APPENDIX D

Marine Cultural Resources Report

MARINE CULTURAL RESOURCES TECHNICAL REPORT FOR RTI INFRASTRUCTURE, INC.

EUREKA SUBSEA CABLES PROJECT

PREPARED FOR:

RTI Infrastructure, Inc.
268 Bush Street
San Francisco, California 94104

PREPARED BY:

Macfarlane Archeological Consultants
7290 Marmota Street
Ventura, California 93003
Contact: Heather Macfarlane, Archeologist
Phone: 805-659-2657

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Tables and Figures

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Table Notes:

Shipwrecks reported include several vessel types and designs identified as follows:

Barque (also Bark). A barque is a sailing vessel with three or more masts, fore and aft rigged on after mast, square rigged on all others.

Brig. A brig is a vessel with two masts and square rigged on both of them.

Barques and brigs are not to be confused with a barquentine/barkentine or brigantine, which are rigged differently.

Packet. A packet is a mail vessel that also may carry passengers and cargo.

Schooner. A schooner is a fore and aft rigged vessel with two or more masts.

Scow. A scow is a flat-bottomed, square-ended craft used for transport of cargo.

Ship. A ship is technically a sailing vessel with three or more masts and yards crossed on all of them.

Sloop. A sloop is a one-masted sailing vessel with a fore and aft rig, bowsprit, and jib stay—or any vessel with a single-head sail (Layton 1987 in MMS 1990:IV–25.

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Acronyms and Abbreviations

AWOIS	Automated Wreck and Obstructions Information System
BOEM	Bureau of Ocean Energy Management
B.P.	Before Present
cable	fiber optic cable
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CHIRP	compressed high-intensity radar pulse
CRHR	California Register of Historical Resources
CSLC	California State Lands Commission
km	kilometer(s)
LGM	Last Glacial Maximum
m	meter(s)
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
OCS	outer continental shelf
OGB	ocean ground bed
PRC	Public Resources Code
Project	Eureka Subsea Cables Project
ROV	remotely operated vehicle
RTI	RTI Infrastructure, Inc.
TCP	traditional cultural property
USACE	U.S. Army Corps of Engineers

INTRODUCTION

The RTI Infrastructure, Inc. (RTI, the Applicant) proposed Eureka Subsea Cables Project (Project) is located in Samoa (Figures 1, 2, and 3). Samoa is a census-designated place in Humboldt County, California. It is 1.5 miles northwest of Eureka, at an elevation of 23 feet. Samoa is in the northern peninsula of Humboldt Bay. Historically, the northern peninsula is identified as the "northern sand spit of the Humboldt Bay bar."

The proposed Project would install four subsea fiber optic cables (cables) carrying telecommunication data to connect the United States with Singapore, Taiwan, Asia, and Australia. The Project entails four phases (Figure 4). Phase 1 would build the infrastructure to receive four cables and bring the first cable from Singapore to California in 2021.

Project-related work would take place in both terrestrial (land) and marine (ocean) areas onshore and offshore of a privately owned parcel of land. The study area for this Project includes those offshore areas extending from the mean high water (MHW) tide line out to the edge of the continental shelf break at a water depth of 5,904 feet (1,800 meters [m] [984 fathoms]). This area includes waters within the 3-nautical-mile (nm) State waters limit, as well as deeper waters of the U.S. Territorial Sea and U.S. Contiguous Zone. The prehistoric and historic maritime activities in northern California provide the context for review and analysis of the Project. A separate cultural resources report has been prepared under separate cover for terrestrial components.

The analysis in this technical report finds that RTI's proposed Project has the potential to disturb or destroy previously unknown or inaccurately recorded submerged prehistoric and historic maritime cultural resources. This impact would be significant under the California Environmental Quality Act (CEQA). Mitigation measures are recommended in the Impacts and Mitigation Measures section of this report to reduce the impact to a less-than-significant level. These mitigation measures would require identification of resources and avoidance of potentially significant resources by rerouting the cable.

Marine Cultural Resources Categories

Three broad categories of marine cultural resources are considered in this study, all of which are currently submerged and may be encountered during the marine installation of the Project: (1) historic period shipwrecks, including downed aircraft and unidentified debris; (2) prehistoric period watercraft; and (3) prehistoric archaeological resources, both as in situ site deposits and isolated artifacts.

Historic Period Shipwrecks

Historic period shipwrecks consist of the remains of watercraft that were used as early as the 16th century to cross the waters of the study area. These historic period watercraft include vessels that came to rest on the ocean floor due to foundering, stranding, collision between vessels, or burning; or that were abandoned at sea not due to age. Their remains currently may be partially or wholly obscured by sediments of the ocean floor.

