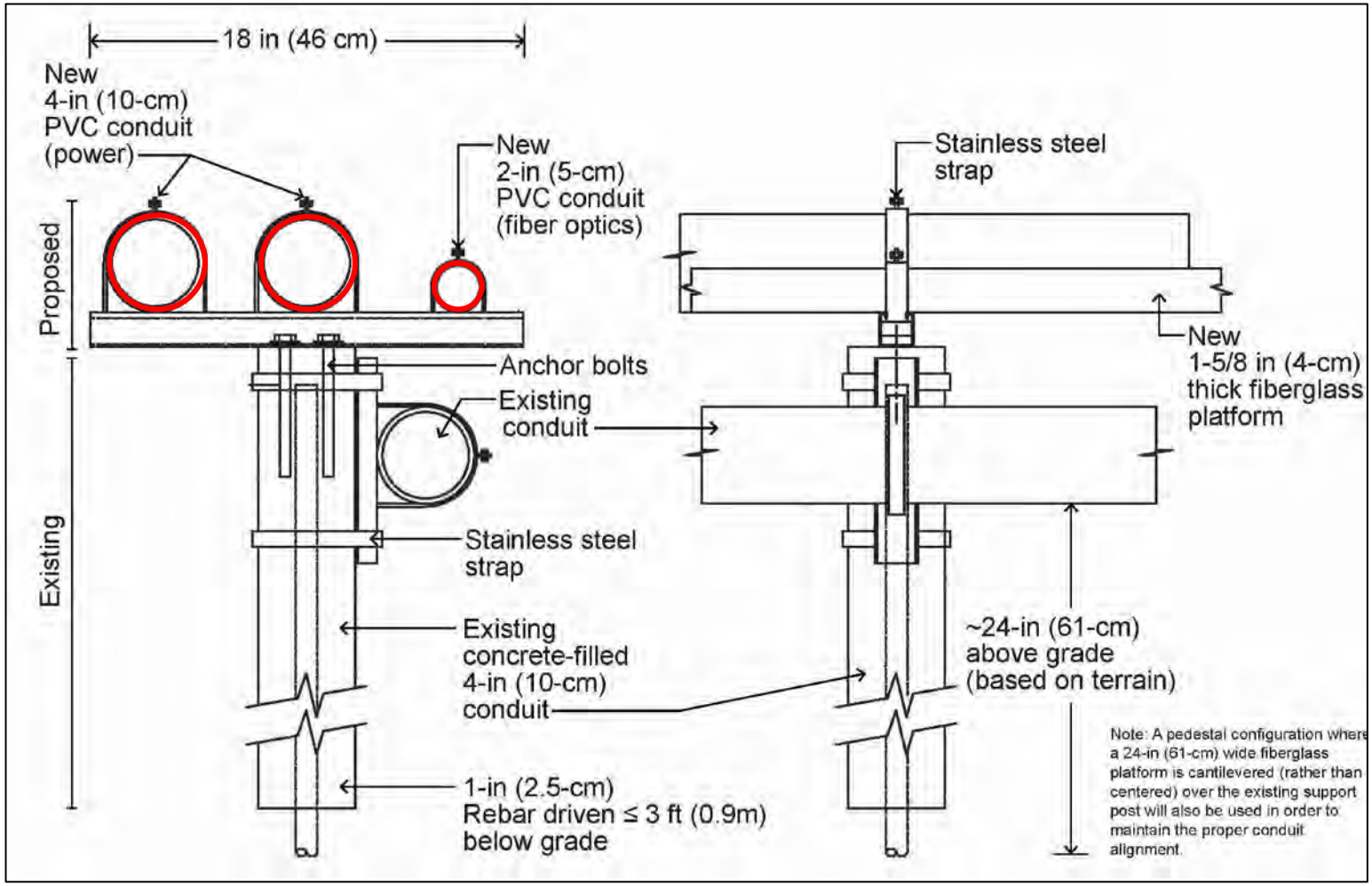
Coordinate System: UTM Zone 4 North - Depth in Meters
Data Source: Sea Engineering, RSIMS, NOAA
Geovisualization by Sound & Sea Technology, Inc.

Meters 0 40 80 160

Elevation in Meters

SURFACE LAID OPTION 2
27 Mar 2013

Enclosure 1. Aerial view of Undertaking showing Proposed Action (drawing courtesy of NAVFAC Pacific 2013).



Enclosure 2. Modified pedestal for additional surface laid power and fiber conduits (drawing courtesy of NAVFAC Pacific 2013).

WAVE ENERGY TEST SITE, MARINE CORPS BASE HAWAII PROJECT DESCRIPTION

1. OVERVIEW

Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) proposes to construct and operate two wave energy test site (WETS) berths for testing offshore wave energy conversion (WEC) devices in waters off the north coast of Mokapu Peninsula at MCB Hawaii. The "deep-water" WETS berths would be located in approximately 197 feet (ft) (60 meters [m]) and 262 ft (80 m) of water, approximately 6,500 ft (2 kilometers [km]) and 8,200 ft (2.5 km), offshore of MCB Hawaii, respectively (Figure 1-1). The Proposed Action includes installation and operation of two trunk power and communications transmission cables, in-water scientific data gathering equipment, and associated shoreside electrical transmission and monitoring equipment. Construction of the new berths would occur within a three-year period, with the first deep-water WEC device anticipated to be installed in 2014. Timing of WETS decommissioning would be based on WEC device test activity but is currently planned for the 2016 timeframe.

1.1 | Background

In 2003, the Department of the Navy ("Navy") prepared an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for a Wave Energy Technology (WET) test project that addressed the phased installation and testing of up to six WEC buoys in waters approximately 100 ft (30 m) deep, approximately 3,300 ft (1,000 m) offshore of Mokapu Peninsula, MCB Hawaii, hereby referred to in this document as the "2003 WET EA." In September 2003, the anchor and subsea cable for one berth were installed and the first WET buoy system became operational in 2004. This test site includes a surface floating WEC device, one mooring site with a 3-point anchoring system, equipment canister, an onshore utility vault, undersea and onshore power and data/communications cables, a shoreside control room with monitoring equipment (Building 614), and a connection to the MCB Hawaii electrical grid (see Figure 1-2 for vicinity map). As covered in the 2003 WET EA, the original plan was to deploy up to six WEC devices (one at each of the six proposed berths simultaneously) over a two- to five-year period. Three WEC devices have been deployed at the existing WET site since it became operational in 2004; however each was installed, tested, and removed prior to the subsequent WEC device installation. (The existing WET berth at the 98 ft (30 m) water depth is referred to as the "shallow-water WET berth."[1])

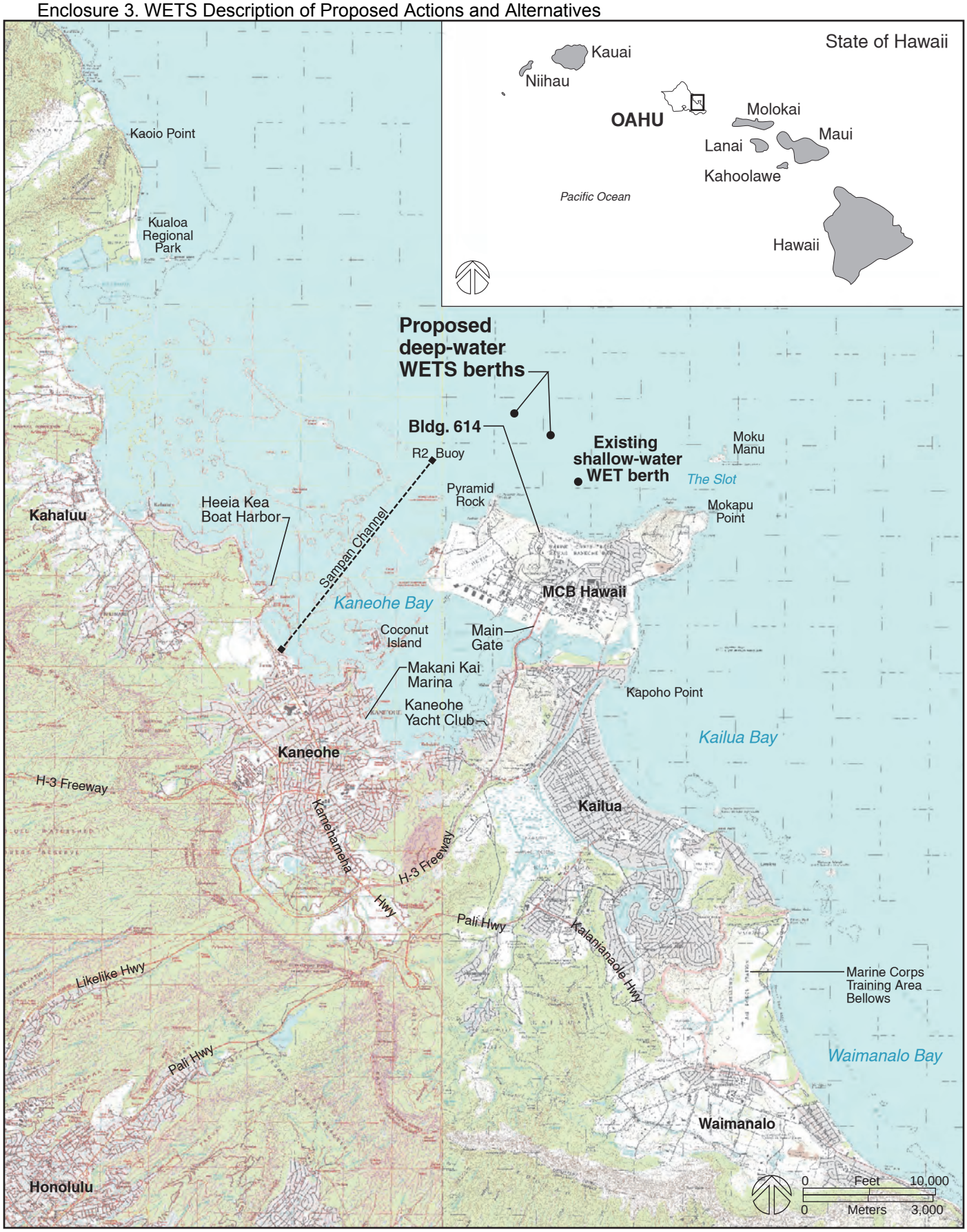
Based on the potential for various renewable ocean energy resources at United States (U.S.) Navy and U.S. Marine Corps (USMC) installations, the Navy determined that constructing deep-water WETS berths at MCB Hawaii would be the most cost-effective and practicable means to test WEC devices that have significant potential for commercial applications, including demonstrating the feasibility of using wave power for Department of Defense (DoD) facilities worldwide. Existing data from surveys and studies documenting the conditions in the area and the impact of previous WEC systems on the marine environment provide information valuable to the planning and evaluation of a deep-water WETS in waters offshore of MCB Hawaii.

2. SUMMARY OF PROPOSED ALTERNATIVES

The following alternatives are under consideration for implementation:

- **Proposed Action-Surface-Laid Cable Alternative (Preferred Alternative):** Construct and operate a deep-water WETS that would include two berths for offshore wave energy conversion (WEC) devices at water depths of approximately 197 ft (60 m) and 262 ft (80 m), respectively. These "deep-water" WETS berths would be located roughly 6,500 ft (2 km) and 8,200 ft (2.5 km) offshore of MCB Hawaii, with each berth supported by a 3-point anchoring system or variation thereof. The Proposed

[1] The continued operation of and installation/operation of WEC devices and related scientific monitoring equipment at the shallow-water berth are addressed in a separate NEPA document, as it is an action that could be implemented with or without the Proposed Action covered in the project's forthcoming NEPA EA. Likewise, this Proposed Action is not dependent on the continued operation of and installation/operation of WEC devices and related scientific monitoring equipment at the shallow-water berth.



Regional Location **Figure 1-1**

Wave Energy Test Site Environmental Assessment
MCB Hawaii, Kaneohe Bay

2.4 | No Action Alternative

Under this alternative, the deep-water WETS berths would not be constructed in the waters offshore of MCB Hawaii.

The No Action Alternative would not meet the project objectives, nor support the purpose and need for the action. However, it is carried through the EA analysis to satisfy CEQ requirements and to provide a benchmark to compare the magnitude of environmental effects of the action alternatives.

2.5 | Alternatives Considered but Eliminated from Detailed Study

In addition to the Proposed Action and HDD Alternative, several alternatives were considered but eliminated from further study for various reasons: an alternative cable landing route at MCB Hawaii and other Navy- or USMC-controlled sites in the Hawaiian Islands and U.S. mainland.

2.5.1 Alternative MCB Hawaii Cable Landing Route

An alternate shore landing configuration and route for the communications and data transmission cables from the proposed deep-water WETS berths to shore was also considered. The other ocean-based components are identical to the Proposed Action. In this alternative, instead of being landed through the surf zone and routed over land to Building 614 in the vicinity of the transmission cable from the shallow-water WET berth as in the Proposed Action, a single 6-conductor trunk transmission cable or two 3-conductor cables would be routed along the seafloor from the deep-water WETS berths to the vicinity of Pyramid Rock Beach. This conceptual alternative was proposed at a meeting with Native Hawaiian organizations affiliated with Mokapu Peninsula and stakeholders held at MCB Hawaii on 7 November 2012. The intent of this cable landing alternative was to avoid the Mokapu Burial Area, a culturally sensitive area. MCB Hawaii Public Works staff, the project's design engineers, and the project proponent (NAVFAC EXWC) reviewed and analyzed the feasibility of this alternative. There are several major obstacles that do not make this alternative feasible. First, this would represent studying, surveying, and designing a new subsea and terrestrial cable alignment, delaying the project by two to three years. Funding for the Proposed Action would likely lapse during this period. Second, Pyramid Rock Beach and the immediate area support a high degree of ocean and beach activities (recreational and operational). These activities were documented in the 2003 WET EA for the shallow-water WET berth. A cable landing in the area would be disruptive to the recreational activities and may become damaged by the operational activities (that include amphibious landings). Third, MCB Hawaii Public Works staff indicated that electrical transmission infrastructure is limited in the area of Pyramid Rock. That area of MCB Hawaii is served by overhead primary transmission lines with nearest transformer producing 120/208 volts. There are no suitable facilities available for the WEC device developers in the area for monitoring operations and equipment. For these reasons, this alternative cable landing route was eliminated as a feasible alternative.

2.5.2 Alternative Subsea Cable Route

In the Proposed Action, the nearshore sections of the subsea transmission cables are intentionally sited parallel to and within 100 ft (30 m) to the west of the subsea cable from the existing shallow-water WET berth. An alternative subsea cable route was initially considered, in which the new subsea cables would be aligned in a more direct (i.e., shorter) route from the offshore splice boxes to the shore landing point. In the original routing, the nearshore portions of the new cables (i.e., at depths of 100 ft [30 m] or less) were not parallel the existing shallow-water WET berth cable; instead, they approached the shore landing site from the northwest rather than the northeast (as in the Proposed Action). A March 2013 reconnaissance level Navy marine survey of the alternate (direct) cable route indicated that the proposed cable corridor presented greater biological concerns than the established shallow-water WET cable corridor (NAVFAC EXWC Scientific Diving Services 2013). As a result, at depths up to 100 ft (30 m), the subsea cable route was realigned to within 100 ft (30 m) of the existing shallow-water WET berth cable—an area that has been well-documented since 2003 by numerous pre- and post-construction marine

surveys. Each of the subsea cables would need to be approximately 700 to 800 ft (213 to 244 m) longer in the revised route (i.e., Proposed Action) than in the original route.

2.5.3 Alternative Terrestrial Electrical Equipment Sites

In addition to the Proposed Action's terrestrial cable routing and electrical equipment alignment, location, and grid connection point, two other alternatives were considered, but dismissed:

South side of Building 614. In this alternative, the new electrical equipment shelter and VFI would be constructed at the rear of Building 614, in the same locations described for the HDD Alternative. The electrical and fiber optic conduits would be routed from the new utility vault near the shoreline to Building 614, where the power conduits would connect to the MCB Hawaii grid at an existing underground vault (same as HDD Alternative). In addition to the 3 to 5 new pedestals needed where the conduits exit the new utility vault, this alternative would require 15 to 20 new pedestals to support the conduits where they would diverge from the existing conduit from the shallow-water WET berth to be routed to the rear of Building 614. This alternative would require that two power conductors be extended an additional approximately 700 ft (213 m), thus adding significant costs associated with the additional materials and labor. This alternative was dismissed due to its substantially higher cost relative to the Proposed Action.

Adjacent to Shoreline Utility Vaults. In this alternative, the new electrical equipment shelter and VFI would be located in the vicinity of the existing and proposed utility vault. Similar to the Proposed Action, the power cables would be routed to the existing below-grade electrical vault near the TACAN relocation site, where they would connect to the MCB Hawaii grid. Also similar to the Proposed Action, the new fiber optic cable would be routed to Building 614 on existing pedestals. This alternative was dismissed due to cultural resources concerns related to the proximity to the shoreline and native plant species and location within a known cultural site (the Mokapu Burial Area). The location of the terrestrial electrical equipment in the Proposed Action, while also within the boundaries of the Mokapu Burial Area, is a previously disturbed site, and its use would decrease the disturbance to natural and cultural resources, relative to the other alternatives considered.

2.5.4 Alternative Hawaii Sites

In addition to MCB Hawaii, alternative sites elsewhere on Oahu and Kauai were evaluated for suitability to support a WETS in the 2003 WET EA (U.S. Navy 2003): Pacific Missile Range Facility at Makaha Point and Nohili Point, both on the island of Kauai; Marine Corps Training Area Bellows at Waimanalo, Oahu; and West Loch at Naval Magazine Pearl Harbor. Among the four alternate sites, only the Pearl Harbor site was found to be suitable for the WET; the other three were dismissed from further consideration for a variety of reasons including inhospitable weather and sea conditions, incompatibility with existing training and operational uses, and prohibitive cost (refer to the 2003 WET EA for greater detail). The Pearl Harbor site was not selected because of its minimal wave energy environment (i.e., would not adequately meet project objectives). For these reasons, these sites were eliminated from detailed study and not carried through the environmental analysis.

2.5.5 Alternative U.S. Mainland Sites

NAVFAC EXWC assessed Navy and USMC bases for their ocean energy resource potential. Three locations were identified as having average annual wave power values greater than 10 kW per 3.3 ft (1 m) of wave face and a high resource stability throughout the year (i.e., minimal seasonal variation). MCB Hawaii was one of the three locations, with Navy-controlled San Clemente Island and San Nicolas Island in Southern California identified as two other locations with active wave climates. As remote locations with isolated power grids, San Clemente Island and San Nicolas Island were determined to be less desirable locations for locating WETS since they do not have large, existing infrastructure (i.e., work boats, harbors, repair facilities, etc.) and are geographically remote. Therefore, these alternative locations were eliminated from further consideration as deep-water WETS sites and are not carried through the EA analysis.

Enclosure 4. 2002 WET Section 106 letter initiating consultation

DEPARTMENT OF THE NAVY
PACIFIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
258 MAKALAPA DR., STE. 100
PEARL HARBOR, HI 96860-3134

5750.2M2
Ser PL.N233/ 1958

CERTIFIED MAIL

12 AUG 2002

Mr. Gilbert S. Coloma-Agaran
State Historic Preservation Officer
Kakuhihewa Building, Room 555
601 Kamokila Blvd.
Kapolei, HI 96707

Dear Mr. Coloma-Agaran:

Pacific Division, Naval Facilities Engineering Command (PACNAVFACENGCOM), in coordination with the Naval Facilities Engineering Service Center (NFESC), and in consultation with the Marine Corps Base Hawaii (MCBH), Kaneohe Bay, is preparing an Environmental Assessment for a Wave Energy Technology (WET) test project proposed by the Office of Naval Research (ONR), for installation at North Beach, MCBH Kaneohe Bay (Enclosure (1) Figures 1 and 2). In accordance with 36 CFR Part 800.3(b), PACNAVFACENGCOM is conducting Section 106 consultation in coordination with the National Environmental Policy Act (NEPA) process.

PROJECT DESCRIPTION

The proposed action is the phased offshore installation and operational testing of up to six wave energy conversion (WEC) buoys over a period of approximately two to five years. Enclosure (1) contains photographs, maps, sketches and specifications of the conceptual plan, and area of potential effect (APE), which are summarized here. Installation of the first two buoys and associated energy conversion equipment canister to which all buoys will be attached, and land-based operation support facilities are tentatively scheduled for the end of the calendar year. The system is programmed for removal five years after the installation of the first buoy.

The buoys and equipment canister will be anchored offshore in approximately 100 ft (30M) of water. The armored and shield undersea power cable and data cable, which weighs about 5.5 pounds per foot submerged and 7.5 pounds per foot on land, will transmit high voltage electrical power from the bouys to a land-based, standard, prefabricated concrete electrical vault where it will transition to a lighter weight land power cable and data cable. From the cable vault, the land power and data cables will be incased in a 4 inch diameter PVC conduit and routed to Building 614, Battery French, where the on-shore electrical power and control equipment will be housed. From the Battery, the power cable will be routed to the electrical grid system using existing underground ducts and manholes.

A rubber-wheeled rough terrain crane will be used to offset the vault on a gravel pad approximately 6 in. thick. A pick-up truck will be used to deliver the gravel to the vault site (Enclosure (1) Figures 11, 12, 13), and a rubber wheeled backhoe loader will be used to distribute and level the gravel. No other ground preparation is planned for the project.

Subsequent to leveling the gravel and offsetting the vault, the crane and backhoe loader will travel the existing dirt roadway to the staging site (Enclosure (1), Figures 10 and 12). The

proposed staging site is next to the proposed landing point for the cable, which is adjacent to the northeast corner of the shoreline revetment constructed for the taxiway. The staging site is a small, relatively level terrace comprised of 2-foot thick fill material overlying ancient coastal dunes, and is situated between the rocky coastline and an on-shore basalt rock formation. Once the crane and backhoe loader are situated to support lifting of the heavy undersea cable to the on-shore anchor, the heavy equipment will be stationary. A grouted rock bolt, 18-24 inch long and 1-3/8 inch in diameter, will be drilled into the basalt rock formation to provide an anchor for the land-end of the undersea power cable.

Along the cable route from the cable vault to the Battery, concrete pedestals (2 ft. X 2 ft.) will be placed at 10-ft intervals and fixed to the ground using rock bolts no larger than 5/8 in. diameter and 12 in. long. The conduit will be jacketed with gravel and a metal ramp will protect the conduit where it crosses the existing dirt road. There will be no ground disturbance or use of heavy equipment during installation of the land cable.

The Battery French will serve as the shore-based equipment shelter. It will contain the on-shore electrical power and control equipment comprised of a computer, transformer, alternate current/direct current (AC/DC) and DC/DC converters, capacitor bank, battery bank and an inverter. Power will be transmitted to the system grid via a power cable, which will be installed in existing underground duct banks. Modifications to the Battery are expected to be minimal and limited to the inside of the structure. The existing air conditioner ducts and the compressor will be replaced with smaller units. The land cable will enter the Battery on the west through an existing wire mesh screen and doorway, and mounted on the length of the main interior corridor wall to exit the existing doorway on the east end (Enclosure (1) Figures 7 and 8). From a selected location in the corridor, the cable will enter the space where the shore-based equipment will be installed. When the cable exits the building, it will run above ground to an existing manhole.

AREA OF POTENTIAL EFFECT

The area of potential effect (APE) extends from the shoreline where the undersea cable is brought on-land, over the adjacent staging area and existing dirt roadway to an area adjacent to the taxiway (Enclosure 2). The APE includes the proposed location for the cable vault, which is a relatively flat space adjacent to the east side of dirt roadway. The APE then follows the route of the cable to Battery French and to the manhole where the cable will eventually tap into the existing electrical grid.

IDENTIFICATION OF HISTORIC PROPERTIES

The Mokapu Burial Area (Site 50-80-11-1017) (MBA) is a subsurface archaeological site containing ancient burials and funerary items of religious and cultural significance to Native Hawaiians (Schiliz 1996; Tuggle and Hommon 1986) listed on the National Register of Historic Places (NRHP). Under the criteria of evaluation in 36 CFR Part 60.4, the MBA is significant under criterion (a) for its pattern of repeated traditional Hawaiian activities, and criterion (d) for the information that it has yielded and is likely to yield in the future that is important to the prehistory of the Mokapu Peninsula specifically and Hawaii in general. The horizontal boundary of the site as designated on the NRHP is situated on North Beach in a coastal dune setting that extends approximately from Pyramid Rock to the west and Ulupa'u Crater to the east. The site

has no visible structural elements. The depth is unknown, but in the past natural erosion has exposed humans remains, and burials have been encountered as deep as 6 meters (19.68 feet). Projects involving excavation and ground-penetrating radar technologies, and historic data, however, have identified certain loci within and beyond the NRHP boundary that are either known, or are likely to contain archaeological deposits, and boundary revisions have been suggested (Prishmont 2000; Williams and Patolo 1998).

The location of the proposed action is in a noncontributing portion of land that is within the NRHP boundary of the Mokapu Burial Area site, although it is outside the revised boundary proposed by Williams and Patolo (1998), and touches the west end of an area suggested by Prishmont (2000) (Enclosure (3) to have low to moderate potential to have human burials. The dunes in the area that Prishmont suspects have potential for human burials are deep and covered by fill. The project area that falls within the arbitrary boundary of the Mokapu Burial Area is capped with fill material about 2 feet (61.5 cm) deep composed of sand mixed with basalt gravel, pebbles, cobbles and boulders that have become cemented, creating a firm ground surface with an overlying thin layer (3/4" - 2 1/3" [2-6 cm]) of loose sand (Enclosure (4). The fill is thought to be associated with construction of the runway and revetment. Boulders characterize the shoreline.

For the purposes of Section 106 for this undertaking, Battery 301 Forrest J. French (Site 50-80-11-1432), a concrete subterranean structure built into the ground and covered with earth during World War II, is considered eligible for the NRHP. It is significant under criterion (a) for its indirect association to the December 7, 1941, attack and possibly (c) because it represents a distinctive architectural type (Schilz et al 1996). Six-inch guns were mounted on two turrets exposed above surface. During the late 1960's and early 1970's, the interior of Battery French was modified to provide offices for the Naval Ocean Systems Center Laboratory. The Battery is currently not used, and the modified interior has deteriorated. The basic structure and turret foundation remain intact (Tuggle and Hommon 1986).

DETERMINATION OF EFFECT

In accordance with 36 CFR Part 800.4(d)(1), PACNAVFACENGCOM, in consultation with the U.S. Marine Corps Kaneohe Bay, finds that although there are historic properties present, the proposed undertaking will have no effect on either the Mokapu Burial Area or Battery French that would alter the characteristics of either property qualifying it for inclusion in or eligibility for the National Register.

While the land-based segment of the project includes action within the Mokapu Burial Area, the project is situated in an area capped by 2 feet (61 cm) of firm fill, and action is designed to exclude excavation and minimize ground disturbance by heavy equipment. Heavy equipment will ingress to the project area using the taxiway and an existing dirt roadway in an area capped by fill. Movement of the equipment will be limited to offsetting the vault box with the crane, and staging the equipment near the ingress of the sea cable to the shore, for emergency support.

The proposed modifications for the Battery French will affect only the interior of the structure, which has been previously modified. Existing openings will be used to run the cable into west doorway and out the east doorway of the Battery. The integrity of the existing concrete structure that holds the possibly distinctive architectural features will not be altered. The cable that will

transmit power to the electrical grid system will be installed in an existing underground duct system, with no potential to affect previously unknown subsurface cultural resources.

In accordance with 36 CFR Part 800.4(d) (1), notifications have been sent to the consulting parties (listed below) known to attach religious and cultural significance to the MBA. Notification has also been sent to the Historic Hawaii Foundation. Should you know of any other organizations or individuals that would like to review this project please contact us.

Mr. A. Van Horn Diamond
Ka Lahui Hawaii
Mrs. Kinau Boyd Kamalii
Kekumano Ohana
Ko'olauloa Hawaiian Civic Club
Mr. Carlos Manuel
Mr. Sam Monet
Hui Malama I Na Kupuna o Hawai'I Nei
Oahu Island Burial Council
Office of Hawaiian Affairs
Mrs. Nalani Olds
Ms. Delilah Ortiz
Ms. Ella Paguyo
Paoa-Kea-Lono Ohana
Prince Kuhio Hawaiian Civic Club
Princess Nahoa Olelo 'O Kamehameha Society
Ms. Terrilee Napua Keko'olani Raymond
Temple of Lono
Ms. Miriam V. Yardley

If you have any comments or questions concerning this project we respectfully request that you provide them within 30 days of receipt of this letter. If no comments are received within 30 days, we will assume you have no objections to the finding of "no historic properties affected". Our point of contact for this project is Ms. Jeannette Simons at 808-474-4886, by facsimile at 808-474-5909, or by email at SimonsJA@efdpac.navfac.navy.mil.

Sincerely,

Melvin N. Kaku

MELVIN N. KAKU
Director
Environmental Planning

Encl:
(1) Project Description
(2) Aerial photos of area of potential effect
(3) 1998 Proposed revised boundary and 2002 Area suggested to have low to moderate potential for human burials
(4) Photo of Beach Cut

References Cited

2002 Commander, Navy Region Hawaii, Pearl Harbor, Hawaii

Integrated Cultural Resources Management Plan. Prepared by Helbert Hastert Fee, Planners under contract with Pacific Division, Naval Facilities Engineering Command

2000 Prishmont, Laura

Archaeological Subsurface Testing In Conjunction with the Airfield Runway Repairs Project (ARRP) in the Mokapu Burial Area Marine Corps Base Hawaii Kaneohe Bay, Oahu, Hawaii. Prepared for Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pacific Division, Pearl Harbor, HI.

1996 Schilz, Allan J., Richard L. Carrico, Ann Yoklavich, Robert P. Drolet, Patricia Drolet, Richard Nees, James Landrum

Cultural Resources Management Plan Marine Corps Base Hawaii Kaneohe Bay, Island of O'ahu, Hawaii. Prepared for Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pacific Division, Pearl Harbor, HI.

1986 Tuggle, H. David and Robert J. Hommon

Historic Property Inventory, Marine Corps Air Station, Kaneohe Bay: History, Survey, and Site Descriptions. U.S. Naval Facilities Engineering Command, Pacific Division, Pearl Harbor.

1998 Williams, Scott S. and Patolo

Subsurface Survey and Boundary Delimitation of the Mokapu Burial Area, Marine corps Base Hawaii Kaneohe Bay, Oahu, Hawaii. Submitted to U.S. Naval Facilities Engineering command, Pacific Division, Pearl Harbor

Enclosure 5. 2002 WET Section 106 SHPO concurrence letter.

NE

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCES MANAGEMENT

DEPUTIES
ERIC T. HIRANO
LINNEL NISHIOKA

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

October 1, 2002

Melvin N. Kaku, Director
Environmental Planning Division
Department of the Navy
Naval Facilities Engineering Command
258 Makalapa Dr., Ste. 100
Pearl Harbor, HI 96860-3134

LOG NO: 30773 ✓
DOC NO: 0209EJ17

Dear Mr. Kaku:

SUBJECT: **National Historic Preservation Act Section 106 Review – Environmental Assessment Preparation for a Wave Energy Technology Test Project at North Beach, MCBH, Kaneohe Bay**
Kane`ohe, Ko`olaupoko, O`ahu
TMK: (1) 4-4-008:001

Thank you for the opportunity to comment on the proposed undertaking for the offshore installation and operational testing of wave energy conversion buoys. This project includes installation of buoys and associated land based operations. Our review is based on historic reports, maps, and aerial photographs maintained at the State Historic Preservation Division; no field inspection was made of the project areas. We received notification of this undertaking from your office on August 14, 2002, and apologize for the delay in our response, but we have been working with your staff and members of the O`ahu Island Burial Council's (OIBC) Section 106 Subcommittee to resolve some differences. Subsequent email communication with your staff and the OIBC's Section 106 Subcommittee has clarified several aspects of the undertaking, and we can now provide comment. We appreciate your patience and consideration of the OIBC's concerns.

The project involves anchoring buoys and equipment canisters and cable offshore and transition to land based power and data cables routed to Building 614, Battery French. Ground preparation at the proposed land site for the cable includes installation of a 6-in thick gravel pad for a crane and backhoe loader used to lift the undersea cable to the shore. No ground disturbance or heavy equipment will be used to install the land portion of the cable which will be routed as indicated in a recent electronic transmission from your office (Message from Jeannette Simons at efdpac.navfac.navy.mil on 09/26/2002 at 09:05 AM, SUBJECT: RE: 106

Consultation/Wave Energy Technology MCBH Battery French). In addition, 2 ft by 2 ft. concrete pedestals will be placed along the land route and bolted to the ground with one-inch diameter rock bolts to a maximum depth of three feet, as indicated in the same electronic transmission from your office. Battery French will contain the on-shore electrical power and control equipment. Modifications to the Battery are limited to the inside of the structure. The land cable will enter the Battery through an existing wire mesh screen and doorway and be mounted on the main interior wall to the existing doorway on the east end. Upon exiting the Battery the land cable will run above ground to an existing manhole.

The Navy has determined that although there are historic properties present, Battery French and the Mokapu Burial Area, the proposed undertaking will not alter the characteristics qualifying these properties for inclusion in or eligibility for the National Register. The project is situated within the Mokapu Burial Area where is has been determined that there is a low to moderate potential of containing human burials. Archaeologists from the Navy and the Marine Corps have walked the area and probed the route for the above ground conduit. The area is capped by 2 feet of fill which is thought to be associated with the construction of the runway and revetment. The undertaking has also been designed to minimize ground disturbance within the APE by heavy equipment and excavation as well as placement of the lightweight pedestals for the above ground conduits. Alteration to Battery French is limited to the interior of the structure, which has been previously modified. Based on the information provided in both your original notification and subsequent electronic messages, we concur with your "no historic properties affected" determination.

Should you have any questions about archaeology, please feel free to call Sara Collins at 692-8026 or Elaine Jourdane at 692-8027. Should you have any questions about burial matters, please feel free to contact Kai Markell 587-0008.

Aloha,

Gilbert Coloma-Agaran
State Historic Preservation Officer

EJ:jk

c: Mr. A. Van Horn Diamond, Chair, O`ahu Island Burial Council
Mr. Kai Markell, Burial Sites Program

Enclosure 6. 2002 WET Section 106 NHO response letters.

DEPARTMENT OF THE NAVY
PACIFIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
258 MAKALAPA DR., STE. 100
PEARL HARBOR, HI 96860-3134

5090P.1F13B
Ser PLN231/ 128
16 JAN 2003

Ms. Jalna Keala, Acting Director
Hawaiian Rights Division
Hawaii State Office of Hawaiian Affairs
711 Kapiolani Blvd., Suite 500
Honolulu, HI 96813

Subj: WAVE ENERGY TECHNOLOGY (WET) TEST PROJECT AT MARINE CORPS BASE HAWAII (MCBH) KANEOHE BAY

Dear Ms. Keala:

Thank you for commenting on our letter of August 12, 2002 and the overall project identified above. This responds to your letter of August 20, 2002, which stated that the Office of Hawaiian Affairs would rely on the assurances of the project proponent that proper consultation and mitigation will be done in accordance with applicable Federal and state laws in the event that any unanticipated or unidentified cultural sites were encountered during project development. We would like to assure you that this requirement has been addressed in the WET Environmental Assessment document and is being included in the Best Management Practices for the project. We believe the mechanism for preventing accidental loss of heritage and artifacts has been put in place.

We appreciate your efforts to raise this important concern.

Should you have any questions, please contact Mr. Gary Kasaoka (PLN231GK) at 471-9338.

Sincerely,

Melvin N. Kaku

MELVIN N. KAKU
Director
Environmental Planning Division

Copy to:
ONR (Code 334)
NAVREGHI (N465)
MCBH (LE)

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

August 20, 2002

HRD02/713

Mr. Melvin Kaku
Director, Environmental Planning
Department of the Navy
Pacific Division
Naval Facilities Engineering Command
258 Makalapa Drive, Suite 100
Pearl Harbor, HI 96860-3134

Dear Mr. Kaku:

Subject: Wave Energy Technology Project, MCBH Hawaii, Kaneohe, Oahu

This letter is provided as a response to the materials of August 12, 2002, requesting review relating to the above document and findings. OHA offers the following comments relating to the undertaking. Although the situation for development appears benign in terms of adverse effects to cultural resources of concern to Native Hawaiians, we will rely on the assurances of the proponent of the project that they will engage in proper consultation and mitigation in accordance with federal and state law (as appropriate) should any unanticipated or unidentified cultural, historic, or burial sites be encountered during project development.

Thank you for the opportunity to review and comment relating the proposed project. If you have any questions, please contact Wayne Kawamura, Policy Analyst at 594-1945, or email him at: waynek@oha.org.

Sincerely,

Jalna Keala
Acting Director, Hawaiian Rights Division

JK: wk

cc: BOT
ADM

DEPARTMENT OF THE NAVY
PACIFIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
258 MAKALAPA DR., STE. 100
PEARL HARBOR, HI 96860-3134

5090P.1F13B
Ser PLN231/ 54

9 JAN 2003

Ms. Nalani Olds
P.O. Box 4673
Kaneohe, HI 96744

Subj: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR WAVE ENERGY TECHNOLOGY (WET) TEST PROJECT AT MARINE CORPS BASE HAWAII (MCBH) KANEOHE BAY

Dear Ms. Olds:

Thank you for participating in the review of subject document. This responds to your letter dated October 27, 2002, in which you referenced a Navy letter of August 12, 2002 that was prepared for this project under the implementing regulations of Section 106 of the National Historic Preservation Act (NHPA), 36 CFR Part 800. The Hawaii State Historic Preservation Officer (SHPO) subsequently concurred with our determination of "no historic properties affected."

Although the majority of the comments in your letter were unrelated to the potential effect of the project on historic properties, we attempted to provide the information you requested by meeting with you on November 14, 2002 at Zippy's restaurant in Kaneohe. Ms. June Cleghorn represented the Marine Corps, and the Navy was represented by Messrs. Don Rochon and Kendall Kam. Ocean Powers Technologies, Inc. was represented by Mr. Bill Powers, who along with Mr. Kam briefed you on the technological and operational aspects of the WET project. Also present at the meeting were Mr. Van Horn Diamond, Chair, Oahu Island Burial Council, and Mr. Richard (Keke) Papa, who is part of Mr. Diamond's *ohana*.

We briefed the project and went through the list of questions raised in your October 27, 2002 letter, answering them one-by-one. Several handouts, including those that pertained directly to the Wave Energy Converter buoy, were provided, which we hope you found useful and informative. Reiterating the response to your question on the need for an Ethno-Botanist, we stated that although such a specialist would not be on site, qualified biologists have assessed both the submerged and land-based portions of the project looking for possible threatened and endangered (T&E) species that might be impacted by the project, as well as, for native Hawaiian plant species at the land-based part of the project.

Regarding the concern for possible inadvertent discovery of Native Hawaiian human remains in the Mokapu Burial Area, as discussed during the November 14, 2002 meeting, we believe the likelihood of this occurring is very low. Should human remains be

discovered during project implementation, Navy will follow the Native American Graves Protection and Repatriation Act (NAGPRA) regulations that apply.

Regarding your suggestion that project workers be informed of the cultural significance of the Mokapu Burial Area, we appreciate your offer to conduct a briefing on this topic and will contact you to discuss this further and make arrangements. As discussed during the November 14, 2002 meeting, the Navy can accommodate a Hawaiian groundbreaking ceremony prior to construction activities should you or a Native Hawaiian organization wish to conduct one on a voluntary basis, with the condition that the blessing be conducted and coordinated by a non-government entity, subject to reasonable requirements for identification, safety, and other administrative and security procedures.

Should you have any questions, please contact Mr. Gary Kasaoka (PLN231GK) of my staff at 471-9338.

Sincerely,

Melvin N. Kaku
Director
Environmental Planning Division

Copy to:
ONR (Code 334)
NAVREGHI (N465)
MCBH (LE)

Blind copy to:
NFESC (Code ESC 52)
NFESC (Code ESC 427)
O9C
BOS1624

NALANI OLDS
P. O. BOX 4673
KANE'OHE, HI. 96744

October 27, 2002

To whom this may concern:

I am writing this in response to your letter of August 12, 2002, not received by myself due to a change of address, until August 30, 2002. I will address my concerns/questions in the order that they are referred to in each paragraph.

1) As I understand from the "Excerpts from Working Draft Environmental Assessment for Preferred Alternative Prepared by PACNAVFACENGCOM July 2002", the project testing will take place over a period of 2 to 5 years.

What operational data is WEC trying to validate with OPT?

What is their overall goal?

2) The Shore Based Transmission Cable will be secured using concrete pedestals and held with rock bolts.

How long and thick are these bolts?

What type of rock will they be going into?

3) Installation Procedures:

Why would you "store" excess cable between buoy(s) 1 and 2 on the ocean bottom? For how long?

Would you be drilling just for that?

Is there consideration taken concerning high, rough, unforeseen wave and current action?

What would the course of action be should the site chosen turn out to be "not conducive to the expected outcome of the project"?

Would I expect that if the above were the case, moving to another site would <u>not</u> be an option?

4) System Removal:

How long will it take to remove <u>everything</u>?

Is there consideration as to the restoration of the areas under water as well on Land? This means restoration back to the way those areas were found.

5) If this proves to be a "good" project, what are the assurances that this will be the end of it, or will the next "project" be to install a permanent or modified system without notifying anyone? For me, if this project moves forward, it would be just for this one time. No one can even guess as to what the ramifications of this project might be.

6) Culturally I have a few questions.

Is this type or kind of testing being done anywhere else in the world? If so, where, and is the method the same?

Are those other site(s) historically significant to their specific areas? If not, why not and, why Hawai'i in particular?

Is an Ethno-Botanist in the equation from the beginning to the end to assess/protect/restore flora on the ocean bottom and also on land?

Will the MCBH Archaeologist be part of the project "team" to watch for any unforeseen ancient burials?

Why would the installation date of the equipment be chosen during a period of time when the ocean currents and tides are at their highest? Wouldn't it stand to reason that studying the tide charts would be premier to the success of the project. Winter is when the seas are the roughest.

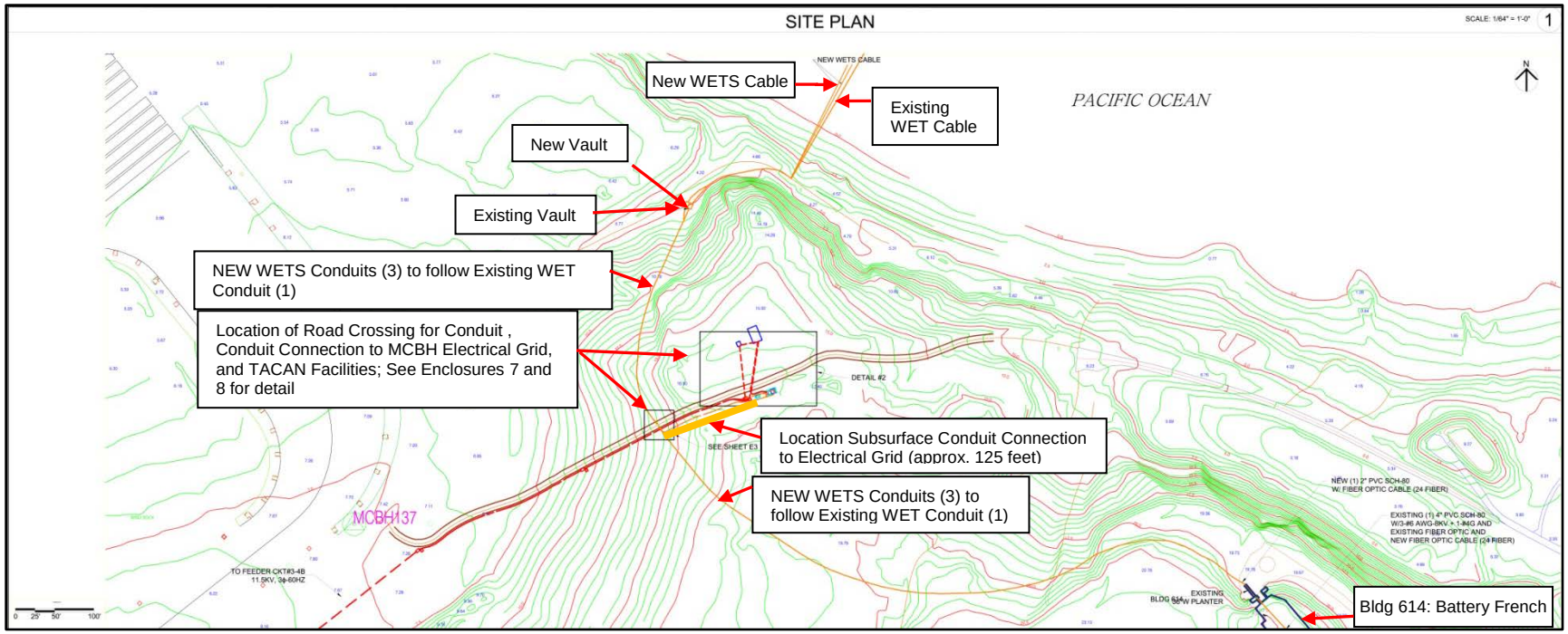
7) One final comment.

I am assuming that all of the "team" who will actually be working on the project, from the beginning to the end,- and whenever "new" persons come along,- will be trained culturally as to the significance of Mokapu, and all of its surrounding area.

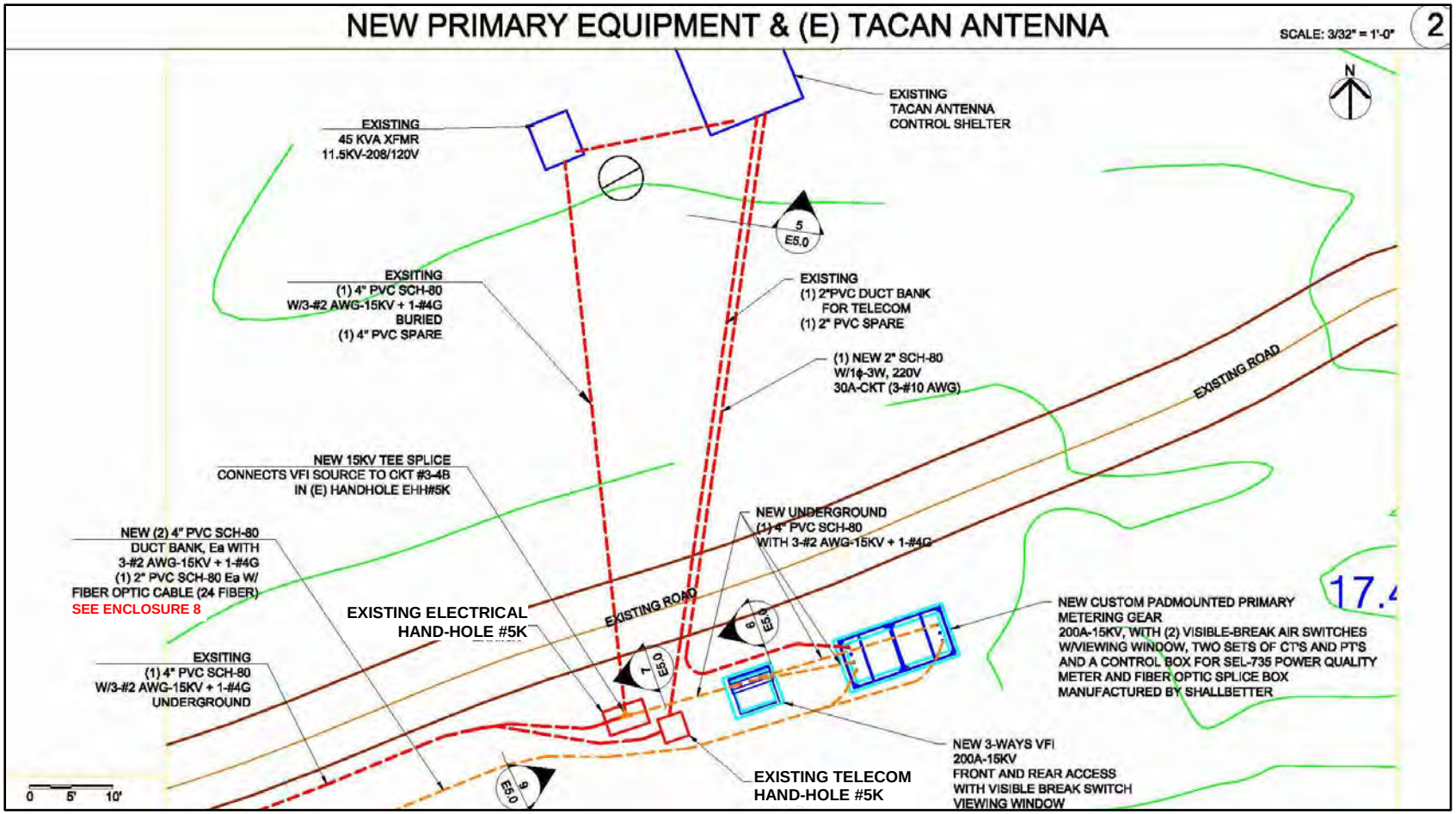
Should you have any comments I can be reached at 808-261-1171 or at the above address.

Me ka Mahalo,

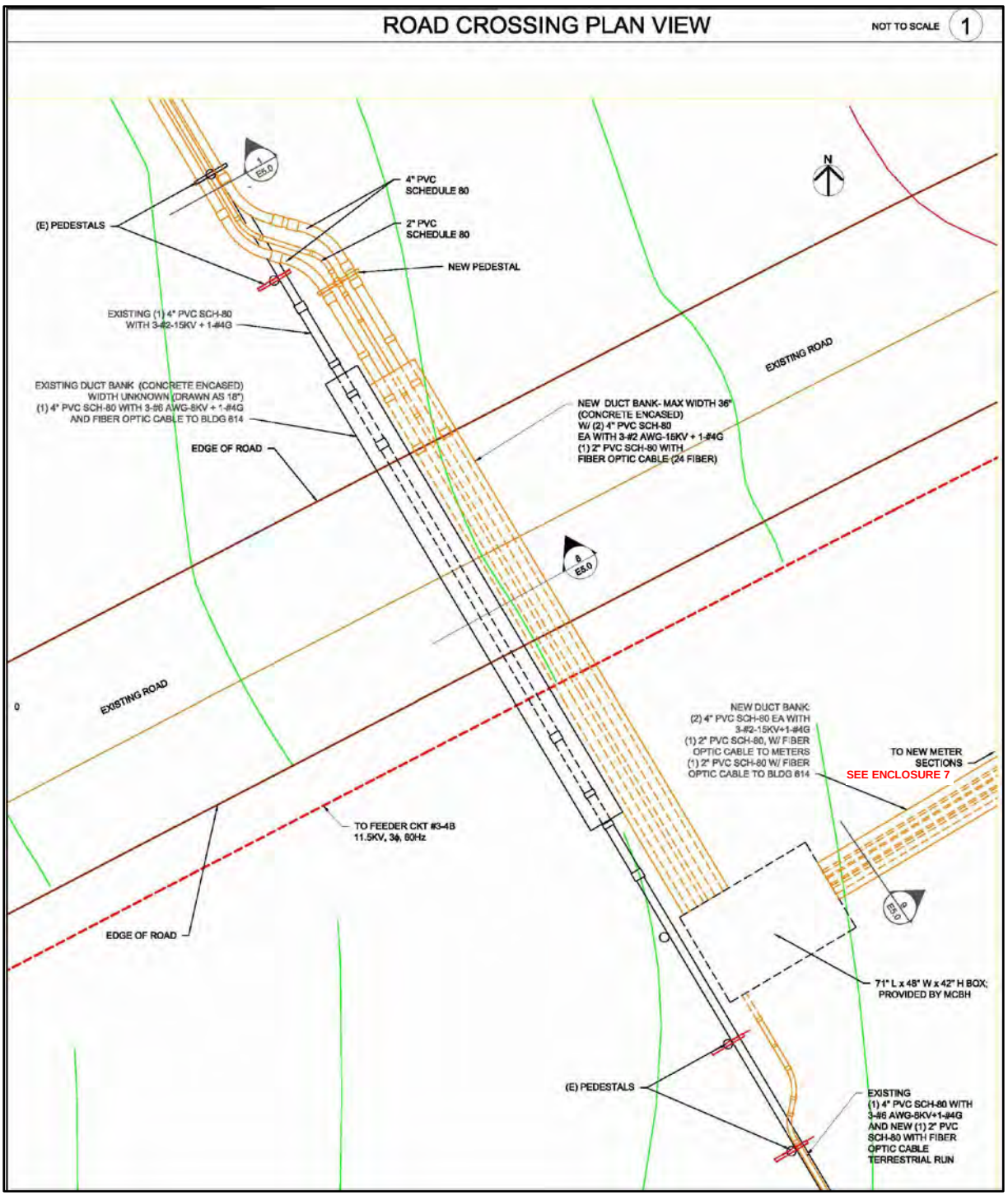
Nalani Olds



Enclosure 7. Site Plan showing locations of new WETS equipment as well as existing WET equipment (courtesy NAVFAC Pacific 2013).



Enclosure 8. Detailed plan view of WETS equipment vault placement and electrical grid connection at relocated TACAN site; Note: Blue rectangles at lower portion are the new electrical equipment vaults to be placed on the ground surface, orange dashed line denotes proposed subsurface 125 foot conduit installed along the road (courtesy NAVFAC Pacific 2013).



Enclosure 9. Plan view drawing showing detail of WETS conduits at road crossing and alongside the road near TACAN site that would be installed subsurface (denoted in orange) (courtesy NAVFAC Pacific 2013).

MARINE CORPS BASE HAWAII CONTINUING SECTION 106 CONSULTATIONS

Date/Time of Consultation Meeting: Oct. 30, 2013 10:00 a.m.
Meeting Location: Site visit to WETS location, MCB Hawaii Kaneohe Bay

Consultation Meeting Subject: Wave Energy Test Site (WETS), MCB Hawaii Kaneohe Bay

Attendees:

Capt. Derek George, MCB Hawaii Env Dept Director
June Cleghorn, MCB Hawaii Senior Cultural Resources Manager
Alexandra DeVisser, Navy
Kendall Kam, Navy Consultant
Kai Markell, Office of Hawaiian Affairs (OHA)
Jerome Yasuhara, OHA

Meeting / Site Visit Summary:

The purpose of the subject site visit was to continue Section 106 consultation with OHA in order to seek resolution to OHA's disagreement (transmitted via OHA letter dated May 24, 2013) with the MCB Hawaii no adverse effect determination of the WETS project upon historic properties, namely the Mokapu Burial Area (MBA).

BACKGROUND: On behalf of MCB Hawaii, Capt. George and June Cleghorn initiated Section 106 consultation for the WETS project in the late fall 2012 (via MCB Hawaii letter dated Oct. 9, 2012). In Nov 2012, the State Historic Preservation Officer (SHPO) requested more information about the project stating that they could not yet determine their concurrence with our no adverse effect determination. Additionally, MCB Hawaii received email correspondence from OHA, also in Nov. 2012, expressing concerns over the WETS project and its effects upon the MBA. MCB Hawaii continued Section 106 consultation with meetings and site visits in early 2013 in order to provide the requested information to the SHPO and to all consulting parties. MCB Hawaii then distributed a second letter to all consulting parties (dated Mar. 29, 2013) within which was stated the no adverse effect determination with the accompanying solicitation of concurrence from the SHPO and solicitation of review and comments from the other consulting parties. As noted above, OHA sent MCB Hawaii a letter in May 2013 stating their disagreement with the MCB Hawaii no adverse effect determination.

In addition to Capt. George and June Cleghorn, Alexandra DeVisser attended the subject site visit as the project proponent (Navy) and manager, and Kendall Kam attended as the Navy's consultant on alternative energy for this project.

OHA's participation in this consultation had been represented by Keola Lindsey through Aug. 2013. Kai Markell became the OHA representative participating in this consultation when Mr. Lindsey assumed other responsibilities. MCB Hawaii was continuing consultation with OHA when this transition occurred. MCB Hawaii replied to OHA's disagreement in the effect determination in a letter dated Oct. 1, 2013. Thus, as Mr. Markell and Jerome Yasuhara (also representing OHA at the subject site visit) were not familiar with the WETS project, MCB

Hawaii offered to conduct a site visit at the WETS project location so the OHA representatives could see the existing wave energy cable and infrastructure while getting information directly from the project proponents on the proposed WETS project. During the site visit, June Cleghorn and Capt George reiterated and explained the basis for the no adverse effect determination as follows (and as described in the MCB Hawaii letter of Oct. 1, 2013):

The proposed undertaking:

(1) *Will not alter the characteristics that qualify the MBA for inclusion in the National Register and it will not diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association;*
(2) *Will not cause physical destruction or damage to the MBA or to the traditional cultural significance of it to NHOs;*
(3) *The MBA and its traditional cultural significance to NHOs is not being altered and to the contrary, MCB Hawaii has fully accepted and acknowledged the traditional cultural significance of the MBA to NHOs;*
(4) *The MBA is not being removed from its historic location;*
(5) *The character and setting of the MBA, including its traditional cultural significance to NHO, is not being changed;*
(6) *There is no introduction of new visual, atmospheric or audible elements that diminish the integrity of the MBA or its traditional cultural significance to NHO (the visual element of the original WET cable has existed within the MBA for a decade); and*
(7) *The MBA is not being leased or sold.*

At the end of the site visit, Mr. Markell and Mr. Yasuhara stated that they understood the project better than they had previously, and that after visiting the location of the existing wave energy cable and infrastructure and seeing how the proposed WETS project infrastructure would be installed they felt assured that MCB Hawaii was doing everything possible to avoid and minimize effects to the MBA. Mr. Markell further stated that he would recommend to OHA leadership that they agree with the MCB Hawaii no adverse effect determination. MCB Hawaii asked that OHA send a letter stating such within two weeks' time.

Summary written by J. Cleghorn on Dec. 3, 2013.

From: Suwa, Alan M CIV NAVFAC Pacific, EV <alan.suwa@navy.mil>
Sent: Thursday, December 19, 2013 5:07 PM
To: Chang, Connie M CIV NAVFAC PAC; Fong, Jeffrey W CIV NAVFAC Pacific, EV; Lomeli, Jill CIV EXWC, EV1; West, Eric W CIV NAVFAC PAC; Gail Renard; luisvega@hawaii.edu; 'Kendall Kam' (Kendall.Kam@rivertopsolutions.com)
Subject: Received OHA Response to WETS

-----Original Message-----
From: Kai Markell [mailto:kaim@oha.org]
Sent: Thursday, December 19, 2013 3:38 PM
To: Cleghorn CIV June N
Cc: George Capt Derek R; Rasmussen CIV Coral M; Irvin CIV Carolyn E; Jerome K. Yasuhara
Subject: RE: OHA Response to WETS project?

Aloha Captain George and June:

The Office of Hawaiian Affairs (OHA) is responding to your October 9, 2012 letter that initiated National Historic Preservation Act consultation for the proposed expansion of the Wave Energy Testing Site aboard Marine Corps Base Hawaii (the undertaking) as well as your December 4, 2013 and December 17, 2013 email communications.

Thank you for your patience during our review of this most sensitive issue.

Your letter provides the United States Marine Corps (USMC) determination that this undertaking will result in “no adverse effect” to historic properties and seeks concurrence of this determination from the State of Hawaii Historic Preservation Officer.

Pursuant to NHPA implementing regulations 36 CFR Part 800.5(c)(2)(i), please accept this email as OHA’s formal notification to the USMC that at this time we will concur with your determination of “no adverse” effect.

This position is based upon an October 30, 2013, site inspection by Compliance Enforcement staff, Jerome Yasuhara, and myself, whereupon we viewed the existing infrastructure and proposed utilization of the existing infrastructure for this new project.

We also viewed the existing cable alignment from the beach and viewed the areas of previous trenching.

Based upon the representations of the Marine Corps at this site visit, regarding sub-strata and the lack of previous discoveries in the area, OHA will concur with the "no adverse effect" at this time.

In the event human skeletal remains are encountered at any portion of the project, we would ask that the provisions of NAGPRA are implemented, all work cease, and a reassessment of the project occur relative to the discovery.

If you have any questions, please do not hesitate to contact me. Mahalo piha...

Kai Markell
Ka Pou Kākoʻo
Manager
Kiaʼi Kānāwai
Compliance Enforcement

Office of Hawaiian Affairs
737 Iwilei Road
Honolulu, HI 96817
594-0020
kaim@oha.org

Appendix C
Ocean Recreation and Public Safety Report

Wave Energy Technology Buoy Project

Ocean Recreation and Public Safety Report

Marine Corps Base, Hawaii, Kaneohe Bay, Oahu, Hawaii

Contract N62742-11-D-1800

Prepared for:

Helber Hastert & Fee Planners, Inc.
Pacific Guardian Center
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Prepared by:

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

January 2013

I. Marine Public Safety and Recreational Uses

1.1. Purpose

This marine public safety and recreational uses report is intended to provide information for an Environmental Assessment (EA) for several Wave Energy Technology (WET) buoys, which are proposed to be installed offshore Marine Corps Base Hawaii (MCBH) Kaneohe Bay. In accordance with the National Environmental Policy Act of 1969 (NEPA), an EA is being prepared to identify existing environmental conditions and potential environmental impacts. Helber Hastert & Fee, Planners, Inc. is the EA contractor for the project.

1.2. Project Description

The U.S. Navy is proposing to expand the present WET test site, which is in shallow water (30m), to a deep-water site, which would accommodate larger, higher power conversion buoys. The deepest extension of the proposed expansion site would be the 100m depth contour.

1.3. Scope

The scope of work included:

a. Observing ocean recreation activities and ocean conditions offshore MCBH Kaneohe Bay.
b. Interviewing ocean recreation activity users.
c. Indentifying potential impacts of the buoys on the ocean recreation activities and users.

1.4. Survey Methodology

Information for this report was gathered in 2011 and 2012 from a site visit to MCBH Kaneohe Bay and from interviews with people familiar with the existing and proposed test sites and the waters offshore the base. Additional baseline information came from my 2002 report entitled “Marine Public Safety and Recreational Uses Report for the Wave Energy Technology (WET) Test Environmental Assessment (EA).”

2 Physical Conditions

2.1 Test Site Area

The location of the present shallow-water test site is approximately one-half mile offshore the seaward end of the main runway. The location of the proposed deep-water test site at the 60- and 80-m depth contours is approximately one mile offshore the seaward end of the runway.

2.2 Base Regulations

The following information regarding the test site is summarized from MCBH Base Regulations, Chapter 11 Recreational Activities.

2.2.1 Buffer Zone

MCBH Kaneohe Bay is situated on Mokapu Peninsula, the large peninsula at the south end of Kaneohe Bay. The waters surrounding the base up to approximately one mile (1,609 meters) offshore have been established as a Naval Defense Sea Area (NDSA) by Executive Order. The Chief of Naval Operations has suspended restrictions imposed on entry into the NDSA except for a 500-yard (457.2 meter) buffer zone extending seaward from the shoreline of the base. However, entry restrictions into the entire NDSA are subject to reinstatement by the Chief of Naval Operations at any time without prior notice.

The present shallow-water test site is located at the seaward edge the 500-yard buffer zone. The proposed deep-water test site is located outside of the buffer zone, but within the established NDSA.

2.2.2 Boating

Boats within the buffer zone are subject to inspection by military police, MCBH game wardens, U.S. Coast Guard (USCG), MCB Hawaii Environmental Department's Conservation Law Enforcement Officers, and MCBH Waterfront Operations harbor patrol at any time without notice. Commercial fishing within the NDSA is unauthorized unless approved by the Commander, Naval Base Pearl Harbor. Only active duty military personnel and MCBH civilian employees may conduct boating activities in the buffer zone. All others must receive approval from the MCBH Commanding General.

While the same regulations may be applied to the deep-water test site, the Government does not plan to restrict passage to civilian boats between the shallow-water and deep-water test sites. The restricted buffer zone will remain at its current 500 yards from shore. However, boarding and trespassing on the wave energy devices and buoys at the deep-water test site will be prohibited. The surface devices will have lights and reflectors per USCG requirements and appropriate signage.

2.2.3 Variances

Commercial fishers and other persons and organizations desiring entrance into the 500-yard buffer zone must apply in writing to the MCBH Commanding General. The same regulation will not apply to the deep-water test site.

2.2.4 Penalties

Violations of the regulations governing boating, diving, and other ocean recreation activities may result in denial of the privilege to use MCBH Kaneohe Bay waters as well as other administrative or disciplinary action under the Uniform Code of Military Justice (UCMJ) and state/county law. MCBH will prosecute civilians violating the NDSA 500-yard buffer zone by trespassing to the fullest extent of the law.

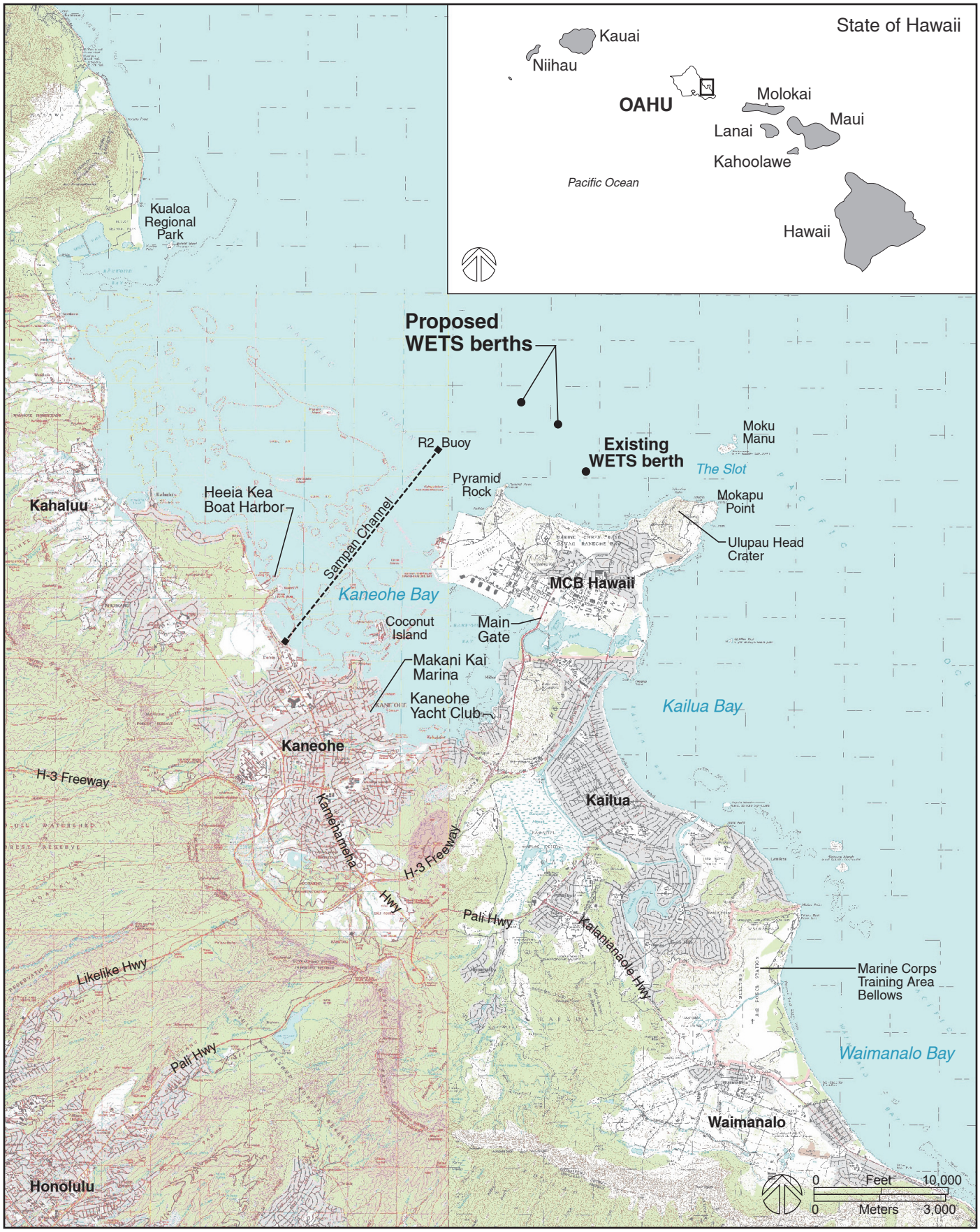
3 Ocean Activities

Mokapu Peninsula is a wide headland that separates Kailua Bay and Kaneohe Bay, two important ocean recreation sites on windward Oahu with both bays having public boat ramps for trailered boats. Kaneohe Bay also has a public small boat harbor at Heeia Kea, two private marinas, the Kaneohe Yacht Club (KYC) with 190 slips and the Makani Kai Marina with 80 slips, and other private piers and slips on the shore of the bay. The waters of the deep-water test site are located in a well-used transit corridor for boats traveling to and from Kaneohe Bay from other parts of Oahu, the neighbor islands, and the mainland. Specific activities that occur in and around the test site are primarily boating and fishing.