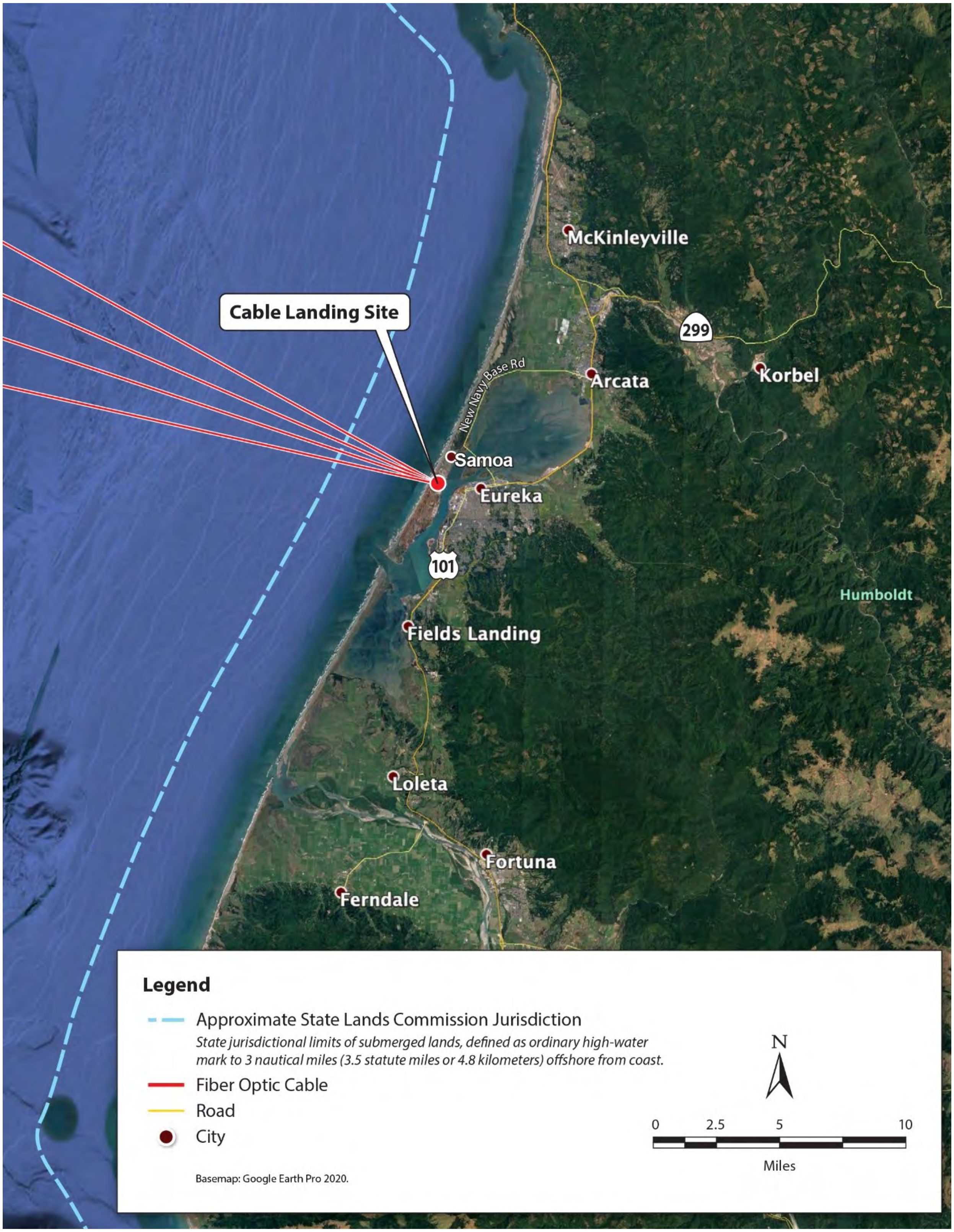