3.1 Boating

The waters of the NSDA seaward of the 500-yard buffer zone are a transit corridor for all types and sizes of boats. Boating traffic coming out of Sampan Channel at the east end of Kaneohe Bay almost always heads east and usually passes the seaward side of Moku Manu Island, but some boaters elect to go through the "The Slot," the channel between Moku Manu Island and Ulupau Crater. (See Figure 1.) During strong trade wind and seasonal high surf conditions, waters in The Slot are turbulent, so many boaters avoid it unless seas are calm. Boaters using The Slot pass between the shallow-water test site, where the present WET buoy is located, and the proposed deep-water test site.

Certain waters around Moku Manu Island, including The Slot, fall within a restricted area that is associated with the firing range in Ulupau Crater. When the range is in use, the waters offshore the crater are considered a possible impact zone for live ordnance, so MCBH has placed several yellow buoys in the area to designate the restricted zone. When the range is in use, the range



Regional Location
Wave Energy Test Site
MCB Hawaii, Kaneohe Bay

Figure 1

manager flies a red flag. As long as the flag is up, boaters are required to stay outside of the area marked by the buoys. When the range is in use, all boaters pass outside of Moku Manu Island and transit through the proposed deep-water test site. Range hours are 6:00 a.m. to 11:00 p.m., Monday through Sunday.

Sailboats are among the boats that transit the proposed deep-water test site. Many of them are from Kaneohe Yacht Club (KYC), which holds a number of races for their racing fleet in and around the deep-water test site area. These races draw from five to 20 participants. One of their popular races is from the R2 buoy, the head buoy at Sampan Channel, out to Moku Manu Island and back. (See Figure 1.) KYC also sponsors the Kalakaua Cup, an annual race from Waikiki to Kaneohe that transits the NDSA with the boats heading for Sampan Channel. The two day race includes a return leg to Waikiki over the same route on the second day.

Every even year in July, KYC hosts the Pacific Cup, a sailing race from California to Hawaii that ends in Kaneohe Bay. The finish line is an imaginary line from the top of Pyramid Rock on MCBH to the R2 buoy marking Sampan Channel. The race attracts approximately 70 entries. Race information and entry forms for the 2012 race are posted on the KYC website. As the boats in the race approach the finish line, they normally pass outside of Moku Manu Island, especially at night, but they may proceed through The Slot during the day if calm conditions prevail.

Non-motorized boats, such as kayaks and outrigger canoes, occasionally traverse the proposed deep-water test site for recreation, training, and racing.

3.2 Fishing

Trolling and bottom fishing are two popular types of fishing in the test site area. Boaters who are trolling coming out of Kaneohe Bay usually head out to sea towards several fish aggregating devices (FADs), such as the U Buoy, which is anchored in 554 fathoms and approximately 7.7 miles off Mokapu Peninsula. However, they often pass through the test site area, which is known to some to some of them as the Ono Run. Some bottom fishing for uku (*Aprion virescens*), moano kali, and other bottom fish species occurs in the test site area. Some scuba diving occurs near Moku Manu Island, mainly on the underwater ledges that are on the seaward and east sides of the island.

4 Marine Public Safety and Recreational Use Issues

During 2011 and 2012, interviews were conducted with following individuals who are familiar with the deep-water test site and the waters surrounding it.

Brian Benton, Dive Oahu staff member
Daniel Bishop, boater, fisherman, Kaneohe Bay
Elani Ching, Tropical Ocean Sports, Kaneohe Bay, staff member
John Dunbar, Senior Resource Efficiency Manager, Redhorse Corporation, MCBH
Marc Erickson, Sea Engineering, Inc
Lou Ickler, boater, Commodore, Kaneohe Yacht Club
Stan Osserman, boater, Kaneohe Yacht Club member
Robert Rocheleau, Sea Engineering, Inc.
Michael Roth, boater, Kaneohe Yacht Club member
Bud Scelsa, boater, Marine Surveyor, former Makani Kai harbormaster
Kit Welch, Aaron's Dive Shop staff member
Christian Werjefelt, boater, Kaneohe Yacht Club member
Lt. David Williams, Waterfront Operations, MCBH

An interview was also conducted with Earl Nishikawa, Chevron Hawaii Fire Chief, in regard to marine public safety and recreational user issues at the Chevron/Tesoro refineries mooring buoy site off Campbell Industrial Park.

4.1 Public Safety Concerns

Marine Corps Community Services lifeguards are normally on duty at North Beach and Pyramid Rock Beach, Monday through Friday 11:30 a.m. to 6:00 p.m. and on weekends, holidays, and liberty periods from 8:00 a.m. to 6:00 p.m. Lifeguards have authority to enforce regulations pertaining to beach safety. Failure to comply with the lifeguards' instructions is reported to the Military Police Department.

As noted in Section 2.2.2., boats operating within the 500-yard (457.2-meter) buffer zone are subject to inspection by military police, MCBH game wardens and Conservation Law Enforcement Officers, USCG, and MCBH Waterfront Operations harbor patrol.

The buoy device developers would monitor their respective buoys at both the shallow-water and deep-water sites. The Navy would be responsible for the mooring infrastructure. Although MCB Hawaii personnel, such as lifeguards, would not be directly responsible for monitoring or providing security for the existing shallow-water or proposed deep-water test sites, if any MCB Hawaii personnel notice suspicious activity related to the shallow-water or deep-water WET test sites, they would notify MCB Hawaii Waterfront Operations and the WET test site operating authorities.

In regard to the buoys at the deep water test site, informants were unanimous in their opinion that each buoy should be equipped with a warning light to minimize its potential as a hazard to navigation. Additional suggestions included advising boaters of the test site through a Legal Notice to Mariners (LNM), ensuring that chart corrections are made to show the locations of the buoys, and placing warning signage on the buoys.

Most informants also believe that the buoys at the deep water test site will act as fish aggregating devices (FADs), which will bring boats to the area.

Other public safety concerns identified by the informants are as follows:

a. Boaters may tie up to the buoys, especially if they include floating platforms or barges, which may result in damage or vandalism. Boats tying up at night would be hard to see from vantage points on base.
b. The oil in the buoys' hydraulic systems should be environmentally friendly, biodegradable, in the event of a spill.

4.2 Miscellaneous Comments

The idea of using wave energy to generate electricity is a good one.
We need to get off oil, so the wave energy technology is a good idea.

4.3 Barbers Point Offshore Moorings

The Chevron and Tesoro refineries at Campbell Industrial Park share a mooring site approximately one mile offshore at 100 feet (30.5 meters) deep. The site has experienced some challenges from unauthorized boaters and has, therefore, been designated as a restricted zone in the regulations of the Fourteenth Coast Guard District as follows:

Title 33: Navigation and Navigable Waters. Part 165- Regulated Navigation Areas and Limited Access Areas, Subpart F-Specific Regulated Navigation Areas and Limited Access Areas § 165.1407. Security Zones; Oahu, HI. *Barbers Point Offshore Moorings*. All waters around the Tesoro Single Point and the Chevron Conventional Buoy Moorings beginning at 21°16.43' N/158°06.03' W, thence northeast to 21°17.35' N/158°3.95' W, thence southeast to 21°16.47' N/ 158°03.5' W, thence southwest to 21°15.53' N/158°05.56' W, thence north to the beginning point.

In spite of the restricted zone designation, the buoys have been subject to damage and vandalism by unauthorized boaters. In response, Tesoro installed a security camera on one its tanks at the refinery. The camera focuses on the moorings, and boating violations in the security zone are reported to the Coast Guard.

5 Impacts on Public Safety and Ocean Activities

The impact of the WET buoys in the deep water test site on public safety and ocean activities will be minimal. Boaters will have to avoid the surface devices and other supporting equipment, but the devices and equipment will have lights and reflectors per USCG requirements, and appropriate signage. All the mooring and surface buoys associated with the project will be listed in a USCG Notice to Mariners. Therefore, the proposed new deep-water wave energy test site will not pose a hazard to navigation. Boarding and trespassing on the devices and equipment will be prohibited.

In addition, the Government does not plan to restrict passage between the shallow-water and deep-water test sites or have any plans to extend the present restricted buffer zone beyond its current 500 yards from shore.

Appendix D
ESA/EFH Informal Consultation

Appendix D.1
Navy ESA/EFH Consultation with Revised Information Package

- Navy consultation letter (6 June 2013)
- Navy concurrence request email (22 November 2013)
- Navy revised ESA/EFH information package (21 November 2013)

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, PACIFIC
258 MAKALAPA DR., STE. 100
PEARL HARBOR, HAWAII 96860-3134

5090P.1F13B
Ser EV2/0357
6 June 2013

Mr. Michael Tosatto
Pacific Islands Regional Office
National Marine Fisheries Service
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814-4700

Dear Mr. Tosatto:

SUBJECT: EFFECTS OF NAVY'S PROPOSED CONSTRUCTION AND OPERATION OF WAVE ENERGY TECHNOLOGY DEVICES ON PROTECTED SPECIES AND ESSENTIAL FISH HABITAT, MARINE CORPS BASE HAWAII, KANEOHE BAY, OAHU, HAWAII

Pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 USC § 1531 et seq.), the Navy requests informal consultation with the National Marine Fisheries Service (NMFS) regarding the proposed construction and operation of two offshore wave energy conversion (WEC) devices near Marine Corps Base Hawaii (MCB Hawaii), Kaneohe Bay. We have determined that species in the action area listed pursuant to the Endangered Species Act (ESA) are the threatened green sea turtle (*Chelonia mydas*), and the endangered Hawaiian monk seal (*Monachus schauinslandi*), humpback whale (*Megaptera novaeangliae*), and hawksbill sea turtle (*Eretmochelys imbricata*). Two coral species (*Montipora patula* and *M. flabelatta*) proposed to be listed pursuant to Section 4 of the ESA are also found in the project area. Please let us know if there are other listed or proposed species in the project area that may be affected that we have not considered.

This letter also requests your concurrence to fulfill Navy's requirements to consider the impacts of its actions on Essential Fish Habitat (EFH) as required by the Magnuson-Stevens Fishery Conservation and Management Act (16 USC § 1801 et seq.).

In brief, the Naval Facilities Engineering and Expeditionary Warfare Center proposes to construct and operate two deep-water berths for testing WEC devices approximately 6,500 feet (ft) (2 kilometers [km]) and 8,200 ft (2.5 km) off the north coast of the Mokapu Peninsula at MCB Hawaii, Kaneohe Bay. The proposed wave energy test site (WETS) would be located in waters with depths of approximately 197 ft (60 m) and 262 ft (80 m). The Navy previously established a similar wave energy technology (WET) test site ("shallow-water WET") in a nearby location at 100 ft (30 m) depth in 2003. Since that time, a total of three WEC devices have been sequentially installed, tested and removed at the existing shallow-water WET site.

The proposed action includes installation and operation of a three-point mooring system for each WEC device berth, two subsea power and communications transmission cables, in-water scientific data gathering equipment, and shoreside electrical transmission and monitoring equipment. Mooring systems would be held in place using commercially available drag embedment anchors and weights, and the power lines would be secured to the sea floor down to 100 ft (33 m) by hand-drilled bolts. A maximum of two WEC devices would be installed and operated simultaneously at the WETS. Construction of the new berths would occur within a three-year period, with the first deep-water WEC device installed in 2014. Timing of WETS decommissioning would be based on WEC device test activity but is currently planned for 2016.

A more detailed description of the project, including the Navy's analysis of anticipated impacts of the action on protected species and habitats, is provided in enclosure (1) for your reference.

Regarding ESA species:

The mooring structure for the proposed WEC device berths do not present a collision hazard because the moorings and devices are large and conspicuous enough to be avoided by marine mammals passing through the area. None of the elements of the mooring are loose or pliable enough to entangle a marine mammal or turtle. During installation and operation the sound pressure level from the loudest activities will be below the level that causes temporary threshold shift in hearing. Additionally, radiant heat, electric and magnetic fields are minimal around the power lines and are unlikely to be detectable or notable for marine mammals or sea turtles.

The Navy requests your concurrence with our determination that the proposed action *may affect but is not likely to adversely affect the ESA species listed above, because the effects, if any, will be discountable*. There were no observed impacts to marine mammals during the installation and utilization of the 2003 shallow-water WET berth, and although sea turtles were seen in the vicinity of the berth and other components, there was no evidence that any were adversely affected by it. The project will be insignificant in scope and duration and no taking of any listed species is expected. As such, formal consultation will not be required.

The two proposed coral species are found only in very low densities in the project area. The Navy has determined that impacts to these corals will be completely avoidable through carefully supervised installation of the WETS equipment and infrastructure. In accordance with Section 7, your concurrence with this determination of "no effect" is not required.

Regarding EFH:

The substrate in the project footprint is primarily algae and sand with scattered corals at low density. Although some coral in the area may form EFH, the Navy has determined that *the proposed project may affect EFH, but effects will be minimal and insignificant*. During the installation of the WETS, *steps can be taken to minimize and avoid effects on coral*.

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Ser EV2/0357
6 June 2013

Thank you for your consideration of our request for your review and concurrence. Should you have any questions or other concerns, please contact Dr. Sean Hanser of my staff at (808) 472-1388 or sean.hanser@navy.mil.

Sincerely,

KAREN SUMIDA
Business Line Manager
Environmental

Enclosure: 1. Wave Energy Test Site, Marine Corps Base Hawaii - Project Description and Assessment of Affected Marine Environment

From: Hanser, Sean F CIV NAVFAC Pacific, EV <sean.hanser@navy.mil>
Sent: Friday, November 22, 2013 6:05 PM
To: Devisser, Alexandra CIV EXWC, CIOFP1; Suwa, Alan M CIV NAVFAC Pacific, EV; Gail Renard
Cc: Chang, Connie M CIV NAVFAC PAC
Subject: FW: Wave energy test site ESA Section 7 informal consultation
Attachments: FW: the final WETS information package (2.08 MB)

-----Original Message-----
From: Sumida, Karen C CIV NAVFAC PAC
Sent: Friday, November 22, 2013 14:58
To: Mike Tosatto
Cc: Donald Hubner; Hanser, Sean F CIV NAVFAC Pacific, EV; Chang, Connie M CIV NAVFAC PAC
Subject: Wave energy test site ESA Section 7 informal consultation

Dear Mr. Tosatto,

Naval Facilities Engineering Command, Pacific has been conducting an informal consultation with your office under Section 7(a)(2) of the Endangered Species Act (ESA) for protected species that could be affected by the wave energy test site (WETS) proposed to be installed near Marine Corps Base Hawaii, Kaneohe Bay. The consultation was initiated with a letter requesting concurrence dated June 6, 2013. Constructive discussions have taken place with your office that have improved the assessment of the potential effects of the proposed project. The Navy and NMFS have been able to arrive at an agreement on the interpretation and understanding of the science that applies to the marine resources in the project area and the potential stressors associated with the project. The enhanced consultation package does not change the conclusion for which the Navy is requesting concurrence; the conclusion is still that the WETS projects may affect, but is not likely to adversely affect marine resources at the project site. The Navy has rewritten the assessment of the project and submitted the package on November 21, 2013 to Mr. Donald Hubner. I have attached the email submittal for your information. We request concurrence from your office based on the findings in the newly rewritten assessment.

Construction of the WETS would begin as soon as practicable following completion of consultation and permitting. Mooring installation is expected to last three to five days, based on current project information and may be adjusted as details on environmental conditions and engineering plans progress. The first WEC device is expected to be installed in 2014 and remain deployed for about a year. Current funding for the WETS is committed through 2016. Use of the site could extend beyond that time. Concurrence would be requested for an undetermined period that extends beyond 2016. The Navy acknowledges that wave energy conversion devices that are installed will need to comply with project parameters supplied for the consultation and that there could be future events, such as an ESA listing, that could trigger re-initiation of consultation.

Thank you for your consideration of our request. Please contact Dr. Sean Hanser of my staff at (808) 472-1388 or sean.hanser@navy.mil if you have any questions.

Sincerely,

Karen C. Sumida, P.E.
Environmental Business Line Manager
NAVFAC Pacific
808-472-1382

WAVE ENERGY TEST SITE, MARINE CORP BASE HAWAII
PROJECT DESCRIPTION AND ASSESSMENT OF AFFECTED MARINE ENVIRONMENT

21 November 2013

PROPOSED ACTION

OVERVIEW

Naval Facilities Engineering Command (NAVFAC) Expeditionary Warfare Center (EXWC) proposes to construct and operate two deep-water wave energy conversion (WEC) device mooring berths (A and B in Figure 1) near Marine Corps Base Hawaii (MCB Hawaii), Kaneohe Bay, Hawaii. The WEC berths would be sited at locations that are approximately 198 ft (60 m) and 264 ft (80 m) deep. This "deep-water" wave energy test site (WETS) would be located roughly 6,500 ft (2 km) and 8,200 ft (2.5 km) offshore of MCB Hawaii, with each berth supported by a 3-point anchoring system (described below). A similar test site at 100 ft (30 m) depth was installed in the same area in 2003 (shown in Figure 1). The Proposed Action

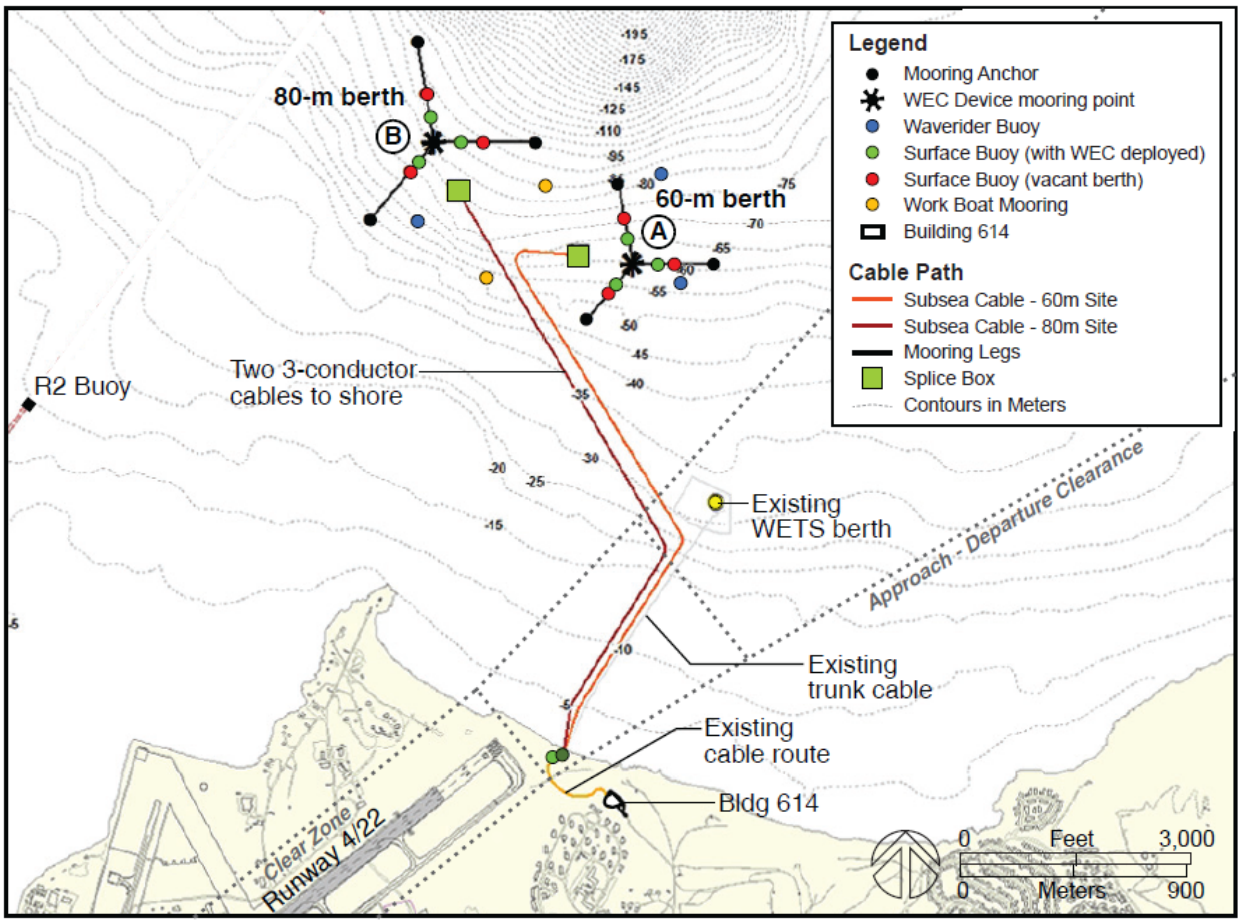


Figure 1. Proposed locations of the WETS near MCB Hawaii. The WET berth installed in 2003 is shown southeast of the proposed deep-water sites.

includes installation and operation of two trunk power and communications transmission cables and

associated shoreside equipment, and utilization of existing onshore data collection and monitoring facilities. The Proposed Action also includes installation and operation of scientific data gathering equipment in the vicinity of the deep-water berths.

There will be installation and operation of up to two new WEC devices at a time at the deep-water test sites. Different types of WEC devices could be tested at the WETS. Therefore, the berths would be designed to offer enough flexibility to support point absorber or oscillating water column WEC device mooring requirements. There will also be installation and operation of in-water equipment to gather scientific data on: 1) wave height/direction and currents near the deep-water WETS berths, 2) electromagnetic fields associated with the WETS electrical power transmission lines, and 3) underwater acoustics.

SYSTEM COMPONENTS

Deep-Water WEC Devices

Two basic types of WEC devices are likely to operate at the proposed deep-water WETS and are described in detail below: 1) point absorber and 2) oscillating water column. Examples of WEC devices are shown in Figures 2 and 3 and summarized in Table 1.

A ***point absorber*** is a wave device with dimensions much smaller than the wavelength of the incident ocean wave. These devices use the rise and fall of the water level or the surge motion (i.e., toward and away from shore) about a single point to convert wave motion into usable energy. They may use relative motion or water pressure to convert wave motion into power. In the "float and spar" configuration shown, the float follows the wave surface as it passes the device while the spar(s) remains relatively stationary, thus producing a differential motion between the two components of the buoy. Figure 2 shows several types of point absorbers WEC devices.

Oscillating water column (OWC) WEC devices use the rise and fall of the ocean water level inside a chamber to force air through a turbine/electrical generator. Figure 3 shows two oscillating water column WEC devices. Power is generated when sea water enters through a subsurface opening into a chamber with air above it (Figure 3B). Wave movement then causes the water column to move up and down, thereby forcing air through an opening to a turbine. The turbine used may be bi-directional where the turbine reverses with alternating air flow from the rise and fall of the water level, or the turbine may rotate in the same direction regardless of airflow direction.

The WEC devices would be equipped with reflectors and lighting complying with the U.S. Coast Guard (USCG) specifications, as Private Aids to Navigation. The USCG District 14 would specify the color and flash rate of the navigation light to be installed on the WEC devices deployed offshore of MCB Hawaii. Warning signs would also be attached to the WEC devices (e.g., "U.S. Navy Property—Keep Off" and "Danger—High Voltage—Keep Clear").

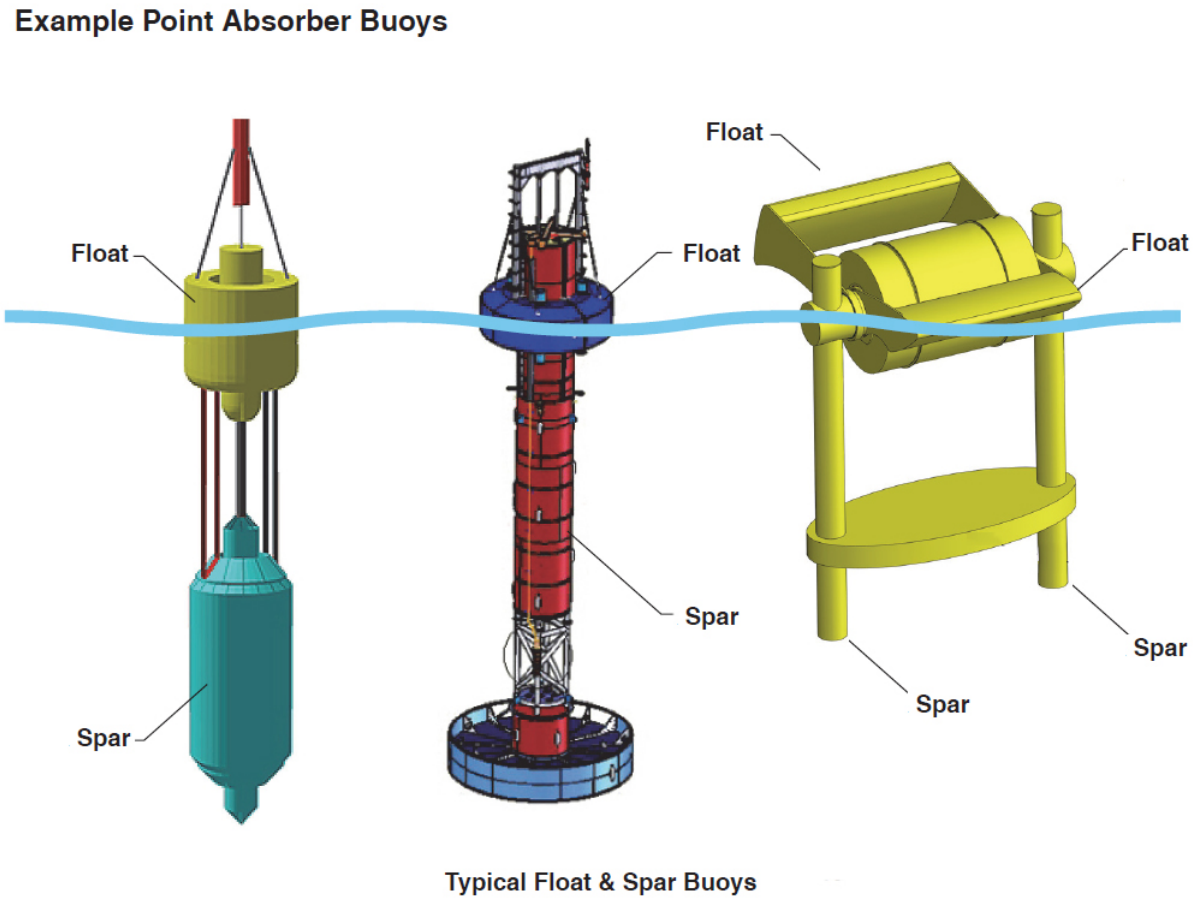
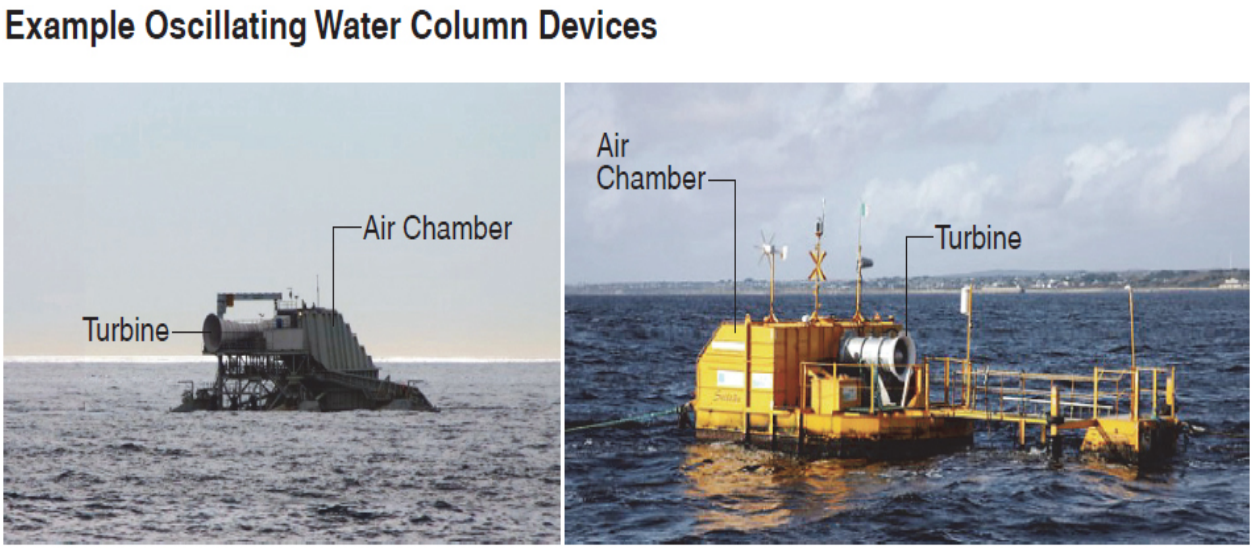


Figure 2. Three examples of point absorber WEC devices

A.



B.

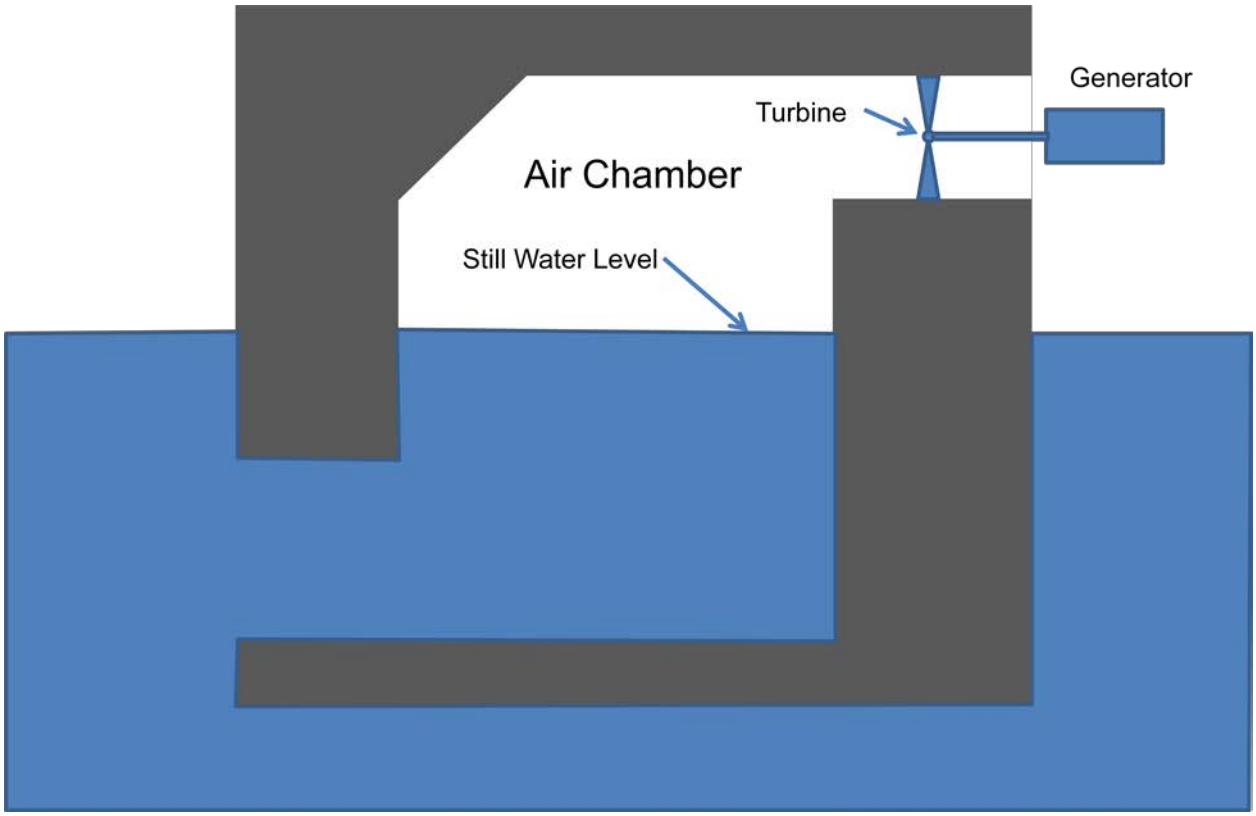


Figure 3. A) Two examples of oscillating water column WEC devices; B) depiction of the interior of an oscillating water column WEC device.

Table 1. Typical Point Absorber and Oscillating Water Column WEC Device Properties

Property	Point Absorber	Oscillating Water Column
Width	16 to 72 ft (5 to 22 m)	66 to 82 ft (20 to 25 m)
Length	16 to 82 ft (5 to 25 m)	49 to 164 ft (15 to 50 m)
Height	13 to 203 ft (4 to 62 m)	66 to 82 ft (20 to 25 m)
Height Above Water Line	5 to 30 ft (1.5 to 9 m)	7 to 36 ft (2 to 11 m)
Dry Weight	8 to 1,320 short tons (7 to 1,200 metric tons)	8 to 1,320 short tons (7 to 1,200 metric tons)
Power Take-Off	a) Vegetable-based hydraulics or gear drive connected to electrical generator; or b) Magnetic generator technology	Air turbine connected to electrical generator
Mechanical Operation	Two or three main components oscillate relative to each other	Oncoming waves force air through turbine via internal chamber
Power Output	10 to 1,000 kilowatt (kW)	500 to 1,000 kW

WEC Device Installation

As WEC device developers have not yet been selected for research/testing at the deep-water WETS, the devices that are ultimately deployed may have slightly different installation procedures. Deployment of the individual WEC devices at the deep-water WETS berths would require both NEPA documentation (separate from the Ecological Assessment for this project) and Rivers and Harbors Act, Section 10 permits from the Department of the Army.