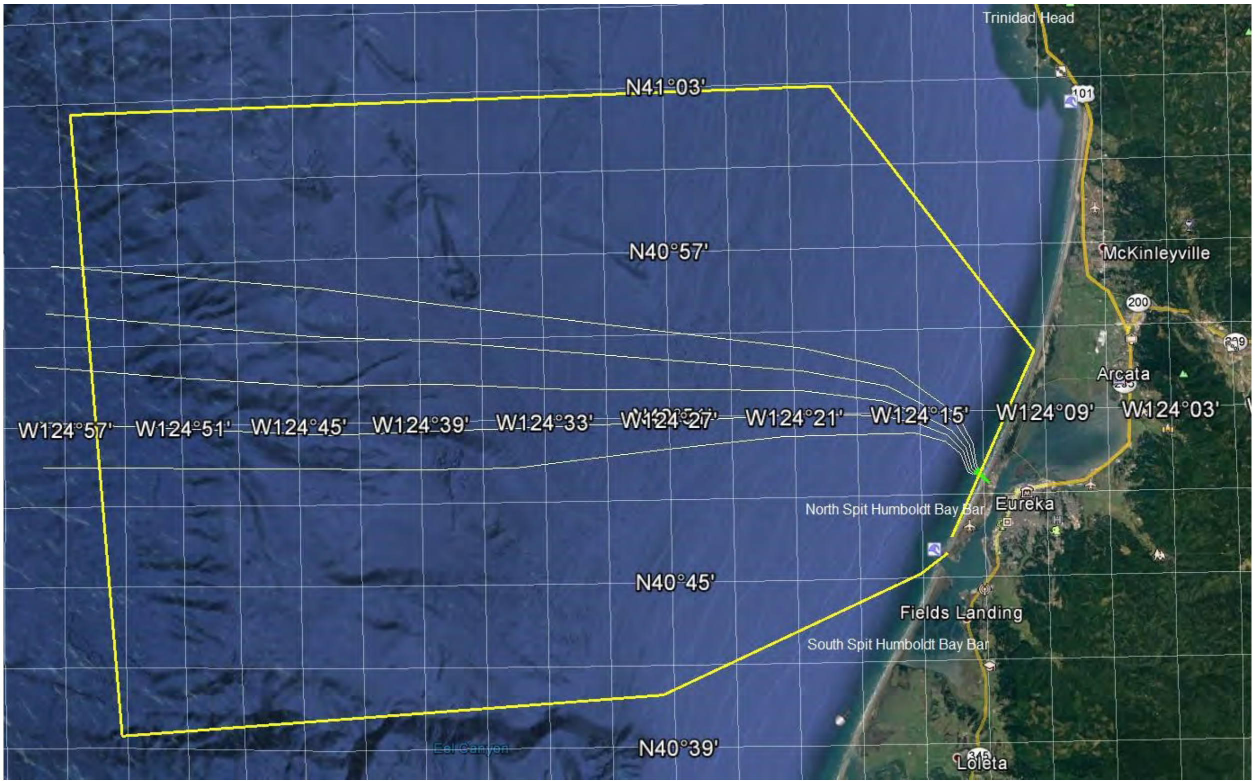