Mooring System

The deep-water mooring system would be a three-point, conventional catenary design, with each leg located approximately equidistant from each other in a circular configuration around each of the two WEC device locations. Figure 1 shows the proposed locations of the three-point mooring systems and Figure 4 illustrates a schematic diagram of a typical mooring leg profile. The bottom material in the proposed deep-water WETS mooring sites is comprised of a sand layer at least 16.4 ft (5 m) deep, which is suitable for commercially available drag embedment anchors. Therefore, commercially available anchors (e.g., Bruce or claw anchor) are likely to be used at the deep-water WETS.

The anchors would be located approximately 922-ft (281-m) from the center of the 197-ft (60-m) depth WETS berth (Mooring A) and 1,155 ft (352 m) from the center of the 269-ft (82-m) depth WETS berth (Mooring B, see Figure 1). The anchors would be connected to 3-in (7.6-cm) ground chain, or similar apparatus. From the anchor, approximately five concrete sinker weights would be connected to a length of mooring chain to increase anchor holding capacity and minimize movement of the chain and anchor on the seafloor. The sinker weights provide about 7.5 tons of dry weight to each leg of the mooring system. Approximately 700 ft (213 m) of chain would extend from the anchor, to the sinkers, through the water column to a 13 ft (4 m) long chain pigtail connected to the bottom of a surface buoy (see Figure 4). The length of chain that extends from the last sinker to the surface buoy will be approximately equal to the depth of the water. The surface buoy (approximately 10 ft [3 m] in diameter) would have a steel core with an outer polyurethane jacket and be equipped with reflectors, lights, and warning signage in accordance with USCG requirements.

Under the Proposed Action, the Navy would install and maintain the mooring system up to and including the chain pigtail and surface buoy. The WEC device developers would be responsible for the remaining components needed to connect their devices to the mooring system (e.g., mooring rope connecting to the chain pigtail at the surface float).

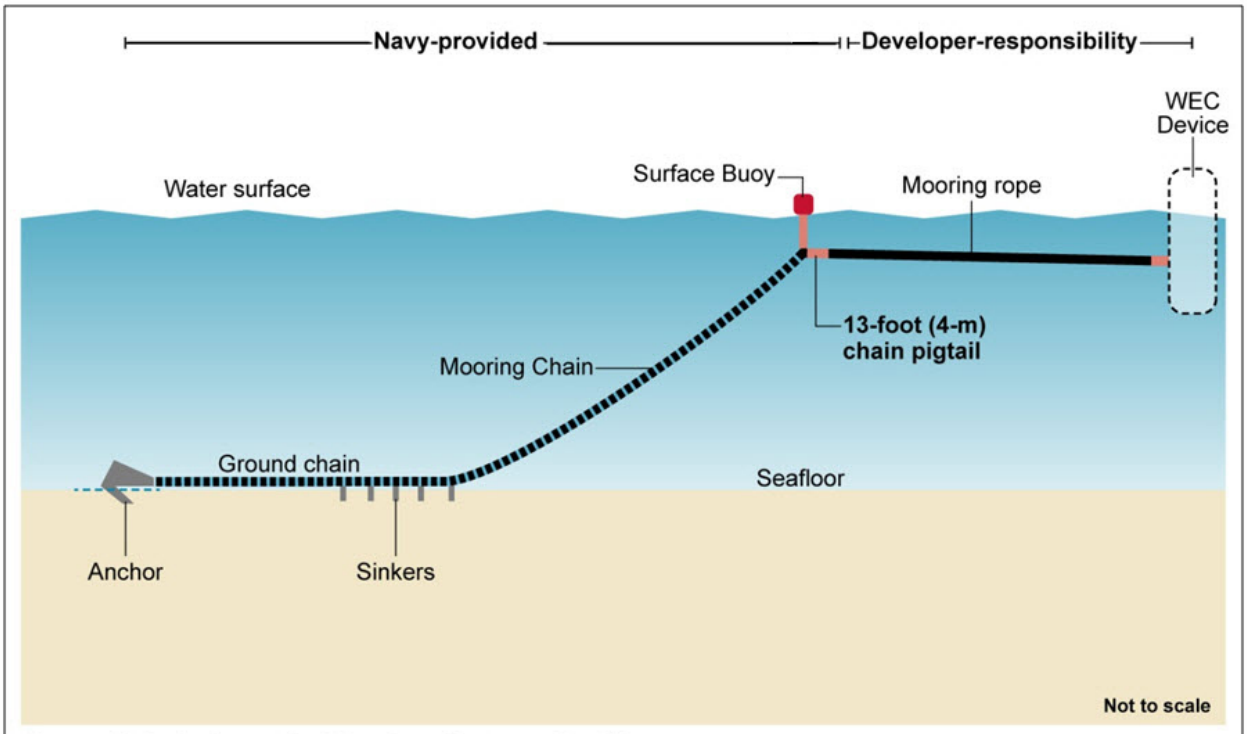


Figure 2-3: Schematic Mooring System Profile

Figure 4. The elements of a single leg of the three-point mooring system. This Figure will also appear in the Assessment for this project as Figure 2-3.

Mooring Installation

The general procedure for installation of a drag embedment anchor mooring system would take three to five days. Anchors and associated mooring hardware would be loaded on an offshore work boat or barge with a heavy lift capability. The offshore work boat/barge would transit to the first mooring anchor site and position itself over the desired deep-water WETS berth anchor position using dynamic positioning or by deploying a temporary mooring using onboard boat anchors. Anchors from work boats/barges would be placed to avoid coral to the highest degree practicable.

The first anchor would be lowered into position using a ground chain, which would be slightly longer than the water depth at the anchor site. Once the anchor has been set on the bottom, the first sinker weight would be connected to the ground chain as the chain is deployed. The work boat would then warp toward the center of the mooring area while connecting and lowering the remaining sinker weights with the mooring chain such that the ground chain is laid taught on the bottom. Once the last sinker weight reaches the bottom, the balance of the mooring chain would continue to be paid out. When the end of the mooring

chain is reached, the chain pigtail and surface float would be attached where it would be allowed to float above the last sinker weight. The mooring chain will float directly above the last sinker weight and will be under tension, because the float will not reach the surface. The length of chain that is attached to the last sinker, called the mooring chain or riser chain (Figure 4), will be equivalent to the depth of the water. Therefore, there will be no slack or movement of the chain that will scour the substrate around the anchor and sinkers. When a WEC devices is installed, the mooring rope that will be necessary to allow the device to be secured to the mooring chain will be put in place at that time. The mooring rope will be removed when the WEC device is removed.

The work boat and barge would return to Honolulu Harbor and load anchors and mooring hardware for the remaining moorings and repeat the process outlined above.

Transmission Cable System

A representative transmission cable system planned for the deep-water WETS would contain two power and communications cables. The power cable would transmit electrical power and data from the deep-water WEC devices to onshore facilities. Figure 5 schematically illustrates the undersea power and communications cable system. The power conductors within the power transmission cable would be rated for 15 kilovolts (kV) and the cable would also contain fiber optic cable for transmitting data and communications information. The actual system used for the WETS project may vary from this description in materials, dimensions, connections, etc., but would fall within the general framework and function described.

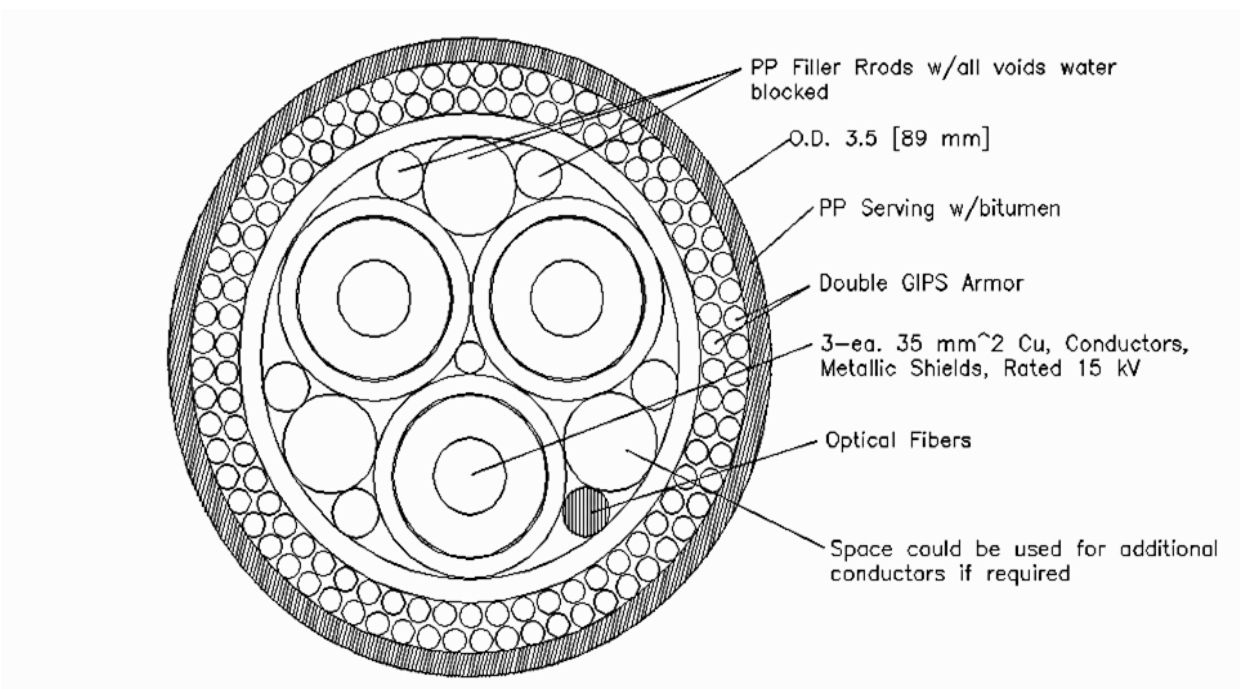


Figure 5. A cross section of 3-conductor – 15 kV submarine power cable like the one expected to be used for the WETS project. As stated on the diagram, the outside diameter is 3.5 inches.

Umbilical Cables and Splice Boxes

Each WEC device developer is to provide a short section of 3-conductor umbilical cable containing the electrical power output and fiber optic data lines that would extend from each deep-water WEC device through the water column and connect to a splice box on the seafloor (Figure 6). The trunk cables would then be routed from the splice box to an existing onshore electrical grid connection point within MCB Hawaii. Each splice box consists of a steel frame anchored by weights and fitted with splice housings for power conductors and fiber optic lines. When different WEC device developers deploy their respective devices at the deep-water WETS, the splice boxes would be raised to the water surface so the umbilical cables for the new devices can be connected to the respective trunk cable.

A series of floats would be used to create an "S-tether" in the top portion of the umbilical, with this section of cable suspended in the water column in the "S" configuration. The umbilical segment closest to the WEC device would sink under its own weight, while the floats raise the next umbilical section to a depth that would still allow safe passage for any vessel traffic that would typically traverse the area (i.e., 30 ft [9 m]). The "S-tether" is a typical configuration used for WEC device umbilicals as it allows the device to move laterally and vertically in a limited watch circle in order to avoid straining the cables and connections. To facilitate the launch and future recovery of the splice box, a wire rope retrieval line would be connected between the splice box and a subsurface float. The subsurface float would be located approximately 30 ft (9 m) below the ocean surface.

Cable and Splice Box Installation

The nearshore route (i.e., to the 100-ft [30-m] depth) of both new subsea cables would be parallel to and within 100 ft (30 m) to the west of the existing shallow-water WET berth subsea cable. The in-water installation process for the subsea cables and associated equipment would occur over a period of one to two days.

New cable comes from a cable-laying vessel that would be anchored offshore. Using an onshore pulling line and winch or other truck-mounted pulling equipment (e.g., excavator or backhoe) located near the existing utility vault, the end of the trunk cable is pulled off the vessel towards shore. As the cable leaves the vessel it is buoyed on the surface using floats tied to the cable at regular intervals of 10 ft (3 m). The floats prevent the cable from contacting the seafloor during the shore landing. The cable would be anchored to the shore above the high water mark using rock bolts. Divers would then remove the floats, starting from the beach out and progressing to the installation vessel. As the divers cut the floats off the cable, biological divers from an accompanying small support boat would guide the cable to the seafloor, readjusting it, if necessary, to ensure that it is properly placed on the seafloor, avoiding coral and other seafloor features.

As was done for the existing transmission cable from the shallow-water berth, the transmission cable would be anchored along its length from the bore hole exit point (in 33 ft [10 m] of water) to a depth of approximately 98 ft (30 m) by either rock bolts or protective split pipe. The hollow, self-securing rock bolts would be filled with grout which would set within 24 hours. No trenching would be required. The offshore route would avoid areas of high vertical relief, which would cause cable suspensions, and follow branches of sand deposits that extend seaward from the beach through the sand channel zone, where practical. The offshore route (i.e., greater than 100-ft [30-m] depths) would be planned during the design phase following completion of a route elevation and visual inspection survey.

The splice box would be installed or changed as follows:

1. When the installation vessel is laying the 3-conductor trunk cable, it would slow to a stop when it is about 130 to 165 ft (40 to 50 m) from the intended splice box location.

2. The vessel would position itself so the lifting equipment (A-frame or crane) pick-up point is above the desired splice box location.

3. The vessel would connect the lifting wire to the splice box subsurface float, lift the splice box off the deck and then lower it to its final location on the seafloor in a controlled manner.

4. Once the splice box is on the seafloor, divers would disconnect the lifting wire from the splice box subsurface float.

5. Splice box installation is complete at this point.

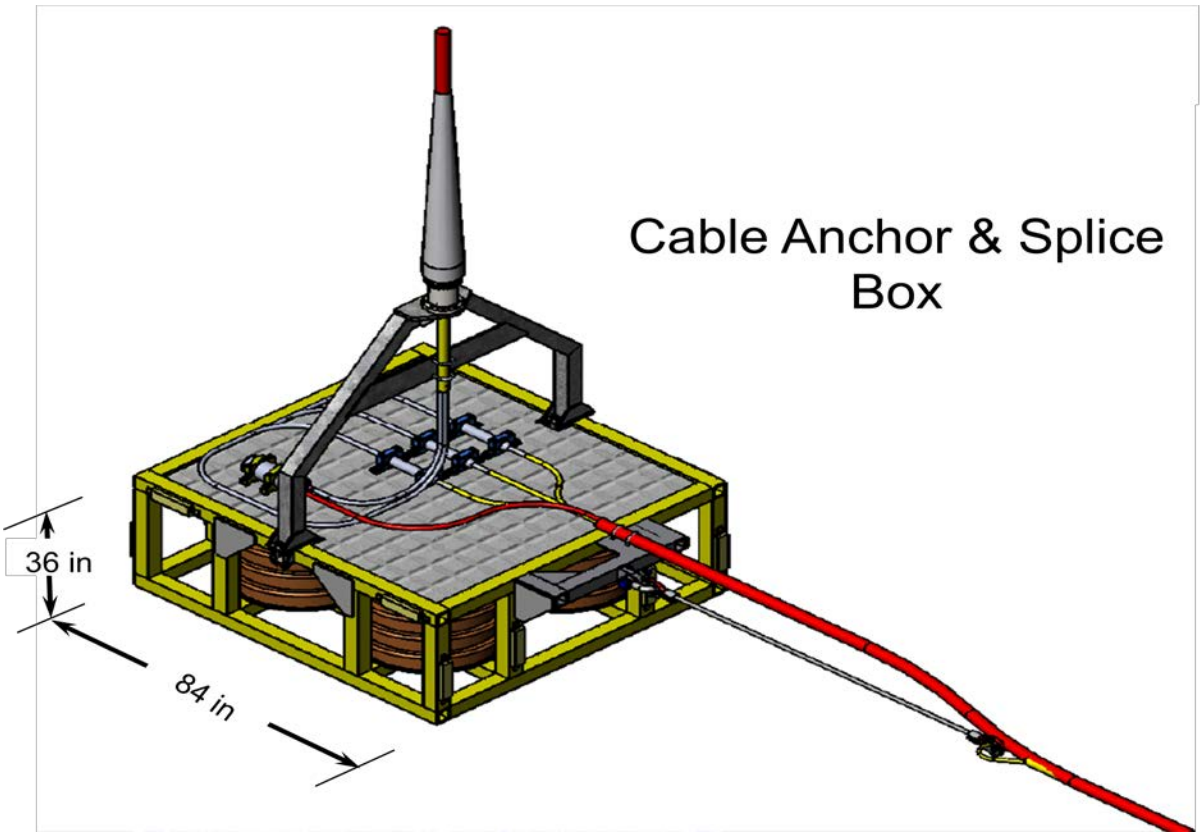


Figure 6. The splice box where the umbilical for a WEC device attaches to the transmission line that carries power to the shore.

Scientific Data Gathering Equipment

The Proposed Action also includes installation and operation of scientific data gathering equipment in the vicinity of the deep-water WEC berths. The data gathering devices are funded by the U.S. Department of Energy under grants made to Hawaii National Marine Renewable Energy Center at the University of Hawaii at Manoa. All devices will be deployed and retrieved in a controlled manner. The data gathering devices include: three wave measuring buoys in the vicinity of the deep-water WETS, probes to measure

the electromagnetic field (EMF) signature of the undersea power cables, acoustic monitoring stations to measure sound levels from the WEC devices, and an Acoustic Doppler Current Profiler (ADCP) to record ocean current and wave conditions. Consultations are already completed for these data gathering buoys during US Army Corps of Engineers permitting to the University of Hawaii under Nationwide Permit #3, POH-2011-00308 (NMFS, Pacific Island Regional Office # I-PI-12-1006-LVA). These devices would be removed by the completion of the WETS testing period. The Nationwide Permit covers the deployment of three buoys. If additional buoys were to be deployed by University of Hawaii, the effects of additional buoys would be considered between NMFS and the US Army Corps of Engineers to modify the permit.

Wave height and wave direction. "Waverider©" buoys have become the standard for measuring wave height and direction by using accelerometers and a compass mounted in a stabilized platform. The 3-ft (0.9-m) diameter buoy weighs 495 lbs (225 kg) (in air) and resolves the wave field to approximately 0.4 in (1 cm) in height and 1.4 degrees in direction with accuracies of 0.5% to 1% of measured height value and 0.5 degrees for direction. Using standard recording parameters, three years of continuous operation can be achieved. The University of Hawaii deploys and maintains the Waverider© buoys installed throughout Hawaii. This type of data would assist in understanding the wave energy technologies being tested as well as how wave energy technologies can more effectively produce energy. These buoys would also provide data that can be used to better characterize the Kaneohe Bay area ecosystem. Three of the proposed locations are shown in Figure 1; the fourth location is to be determined.

Electromagnetic field probes. Two EMF probe units would measure EMF levels resulting from operation of the energized trunk transmission cables from the deep-water WETS berths. The units consist of field recorders connected to a flat 4-ft (1.2 m) by 5-ft (1.5-m) platform that would be placed on the seafloor. A surface marker buoy would be attached to allow for retrieval. One unit would be deployed within 6.5 ft (2 m) of the trunk cable being measured and the other would be located about 3,280 ft (1 km) from the cable in an area of similar depth, as a "control" site.

Acoustic monitoring. To passively receive sound data, three acoustic monitoring stations would be employed at various times throughout the WETS operational period. Each station consists of hydrophones encased in a waterproof covering that would be used to listen and record sounds emitted by the WEC devices. Each station would be 72 in (1.8 m) long by 6 in (15 cm) in diameter. They would initially be deployed near each WEC device (three hydrophones per device) and gradually moved further distances away to record noise attenuation patterns. Because they are buoyant in water, the stations would be weighted down to ensure they remain in place.

The EMF probe and acoustic monitoring stations would be deployed and retrieved from a small boat-mounted crane by one or two people. The stations would include deployment of subsurface buoys (approximately 10 in [25 cm] in diameter) to facilitate retrieval of the stations by divers. These subsurface buoys would float approximately 98 ft (30 m) below sea level. The stations would be operational for approximately two years.

Doppler Profiler. An ADCP would be deployed on the seafloor near the deep-water WETS berths to record real time wave and current data. The device emits sound bursts into the water and calculates wave and current data based on the Doppler shift of the returning echoes. The ADCP would transmit at a

frequency of 600 kHz. The ADCP proposed for use is 16 in (40 cm) high and 9 in (23 cm) in diameter. It would be bolted to a fiberglass grate base approximately 24 in (60 cm) by 24 in (60 cm) and installed on and retrieved from the seafloor using the same procedures as for the acoustic monitoring stations (i.e., by small boat, utilizing subsurface buoys facilitating retrieval by divers). Four 22-lb (10-kg) weights would be tied to the corners of the grate base to anchor the assembly on the seafloor. Upon completion of the WEC device, the ADCP (including grate and weights) would be removed by divers.

BEST MANAGEMENT PRACTICES

A series of best management practices will be applied during the construction and operation of the proposed action. The BMPs are divided into two parts (A and B). Part A is specific BMPs directed at minimizing effects from the project on protected species. Part B is a series of BMPs that minimize effects from the project on the environment. All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g. employee, contractor, etc.) shall be fully briefed on these BMP and the requirement to adhere to them for the duration of their involvement in this project.

A. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the proposed action, particularly in-water activities such as boat operations, diving, and deployment of anchors and mooring lines.

1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the proposed action for ESA-listed marine species.
2. During construction or WEC device installation, surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.
3. Personnel shall remain alert for marine mammals before and during drilling. Do not commence drilling if a marine mammal is observed within 1,640 ft (500 m) of operation. Wait 30 minutes after the last sighting of the marine mammal before starting to drill. If drilling is already started and a marine mammal is sighted within 1,640 ft (500 m) after drilling has commenced, drilling can continue unless the marine mammal comes within 820 ft (250 m) during drilling; operations should then cease until the animal is seen to leave the area of its own volition or after 30 minutes have passed since the last sighting.
4. All work shall be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species (other than monk seals on land) are noticed within 50 yards after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that the activity would not affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.
5. All personnel will stay more than 150 ft (45.5 m) from monk seals and sea turtles that haul out on the beach.
6. Personnel will not perform work on the beach during the time that a Hawaiian monk seal is hauled out if the work would be so loud as to expose them to 100 dB re 20 μPa in-air.
7. Personnel will not perform work on the beach if turtle nesting is known or suspected to be occurring.

8. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.
9. When laying subsea transmission cables, divers or a remotely operated vehicle (ROV) will accompany the cable to ensure the cable is placed flat on the seafloor along its entire length, further ensuring no entanglement is possible.
10. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include 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.
11. Subsea cables shall be routed to minimize impacts to corals. Colonies of *Montipora flabellata* and *M. patula* (corals proposed for listing under the ESA) observed along the subsea cable route shall be identified and avoided completely. Other corals shall be avoided to the highest degree practicable. Diver or ROV assisted installation shall be employed to assist coral avoidance, and the cables shall be secured to the seafloor at depth less than 100 feet, to ensure they don't move.
12. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.
13. When piloting vessels, 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.
14. Reduce vessel speed to 10 knots or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots or less.
15. If despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 feet away, and then slowly move away to the prescribed distance.
16. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.
17. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

B. Minimizing effects to the marine environment from project-related activities.

18. A contingency plan to control toxic materials is required.
19. Appropriate materials to contain and clean potential spills shall be stored at the work site (including aboard project-related vessels), and be readily available.
20. All project-related materials and equipment placed in the water shall be free of pollutants.
21. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.
22. Fueling of land-based vehicles and equipment shall take place at least 50 ft away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.

23. Turbidity and siltation from project-related work shall be minimized and contained through the appropriate use of erosion control practices, effective silt containment devices, and the curtailment of work during adverse weather and tidal/flow conditions.
24. A plan shall be developed to prevent debris and other wastes from entering or remaining in the marine environment during the project.

DESCRIPTION OF THE MARINE ENVIRONMENT

Endangered Species Act Species

ESA species that may be present within the footprint of the project include the endangered Hawaiian monk seal (*Monachus schauinslandi*), humpback whale (*Megaptera novaeangliae*), Hawaiian insular stock false killer whales (*Pseudorca crassidens*), and hawksbill sea turtle (*Eretmochelys imbricata*). The threatened green turtle (*Chelonia mydas*) may also be present near the project location. Of these species *Pseudorca* is extremely unlikely to occur at the WETS. They are species that are found in deeper water and rely on food sources that are typically pelagic, so their presence is anticipated only as an unusual and rare event.

According to the Navy's 2003-2013 surveys and multi-agency surveys performed in 2004, there were no sightings of endangered ESA species at or in the vicinity of the existing shallow-water WET berth, and only one green turtle was seen within 1,625 ft (500 m) of the site. These surveys also concluded that installation and operation of the WEC devices and associated infrastructure at the shallow-water WET berth had not resulted in increased forage/food sources for hawksbill or green sea turtles. Therefore, the equipment has not served as an attractant for these protected species, based upon increased food sources. No threatened or endangered species were seen or detected acoustically within 1,625 ft (500 m) of the anchor base or transmission cable of the existing shallow-water WET berth during the May 2011 surveys, although green sea turtles were sighted during transits through Kaneohe Bay and the Main Channel to and from the survey areas. There has been no evidence that any ESA species has become entangled or entrapped in any of the equipment associated with the installation or operation of the shallow-water WET berth.

The scleractinian corals *Montipora patula*, and *Montipora flabellata* have been proposed by NOAA Fisheries for "threatened" status under the ESA. Colonies of both species were found sparsely scattered among other corals in the reef flat zone, at depths between about 30 and 50 feet, during surveys conducted by the Navy between 2003 and 2011 for the existing shallow-water (30-meter) WET berth off MCBH.

Critical Habitat

Per the proposed rulemaking to revise designated critical habitat for Hawaiian monk seals, the planned mooring sites are within an area that has been proposed for designation (76 FR 32026, June 2, 2011). However, MCB, Hawaii and adjacent marine waters out to 500 yards (454 m) from shore are specifically excluded from the proposed designation based on the installation's integrated natural resources management plan (INRMP).

Essential Fish Habitat

The marine EA for the shallow-water WET project (Appendix H in 2003 WET EA) described the shallow-water WET berth project area as comprised of six basic habitat types or zones. These six zones, described below, have remained generally unchanged with the installation and operation of the existing shallow-water WET berth, and continued to accurately characterize the conditions in May 2011 (NAVFAC EXWC 2011).

Sand-Boulder Zone. From 0 to approximately 12 to 15 ft (3.7 to 4.6 m), this zone consists of a bed of coarse-grain carbonate sand that is kept in a state of continual resuspension by wave energy. Very little coral was observed residing in the sand-boulder zone during the 2002 marine survey.

Sand Channel Zone. From approximately 12 to 18 ft (3.6 to 5.5 m) to approximately 30 to 35 ft (9.1 to 10.6 m), the ocean bottom consists of consolidated limestone bisected by small channels, which vary in width and eventually end in ridge formations. These spur and groove formations are oriented roughly perpendicular to the bottom contours and the shoreline. Generally 3 to 4 ft (0.9 to 1.2 m) of relief is present between the bottom of the channels and the adjacent ridges. While the channel bottoms typically consist of flat and scoured limestone with a thin veneer of sand, some live coral is present on the ridges. The constant state of resuspension in the sand channel zone restricts settlement of bottom dwelling organisms on both the sand and limestone surfaces. Macrobiota observed in this zone were scattered heads of the branching coral *Pocillopora meandrina*, native to Hawaii, which grow along the vertical sides of the reef channels.

Reef Flat Zone. From 30 to 35 ft (9.1 to 10.6 m) water depth to approximately the 50-ft (15-m) depth, there is a wide plateau of relatively solid, flat limestone. Some scattered areas of vertical relief exist, generally due to potholing, coral growth, or the presence of small limestone ridges and ledges. The bottom slope in this zone is approximately 1 to 70 (rise to run). The surface of the limestone reef flat consists of a short algal turf that binds a thin layer of carbonate sediment. Macrobiota in this zone include sporadic heads of the coral *P. meandrina* and flat encrustations of the corals *Porites lobata* (native), *Montipora capitata* (native), *Montipora patula*, and *Montipora flabellata*. *M. patula* and *M. flabellata* were proposed by NOAA Fisheries for "threatened" status under the ESA. Coral growth is greater along the edge of the ledges than the flat areas. Colonies of the native coral *Pocillopora eydouxi* up to 2 ft (0.6 m) in height occur infrequently in this zone.

Escarpment Zone. *Found* between 50 ft (15 m) to 90 to 95 ft (27 to 29 m), with an approximate slope of 25 to 30 degrees between 50 to 65 ft (15 to 20 m) depth. While there are bottom slopes as steep as 1 to 7 (rise to run), no prominent vertical ledges or wave-cut notches are present in the shallow-water WET berth area. The bottom is relatively flat limestone with widely scattered areas of vertical relief. The primary macrobiota on the escarpment is the flat encrusting coral *M. capitata*. In some localized areas, this species covers up to 50 percent of the substrate.

Deep Reef Platform Zone. From the bottom of the escarpment zone, the seafloor slopes gradually to a depth of approximately 100 ft (30.5 m) where it becomes almost featureless. The flat limestone surface is covered by sand 1 to 2 in (2.5 to 5 cm) deep, and covered in some areas by algal turf. The most plentiful macrobiota are scattered heads of the coral *P. meandrina* and flat encrustations of the coral *M. capitata*.

Macrobiotic composition varies from relatively high coral cover above the 95 ft (29 m) depth contour to the relatively little cover below this boundary.

Undercut Ledges. At several locations at the eastern end of the deep reef platform, a system of small undercut ledges runs parallel to the depth contours (in the vicinity of the shallow-water WET berth). A ledge with an approximate length of 25 ft (7.6 m) exists at the 93-ft (28.3-m) depth and a 150-ft (45.7-m) long ledge system exists at around the 100-ft (30.5-m) depth contour.

The ***deep-water zone*** refers to habitat beyond the 98-ft (30-m) depth. In 2011, Sea Engineering, Inc. conducted a multibeam bathymetry survey of the proposed deep-water WETS berths. The area is characterized by extensive flat and featureless substrate with occasional sand ribbons and barchans (dunes). There were patches of algae and, in some areas, sparsely scattered coral heads (*M. capitata*). The areas chosen for placement of the deep-water WEC device anchoring systems are characterized by featureless sandy substrate. Pelagic species of fish are present in the water column, but there is minimal to no relief or sheltered habitat for benthic or reef associated organisms.

There was no evidence that any portion of the shallow-water WET berth power cable had moved since being installed in 2003 and no evidence that any corals had been damaged due to movement of the power cable. The 2011 survey verified that none of the corals observed on or immediately adjacent to the anchor base complex or transmission line showed any signs of disease or stress since 2003; with the exception of some moderate bleaching found on *P. meandrina* and *M. capitata* at distances of at least 490 ft (150 m) from any equipment associated with the shallow-water WET berth.

Scleractinian corals have successfully recruited to and grown on existing shallow-water WET berth project equipment. The density of corals on the power transmission cable is, in fact, greater than the density of corals on the adjacent seafloor areas. The first coral detected on the anchor chains was *P. meandrina* sighted in February 2005. More coral recruitment has been observed on the anchor chains than on any other portion of the equipment complex. *Pocillopora meandrina* was the overwhelmingly dominant recruit (>90%) of all recruits observed. The other species which were observed growing on the anchor chains were *P. damicornis* (native), *M. capitata*, and *Porites lobata*. In spite of signs of predation by parrotfish in 2005, the number and size of the colonies steadily increased through 2007. By 2011, the subjectively estimated biomass of corals growing on the anchor chains was greater than in 2007, but the total number of colonies was less.

Within less than 18 months of the transmission cable installation at the existing shallow-water WET berth, the flora and fauna on the cable closely matched the flora and fauna adjacent to the cable and within 81 ft (25 m) on either side (see Figure 7). At the time of the May 2011 survey, the cable supported a healthy cover of turf algae, crustose coralline algae, other algae, and scleractinian corals. Macroscopic biotic cover, including the coral *P. meandrina*, was greater on the power cable than on the seafloor at all depths.

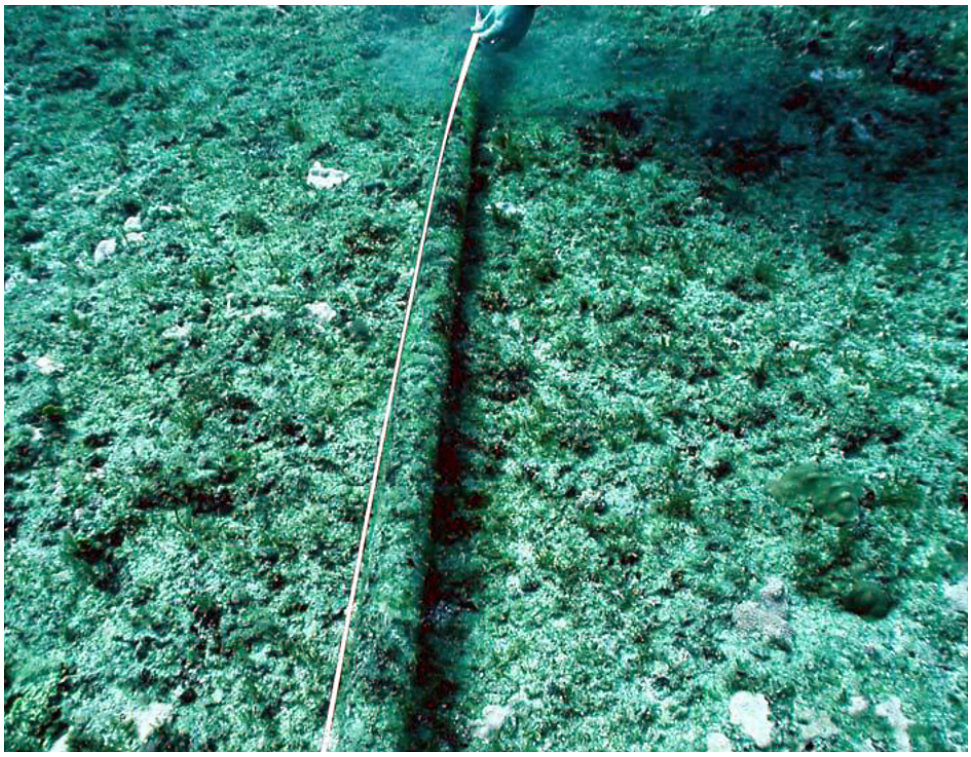


Figure 7. Power transmission cable in seaward portion of Reef Flat Zone; note that cable is nearly indistinguishable from the surrounding sea floor. (September 2004)

ASSESSMENT OF THE EFFECTS

Threatened, Endangered and Protected Species

Marine Mammals.

The ESA-listed marine mammals that could transit the project site are the Hawaiian monk seal, the humpback whale and the Main Hawaiian Islands insular false killer whale stock. Impacts to marine mammals from the existing shallow-water WET berth were assessed from 2001-2003 and again in 2011, before and after the first shallow-water WEC device was installed. During these surveys, no threatened or endangered species or marine mammals were seen (or heard) within 1,640 ft (500 m) of the anchor base or power cable, although pods of spinner dolphins were sighted during transits through Kaneohe Bay and the Sampan Channel to and from the survey areas. The general lack of marine mammals observed in the project area on a regular basis over time indicates a reduced risk of adverse impacts to marine mammals.

Sea Turtles.

The qualitative and quantitative data gathered by the Navy between 2003 and 2011 for the existing shallow-water WET berth indicate that no endangered hawksbill sea turtles have been sighted at or in the general vicinity of the project site. Also, no threatened green sea turtles were sighted during underwater surveys and only one specimen was seen within 1,640 ft (500 m) of the shallow-water WET berth from the surface of the water. The low abundance of turtles in the area may be due to the lack of foraging and resting habitat, coupled with the less desirable high energy environment. Due to the low abundance of sea

turtles in the general area, it is expected that the Proposed Action will not impact sea turtles. Potential minimal impacts may include noise from securing the cable, avoiding or being attracted to the equipment, and interaction with the subsea transmission cable during installation.

Collision Hazard

During installation of the new WETS berth infrastructure and scientific measuring devices, in-water operations would pose low risk to marine mammals and sea turtles, as vessel speeds would be low and controlled (i.e., 0.5 knots). Operators will be vigilant for marine species at all times and follow the BMPs in order to operate safely and avoid marine species. During the operational period, the mooring hardware, subsurface buoys, scientific monitoring equipment, and WEC devices would not pose a collision hazard to marine mammals and sea turtles, as these elements would be large enough to be easily detected and these species are agile and maneuverable within their medium. Due to the low number of marine mammals and sea turtles in the area, the low speeds that vessels will need to be operated at the project site, and relatively low number of trips required for boats to construct the deep-water WETS, and the application of BMPs, vessel movement may affect, but is not likely to adversely affect marine mammals because the effects are discountable.

Entanglement/Entrapment

There has been no evidence that sea turtles, monk seals, or other marine mammals have ever become entangled or entrapped in any of the existing shallow-water WET berth equipment or infrastructure.

The deep-water WETS berth power transmission cables would be attached to the seafloor to a depth of approximately 100 ft (30 m); therefore there is no likelihood of movement of the cable by waves and there is virtually no likelihood of entanglement at these depths. The sea bottom along the proposed deep-water cable route lacks forage and resting habitat, for sea turtles therefore the likelihood of turtles being on the substrate near the transmission cables is unlikely. Diver- and/or ROV-assisted cable laying would reduce risk of interaction between turtles and WETS hardware, because careful placement of the cable can ensure that it is flat on the seafloor and no loops in the cable are present to encircle sea turtles. The elements of the WETS berth that will be present in the water column, such as the mooring chain and the mooring rope, are large, conspicuous, and will be under tension. Not only would these items be avoidable by a marine mammal swimming in the environment, they are also robust enough to resist breaking and entangling an animal. Both the chain and the rope have a breaking strength of close to 1,000,000 lbs (453,592 kg). The umbilical cable will not be under tension, but is a stiff, large diameter (3.5 in [8.9 cm]) cable. It is not able to form loops, wrap around an object, or cinch tight on a relatively small diameter animal such as a marine mammal or sea turtle. The methods for anchoring WETS equipment and the stiffness and tension of elements of the mooring system means that equipment that could entangle or entrap may affect, but is not likely to adversely affect marine mammals because the effects are discountable.

Sound

The marine species that may utilize the area and are capable of hearing project related noise are cetaceans, monk seals, and sea turtles. Humpback whales are considered to be in the low-frequency functional hearing group (most sensitive from 7 Hz to 22 kHz) and false killer whales are in the mid-frequency functional hearing group (most sensitive from 150 Hz to 160 kHz) (Southall et al 2007). As pinnipeds, monk seals are considered a separate functional hearing group that can perceive frequencies between 75

Hz and 75 kHz (Southall et al 2007). Sea turtles have low-frequency hearing, with their greatest sensitivity being below 1 kHz (Ridgway *et al.* 1969, Bartol *et al*. 1999).

The applicable noise criteria would be the general exposure thresholds that NMFS applies for pile driving and other construction activities: 1) the onset of hearing injury for cetaceans is exposure to 180 decibels (dB) re 1 micro Pascals (µPa) rms (root mean squared) and 190 dB re 1 µPa rms for pinnipeds; 2) the onset of behavioral disturbance for all marine mammals is 160 dB re 1µPa rms for impulsive sounds and 120 dB re 1µPa rms for non-impulsive sounds. In the absence of turtle-specific thresholds, the marine mammal thresholds are applied and are believed to be conservative for sea turtles.

The activity with the noise source of greatest concern would be drilling the substrate for installation of rock bolts to secure the subsea cable to the seafloor. If this is required, it would be limited to the section of cable extending from the shoreline until a depth of approximately 100 ft (30 m). The sound pressure level (SPL) of the hydraulic drills that would be used to drill the rock bolt holes in the seafloor has been measured from about 10 Hz to 40 kHz by several studies. The report referenced for the shallow water WETS EA (DoN 2003) was performed by the Naval Civil Engineering Laboratory (John J. McMullen, Assoc., 1984). The greatest SPLs occur between 1 kHz and 6.5 kHz. At these frequencies, the mean SPL reported was about 169 dB re: 1µPa at 6 ft from the drill. However, other more recent studies have reported lower SPLs. A study by Health and Safety Executive noted the sound pressure level from a Stanley hand drill underwater of 159 dB re 1µPa at 1 m (Anthony, Wright, and Evans 2009). Nedwell and Howell (2004) review of offshore windfarm related underwater noise sources reported an average for a variety of hand held tools of 161 dB re 1µPa at the source. A recent environmental impact assessment reported that rock socket drilling and drilling for the installation of large piles showed loudest measurement of 163 dB re 1µPa at the source (Nedwell et al. 2003). Given the information in these reports, the Navy will assume an approximate level of 163 dB re 1µPa 1 m from the source for the hand drills to be used for installing the power cable for the deep water WETS. The 120 dB re 1µPa isopleth would lie at 141 m using the equation for spherical spreading loss.

At a distance of 6 ft (1.8 m) from the drills, the SPL of frequencies below 1 kHz are at least 20 dB re: 1 µPa less than the frequencies with the highest SPLs (found in the Navy's 2003 EA). With their greatest sensitivity being below 1 kHz, the portion of the sound produced by the hydraulic drills that would be salient to turtles would have less effect on turtles than on marine mammals.

The BMPs that will be applied to this project require that the work area be observed for protected species and that drilling be postponed when marine mammals are within 500 m. The BMPs allows for drilling that has commenced to continue if marine species enter the area after the work has begun. Shutdown is required if animals approach to within 250 m. The monitoring zones are conservative toward the species, and drill use will be short and punctuated. Given that the BMPs are conservative in protecting marine mammals, and animals that are exposed to sound would be below levels of 120 dB re 1µPa. The sound from underwater drilling may affect but is not likely to adversely affect marine mammals and sea turtles because exposure to non-impulsive sound at or below 120 dB re 1µPa will have insignificant effects. It is discountable that marine mammals or sea turtles would approach close enough to drilling to be exposed to SPLs above 120 dB re 1µPa which could mask communication or potentially have physical effects on hearing.

During the operational period, the WEC devices are expected to produce a continuous acoustic output with amplitudes approximately similar to that of light to normal ship traffic (e.g., in the range of 75 to 80 dB), with a spectral content shifted to frequencies somewhat higher than shipping (Sound and Sea Technology 2002 in Navy 2003). Thomson et al. (2012) provide the spectrum of 1/7 scale WEC device in Puget Sound. The report shows sound energy peaks at 20, 100, 300, 700, and 1500 Hz. They reported a level of 126 db re: 1 μPa at 10 m from the device they measured. At close distances, such as 10 m, spherical spreading loss would be the more appropriate model of sound transmission loss, and is more conservative about the estimating the SPL. That is, in this case, it estimates the SPL at 1 m to be higher than using practical spreading loss. Using this approach, the SPL of the WEC device recorded by Thomson et al (2012) is estimated to be 145 dB re: 1 μPa at 1 m. The SPLs from the WEC systems are dependent on the conditions in which they are operating. Although no recordings of the sound of operation have been analyzed for the WEC devices for the deep water WETS, the maximum SPL is expected to be between 148 and 151 dB re: 1 μPa at 1m from the device. This judgment is based on the SPL that Thomson et al. (2012) report for their smaller scale device and adding 3 to 6 dB to the SPL based on engineers' best judgment about the noise that will be generated by a device that is larger than the one assessed in Thomson et al.

The WEC devices are expected to levels of noise that are lower than the peak levels when average or below-average wave conditions are occurring. During high wave activity, a WEC device might have a SPL of up to 151 dB re: 1 μPa at 1 m, but the sound will occur amidst ambient wave noise, which will mask the sound to some degree. For a WEC device that has a SPL of 151 dB re 1μPa at 1 m, the 120 dB re 1μPa isopleth would lie at about 35 m from the source, using spherical spreading loss. Under conditions of high ambient noise, the WEC device may be difficult to detect acoustically at distances greater than the 120 isopleth. No hearing impacts are expected on marine mammals from exposure to the sound of a WEC device. Any behavioral disturbance, such as avoidance of the area, would occur at less than 35 meters from the device. Due to the nature of the sound, its similarity to light vessel traffic, and its association with wave noise, exposed animals are expected to habituate to the sound which would make any behavioral modification or avoidance temporary. The acoustic signature of the WEC devices may affect, but are not likely to adversely affect marine mammals and sea turtles because the effects are expected to be insignificant.

Electrical Leakage

During operation, there is a potential for the WEC devices to experience an electrical fault or short due to damage to the transmission cables. In the event of an electrical fault, there is a short period of time during which the electrical current generated by the WEC system would leak to seawater. However, the computer-controlled electrical fault detection and circuit interruption system would shunt (redirect) the electrical current to the load resistors within 6 to 20 milliseconds (ms), limiting the duration of the electrical field.

A series of Navy studies on the effects of electrical fields found that fault durations of less the 20 ms and fault currents of less than 5 millivolts (mV) had only transient effects on marine life or divers. For divers, effects were generally described as a mild discomfort. To prevent electrical faults or shorts from occurring, the undersea transmission cables would be armored with steel wires and an external jacket that

make it highly resistant to damage. In addition, protection from leakage has been designed into the system. A computer-controlled fault detection and interruption system would divert the electric current from the cable and store it in load resistors in the event of a fault. Since significant protective structure is built into the transmission cables and there are computer controlled safeguards that would limit an electrical fault to a very brief period of time, electrical leakage from the WETS may affect, but is unlikely to adversely affect marine mammals and sea turtles, because the effects are discountable.

Heat

The energy loss from resistance in an undersea cable results in the generation of heat and dissipation of this heat to the surrounding environment. The resistive losses in the subsea transmission cable are calculated to range from 20 mW per foot (0.9 m) of cable for a single buoy generating 20 kW of power. Heat losses from the undersea transmission cables would have negligible impacts on seawater temperature in the vicinity of the cable, due to immediate dissipation by the natural flow of seawater. The large volume of seawater around the cable would keep temperature differences less than the natural differences due to solar heating, upwelling, and current-induced mixing. Heat loss from the WETS may affect, but is unlikely to adversely affect marine mammals and sea turtles, because the effects are expected to be insignificant.

Electric and Magnetic Fields

Power transmission cables can generate both electric and magnetic fields. The flow of seawater across the electric field of a power cable generates a weak magnetic field. Species with developed sensory receptors that can detect electric or magnetic fields could be affected by electric or magnetic fields. Electroreception (i.e., the sensing of electric fields by organisms) is not found generally among mammals, including those that are most likely to be present in the project area. There is conflicting evidence for magnetoreception (i.e., the sensing of magnetic fields by organisms) or use of the Earth's magnetic field in marine mammals, but any evidence of marine mammals using geomagnetic information suggests that the information would be used at the landscape level instead of the bathymetric micro-feature level.

Sea turtles are not known to be adept at electroreception, but they are known to be able to detect and use geomagnetic information to navigate, although it may play a limited role in their movement. Scientific literature exists that suggests sea turtles appear to navigate by geomagnetic patterns, but the scale appears to be at the landscape level while orientation at the local level is more likely to be guided by visual cues.

Organisms sensitive to magnetic fields may exhibit one of three behaviors: (1) detection and no effect, (2) detection and confusion or avoidance, or (3) attraction. Detection and no effect is a highly probable result since the cable would be carrying alternating current rather than polarized direct current. The organism would detect the magnetic field but not exhibit any response. In these instances of avoidance or confusion the animal may disrupt its current behavior while it "reanalyzes" the situation. The expected outcome is for the organism to assess the information from other sensory cues, ignore the anomalous magnetic perception, and continue its previous behavior. Avoidance would be the worst-case situation because it would mean that organisms were intimidated or uncomfortable within the magnetic field. The magnetic field would be limited to only a few inches beyond the cable itself, and therefore avoidance would not inhibit the animal from crossing or utilizing the waters in the immediate vicinity. Since the cable occupies a narrow area of the seafloor, the impact of avoidance behavior would be minimal. Behavioral attraction

of sea turtles to magnetic fields has not been reported in the literature.

An animal exposed to the weak electromagnetic field from the WETS may momentarily detect the anomalous signal, but is expected to continue its previous behavior based on other sensor cues. Any exposure to electromagnetic fields from the WETS may affect, but is not likely to adversely affect marine mammals and sea turtles because the effects are expected to be insignificant.

General Disturbance

If Hawaiian monk seals or green turtles haul out on the beach near where the power cables come ashore, there is no part of the WETS that is exposed or presents a threat to basking monk seals or turtles. Power and communication cables are stationary and protected by a split pipe covering. The cable that runs ashore connects to land infrastructure in an enclosed utility vault.

Any personnel installing the WETS will follow the legal requirement to stay more than 150 ft (45.5 m) from monk seals or turtles that haul out on the beach. The presence of any monk seal will be reported to National Marine Fisheries Service. If there is any evidence that a turtle is nesting on the beach, a Navy representative will contact National Marine Fisheries Service immediately. The BMP for the project require all work to be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and vessel operators will course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles. Because of the application of BMPs, general disturbance from the WETS project may affect, but is not likely to adversely affect marine mammals and sea turtles in the area because effects would be insignificant.

General Conclusion for ESA Marine Mammals and Sea Turtles

Based on an assessment of available biological information, the Navy found that installation and operation of the deep water WETS berth may affect but is not likely to adversely affect marine mammals because the effects of the project are discountable or insignificant. The Navy also found that installation and operation of the deep-water WETS berths may affect, but is not likely to adversely affect green and hawksbill turtles because the effects of the project are discountable or insignificant.

Corals.

Two ESA proposed coral species, *Montipora flabellata* and *M. patula*, were found in the vicinity of the proposed action during surveys of the existing shallow-water WET berth conducted by the Navy between 2003-2011. Although coral is present, the majority of the project area has very low coral cover that is sparsely scattered, and the occurrence of the proposed coral species is very infrequent, limited to the reef flat zone.

Based on the type of work that would be done to lay and secure the power cables across the reef flat zone where these corals are known to occur, the proposed action may affect those corals through: 1) direct physical impact and 2) exposure to elevated turbidity/sedimentation.

Direct physical impact: Laying the power cables on the sea floor, divers working to position and secure the cables, and anchors used by support vessels all have the potential to directly strike coral colonies should they be present when the equipment or divers contact the bottom. The severity of injury to the

coral will depend largely on the size and hardness of the impacting object and the intensity of the impact. Injury could range from a small area of soft tissue damage that quickly heals to total obliteration of the colony. The project plan and BMPs require that divers be aware of the identity and status of the ESA proposed corals and to specifically watch for and avoid them completely during work to position and install the power cables, including anchoring support vessels. Based on the sparse distribution of these corals, the limited amount of work to be done where they occur, and the expectation that divers will comply with the BMPs, the Navy have determined that the risk of direct impact on colonies of either species is discountable.

Exposure to elevated turbidity: Securing the power cable would involve the use of handheld drills to install rock bolts over a few days at most. Drilling would briefly mobilize small bursts of fine sediments into the water column. Although this material could settle onto coral colonies, the plumes are expected to be very light and quickly diluted. They would extend no more than a few yards from the work and dissipate within minutes. Therefore, no significant sedimentation would result due to exposure to elevated turbidity.

Based on an assessment of available biological information, the Navy found that the Proposed Action may affect, but is not likely to adversely affect ESA proposed threatened coral species, and as such, would not jeopardize the existence of those species.

Proposed Critical Habitat.

The strip of beach adjacent to the location where the proposed cables would land (North Beach) is a popular recreational beach at the departure end of an active military runway. The beach is not known as a significant haul out or pupping site, the nearshore waters at the site are inconsistent with preferred weaning habitat as described in the proposed rulemaking, and the proposed rulemaking to revise designated critical habitat specifically excludes MCBH and adjacent marine waters out to 500 yards from shore from designation based on the installation's INRMP.

The impacts on habitat resources beyond 500 yards from shore, such as changes to water quality and the quality and availability of prey, that may result from the proposed installation of the WETS moorings, cables, associated monitoring equipment, and WEC devices would be temporary and virtually undetectable.

Based on the nature of the planned work along with expected compliance with project BMPs, in-water substrate disturbance would be episodic (limited to the period of construction, and to infrequent actions to install or move monitoring equipment, or to install/remove WEC devices) and small scale resulting in small amounts of temporarily mobilized sediments that would not extend beyond a few yards of the work and would settle out of the water column within a few minutes of the work. The Navy further expects that toxic discharges and spills are unlikely to occur, but would be infrequent, small, and quickly cleaned if they do occur. Therefore, the Navy have determined that the action would have insignificant effects on water quality.

The planned installations would result in 6 lengths of mooring chains with 1 large anchor and 5 large concrete blocks each being place on the sea floor at depths between about 60 and 80 m (198 and 264 ft).

Two power cables would also be laid across the sea floor, 1 from each berth to the shore, and several small temporary monitoring stations would be installed on the sea floor in the area. These structures would cover about 538 yards^2 (450 m^2) of unconsolidated substrate habitat, which monks seals often use as forage grounds. However, these structures would result in a slight increase in the structural complexity of the benthic habitat in the action area. The added structure could provide shelter habitat for prey organisms such as small eels and octopus that might otherwise not have lingered in the area. Given that the total amount of affected benthos is would be tiny fraction of the total available, and that the increased complexity would likely increase the available prey resources, the Navy have determined that the proposed action would have insignificant effects on the availability of monk seal prey resources.

The structures themselves are not expected to hinder monk seal access to or through the area. The WEC devices may have acoustic signatures that may initially deter monk seals from entering the immediate area around the device (less than 50 yards, 45.5 m, around the device), but that would likely not include the sea floor under the device because of the water depth, and monk seals are expected to quickly habituate to the presence of the WEC devices once they are installed. The Navy have determined that proposed action may temporarily deter monk seals from entering an insignificantly small area immediately around a deployed WEC device, but given that the devices would be over 3,000 feet apart, the impacts of the proposed action on the accessibility of the area for Hawaiian monk seals would be insignificant.

Based on the best available information, the Navy have determined that the proposed action would result in insignificant impacts on the essential features of proposed monk seal critical habitat, and as such is not likely to adversely affect that habitat. Given that the action is not expected to adversely affect proposed critical habitat for the reasons described above, the proposed action is not likely to result in the destruction or adverse modification of proposed critical habitat.

Essential Fish Habitat

Based on marine surveys conducted between the installation of the shallow-water WET berth transmission cable in 2003 and 2011, no significant impacts to the shallow-water EFH during installation of the subsea cable were observed. In less than a year, the minor impacts to the substrate were no longer visible. The same is expected for the shallow-water portion of the Proposed Action's subsea cables which will be running parallel to the existing cable line. Based on the multibeam, ROV, and side scan sonar surveys conducted in the deep-water portion of the Proposed Action, there will be minimal/insignificant impact to any coral habitat due to the scattered, low density presence of coral, consisting of common species *Montipora capitata*. The following is a habitat zone breakdown of expected impacts:

The ***sand-boulder zone*** (0-15 ft or 0-4.6 m) consists of unconsolidated materials with high surf making it unsuitable habitat for most organisms. The Proposed Action is expected to have minimal to no impact in this habitat.

The ***sand channel zone*** (12-18 ft or 3.6-5.5 m) exhibits some coral growth on the sides of the channels, mainly *Pocillopora meandrina*. This habitat is high energy with some refuge in the grooves of the channels. The routing of the cable may be directed to avoid areas where corals are growing (i.e., the

channels), which would result in minimal to no impact from the Proposed Action.

The ***reef flat zone*** (35-50 ft or 10-15 m) is characterized by fairly flat habitat with algae (*Porolithon*) and sparsely scattered coral heads (*Pocillopora eydouxi*, *Porites lobata*, *Montipora capitata*, *M. flabellata*, and *M. patula*). Marine organisms are more abundant around areas with coral growth. Diver or ROV assistance would be employed during installation of the subsea cables. This would minimize impacts to coral in this zone by avoiding any ESA proposed species, areas where corals are growing (e.g. ledges), and other species of scattered coral heads.

The ***escarpment zone*** (50-95 ft or 15-29 m) is characterized as a limestone slope with areas of up to 50% coral cover (M. *capitata*), with abundant populations of fish. Because of the greater density of coral cover in this zone, diver or ROV assisted installation of the subsea cables would be employed to minimize impacts to coral in this zone. In instances where laying cable over coral is unavoidable, the area of impact would be minimal (12-in [0.3-m] width of cable over a 3 to 6 ft [1 to 2 m] length of unavoidable coral), and, although adverse, would not jeopardize the overall habitat function. ESA proposed coral species would be avoided completely and the other common corals will be avoided to the highest degree practicable. The cable would also be secured to the seafloor within this habitat zone to ensure it doesn't move and damage corals that were avoided during installation.

The ***deep reef platform zone*** (100 ft or 30 m) is a flat limestone area with a few inches of sand cover and some turf algae. Scattered corals of *P. meandrina* and encrusting *M. capitata* are present. The coral cover declines from the escarpment zone into this deep reef platform and the cable can be assisted by ROV and divers to avoid impacts to coral. The Proposed Action is expected to have minimal to no impact to this zone.

The ***undercut ledges*** (at depths 93 ft or 28.3 m and 100 ft or 30 m) are important habitat to various species of fish and coral growth. The ledges are not consistent, and with ROV and diver assistance, they can be avoided all together. The Proposed Action would have no impact to the undercut ledges.

The ***deep-water benthic zone*** (beyond 100 ft or 30 m) is mostly sandy substrate with few topographical features, and does not provide much habitat for marine invertebrates, nor shelter for fish. There is little vegetation and occasional spots of sparsely scattered coral heads. However, the location of the anchoring would be placed away from the sand ribbons and barchans, where presence of vegetation or sparse coral heads is minimal. The potential impact to this area from the Proposed Action would include disturbance of the substrate. The disturbance of the substrate would be limited to areas where there was minimal to no coral cover. The Proposed Action will be conducting topographic surveys during the final stages of installation to assist in the cable laying operations, as well as the final installation of the anchors, associated weighting systems, and splice boxes. During these final stage topographic surveys, any anomalies detected that may represent these common species corals will be noted and avoided where possible, using ROV to assist the laying of the cable. It is expected that some non-ESA coral will not be avoidable, however the footprint of the cable in the deepwater area is minimal and combined with the low density of coral presence, the impact will be insignificant.

Best Management Practices

The following precautionary BMP will be implemented during project construction to increase stewardship over corals.

- Use divers or an ROV to assist with laying the cable to avoid placement next to or over coral colonies and avoid important EFH.

- Where coral heads are unavoidable and can be easily dislodged from the substrate, divers will attempt to pry the coral head from the substrate and move it an appropriate distance from the impact line of the cable.

Conclusion for EFH

The Navy finds that installation of the deep water WETS berth may adversely affect EFH. Operation of the deep water WETS berth will have no effect on EFH. Informal consultation will be pursued for EFH. There may be adverse impact from diver presence while laying and securing the cable. Sand may be kicked up, or a coral colony accidentally damaged by a diver assisting the installation. Although the Proposed Action may have an unavoidable adverse effect to some coral colonies during construction, the impact will be minimal. The Proposed Action is expected to have minimal to no impact to other marine invertebrate communities.

LITERATURE CITED

Anthony, T. G., N. A. Wright, and M. A. Evans (2009) Review of Diver Noise Exposure. Prepared for Health and Safety Executive by QinetiQ. 62 pp.

Bartol, S.M., J.A. Musick, and M.L. Lenhardt. 1999. Auditory Evoked Potentials of the Loggerhead Sea Turtle (*Caretta caretta*). *Copeia*, Vol. No. 3. August 2, 1999. pp. 836-840.

Department of the Navy (2003) Environmental Assesment Proposed Wave Energy Technology Project, Marine Corps Base Hawaii, Kaneohe Bay, Hawaii. 300 pp.

John J. McMullen Associates, Inc. 1984. Evaluation of three Stanley hydraulic rock drills for use by divers. Prepared for Naval Civil Engineering Laboratory, Report No. CR 84.020. 47 pp.

NAVFAC EXWC (formerly Naval Facilities Engineering Command Engineering Service Center). Site Specific Report SSR-3671-ENV Marine Ecological Assessment of Proposed Wave Energy Project Area Offshore Marine Corps Base Hawaii. Prepared by Stephen H. Smith. September 2011.

Nedwell, J and T. Howell (2004) A Review of Offshore Windfarm Related Underwater Noise Sources. Prepared for Collaborative Offshore Winde Energy Research Into the Environment by Subacoustech, Ltd. 63 pp.

Nedwell, J., J. Langworthy, and D. Howell (2003) Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore windfarms, and comparison with background noise. Prepared for Collaborative Offshore Wind Energy Research Into the Environment by Subacoustech, Ltd. 72 pp.

Ridgway, S. H., E.G. Wever, J.G. McCormick, J. Palin, and J.H. Anderson. 1969. Hearing in the Giant

Sea Turtle, *Chelonia mydas*. PNAS, 64, 884-890.

Southall B.L., Bowles A.E., Ellison W.T., Finneran J.J., Gentry R.L., Greene C.R.J., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., Richardson W.J., Thomas J.A. & Tyack P.L. (2007) Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* **33**, 411-521.

Thomson J., B. Polagye, C. Bassett (2012) Noise Measurements of Columbia Power Technologies 1/7 Scale Prototype (SeaRay). Report prepared by Northwest National Marine Renewable Energy Center, University of Washington for Columbia Power Technologies, Inc. 7 pp.

Appendix D.2
NOAA Fisheries ESA Concurrence

- NOAA Fisheries ESA concurrence letter (4 December 2013)

U.S. DEPARTMENT OF COMMERCE
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DEC 04 2013

Ms. Karen Sumida
Business Line Manager, Environmental
Department of the Navy
Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
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Dear Ms. Sumida:

This letter responds to your June 6, 2013 letter, and subsequent electronic mail (e-Mail) on November 22, 2013, regarding the Naval Facilities Engineering Command (NAVFAC) Expeditionary Warfare Center (EXWC) proposal to construct and operate a new two-mooring wave energy test site (WETS) off Marine Corps Base Hawaii (MCBH), Kaneohe, on the island of Oahu. In your final consultation package, the Navy determined that the proposed action is not likely to adversely affect any species under our jurisdiction that has been listed or proposed as threatened or endangered, or their designated or proposed critical habitat, and requested our concurrence under section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531 et seq.), with that determination.

Proposed Action/Action Area: The action and potential impacts are described in detail in the project description and assessment of effect that was enclosed with your e-mail (USN 2013). In summary, the proposed action consists of the Navy's contractors installing two 3-point moorings; one each at depths of about 60 and 80 m (198 and 264 ft), about 2 and 2.5 km (6,500 and 8,200 ft) north of MCBH. Each mooring would include a power and communication cable that would extend from shore and terminate at a junction box at the mooring. Following installation of the moorings, wave energy conversion (WEC) devices would be installed and tested at the site. The action also includes environmental monitoring of the site that would be done by the University of Hawaii's Hawaii National Marine Renewable Energy Center (HINMREC).

The Navy's contractors would operate vessels with heavy lift capability to deliver the mooring components from Honolulu Harbor and install them at the two mooring sites, where the substrate consists of a sand layer that is at least 5-m (16.4 ft) deep. Crews would carefully lower a large embedment anchor on 3-inch chain with 5 concrete weights in line for about 213 m (700 ft). From the last weight, the chain would extend nearly vertically to a large surface float with an additional 4 m (13 ft) of "pigtail" chain that would be used to secure WEC devices when they are installed. One round trip of the vessel would be required for each anchor assembly; 3 trips per mooring site. About 3 to 5 days of work would be required to install each mooring.

A cable laying vessel would arrive off North Beach and pay out one cable for each mooring. It was not specified, but it is likely that each cable would be installed separately due to the

divergence of their routes beyond the 30-m depth. Each cable would have attached floats. Small boats and divers would escort the cables to the existing bore hole exit point where the cable for the existing 30-meter WETS mooring is installed in about 10-m (33-ft) deep water. The floats would be sequentially disconnected from the shore end of the cables, which would be pulled though the bore hole and secured on shore. Divers would continue removing floats and laying the cable on the sea floor along a route that parallels the existing cable, and avoids corals as much as possible, with particular attention paid to completely avoid any colonies of *Montipora flabellata* and *M. patula* that may be present along the route. Between depths of 10 and 30 m, the cable would be encased in articulated split pipe protection and secured to the hard substrate with rock bolts that would be drilled into place by the divers. At the 30-m depth, the cables would angle off to their respective moorings, where they would terminate in junction boxes that would be lowered to the sea floor by crane. The junction boxes are designed to be raised and lowered to allow above-water connection/disconnection of WEC devices. About 1 to 2 days of work are expected to install each cable and junction box.

After the moorings are installed, WEC developers would tow WEC devices to the site, where vessel supported divers would attach the devices to the moorings. The power cable junction boxes would be raised by crane, the devices' umbilicals would be connected to it, and then the junction box would be lowered to the sea floor. Each device would be completely removed from the site after their testing is complete. Deployment and recovery are each expected to require about 2 days of in-water work, and WEC developers would be required to comply with the NMFS/PRD-recommended best management practices for in-water work and boat operations.

Mooring construction would begin as soon as practicable following completion of consultation and permitting, and is expected to last less than a month. The first WEC device is expected to be installed at the new moorings in 2014, and remain deployed for about 1 year. Current funding for the project is through 2016, but the facility is expected to remain active for an undetermined period that would extend well beyond then. For example, the adjacent 30-m WETS was installed in 2003 and is still operational. With the existing 30-m WEC mooring, up to 3 WEC devices could be simultaneously deployed off MCBH after installation of the planned deep moorings.

The University of Hawaii's HINMREC would install 3 moored wave rider buoys, and periodically install or move 2 bottom-mounted electromagnetic field (EMF) recorder suites, a bottom-mounted wave and current profiler, and hydrophones consisting of a bottom-mounted hydrophone platform and a free a floating hydrophone to collect environmental data and to monitor the EMF and acoustic signatures of WEC devices. HINMREC monitoring of the WETS would occur over a 5-year period, with monitoring of WEC devices typically beginning 2 to 3 months prior to installation of a device and ending 2 to 3 month after its removal.

ESA consultation for the wave rider buoys was previously completed during the U.S. Army Corps of Engineers permitting process (POH-2011-00308, NMFS PCTS: PIR-2012-3074, PIRO: I-PI-12-1006-LVA) and as such is not considered here. HINWREC would operate a power boat with an A-frame or small crane to install the EMF, hydrophone, and wave profiler platforms on the seafloor. Divers would be used to help install and recover the monitoring devices. HINWREC is required to comply with the NMFS/PRD-recommended best management practices for in-water work and boat operations for this work.

The action area for this project is estimated to be the in-water area within about 1 km (1,100 yards) of the 60 and 80-m moorings, which are located between 2 and 2.5 km north of North Beach at MCBH, and all in-water areas within 46 m (50 yards) around all project-related vessels and divers used during installation, maintenance, and removal of the moorings, cables, WEC devices, and the various monitoring devices, as well as the down-current extent of any plumes that may result from discharges of wastes or toxic chemicals such as fuels and/or lubricants associated with any machinery used for this activity.

Species That May Be Affected: Based on the project's location, scope, and timing, the Navy has determined that the proposed action may affect but is not likely to adversely affect green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), Hawaiian monk seals (*Monachus schauinslandi*), false killer whales, Main Hawaiian Insular DPS (*Pseudorca crassidens*), and humpback whales (*Megaptera novaeangliae*). No other ESA- listed marine species are expected to be affected by the proposed action. The Navy further determined that the proposed action may affect but is not likely to adversely affect the corals *Montipora flabellata* and *M. patula*, which are currently proposed for listing as threatened under the ESA. Detailed information about the biology, habitat, and conservation status of sea turtles, marine mammals, and corals can be found in their recovery plans and other sources at http://www.nmfs.noaa.gov/pr/species/turtles/, http://www.nmfs.noaa.gov/pr/species/mammals/, and http://www.nmfs.noaa.gov/pr/species/invertebrates/.