Figure 1. Project Location



Project (Image Landsat/Copernicus, Data SIO, NOAA, US Navy NGA GEBCO©Google)

Figure 2. Marine Project Area

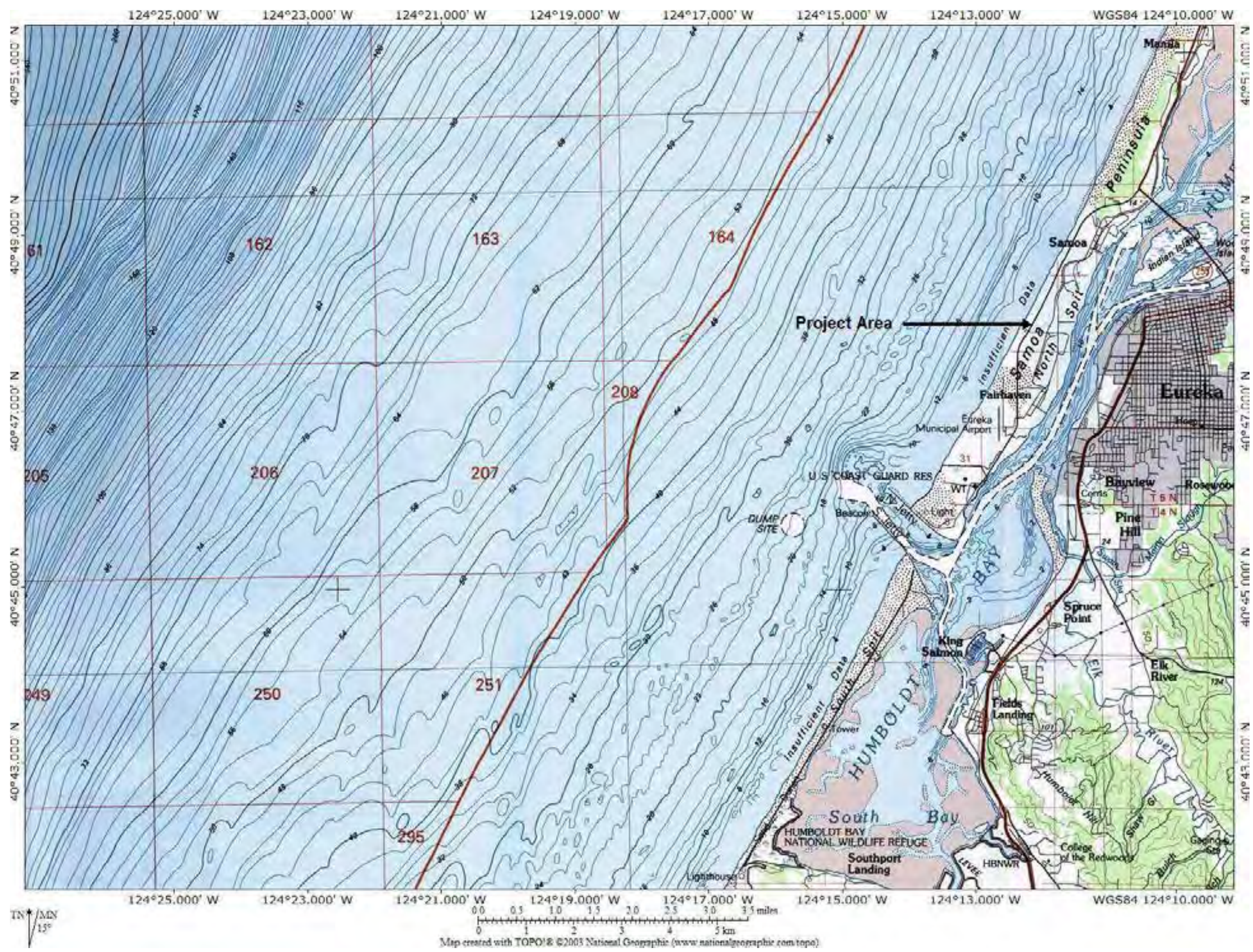


Figure 3. Topographic Map of the Project Area

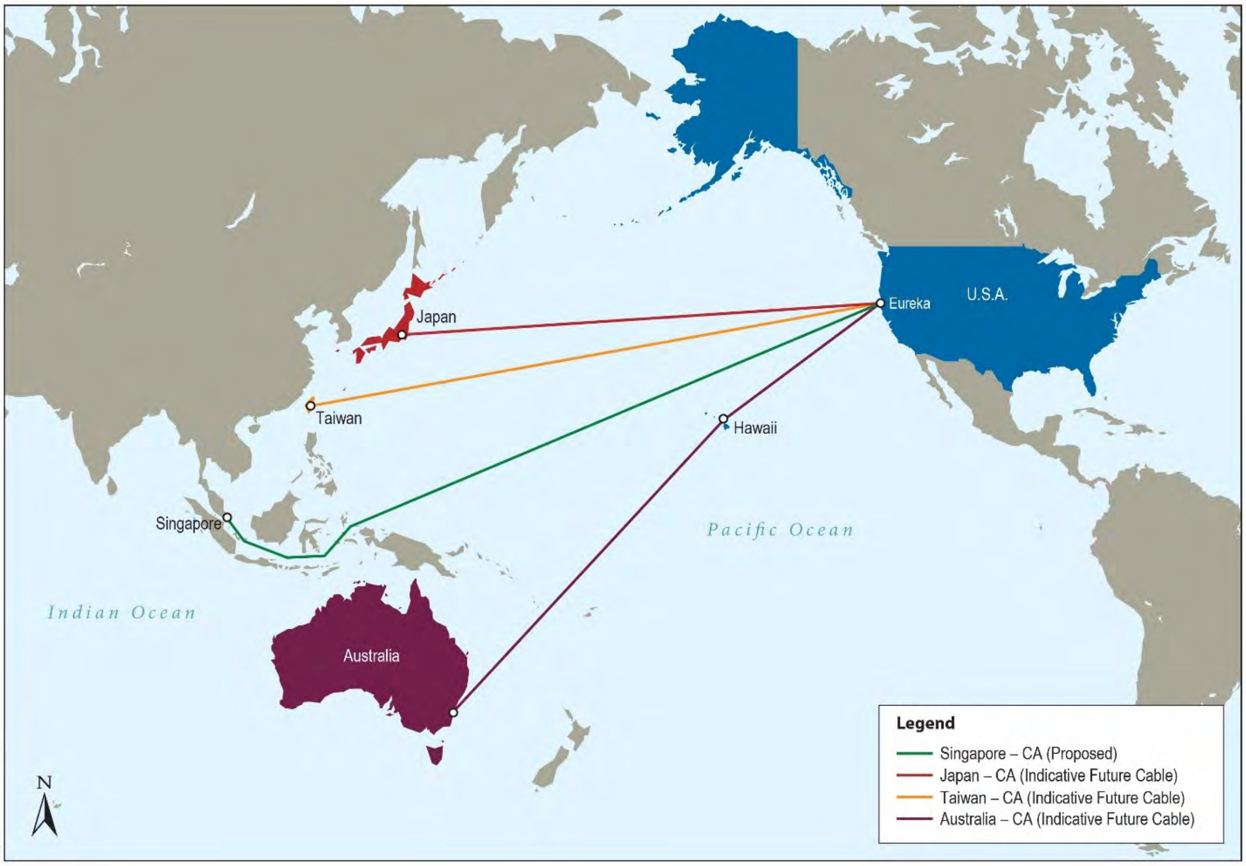


Figure 4. Proposed Project Phases

Prehistoric Period Watercraft

Native Americans used watercraft for transportation and fishing in salmon streams and lakes, and for hunting offshore and in seal and sea lion rookeries for seal and sea lions. During the approximately 13,000 years of Native American navigation through the study area, some native vessels may have been inundated, stranded, or capsized. Preservation of such vessels in the nearshore environment is considered to be rare or unlikely.

Prehistoric Archaeological Resources

Prehistoric archaeological resources include places where Native Americans lived, performed activities, altered the environment, and created art before they sustained contact with Europeans. Prehistoric resources contain features left behind by these activities as well as artifacts and subsistence remains. Additionally, they may contain human remains in the form of burials, cairns, or cremations. Although originally deposited on a non-marine landscape, changes in sea level have resulted in such resources currently being submerged. Such sites may date from the terminus of the Pleistocene through Holocene periods.

The proposed Project involves terrestrial and marine components. Because this report addresses only the marine environment, terrestrial Project components are summarized below. A more detailed discussion of the marine Project components follows.

Terrestrial Project Components

The following terrestrial Project components would be needed to install four cables (coming from Asia or Australia) and their related structures on land above the ordinary high-water mark (OHWM) (outside of the California State Lands Commission [CSLC] jurisdiction), as seen in Figure 5.