Critical Habitat: No critical habitat has been designated for marine species in the Main Hawaiian Islands (MHI). However, the proposed rulemaking to revise designated critical for Hawaiian monk seals includes a portion of the action area in the proposed designation (76 FR 32026, June 2, 2011).

Analysis of Effects: In order to determine that a proposed action is not likely to adversely affect listed species, NMFS must find that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the Endangered Species Consultation Handbook (USFWS & NMFS 1998): (1) insignificant effects relate to the size of the impact and should never reach the scale where take occurs; (2) discountable effects are those that are extremely unlikely to occur; and (3) beneficial effects are positive effects without any adverse effects. This standard, as well as consideration of the probable duration, frequency, and severity of potential interactions between the marine listed species and the proposed action, were applied during the analysis of effects of the proposed action on ESA-listed marine species, as is described in detail in the Navy's assessment of effect. The most likely potential stressors and impacts on marine listed species are: (1) Collision; (2) Entanglement; (3) Sound; (4); Electrical leakage; (5) Heat; (6) Electric and magnetic fields; (7) General disturbance; (8) Direct physical impact; and (9) Exposure to elevated turbidity/sedimentation. The Navy specifically addressed all of these stressors in their assessment, providing detailed impact analyses to justify their determination.

The essential features of Hawaiian monk seal critical habitat that may be found in the portion of the action area that is proposed for designation are: Marine areas from 0 to 500 m in depth preferred by juvenile and adult monk seals for foraging; and marine areas with adequate prey quantity and quality. The Navy's assessment considered impacts on those essential features and

determined that the proposed action would have insignificant effects on accessibility to the area and on the availability of monk seal prey resources.

Based on consideration of the record, NMFS agrees with the Navy that the proposed action would have insignificant impacts, or the likelihood of impacts would be discountable, for the sea turtles, marine mammals, and corals considered in this consultation, as well as insignificant impacts on the essential features of proposed critical habitat for Hawaiian monk seals.

Conclusion: NMFS concurs with your determination that the proposed construction and operation of a new two-mooring wave energy test site off Marine Corps Base Hawaii, on the island of Oahu is not likely to adversely affect any species listed or proposed as threatened or endangered, or their designated or proposed critical habitat. Our concurrence is based on the finding that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the joint USFWS-NMFS Endangered Species Consultation Handbook and summarized at the beginning of the Analysis of Effects section above. This concludes your consultation responsibilities under the ESA for species under NMFS's jurisdiction. However, this consultation focused solely on compliance with the ESA. Additional compliance review that may be required of NMFS for this action (such as assessing impacts on Essential Fish Habitat) would be completed by NMFS Habitat Conservation Division in separate communication, if applicable.

ESA Consultation must be reinitiated if: 1) a take occurs; 2) new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the identified action is subsequently modified in a manner causing effects to listed species or designated critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

If you have further questions please contact Donald Hubner on my staff at (808) 944-2233. Thank you for working with NMFS to protect our nation's living marine resources.

Sincerely,

Michael D. Tosatto
Regional Administrator

Cc: Daniel Clark, ESA Section 7 Program, USFWS, Honolulu
Dan Polhemus, Aquatic Ecosystems Conservation, USFWS, Honolulu

NMFS File No. (PCTS): PIR-2013-9301
PIRO Reference No.: I-PI-13-1100-LVA

Literature Cited

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered Species Consultation Handbook. Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. http://www.nmfs.noaa.gov/pr/pdfs/laws/esa_section7_handbook.pdf

U. S. Navy, (USN). 2013. Electronic mail refine the Navy's request for informal consultation under Section 7 of the ESA for proposed construction and operation of a new two-mooring wave energy test site off Marine Corps Base Hawaii, on the island of Oahu. Including enclosed project description and assessment. November 22, 2013.

Appendix D.3
EFH Correspondence

- NOAA Fisheries EFH conservation recommendations (17 July 2013)
- Navy EFH response letter (3 October 2013)

U.S. DEPARTMENT OF COMMERCE
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Karen Sumida
Business Line Manager, Environmental
Naval Facilities Engineering Command, Pacific
Department of the Navy
258 Makalapa Dr., Ste. 100
Pearl Harbor, Hawaii 96860-3134

July 17, 2013

Dear Ms. Sumida,

The Habitat Conservation Division of the NOAA Fisheries Service (NMFS) Pacific Islands Regional Office has reviewed the 6/6/13 EFH consultation request letter (5090P.1F13B Ser EV2/0357) by Naval Facilities Engineering and Expeditionary Warfare Center (Navy) for the proposed construction and operation of two offshore wave energy conversion (WEC) devices near the Marine Corps Base Hawaii (MCBH), Kaneohe Bay, Hawaii. We offer the following comments, pursuant to the Essential Fish Habitat (EFH) provision (§305(b)) of the Magnuson Stevens Fishery Conservation and Management Act (MSA;16 U.S.C. 1855(b)) and the Fish and Wildlife Coordination Act (16 U.S.C. § 662(a)).

The proposed project involves construction and operation of two deep-water berths for testing WEC devices between approximately 2 kilometer (km) and 2.5 km off the north coast of the Mokapu Peninsula at MCBH. The proposed wave energy test site (WETS) would be located in waters with depths of approximately 60 m to 80 m. The proposed action includes: installation and operation of a three-point mooring system for two WEC device berths; installation of two 3.5 inch diameter subsea power and communications transmission cables including two 84 x 84 inch splice boxes; installation of up to four in-water scientific data gathering device; and installation shoreside of electrical transmission and monitoring equipment. Mooring systems would be held in place using commercially available drag embedment anchors and weights, and the cables would be secured to the sea floor down to 33 m by hand-drilled bolts. A maximum of two WEC devices would be installed and operated simultaneously at the WETS. Construction of the new berths would occur within a three-year period, with the first deep-water WEC device installed in 2014. Timing of WETS decommissioning would be based on WEC device test activity but is currently planned for 2016.

The marine water column and seafloor at the project site has been designated as EFH supporting several life stages for a variety of management unit species (MUS) identified under the Western Pacific Regional Fishery Management Council's Pelagic and Hawaii Archipelago Fishery Ecosystem Plans (FEPs). The 6/6/13 Navy marine assessment report and various supporting documents (provided in a 7/5/13 e-mail message to NMFS) state that the project area in shallow-

water (< 30 m depth) is comprised of six different habitat types/zones (sand boulder, sand channel, reef flat, escarpment, deep reef platform, undercut ledges, and deep water) harboring coral colonies of a range of species including *Pocillopora eydouxi, P. meandrina, Porites lobata, Montipora patula, M. capitata*, and *M. flabellata.* It is indicated that the inshore sandy areas in this shallow-water area are mostly devoid of corals, and that the limestone areas further out consist mostly of scattered coral colonies, with the exception of some localized sites within the escarpment zone where coral cover is up to 50 percent. The project area in deep water (> 30 m depth) is stated to be characterized by extensive flat and featureless substrate with occasional sand dunes with patches of algae and in some areas, sparsely scattered coral heads of *M. capitata.*

NMFS determines that EFH may be adversely affected by the proposed action. The cables would traverse the shallow-water areas out into the deeper-water area, and WEC devices and anchoring systems also associated structures would be installed in the deep-water area. Corals and other organisms present on the seafloor within the footprints of these structures may be injured and/or lost. Installation and operations could also reduce water quality from pollutant release from devices and vessels, the WEC devices and mooring systems could come to function as organism aggregation devices altering ecosystem dynamics in the area, and there may be a potential for impingement of eggs, larvae or juvenile or adult organisms in the WEC devices.

We do however consider that the impacts as described above can be minimized, largely from implementation of Navy's proposed best management practices (BMPs), so that adverse effects to EFH as a whole are minimal. Navy proposes for example that cables will be laid to avoid corals, and that the corals that cannot be avoided will be relocated to the greatest extent practicable. Navy also states that WETS anchors systems will be placed in sandy areas, which should be devoid of corals, as this is the substrate necessary for the anchors to become embedded. It has further been clarified that anchor deployment locations in the deep water area and the specific routing of the power cables will be defined based on the results of an Remotely Operation Vehicle (ROV) survey to be performed prior to actual hardware deployment, and that a marine biologist will interpret the ROV video results and assess the best routing for the cable and anchor placement. It is stated that hardware placement accuracy with respect to the surveyed cable route and anchor installation is expected to be no more than ± 1% times the water depth, i.e. as interpreted by NMFS between approximately 0.5 m to 1 m distance from the targeted locations.

NMFS reiterates the importance of the above proposed BMPs being implemented effectively and further recommends the following to ensure that adverse effect to EFH and coral reef resources are avoided and minimized:

1. Install all structures so as to avoid abrasion to corals. Lay the inshore cables adhering to BMPs outlined on page 8 in marine assessment document, i.e. float and then drop the cables to bottom by scuba divers within 100m of existing cable avoiding placing this on top of coral especially in the 10-30 m depth within the reef flat, escarpment and the deep reef platform zones. Relocate corals to avoid abrasion/injury as necessary. In depths below 30m depth, i.e. beyond scuba diving depths, use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated

splice boxes to avoid the sparsely scattered corals and formations. Install the WETs anchor system and scientific data gathering devices only in sandy bottom avoiding the scattered corals and mounds as per measures indicated on page 21 in marine assessment document, i.e. using topographic survey data, sonar and especially ROV surveys.

2. Anchor vessels/barges used during construction also operations only in sandy substrate or limestone devoid of corals. If vessels will be visiting the WETS site frequently, consider installing a fixed mooring buoy in sandy/non-coral substrate to which the vessel can tie up.

3. Ensure that all the structures placed on seafloor are secure and do not move after placement. Install, as indicated, the chain of the mooring system that leads to the surface so it does not come in contact and scrape/abrade the bottom also when the WEC devices are not in place (ensure that the chain extends straight up from the sinkers to the buoy). Secure the WEC devices and associated floating structures in such a manner that there is minimal risk of these breaking free during high winds and swells. Consider equipping the WEC devices with a GPS tracking device which alerts project points of contact of movement of the devices in the event these break free.

4. Observe and record if and how the WEC systems act as aggregation devices attracting fish and other organisms, and if and how this behavior influences ecosystem dynamics and/or fishing practices. This information will be useful for environmental analyses for future Navy projects of this type.

5. Employ BMPs to avoid discharge of pollutants such as iron and petroleum products from the structures, WEC devices and vessels.

6. Develop a decommission plan for the installed structures. Include a protocol clarifying how any corals that may come to grow on structures will be handled to avoid losing these resources upon removal of the structures. In certain cases it will be best to remove structures to avoid accumulation of debris in the marine environment. In other cases the structures or parts of these, e.g. if overgrown by corals, may best be left in place.

We appreciate the opportunity to comment on this project and wish to continue engaging with the Navy where needed to support the project purpose, while ensuring the appropriate level of protection of NOAA trust resources. If you have any comments and/or questions regarding this determination, or require further assistance, please contact Danielle Jayewardene at 808-944-2162 (Danielle.Jayewardene@noaa.gov).

Sincerely,

Gerry Davis
Assistant Regional Administrator
Habitat Conservation Division

Cc by e-mail:
Sean Hanser, NAVFAC Pacific
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5090P.1F13B
Ser EV2/0550
October 3, 2013

Mr. Gerry Davis
Assistant Regional Administrator
National Marine Fisheries Service
Pacific Islands Regional Office
Habitat Conservation Division
1601 Kapiolani Blvd., Ste 1110
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Dear Mr. Davis,

SUBJECT: ESSENTIAL FISH HABITAT ASESSMENT FOR WAVE ENERGY TECHNOLOGY DEVICES, MARINE CORPS BASE, HAWAII, KANEOHE BAY, OAHU, HAWAII

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act (16 USC § 1801 et seq) (MSA) and regulations governing conservation of Essential Fish Habitat (EFH), the Navy is providing this letter as a response to National Marine Fisheries Service's (NMFS) July 17, 2013 letter with conservation recommendations for proposed construction and operation of two deep-water berths for testing wave energy conversion (WEC) devices near Marine Corps Base Hawaii (MCB Hawaii), Kaneohe Bay, Hawaii. Although the impacts from the project can be minimized through implementation of the Best Management Practices (BMPs) that will be implemented during construction and operation, the Navy provides responses to conservation recommendations below. As noted in NMFS's letter, the conservation recommendations are pursuant to the MSA and the Fish and Wildlife Coordination Act (16 USC § 662).

The Navy's responses to the six (6) EFH conservation recommendations offered in your 17 July letter pursuant to section 305(b)(4)(A) of the MSA are:

NMFS EFH Conservation Recommendation 1: Install all structures so as to avoid abrasion to corals. Lay the inshore cables adhering to BMPs outlined on page 8 in marine assessment document, i.e. float and then drop the cables to bottom by scuba divers within 100m of existing cable avoiding placing this on top of coral especially in the 10-30 m depth within the reef flat, escarpment and the deep reef platform zones. Relocate corals to avoid abrasion/injury as necessary. In depths below 30m depth, i.e. beyond scuba diving depths, use marine biological expert interpretation of ROV survey data to carefully locate the offshore cables and associated splice boxes to avoid the sparsely scattered corals and formations. Install the WETs anchor system and scientific data gathering devices only in sandy bottom avoiding the scattered corals and mounds as per measures indicated on page 21 in marine assessment document, i.e. using topographic survey data, sonar and especially ROV surveys.

Navy response to Conservation Recommendation 1: As indicated in Recommendation 1, the measures stated in the recommendation are consistent with measures described in the consultation package provided by the Navy and the content that will be in the Ecological Assessment (EA). There are a few minor clarifications or corrections to be made regarding Recommendation 1. First, the cable will be laid within 100 ft (~30 m) of the existing cable, instead of 100 m, as stated in Recommendation 1. Second, below 30 m, the course of action that will be taken to avoid coral in the path of the cable is to survey the cable route corridor with an (Remotely Operated Vehicle) ROV and obtain video documentation prior to deployment. There will be marine biological expert interpretation of ROV survey data in order to identify marine resources in the area. This process will ensure that no coral or potential suspensions are along the planned route. Using an ROV during the deployment operations will not take place, because the ROV would add undue complexity related to coordinating interactions between the vessel and ROV positions and the ROV's umbilical line in the water column. All of the moving vessels and equipment would pose safety risks for the operators.

Finally, there was an error in the information supplied by NAVFAC on the placement accuracy for the hardware deployment vessel. The issue is a typographical error in a two-page document that NAVFAC sent to NMFS in a 5 July 2013 e-mail. The document was entitled "130703c-NOAA WETS consultation_pt1-QAs.pdf", and it contained answers to questions NMFS had posed about the WETS project. The answer to Question 4 on the second page of the document stated that hardware would be placed at no more than "+/- 1% times the water depth". The text should have indicated that hardware would be placed at no more than +/- 10% times the water depth. Along the cable path from 30 m to a maximum of 80 m, the placement would be within 3 to 8 m of the route center line.

NMFS EFH Conservation Recommendation 2: Anchor vessels/barges used during construction also operations only in sandy substrate or limestone devoid of corals. If vessels will be visiting the WETS site frequently, consider installing a fixed mooring buoy in sandy/non-coral substrate to which the vessel can tie up.

Navy response to Conservation Recommendation 2: Vessel and barge operators will strive to meet this Recommendation. Vessels should be able to determine bottom type with their depth sounders and will anchor in sand whenever possible. If it is determined that vessels will be visiting the same location of the project area many times, mooring buoys will be considered.

NMFS EFH Conservation Recommendation 3: Ensure that all the structures placed on seafloor are secure and do not move after placement. Install, as indicated, the chain of the mooring system that leads to the surface so it does not come in contact and scrape/abrade the bottom also when the WEC devices are not in place (ensure that the chain extends straight up from the sinkers to the buoy). Secure the WEC devices and associated floating structures in such

a manner that there is minimal risk of these breaking free during high winds and swells. Consider equipping the WEC devices with a GPS tracking device which alerts project points of contact of movement of the devices in the event these break free.

Navy response to Conservation Recommendation 3: The measures stated in the Recommendation 3 are consistent with measures described in the consultation package provided by the Navy and the content that will be in the EA. The project has been carefully engineered to avoid negative interaction of the elements of the Wave Energy Test Site (WETS) with sessile marine organisms. All elements of the WETS will be secured both when a WEC device is installed and when a device is absent.

NMFS EFH Conservation Recommendation 4: Observe and record if and how the WEC systems act as aggregation devices attracting fish and other organisms, and if and how this behavior influences ecosystem dynamics and/or fishing practices. This information will be useful for environmental analyses for future Navy projects of this type.

Navy response to Conservation Recommendation 4: The Navy agrees that this information would be useful for future projects. Monitoring surveys have been conducted during the lifetime of the shallow water WETS project. This same type of monitoring will occur during the use of the deep water WETS project. The added dimension of wanting to know if fishing patterns change in the area of the deep water WETS will be considered.

NMFS EFH Conservation Recommendation 5: Employ BMPs to avoid discharge of pollutants such as iron and petroleum products from the structures, WEC devices and vessels.

Navy response to Conservation Recommendation 5: The Navy will ensure that construction and maintenance personnel as well as vessel operators use industry-standard BMPs to avoid discharging pollutants into the marine environment.

NMFS EFH Conservation Recommendation 6: Develop a decommission plan for the installed structures. Include a protocol clarifying how any corals that may come to grow on structures will be handled to avoid losing these resources upon removal of the structures. In certain cases it will be best to remove structures to avoid accumulation of debris in the marine environment. In other cases the structures or parts of these, e.g. if overgrown by corals, may best be left in place.

Navy response to Conservation Recommendation 6: Navy engineers and natural resource subject matter experts will develop a decommissioning plan for the deep water WETS. The plan will include criteria for deciding when to remove elements of the project and when to allow elements that are providing some benefit to the environment to remain in place after the use of the site is complete.

5090P.1F13B
Ser EV2/0550
October 3, 2013

We appreciate the time and careful consideration that went into evaluating the proposed project and providing EFH conservation recommendations. Should you have any questions about the Navy's response, please contact Dr. Sean Hanser of my staff at (808) 472-1388 or sean.hanser@navy.mil.

Sincerely,

P. S. LYNCH
Captain, CEC, U. S. Navy
Vice Commander

Appendix E
Historic Preservation Analysis

ARCHITECTURE
RESTORATION
RENOVATION
RESEARCH

Mason Architects

November 7, 2012

Mr. Ron Brackett
Sound & Sea Technology
2193 Portola Rd.
Ventura, CA 93009-7723

Re: Historic Consulting Services for Battery French and the WETS

Dear Mr. Brackett,

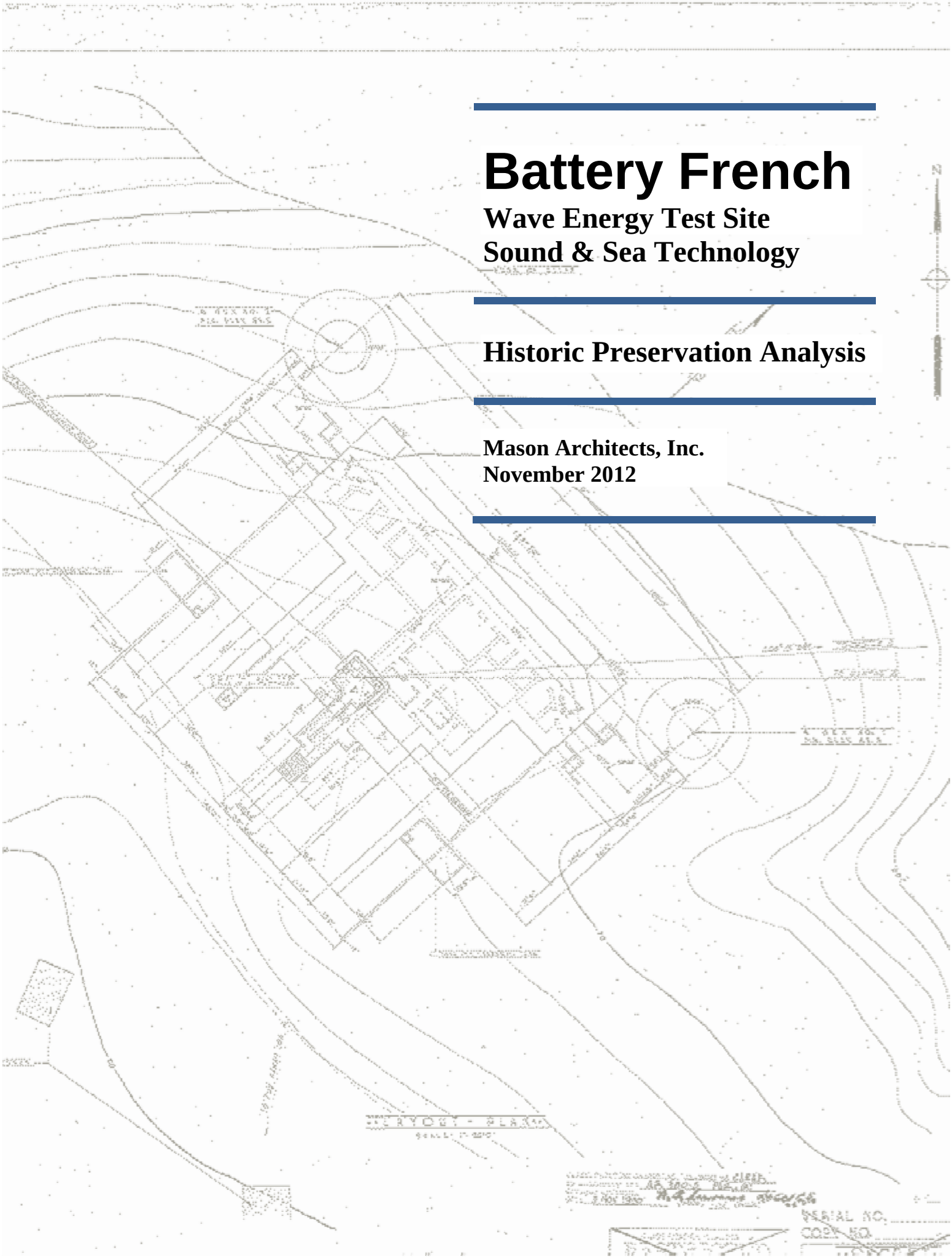
As the historic consultant to Sound & Sea Technology for the Battery French WETS project, we are pleased to provide our report for your use. The report includes a historic context of the battery, a brief description of the WETS project, and our analysis of the design in relation to the Secretary of the Interiors Standards for Rehabilitation.

The report may be provided to the Cultural Resources department to assist them in the Section 106 consultation process for this project. For reasons outlined in the report, we recommend the Federal agency submit the project with a determination of No Adverse Effect.

Please let us know if we can be of any further assistance.

Sincerely,

Angela Thompson, AIA
Mason Architects, Inc.



Battery French

Wave Energy Test Site
Sound & Sea Technology

Historic Preservation Analysis

Mason Architects, Inc.
November 2012

Executive Summary

Sound & Sea Technology and the U.S. Navy have partnered to create a Wave Energy Test Site (WETS) on Marine Corps Base (MCB) Hawaii, Kaneohe Bay. The site is located on the north side of the Mokapu peninsula. The proposed project expands the site and includes the use of Battery French, a historic WWII gun emplacement and bunker. Battery French is eligible for the National Register of Historic Places; therefore, the undertaking will require a Section 106 review by the State Historic Preservation Office (SHPO).

Battery French, completed in 1943, is one of two artillery batteries extant on MCB Hawaii, Kaneohe Bay. Originally part of the U.S. Army's Fort Hase, Battery French was conventionally configured with two six-inch guns mounted in long range barbette carriages located on concrete pads with the guns' underground support areas and battery command post located between them.

The proposed project includes providing additional cabling and conduit, renovation of the interior of the Battery French, and adding electrical equipment on the south side of Battery French. Two alternatives have been considered for the design of the project. The preferred alternative includes placing cable on the ocean floor and continuing it from the beach to Battery French on pedestals less than a foot high. The second alternative includes horizontal directional drilled (HDD) cable which would be underground except near Battery French where it would be on pedestals just as in the preferred alternative.

In order to assist the U.S. Navy in complying with Federal regulations regarding the use of the historic battery, Sound & Sea Technology contracted Mason Architects, Inc. (MAI) to serve as a historic consultant. The team worked together to provide a design that follows the Secretary of the Interiors Standards for Rehabilitation. Taking MAI’s comments into account, Sound & Sea Technology produced a schematic design that serves the needs of the WETS and maintains the historic integrity of the site.

Introduction

The NAVFAC Engineering Service Center began development of a WETS on MCB Hawaii, Kaneohe Bay in May 2004. The current proposal is to expand the WETS to allow developers to make use of the site to test different Wave Energy Converters (WEC). Expansion will include additional cabling plus the use of more area inside Battery French, a historic WWII artillery battery, as the shore station for monitoring and collecting data. This report provides a historic context of Battery French, a description of the proposed project, and analyzes the effects the project will have on the historic structure.

Figure 1: Historic photo of one of the gun emplacements at Battery French camouflaged with a roof resembling the roofs of the adjacent residential neighborhood. Source: MCB Hawaii.

Historic Overview

Battery French, Facility 614, completed in 1943, is one of two artillery batteries extant on MCB Hawaii Kaneohe Bay. Located on north side of the Mokapu peninsula between a residential neighborhood and the shore, Battery French has two gun emplacements separated by a concrete bunker containing more than a dozen rooms. The other battery, Battery Pennsylvania, is a larger, more innovative battery located on the east side of Ulupau Crater. Both batteries were constructed in response to the December 7th, 1941 Japanese attack on Kaneohe Naval Air Station (now MCB Hawaii Kaneohe Bay), Pearl Harbor, and other military installations on Oahu.

Originally part of the U.S. Army's Fort Hase, which was established after the attack as a coastal artillery installation to provide security for Kaneohe Naval Air Station, Battery French was conventionally configured with two six-inch guns mounted in long range barbette carriages located on concrete pads with the guns' underground support areas and battery command post located between them. Battery French featured some of the most advanced technology found in gun batteries at the time, powered operation and automatic controls. Its design resembled plans for the Army's 200-series of batteries that were developed in the early 1940s and mounted twin 6 inch guns that had a range of about 15 miles. About 56 of these

Figure 2: Battery French command post. Photo taken in 2004.

Figure 3: View of a portion of Battery French showing the circular area where the six inch gun was mounted. Note the entry to underground portion of the battery in the background, flanked by ammunition ready boxes. Photo by Fung Associates, 2000.

200-series batteries were constructed in the continental United States, Alaska, and Hawaii for coastal defense. A 1944 drawing indicates the intention was to completely camouflage the battery site by making it appear to be part of the adjacent residential neighborhood. To what extent the plans were carried out is not known, but historic photos indicate that the "dummy house roof" depicted in the drawing was constructed over at least one gun emplacement. See figure 1.

The guns were removed from the battery within several years after the end of World War II. Battery French retains the two concrete pads which surround the circular areas where the guns were mounted. Adjacent to each concrete pad is an entryway into the underground bunker area. As shown in figure 3, each entry is flanked by concrete ammunition receptacles (ready boxes). The exposed concrete of the battery at the entries and ammunition ready boxes has a painted finish. Historic drawings indicate the battery has six foot thick concrete exterior walls and roof all covered by an earthen berm at least three feet thick. The berm has round metal vents protruding out from its top. Located near the center of the berm is the battery command post. This portion of the facility has a thick, flat concrete roof with a visor above a slit-like aperture which originally (now overgrown) afforded a wide view of the ocean approaches to the

Figure 4:

Above - View from the southeast entry down the corridor toward the northwest entry.

Right: Current condition of room 105. The carpeting, shelves, etc. will be removed from the room.

peninsula. On the center of the roof is an open-topped, pyramidal concrete projection with a center cavity and a small access opening. At the bottom of the cavity is a circular pit in the concrete, about three feet in diameter and nine inches deep. This projection and pit originally mounted the battery's radar antenna, which was camouflaged by surrounding it with a wooden housing built to look like a water tank. The exposed surfaces of the command post and pyramidal projection are weathered concrete which appears to show traces of historic paint. At the northwest side of the battery, a feature which looks similar to a planter and is constructed of pre-cast concrete units, has been added along the walkway leading to the entrance, and electrical equipment has been added near the doorway. The planter-like feature covers the existing conduit as it runs toward the entry of Battery French.

The interior of Battery French is typically unfinished concrete floors, though some now have carpet, and painted concrete walls. Some of the rooms within the project area have acoustic ceiling tiles, which appear to be relatively modern. Historic drawings indicate six of the rooms were to have “3/4” acoustic Celotex” installed on the ceiling; however, none of the rooms called out on the drawings is in the project area. Therefore, the existing ceiling tile in the project spaces is not considered historic. Many of the interior spaces have not been used for many years resulting in rooms with finishes and furniture in poor condition. The majority of the interior doors have been removed and the openings covered with plywood, left open, or filled with standard flush wood doors. Rooms 104 and 106 have been used by Ocean Power Technologies (OPT) for testing their WEC. These two spaces are relatively recently renovated with painted walls and floors. Also, room 106 has a window air conditioner installed in a boarded-up doorway.

Character-Defining Features

Battery French has several features which, when combined, create its overall character. These character-defining features include:

- Concrete structure; unadorned, painted flat surfaces (exterior and interior);
- Berm over the concrete structure with natural vegetation;
- Concrete pads where guns were mounted;
- Concrete command post at the center of the structure;
- Box-like entrances; and,
- Interior layout (T-shaped corridor system and spaces).

Two features have been added to the exterior of the structure that detract from the historic character. Both features were added for the wave energy project in 2004. Those features include:

- Concrete unit planter-like feature at the entry walkway;
- Electrical equipment near entry door;

Figure 5:

View of the northwest entrance of the bunker. Notice the added planter-like feature running along the walkway. If the cable is run along the existing cable path, the new conduit will branch off from the existing route just prior to the planter-like feature and will go along the hillside at the right in this photo and continue to the transformer on the south side of the battery. The new cable will be on a pedestal that will be mostly concealed by the vegetation.

Proposed Project Description

The proposed project includes providing additional cabling and conduit, renovation of the interior of the bunker, and adding electrical equipment on the south side of the battery.

Two paths are proposed for the additional cable and conduit. See figure 7 for an illustration of the approximate path for each option. The existing cable will be maintained with both options. Both options include the addition of a vacuum fault interrupter (VFI) on the south side of the battery near existing electrical equipment. The housing for the VFI will be approximately 70.5 inches wide by 90 inches deep by 56.5 inches high (figure 11). Because of the berm over the bunker, the existing equipment is not visible from the ocean side of the battery. From the neighborhood side the equipment is concealed by a wood fence and vegetation. Like the existing equipment, the additional VFI will be concealed from all views. See figure 6.

Figure 6: View from the southeast. The concrete protrusion from the bunker is visible on the right side of the photo and the closest house in the adjacent neighborhood is visible on the left. At the center-left of the photo is the fence and vegetation that is concealing the electrical equipment from view of the adjacent neighborhood. The new equipment will be in this same location.

The first option follows the same path as the existing conduit: The cable runs from the ocean floor to the shore, then from the electrical vault near the shore it runs above ground to the northwest side of the battery and around to the south side of the battery terminating at the VFI. An additional electrical vault will be added adjacent to the existing vault located near the shore (see figure 8). The existing cable is mounted on a short pedestal which is sufficiently close to the ground to be concealed by vegetation. The vegetation along this area covers most of the existing cable. If the new cable is run along with the existing cable, the three new conduits will be attached to the existing pedestal from the vault to the point just short of the planter feature at which point it diverges to go behind the bunker. When the conduits diverge from the existing route, new shorter pedestals will be installed going up the hill behind Battery French. The new pedestal will also be close to the ground and concealed by vegetation. See figure 5 for the area the cable will run near the entry to the battery. See figures 9 and 10 for illustrations of the conduit pedestals.

The second option for the cabling is a horizontal directional drilled (HDD) cable. The cable will run entirely underground from the shore to the southeast side of the battery near the gun emplacement pad. From the exit point of the HDD drill hole to the beginning of the slope south of the paved area near the gun emplacement, the cable will have to run through a concrete tray. Once it reaches the slope, short pedestals with PVC conduit will be used to run the cables up and over the hill to the transformers behind Battery French to the VFI. The pedestal would be sufficiently close to the ground to be mostly concealed by vegetation. Some removal of paving will be required for this option.

The majority of the work that will directly involve Battery French will be inside the bunker area. The corridor and eight rooms will be renovated to provide work spaces and storage rooms for the developers. Each developer will have two rooms, one main work room and one storage room. Work will include:

- Remove unused water line in the corridor;
- Cap unused utility lines in the corridor;

- Remove electrical conduits, wires, and light fixtures from the corridor and work spaces;
- Remove window air conditioning unit from the corridor (currently serving room 106);
- Remove furniture and debris;
- Install condensing unit in the corridor;
- Install fresh air intake duct from the outside wall to the fan coil units within each work space;
- Install fan coil unit in each work space;
- Install light fixtures throughout;
- Install two exit signs in the corridor;
- Install electrical power lines, junction boxes, and outlets throughout;
- Install data cable conduit and trapeze;
- Cover all unused openings into the corridor with plywood;
- Remove carpet, paint floors;
- Clean and paint walls and ceiling;
- Install room signs at all doors in the project area; and,
- Install basic office furniture in each room in the project area.

Schematic drawings of the bunker interior renovations have been included for reference.

Historic Preservation Analysis

Battery French is eligible for the National Register; therefore, any undertaking involving the property is required to follow the Secretary of the Interior's Standards. The following information provides an analysis of the design in relation to those standards.

The view of the historic battery is primarily from the ocean and the adjacent neighborhood. The battery is fairly prominent on the hillside when viewed from the ocean, and the view from the adjacent neighborhood is of the command center area which protrudes from the center of the bunker and the berm which is covered with natural vegetation. The proposed project does not include anything that will change the view of the battery from either the ocean or the neighborhood.

The first, and preferred, option for the cabling primarily involves adding to the existing situation, and the cabling will be almost completely concealed along the area near the battery.

If the second option for the cabling is chosen, there will be some effect due to the removal of the paving near the gun emplacement pad. This alternative would also require more archaeological investigation to determine if archaeological monitoring would be required.

The interior of the facility will be renovated; however, the addition of electrical conduits and air conditioning is planned in a manner that it may all be removed with very minimal damage to the concrete structure. Though the air conditioning system will be visible in the main corridor, this solution was selected over equipment being placed on the exterior of the facility. The main corridor will continue to be open from entry to entry and all openings in the historic concrete structure will be retained.

Currently the facility is mostly vacant and much of the interior has been vandalized, so continuing to use the facility will improve the security and maintenance of the interior helping to reduce deterioration of the structure.

Sound & Sea Technology with the assistance of Mason Architects has designed the proposed project to follow the Secretary of the Interior's Standards for Rehabilitation in order to avoid adverse effects to the historic property, Battery French.

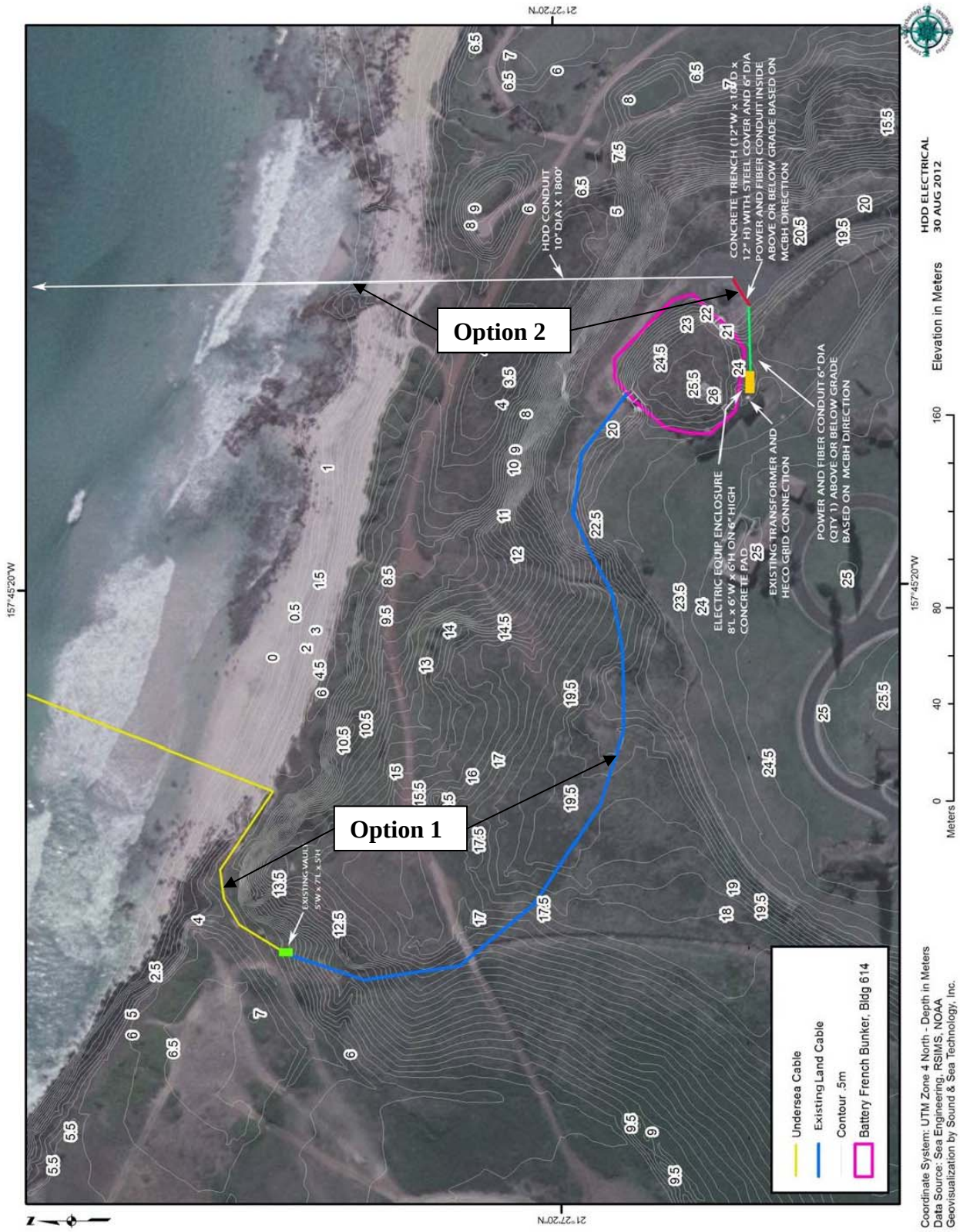


Figure 7: Illustration of the two options to route the conduits from the ocean to the south side of Battery French.

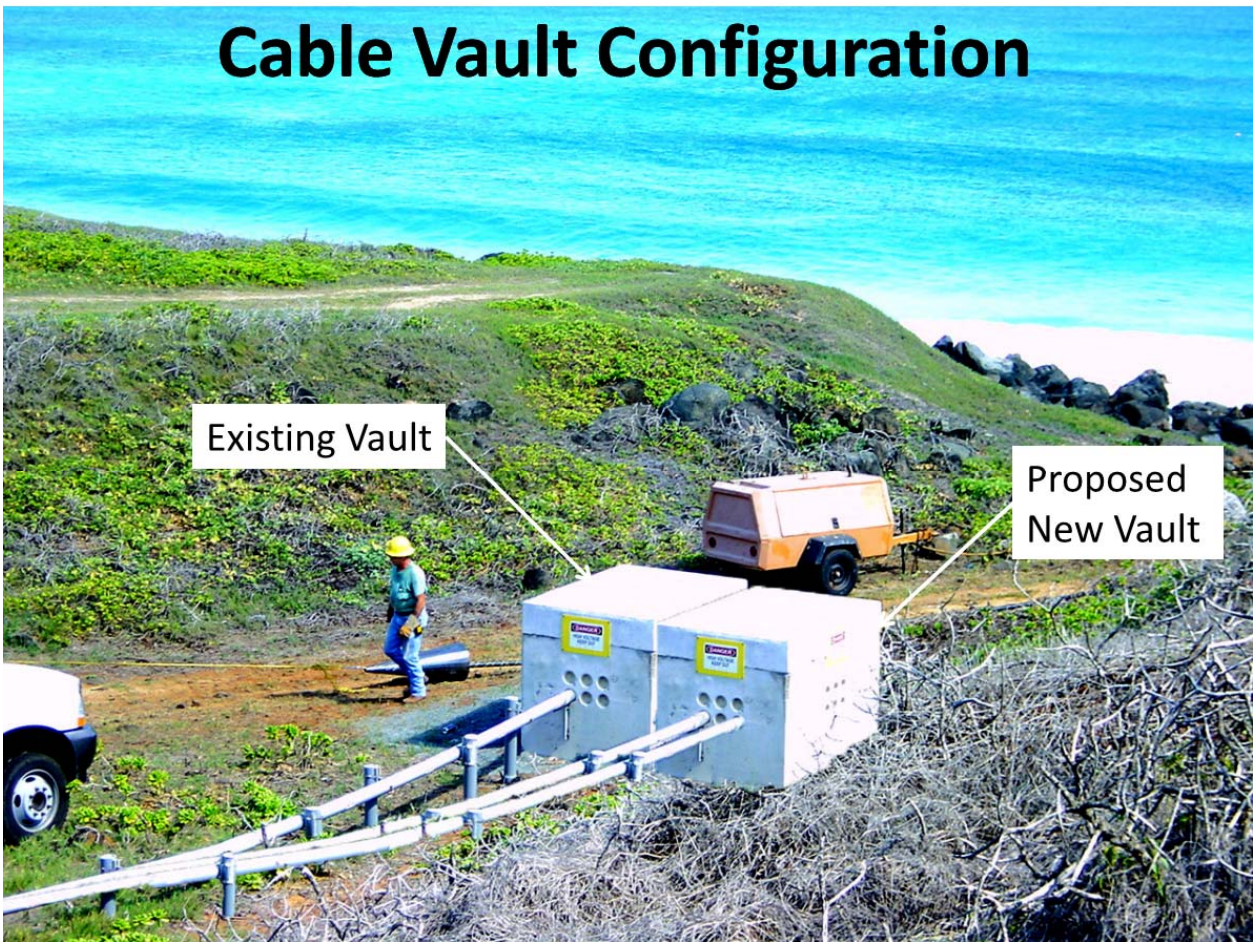


Figure 8: Illustration showing the existing electrical vault near the beach and the proposed electrical vault. Image provided by Sound & Sea Technology.

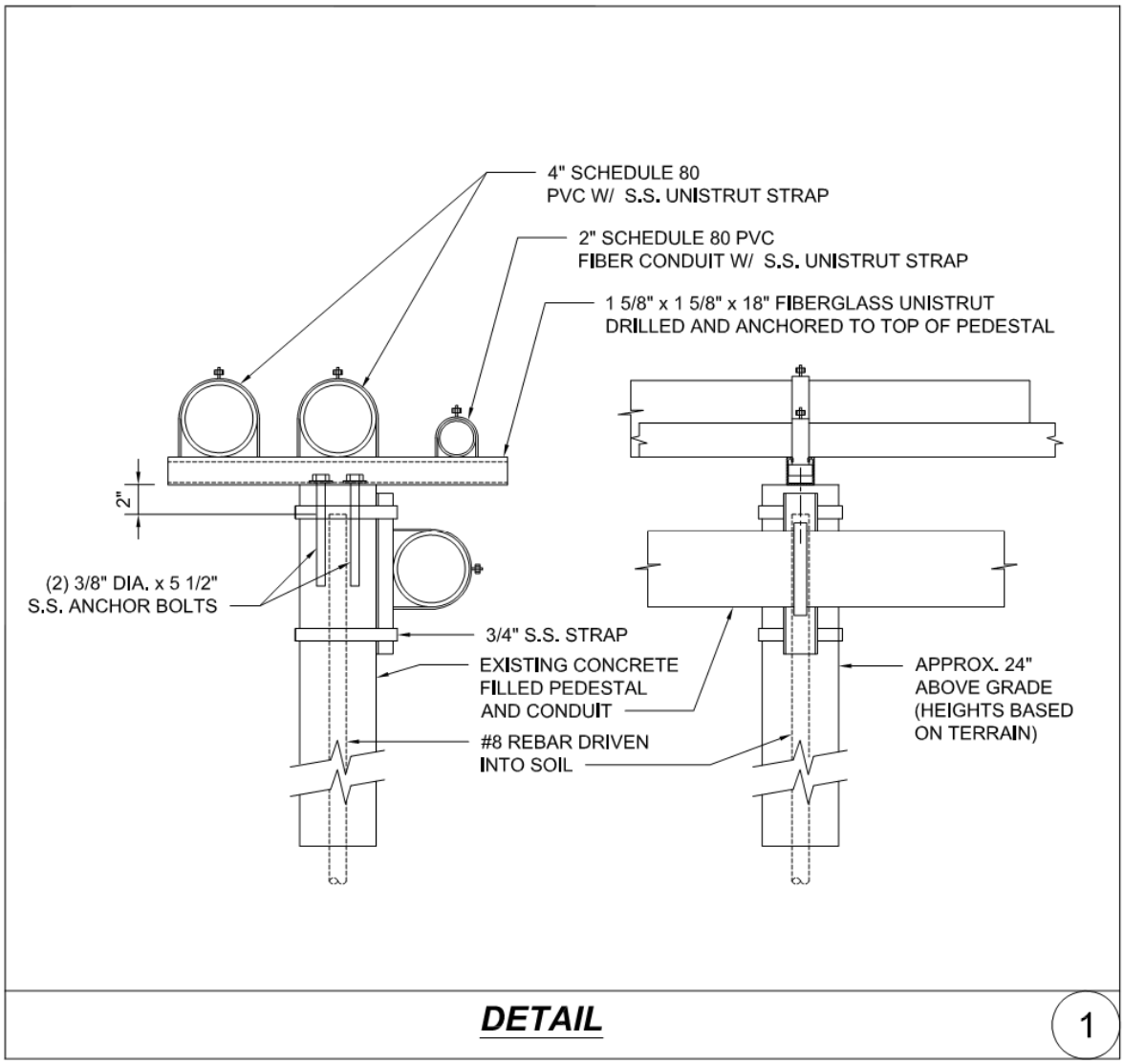


Figure 9: Illustration of the existing pedestal that carries the cable from the shore to Battery French including the proposed conduits. Image provided by Sound & Sea Technology.

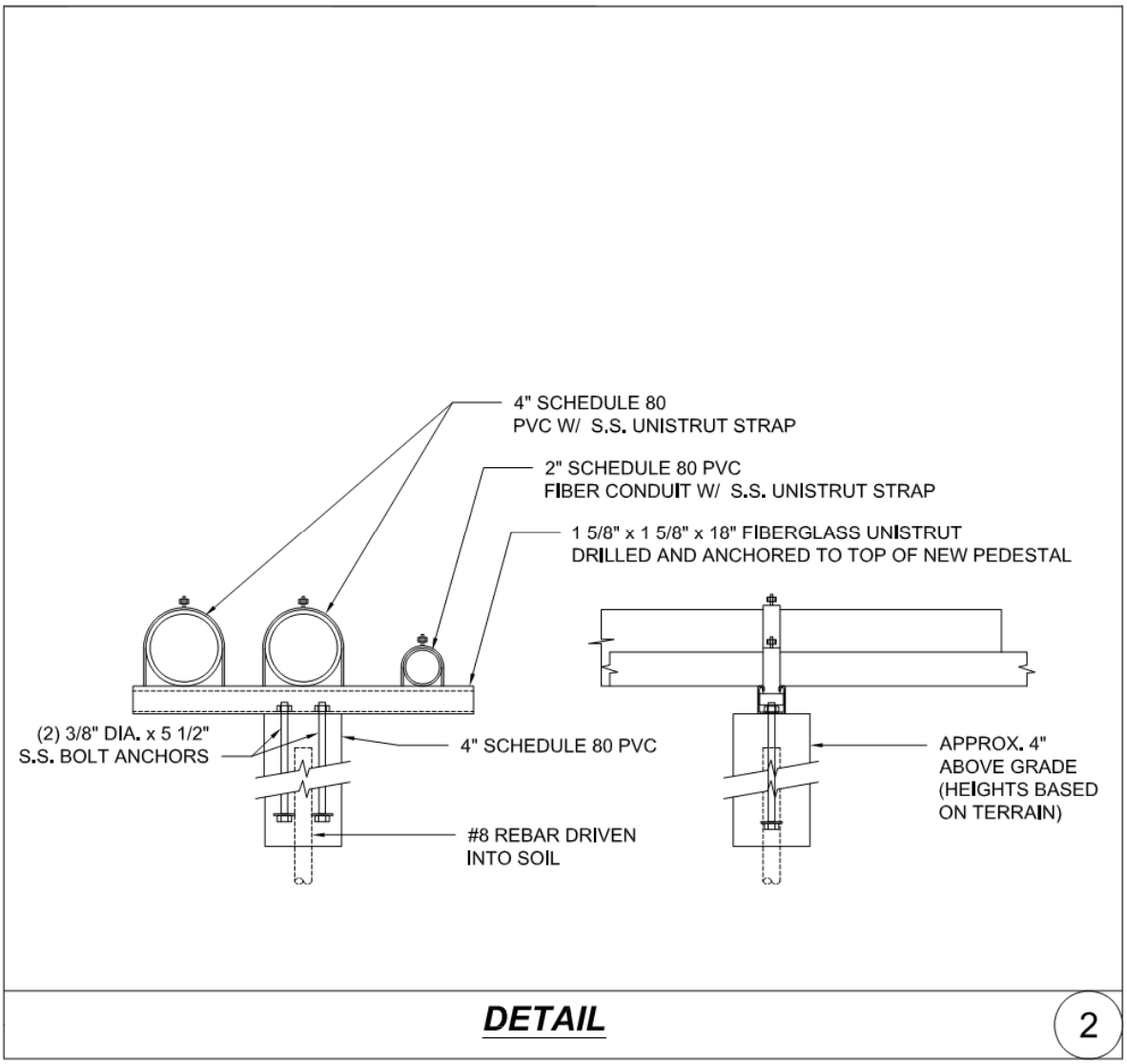
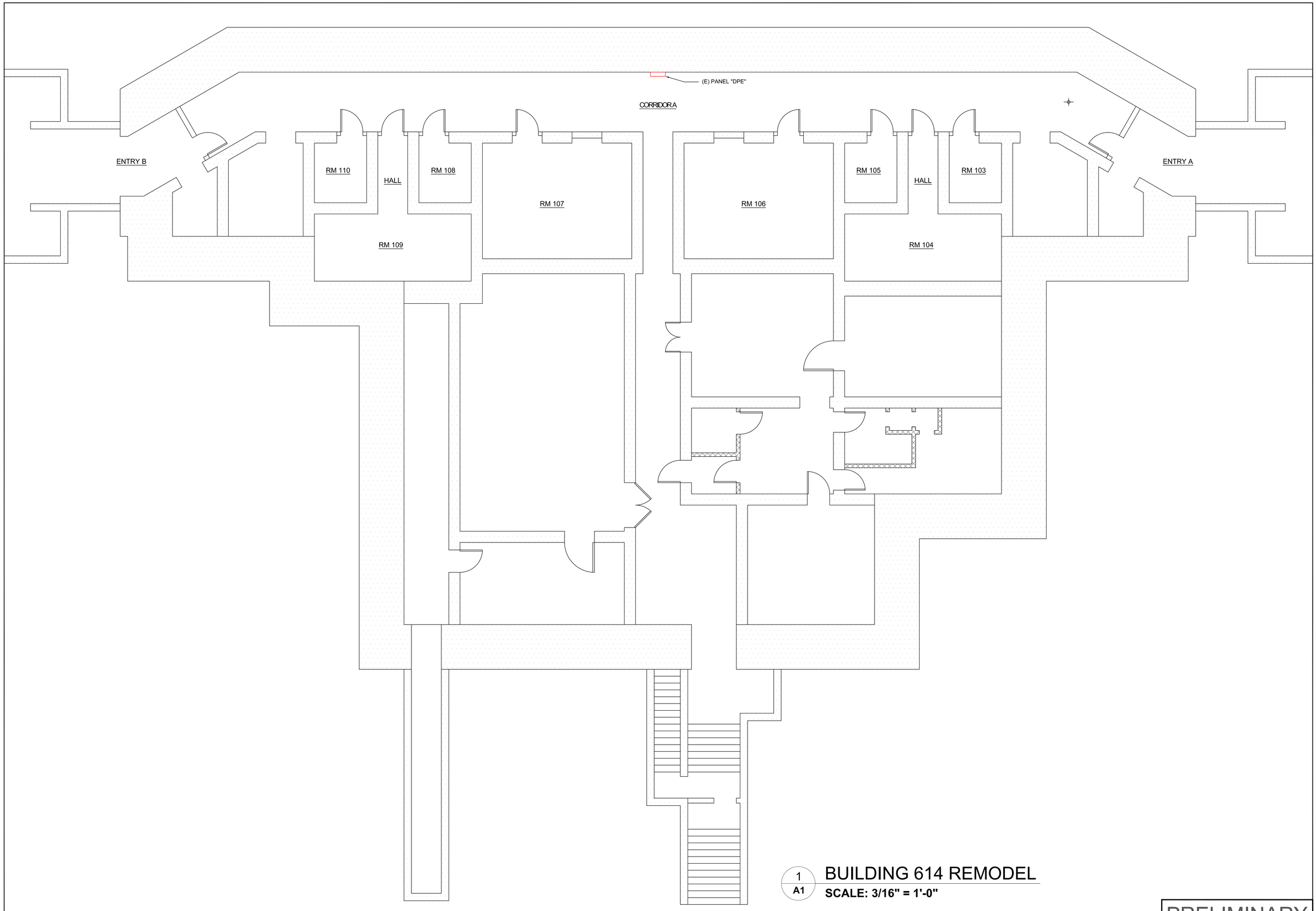


Figure 10: Illustration of the pedestal proposed to carry the additional conduit from the planter feature to the south side of the battery. Image provided by Sound & Sea Technology.

Figure 11: Illustration of the vacuum fault interrupter (70.5"w x 90" d x 56.5" h). Image provided by Sound & Sea Technology.



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BUILDING 614 REMODEL

SCALE: 3/16" = 1'-0"

PRELIMINARY

Pacific Industrial Electric

www.PacificIndustrialElectric.com

230 North Orange Avenue
Brea, CA 92821-4026

Phone: 714/990-9280 Fax: 714/990-9285

PACIFIC INDUSTRIAL ELECTRIC COMPANY INCORPORATED FEB. 20 1973 CALIFORNIA

Contractors License # 655104
A, B, C-10

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PROJECT: SOUND AND SEA TECHNOLOGY BUILDING 614

SHEET TITLE: BUILDING 614 REMODEL

SHEET NO.

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Sheet 1 of 4

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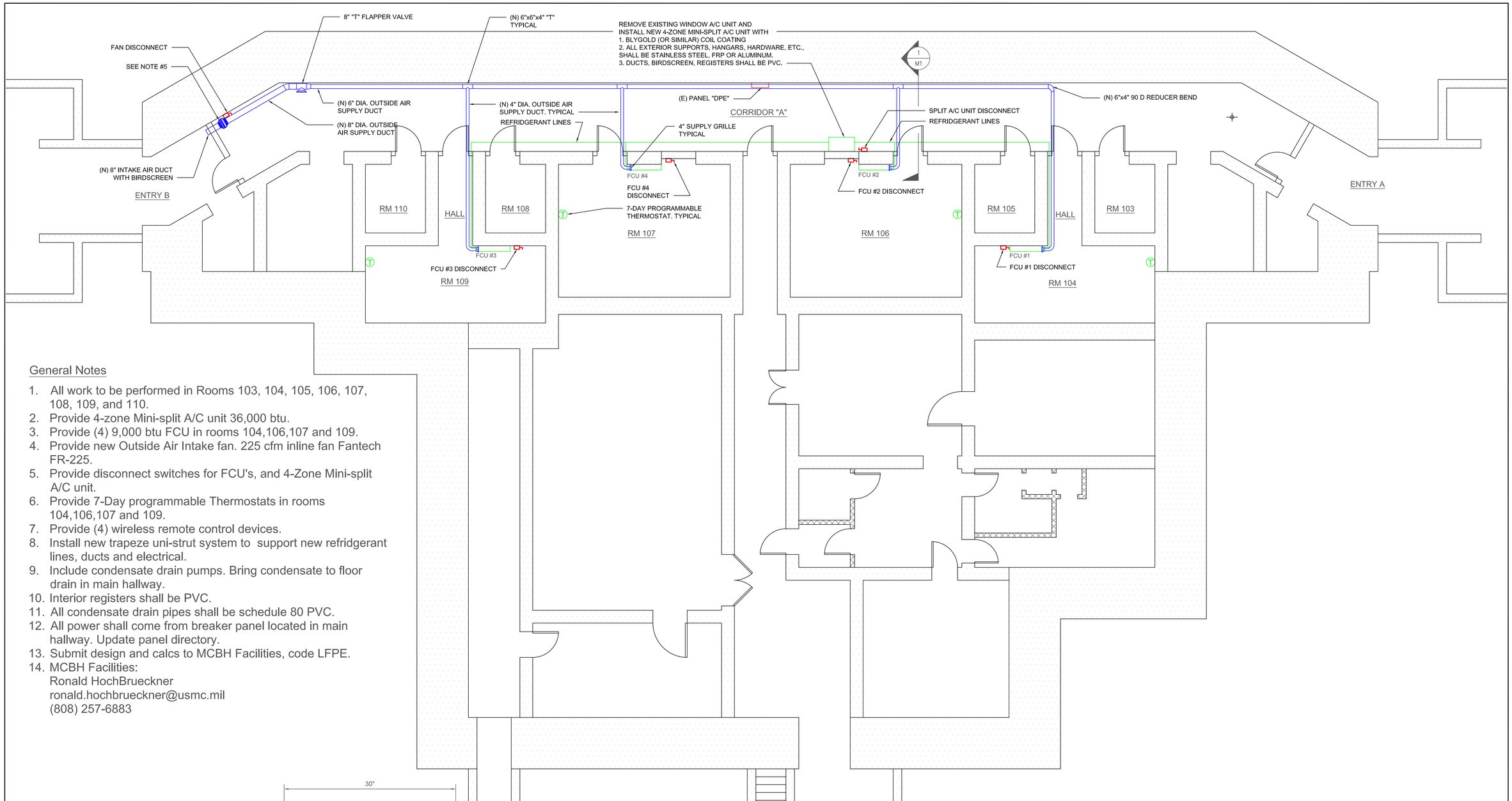
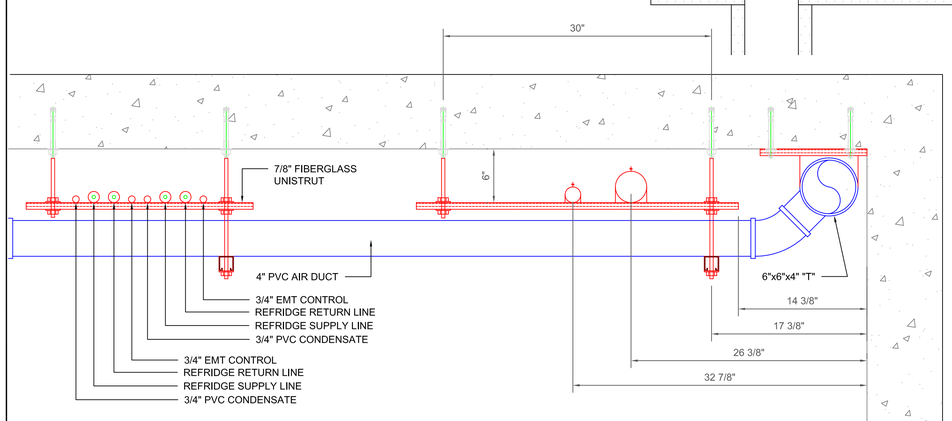


General Notes

1. All work to be performed in Rooms 103, 104, 105, 106, 107, 108, 109, and 110.
2. Provide 4-zone Mini-split A/C unit 36,000 btu.
3. Provide (4) 9,000 btu FCU in rooms 104,106,107 and 109.
4. Provide new Outside Air Intake fan. 225 cfm inline fan Fantech FR-225.
5. Provide disconnect switches for FCU's, and 4-Zone Mini-split A/C unit.
6. Provide 7-Day programmable Thermostats in rooms 104,106,107 and 109.
7. Provide (4) wireless remote control devices.
8. Install new trapeze uni-strut system to support new refridgerant lines, ducts and electrical.
9. Include condensate drain pumps. Bring condensate to floor drain in main hallway.
10. Interior registers shall be PVC.
11. All condensate drain pipes shall be schedule 80 PVC.
12. All power shall come from breaker panel located in main hallway. Update panel directory.
13. Submit design and calcs to MCBH Facilities, code LFPE.
14. MCBH Facilities:
    Ronald HochBrueckner
    ronald.hochbrueckner@usmc.mil
    (808) 257-6883



SECTION AT RACK "15" IN CORRIDOR "A"

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BUILDING 614 REMODEL - A/C PLAN

SCALE: 3/16" = 1'-0"

PRELIMINARY

Pacific Industrial Electric
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Phone: 714/990-9280 Fax: 714/990-9285

PACIFIC INDUSTRIAL ELECTRIC COMPANY INCORPORATED FEB. 20 1973 CALIFORNIA

Contractors License # 655104
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REVISION / RELEASE HISTORY

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PROJECT: SOUND AND SEA TECHNOLOGY BUILDING 614

SHEET TITLE: BUILDING 614 REMODEL - A/C PLAN

SHEET NO. M1

Sheet 4 of 4

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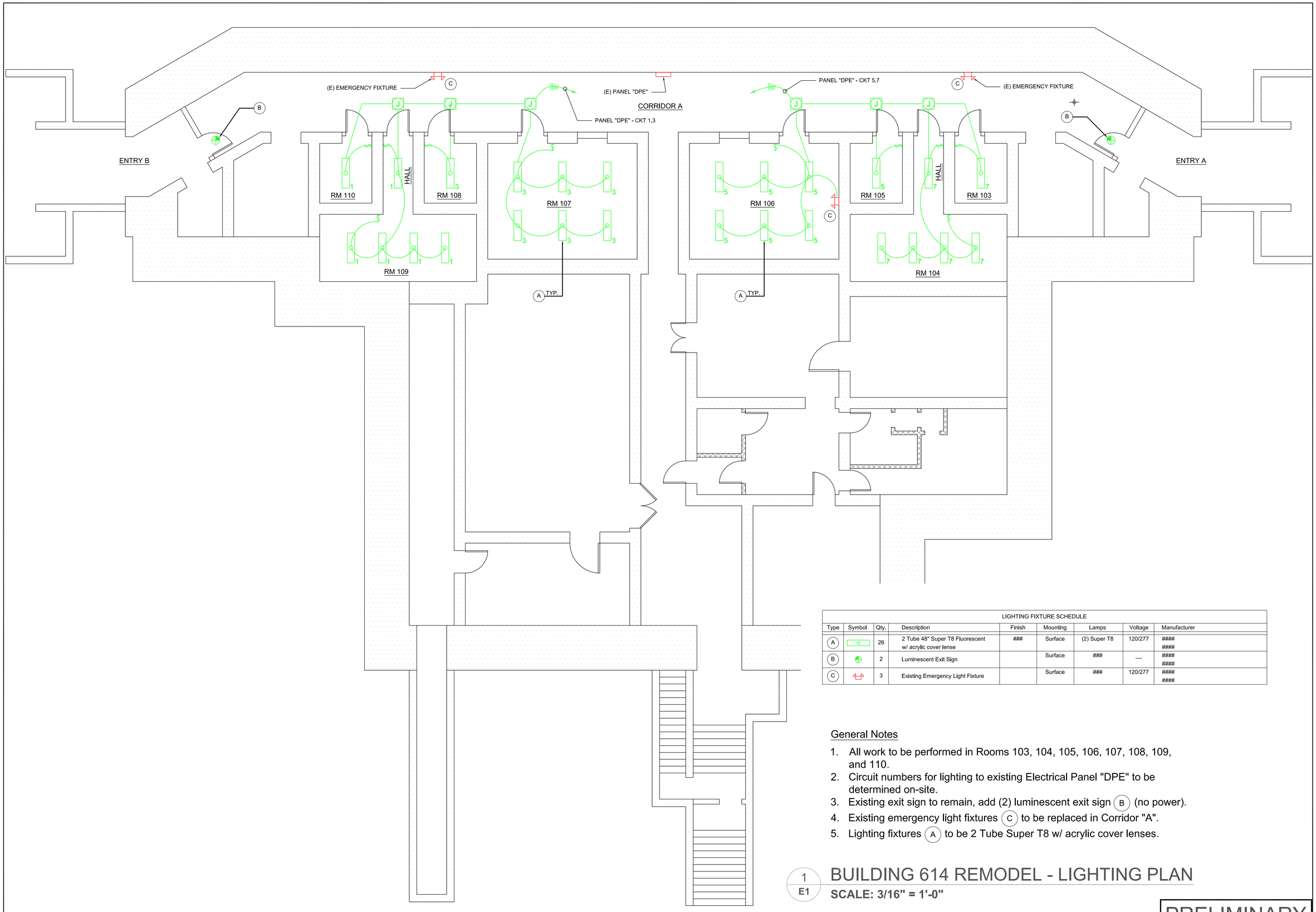

LIGHTING FIXTURE SCHEDULE								
Type	Symbol	Qty.	Description	Finish	Mounting	Lamps	Voltage	Manufacturer
A		26	2 Tube 48" Super T8 Fluorescent w/ acrylic cover lense	###	Surface	(2) Super T8	120/277	#### ####
B		2	Luminescent Exit Sign		Surface	###	—	#### ####
C		3	Existing Emergency Light Fixture		Surface	###	120/277	#### ####

General Notes

1. All work to be performed in Rooms 103, 104, 105, 106, 107, 108, 109, and 110.
2. Circuit numbers for lighting to existing Electrical Panel "DPE" to be determined on-site.
3. Existing exit sign to remain, add (2) luminescent exit sign (B) (no power).
4. Existing emergency light fixtures (C) to be replaced in Corridor "A".
5. Lighting fixtures (A) to be 2 Tube Super T8 w/ acrylic cover lenses.

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E1

BUILDING 614 REMODEL - LIGHTING PLAN

SCALE: 3/16" = 1'-0"

PRELIMINARY

Pacific Industrial Electric

www.PacificIndustrialElectric.com

230 North Orange Avenue
Brea, CA 92821-4026

Phone: 714/990-9280 Fax: 714/990-9285

PACIFIC INDUSTRIAL ELECTRIC COMPANY INCORPORATED FEB. 20 1973 CALIFORNIA

Contractors License # 655104
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PROJECT: SOUND AND SEA TECHNOLOGY BUILDING 614

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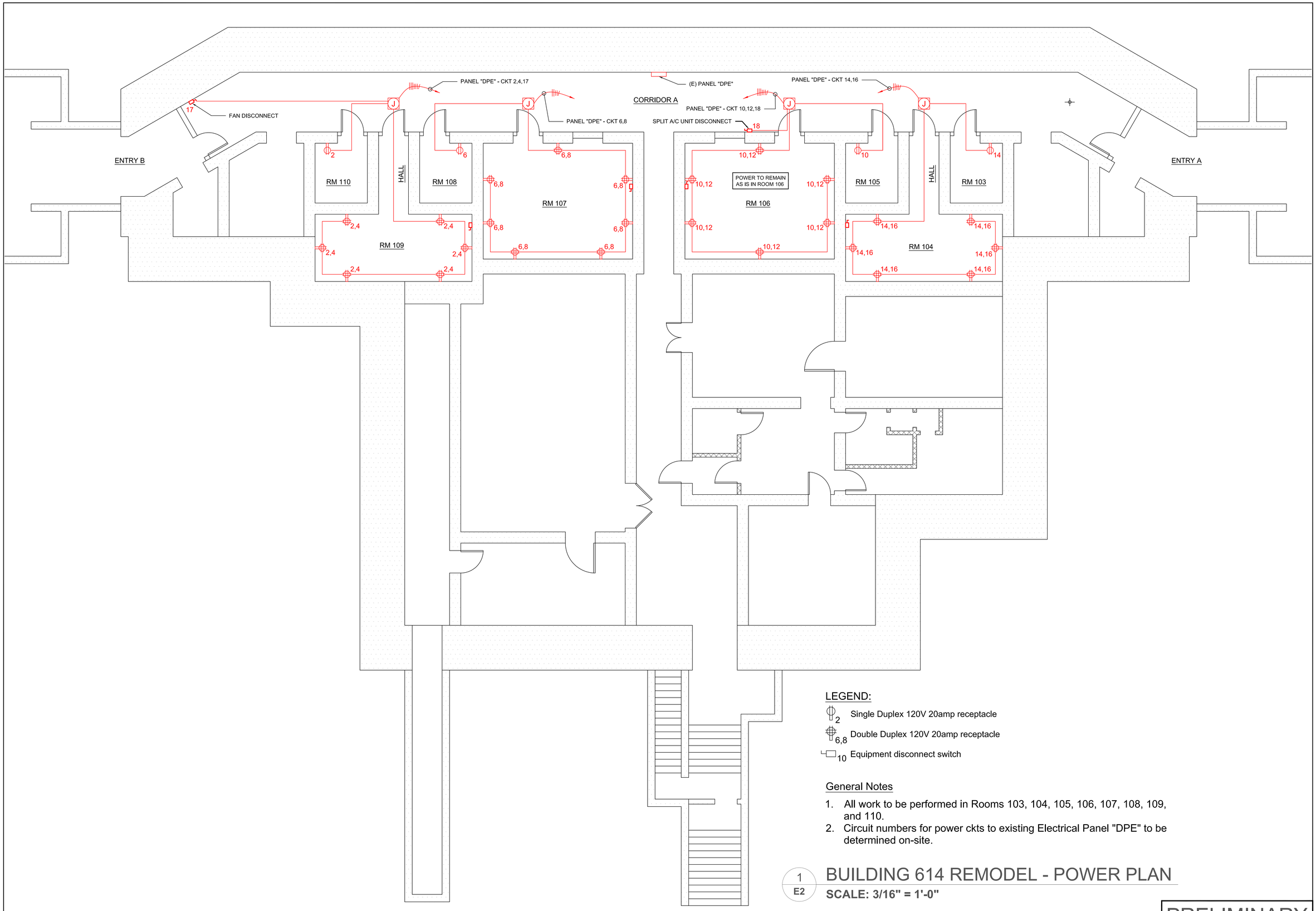
Sheet 2 of 4

Plot date: Aug 10 2012 Plot time: 3:16pm File Name: \\SSTHOME\engumasi\Desktop\6533 - SOUND AND SEA TECH\BLDG 614 - 3-16.dwg



LEGEND:

- 2 — Single Duplex 120V 20amp receptacle
- 6,8 — Double Duplex 120V 20amp receptacle
- 10 — Equipment disconnect switch

General Notes

1. All work to be performed in Rooms 103, 104, 105, 106, 107, 108, 109, and 110.
2. Circuit numbers for power ckts to existing Electrical Panel "DPE" to be determined on-site.

1 / E2

BUILDING 614 REMODEL - POWER PLAN

SCALE: 3/16" = 1'-0"

PRELIMINARY

Pacific Industrial Electric

www.PacificIndustrialElectric.com

230 North Orange Avenue
Brea, CA 92821-4026

Phone: 714/990-9280 Fax: 714/990-9285

Pacific Industrial Electric Company Incorporated — FEB. 20 1973 — California

Contractors License # 655104
A, B, C-10

REVISION / RELEASE HISTORY

A	-
B	-
C	-
D	-
E	-
F	-
G	-
H	-
I	-
J	-
K	-
L	-

0 ½" 1"

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

Designed: -
Drawn: PIE
Checked: -
Approved: -

PROJECT: SOUND AND SEA TECHNOLOGY BUILDING 614

SHEET TITLE: BUILDING 614 REMODEL - POWER PLAN

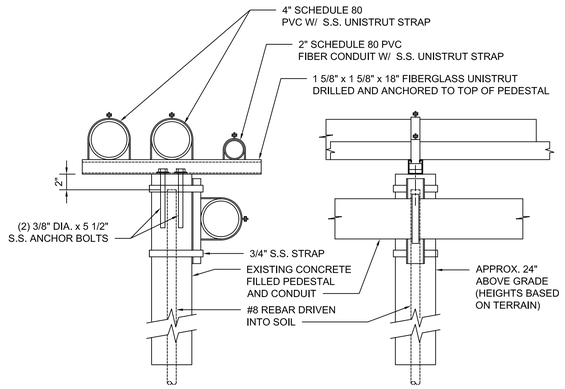
SHEET NO.

E2

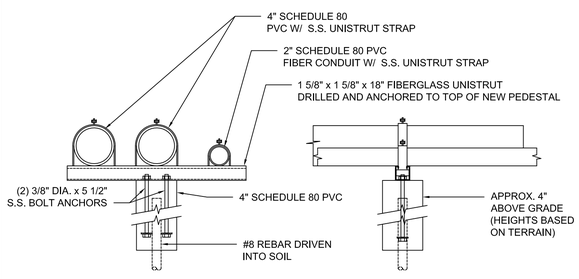
Sheet 3 of 4

File Name: \\SS1\HOME\dagumati\Desktop\8533 - SOUND AND SEA TECH\BLDG 614 - 3-16.dwg

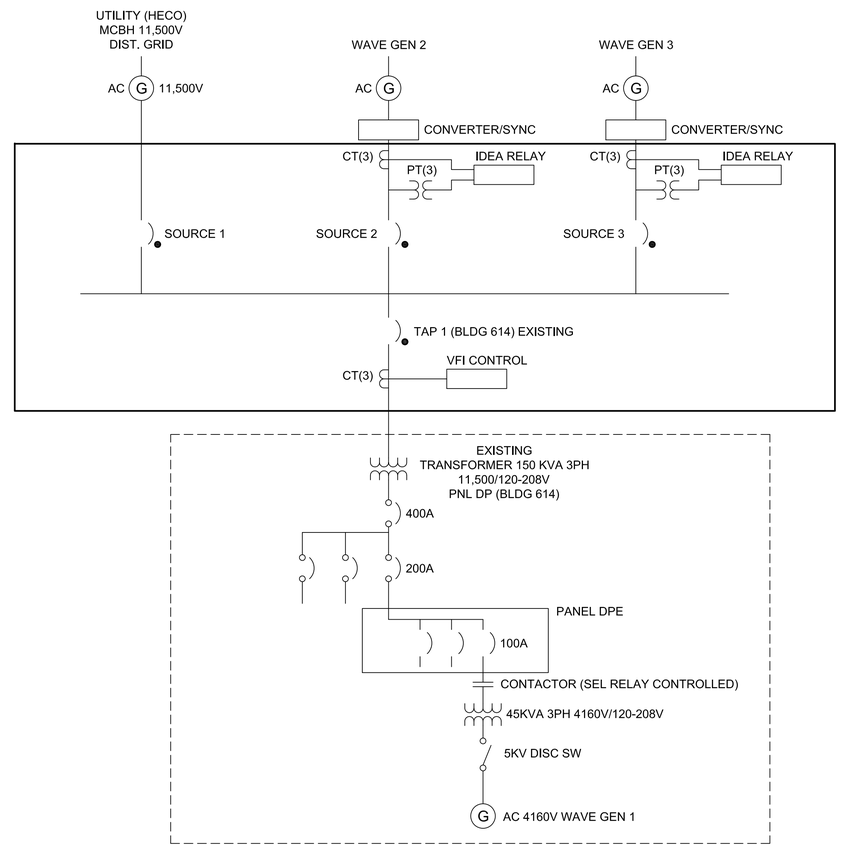
Plot date: Aug 10 2012 Plot time: 3:41pm



(E) PEDESTALS WITH NEW CONDUITS ADDED ON TOP ***DETAIL*** 1



NEW PEDESTAL DETAIL ***DETAIL*** 2



15KV COOPER VFI - 4 WAY
3 - SOURCE WAYS
1 - TAP WAY (BLDG 614)

UNIT CHARACTERISTICS:

1. STAINLESS STEEL TANK & COVERS
2. FR3 INSULATION
3. 200 AMPS ALL WAYS
4. 15KV SYSTEM, 200 AMP CONTINUOUS, 12KA INTERRUPTION RATING
5. MOTOR OPERATOR ON WAYS 2 & 3.
6. IDEA RELAY ON WAYS 2 &3.
7. POTENTIAL TRANSFORMERS (ONE PER PHASE) ON WAYS 2 & 3.
8. TPG CONTROL (TRI-PHASE WITH GROUND) ON TAP WAY.

SINGLE LINE DIAGRAM ***DETAIL*** 3

PRELIMINARY

Pacific Industrial Electric

www.PacificIndustrialElectric.com

230 North Orange Avenue
Brea, CA 92821-4026

Phone: 714/990-9280 Fax: 714/990-9285

PACIFIC INDUSTRIAL ELECTRIC COMPANY INCORPORATED FEB. 20 1973 CALIFORNIA

Contractors License # 655104
A, B, C-10

REVISION / RELEASE HISTORY

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K	-

0 ½" 1"

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

Designed: -
Drawn: PIE
Checked: -
Approved: -

PROJECT: SOUND AND SEA TECHNOLOGY BUILDING 614

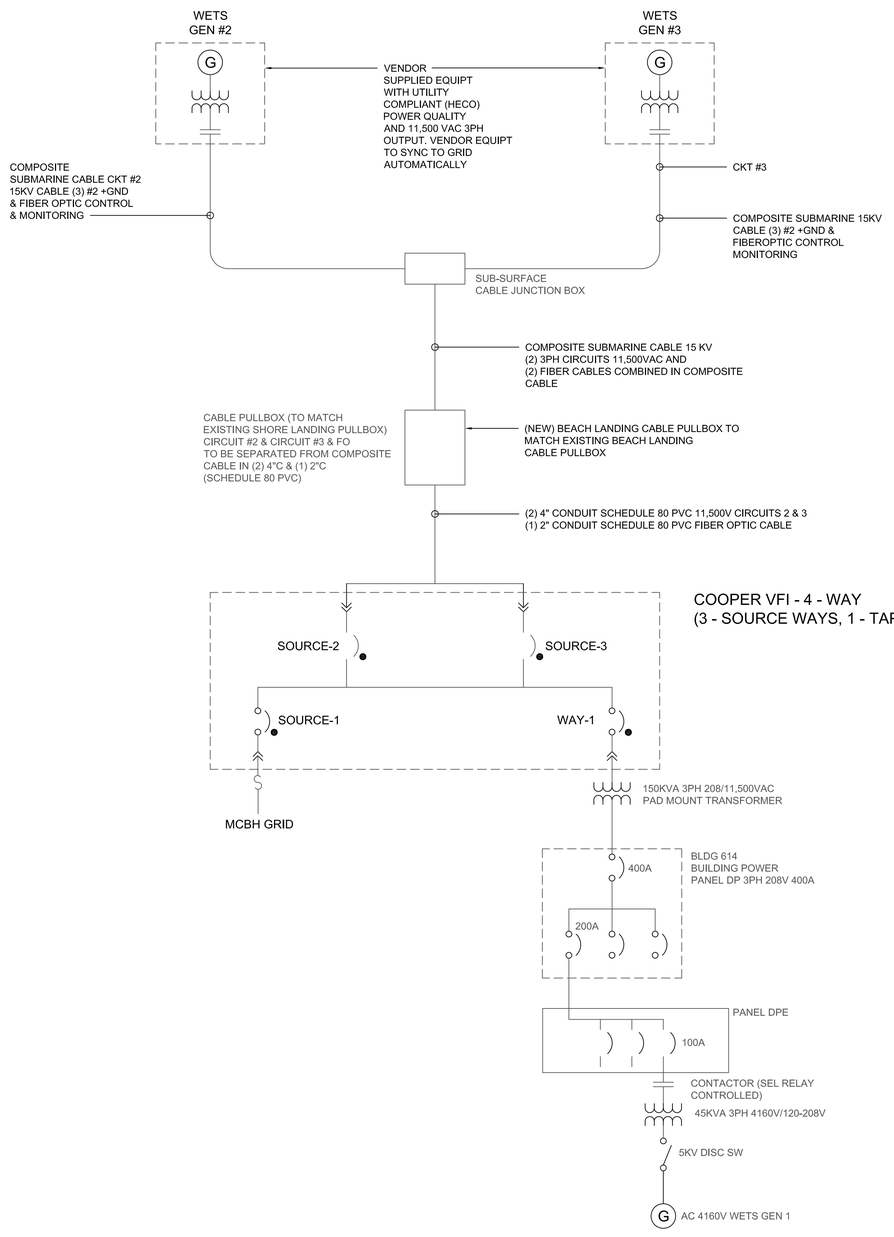
SHEET TITLE: BUILDING 614 REMODEL - SINGLE LINE

SHEET NO.

E3

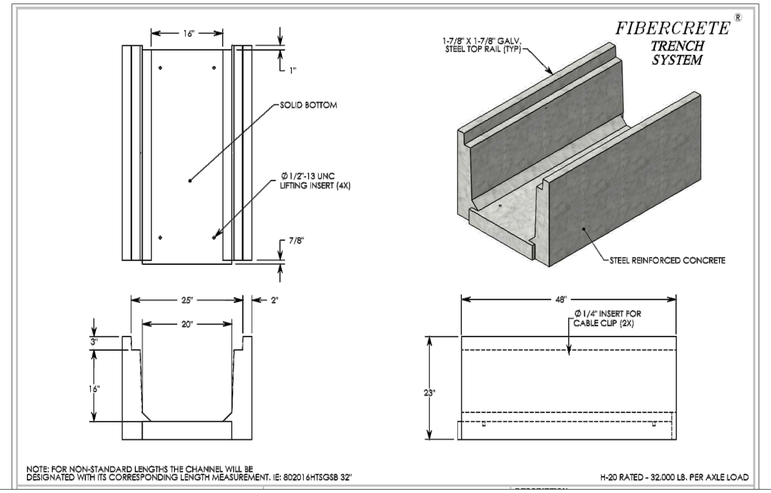
Sheet 5 of 5

Plot date: Sep 10,2012 Plot time: 3:45pm File Name: \\SS1\HOME\fragumas\Desktop\6553 - SOUND AND SEA TECH\BLDG 614 - 3-16.dwg



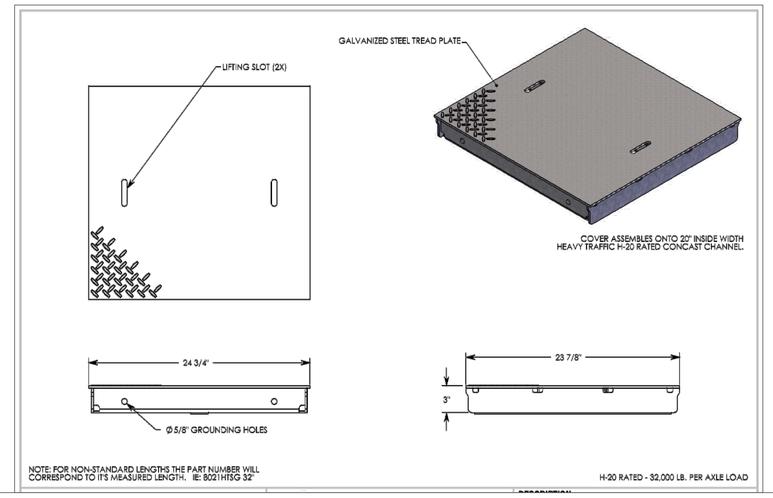
CABLE ROUTING FOR BEACH LANDING AND HDD SCHEMES

1



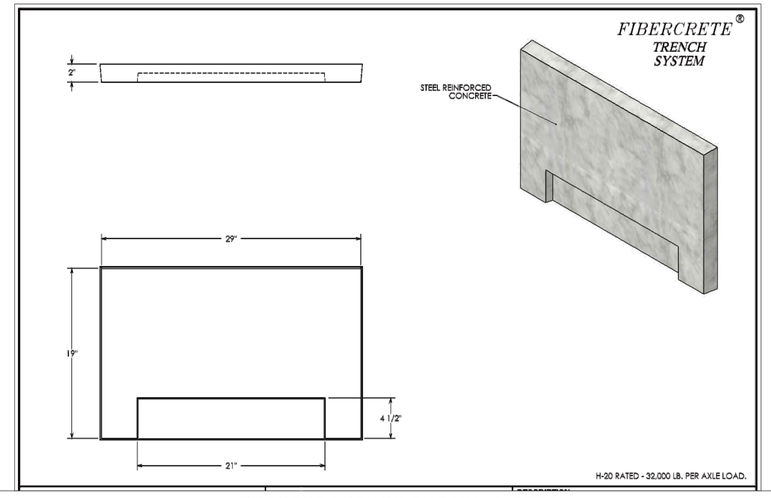
PRECAST TRENCH DETAIL

2



PRECAST TRENCH COVER DETAIL

3



PRECAST TRENCH END WALL DETAIL

4

PRELIMINARY

Pacific INDUSTRIAL ELECTRIC
www.PacificIndustrialElectric.com
230 North Orange Avenue
Brea, CA 92821-4026
Phone: 714/990-9280 Fax: 714/990-9285

PACIFIC INDUSTRIAL ELECTRIC COMPANY INCORPORATED FEB. 20 1973 CALIFORNIA

Contractors License # 655104
A, B, C-10

REVISION / RELEASE HISTORY

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0 ½" 1"
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

Designed: -
Drawn: PIE
Checked: -
Approved: -

PROJECT: SOUND AND SEA TECHNOLOGY BUILDING 614

SHEET TITLE: BUILDING 614 REMODEL - WETS GEN. SINGLE LINE

SHEET NO.

E4

Sheet 6 of 6

Plot date: Sep 12 2012 Plot time: 2:00pm File Name: \\SSTHOME\Virginiamai\Desktop\6533 - SOUND AND SEA TECH\BLDG 614 - 3-16.dwg

Appendix F
CZMA Correspondence

DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION HAWAII
850 TICONDEROGA ST STE 110
PEARL HARBOR, HAWAII 96860-5101

5090
Ser N4/ 04163
01 JUN 2009

CERTIFIED MAIL NO. 7007 2560 0002 0326 9580

Mr. Abbey Mayer
Office of Planning
Department of Business, Economic
Development and Tourism
P. O. Box 2359
Honolulu HI 96804

Dear Mr. Mayer:

SUBJECT: REQUEST FOR CONCURRENCE WITH MODIFICATIONS TO THE DEPARTMENT OF THE NAVY DE MINIMIS ACTIVITIES UNDER THE COASTAL ZONE MANAGEMENT ACT (CZMA)

This letter is to request your concurrence with the attached list of Navy/Marine Corps de minimis activities under the CZMA. The attached de minimis list will amend the current de minimis list which was established on April 2, 2007. The new de minimis list will include the Marine Corps, and will cover areas in the Pearl Harbor Naval complex, Naval Magazine Lualualei, Naval Communications and Telecommunications Area Master Station Pacific, Pacific Missile Range Facility on Kauai, Kaneohe Marine Corps Base Hawaii, Camp Smith and all associated installations/facilities/equipment located outside of those Navy/Marine Corps properties.

The Navy and Marine Corps have determined that the listed Proposed Actions have insignificant direct or indirect (cumulative and secondary) coastal effects and should therefore be categorized as de minimis in accordance with the Department of Commerce, National Oceanic and Atmospheric Administration, CZMA Federal Consistency Regulations 15 CFR part 930.33 (3). With the corresponding mitigation and conditions applied, these actions would be exempt from a negative determination or a consistency determination from the State of Hawaii.

Should you have any questions, please contact Mr. Brian Yamada at 472-1449, by facsimile transmission at 474-5419, or by email at brian.yamada@navy.mil.

Sincerely,

E. J. D'ANDREA
Lieutenant Commander, CEC, U. S. Navy
Assistant Regional Engineer
By direction of the
Commander

Enclosure: 1.Navy De minimis Activities Under CZMA

Navy/Marine Corps De Minimis Activities Under CZMA

***covering areas in Pearl Harbor Naval Complex, Naval Magazine Lualualei, Naval Communications and Telecommunications Area Master Station (NCTAMS) Pacific, Pacific Missile Range Facility (PMRF), Kaneohe Marine Corps Base Hawaii, Camp Smith, and all associated installations/facilities/equipment located outside of these Navy/Marine Corps properties**

No.	Proposed Action	Description	Mitigation / Conditions
1	New Construction	Construction of new facilities and structures wholly within Navy/Marine Corps controlled areas (including land and water) that is similar to present use and, when completed, the use or operation of which complies with existing regulatory requirements.	1, 3, 6, 8, 9, 10, 11, 13, 14, 16
2	Utility Line Activities	Acquisition, installation, operation, construction, maintenance, or repair of utility or communication systems that use rights of way, easements, distribution systems, or facilities on Navy/Marine Corps controlled property. This also includes the associated excavation, backfill, or bedding for the utility lines, provided there is no change in preconstruction contours.	1, 10, 11, 12, 14, 16
3	Repair and Maintenance	Routine repair and maintenance of buildings, ancillary facilities, piers, wharves, dry docks, vessels, or equipment associated with existing operations and activities.	12, 14, 16
4	Aids to Navigation	Includes buoys, beacons, signs, etc. placed within Navy/Marine Corps controlled coasts and navigable waters as guides to mark safe water.	2, 5, 14, 16
5	Structures in Fleeting and Anchorage Areas	The installation of structures, buoys, floats and other devices placed within anchorage or fleeting areas to facilitate moorage of vessels within Navy/Marine Corps controlled property.	2, 5, 14, 16
6	Oil Spill and Hazardous Waste Cleanup	Activities required for the containment, stabilization, removal and cleanup of oil and hazardous or toxic waste materials on Navy/Marine Corps controlled property.	1, 8, 14, 16
7	Maintenance Dredging	Excavation and removal of accumulated sediment for maintenance to previously authorized depths.	2, 3, 4, 5, 7, 8, 9, 13, 14, 16
8	New Dredging	Excavation and removal of material from the ocean floor not to exceed 100 cubic yards below the plane of the ordinary high water mark or the mean high water mark from navigable waters of the US and; excavation and removal of material from the ocean floor within Navy/Marine Corps controlled property. This does not include dredging or degradation through coral reefs.	2, 3, 4, 5, 7, 8, 9, 13, 14, 16
9	Scientific Measuring Devices	The installation of devices which record scientific data (staff gages, tide gages, water recording devices, water quality testing and improvement devices and similar structures) on Navy/Marine Corps controlled property. Devices must not transmit acoustics (certain frequencies) that will adversely affect marine life.	1, 2, 14, 16
10	Studies and Data Collection and Survey Activities	Studies, data and information-gathering, and surveys that involve no permanent physical change to the environment. Includes topographic surveys, wetlands mapping, surveys for evaluating environmental damage, engineering efforts to support environmental analyses, core sampling, soil survey sampling, and historic resources surveys.	2, 3, 6, 8, 9, 11, 12, 13, 14, 16
11	Demolition	Demolition and disposal involving buildings or structures when done in accordance with applicable regulations and within Navy/Marine Corps controlled properties.	1, 11, 12, 14, 16
12	Military Testing and Training	Routine testing and evaluation of military equipment on or over military, or an established range, restricted area or operating area or training conducted on or over military land or water areas in which the impact is not significant.	9, 13, 14, 15, 16
13	Real Estate/Property Transfer	Real estate acquisitions or outleases of land involving new ingrants/outgrants and/or 50 acres or more where existing land use will change.	14, 16

ENCLOSURE(1)

14	Mission Changes	Mission changes, base closures/relocations/consolidations, and deployments that would cause long term population increases or decreases in affected areas.	14, 16
15	Limitation of Access to Property	Permanent closure or limitation of access to any areas that were open previously to public use, such as roads or recreational purposes (provided the access is not required by established agreements with State of Hawaii, private industry, etc.)	14, 16
16	Environmental Management Activities	Environmental management activities within Navy/Marine Corps controlled areas including, but not limited to, activities such as vegetation and mangrove removal, ditch clearing, sediment removal, invasive species removal, construction related to protecting endangered species and wildlife, and actions prescribed by the Integrated Natural Resources Management Plan (INRMP)	2, 13, 14, 16
17	Towers	Installation, operation, and maintenance of towers (such as communication towers, cellular phone antennas, wind-energy towers) within Navy/Marine Corps controlled areas.	1, 2, 6, 8,9 , 12, 13, 14, 16
18	Alternative Energy Research	Installation, operation, replacement, and removal of alternative energy research structures/equipment taking place within Navy/Marine Corps controlled areas.	1, 2, 3, 5, 6, 12, 13, 14, 16
19	Army Corps Nation Wide Permits	Work subject to an Army Corps of Engineers Nationwide permit (which are applicable to Hawaii)	16

Project Mitigation / General Conditions

1) Navy/Marine Corps controlled property refers to land areas, rights of way, easements, roads, safety zones, danger zones, ocean and naval defensive sea areas under active Navy/Marine Corps control.
2) If any listed species enters the area during conduct of construction activities, all activities should cease until the animal(s) voluntarily depart the area.
3) Turbidity and siltation from project related work shall be minimized and contained to within the vicinity of the site through appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.
4) Dredging/filling in the marine/aquatic environment shall be scheduled to avoid coral spawning and recruitment periods.
5) All project-related materials and equipment (dredges, barges, backhoes, etc.) to be placed in the water shall be cleaned of pollutants prior to use.
6) No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.).
7) All debris removed from the marine/aquatic environment shall be disposed of at an upland site or EPA approved ocean disposal site, and Best Management Practices shall be followed.
8) No contamination (trash or debris disposal, alien species introductions, etc.) of adjacent marine/aquatic environments (reef flats, channels, open ocean, stream channels, wetlands, etc.) shall result from project-related activities.
9) Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate clean-up of accidental petroleum releases.
10) Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.
11) Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric, etc.) after exposure and stabilized as soon as practicable (with vegetation matting, hyrdroseeding, etc.).
12) Section 106, of the National Historic Preservation Act (NHPA), consultation requirements must be met. Also, follow guidelines in the area-specific Integrated Cultural Resources Management Plan (ICRMP) if applicable.
13) Navy/Marine Corps shall evaluate the possible impact of the action on species and habitats protected under the Endangered Species Act (ESA). If the Navy/Marine Corps determines that no such species or habitats will be affected by the action, neither U.S. Fish and Wildlife (FWS) Service nor National Oceanic and Atmospheric Administration (NOAA) concurrence is required. Should it be determined by the Navy/Marine Corps, FWS, or NOAA that the action may affect any such species or habitat, informal or formal consultation will be initiated by the Navy/Marine Corps as required by section 7 (Interagency Cooperation) of the ESA.
14) The National Environmental Policy Act (NEPA) review process will be completed.
15) The training, testing and evaluation will be conducted in accordance with applicable standard operating procedures protective of the environment.
16) Navy or Marine Corps staff shall notify State CZM of de minimis list usage for projects which require an Environmental Assessment (EA). Notification can be sent via email: to JNakagaw@dbedt.hawaii.gov

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

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

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-12644

July 9, 2009

Lieutenant Commander E. J. D'Andrea
Assistant Regional Engineer
Department of the Navy
Commander
Navy Region Hawaii
850 Ticonderoga Street, Suite 110
Pearl Harbor, Hawaii 96860-5101

Attention: Mr. Brian Yamada

Dear Lt. Commander D'Andrea:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Concurrence with Modifications to the Department of the Navy De Minimis Activities in Hawaii under the Coastal Zone Management Act (CZMA)

The Hawaii CZM Program has completed the federal consistency review of the proposed modifications to the list of Department of the Navy de minimis activities under the CZMA, including changes to various activity categories, adding new activity categories, and expanding the coverage to Marine Corps Base Hawaii Kaneohe Bay and Camp Smith. The CZM Program conducted a thorough review of the request and a public notice of the CZM review was published in the State of Hawaii Office of Environmental Quality Control's publication, *The Environmental Notice*, on June 23, 2009. The public was provided an opportunity to participate in the review through July 7, 2009. There were no public comments received.

We concur that the activities identified on the modified list entitled, "Navy/Marine Corps De Minimis Activities Under CZMA" are expected to have insignificant direct or indirect (cumulative and secondary) coastal effects, and should not be subject to further review by the Hawaii CZM Program on the basis and condition that the listed activities are subject to and bound by full compliance with the corresponding "Project Mitigation / General Conditions."

The Hawaii CZM Program reserves the right to review, amend, suspend, and/or revoke the "Navy/Marine Corps De Minimis Activities Under CZMA" list whenever it finds that a listed activity or activities will have reasonably foreseeable coastal effects. CZM consistency

concurrence does not convey approval with any other regulations administered by any State or County agency.

Modifying and expanding the list of Navy de minimis activities under the CZMA was a cooperative effort between our Office and Mr. Brian Yamada from the Department of the Navy, who interned with the Hawaii CZM Program in September 2008. We appreciate the efforts of Mr. Yamada in working with our CZM staff. The de minimis activities list will result in more efficient compliance with CZMA federal consistency requirements for both the Navy and the Hawaii CZM Program.

If you have any questions, please call John Nakagawa of our CZM Program at 587-2878.

Sincerely,

Abbey Seth Mayer
Director

c: U.S. Army Corps of Engineers, Regulatory Branch (w/ copy of de minimis list)
Ms. Rebecca Hommon, Region Counsel, Navy Region Hawaii

From: Suwa, Alan M CIV NAVFAC Pacific, EV <alan.suwa@navy.mil>
Sent: Thursday, July 11, 2013 5:36 PM
To: jnakagaw@dbedt.hawaii.gov
Subject: Notification of Proposed Deep-water WETS Project as Navy De Minimis Activities under CZM

Aloha Mr. Nakagawa,

The Navy is preparing an Environmental Assessment for the construction and operation of two deep-water Wave Energy Test Site (WETS) berths for testing offshore wave energy conversion (WEC) devices in waters off the north coast of Mokapu Peninsula at Marine Corps Base Hawaii. The purpose of the project is to evaluate the technical and economic feasibility of various WEC devices with the potential to produce higher power levels in order to support future Navy and Marine Corps applications. The deep-water WETS berths would be located in approximately 200 feet (60 meters) and 260 feet (80 meters) of water, respectively, approximately 6,500 ft and 8,200 ft from shore. Each berth would support a single WEC device at a time. Subsea power and communications transmission cables from the deep-water WEC devices would be landed onshore in the vicinity of an existing transmission cable that serves an existing "shallow-water" wave energy test berth in 100 ft (30 m) of water. The new trans!
mission cables would be routed over land to an onshore termination point where the power cables would connect to the MCB Hawaii electrical grid. The communication lines would terminate in Building 614 located inland, in which transmission lines from the existing shallow-water test site now terminate. All land and sea areas affected by the Proposed Action are controlled by the Navy or Marine Corps within the NDSA**. Scientific data gathering devices will also be installed/operated near the deep-water berths to measure waves, currents, acoustics and electromagnetic fields.

The Proposed Action requires consultation and/or coordination under Section 106 of the National Historic Preservation Act and Section 7 of the Endangered Species Act. All required consultation/coordination activities will be completed.

The Proposed Action falls within the following items on the list of Navy/Marine Corps De Minimis Activities Under CZMA:

Item 1: Construction of new facilities and structures wholly within Navy/Marine Corps controlled areas (including land and water) that is similar to present use and, when completed, the use or operation of which complies with existing regulatory requirements.

Item 2: Acquisition, installation, operation, construction, maintenance, or repair of utility or communication systems that uses rights of way, easements, distribution systems, or facilities on Navy/Marine Corps controlled property. This also includes the associated excavation, backfill, or bedding for the utility lines, provided there is no change in preconstruction contours.

Item 9: The installation of devices which record scientific data (staff gages, tide gages, water recording devices, water quality testing and improvement devices and similar structures) on Navy/Marine Corps controlled property. Devices must not transmit acoustics (certain frequencies) that will adversely affect marine life.

Item 18: Installation, operation, replacement, and removal of alternative energy research structures/equipment taking place within Navy/Marine Corps controlled areas.

Per General Condition 16 of the list of De Minimis Activities Under CZMA, we are notifying you of the Navy's use of the De Minimis for the WETS project. Please contact me if you have any questions by email or call.

V/r

Alan Suwa CIV
NAFAC PAC
Environmental Planning
808 472 1450

** EO 8681 states that "...the territorial waters within Kaneohe Bay between extreme high water mark and the sea and in and about the entrance channel within a line bearing northeast true extending three nautical miles from Kaoio Point, a line bearing northeast true extending four nautical miles from Kapoho Point, and a line joining the seaward extremities of the two above-described bearing lines, are hereby established and reserved as a naval defensive sea area for purposes of national defense, such area to be known as "Kaneohe Bay Naval Defensive Sea Area"; and the airspace over the said territorial waters is hereby set apart and reserved as a naval airspace reservation for purposes of national defense, such reservation to be known as "Kaneohe Bay Naval Airspace Reservation." The proposed deep-water WETS sites are located within the NDSA boundaries identified in the EO.

From: Suwa, Alan M CIV NAVFAC Pacific, EV <alan.suwa@navy.mil>
Sent: Monday, July 15, 2013 3:08 PM
To: Gail Renard
Subject: FW: Notification of Proposed Deep-water WETS Project as Navy De Minimis Activities under CZM
Signed By: alan.suwa@navy.mil

-----Original Message-----
From: John Nakagawa [mailto:JNakagaw@dbedt.hawaii.gov]
Sent: Friday, July 12, 2013 7:32 AM
To: Suwa, Alan M CIV NAVFAC Pacific, EV
Subject: Re: Notification of Proposed Deep-water WETS Project as Navy De Minimis Activities under CZM

Acknowledging receipt of the "Notification of Proposed Deep-water WETS Project as Navy De Minimis Activities under CZM," dated July 11, 2013.

John Nakagawa
Hawaii Coastal Zone Management Program
(808) 587-2878