- **Cable Landing Site**. The four cables would land in an unoccupied area of the Humboldt Bay Harbor, Recreation, & Conservation District. An approximately 150-foot by 100-foot area would be used for the following key Project components.
    - Staging Area. The cable landing site would be used to park vehicles and store construction-related equipment for both terrestrial and marine work.
    - Cable Landing Vaults (LVs). Four LVs (approximately 8 feet wide by 12 feet long by 9 feet deep) would be buried with a cast-iron vault cover (36 inches in diameter) at grade level, meaning flush with the ground. A separate landing pipe (described below) would be installed from each of the LVs and would exit offshore into the Pacific Ocean. Once the landing pipes are installed, each individual cable (from different Project phases) would be pulled from the Pacific Ocean through its own designated landing pipe into an LV. After completion of the Project, the cables ultimately would be connected with soon to be built terrestrial cable infrastructure that is not part of the proposed Project. The LVs also would provide access to the landing pipes for maintenance activities related to the existing terrestrial cable infrastructure.
    - Landing Pipes. Four independent landing pipes[1] (approximately 5 to 6 inches in diameter) for four cables would be installed from each of the LVs. Each landing pipe would be approximately 4,600 feet long, starting from the LV and ending offshore. The terrestrial portion of the landing pipes would be installed at least 35 feet under the cable landing site and the beach using the horizontal directional drilling (HDD) construction method (Figure 6).
    - Ocean Ground Beds (OGBs). A grounding device known as an OGB would be installed underground onshore or offshore for each cable to ground it (Figure 7). An OGB is needed for cathodic protection to control corrosion and to provide a ground for the electricity travelling through the cable to power the marine cable amplifiers.

[1] Each landing pipe would be approximately 4,600 feet long; approximately 3,600 feet of this would be offshore. The total length for all four landing pipes would be about 18,400 feet.

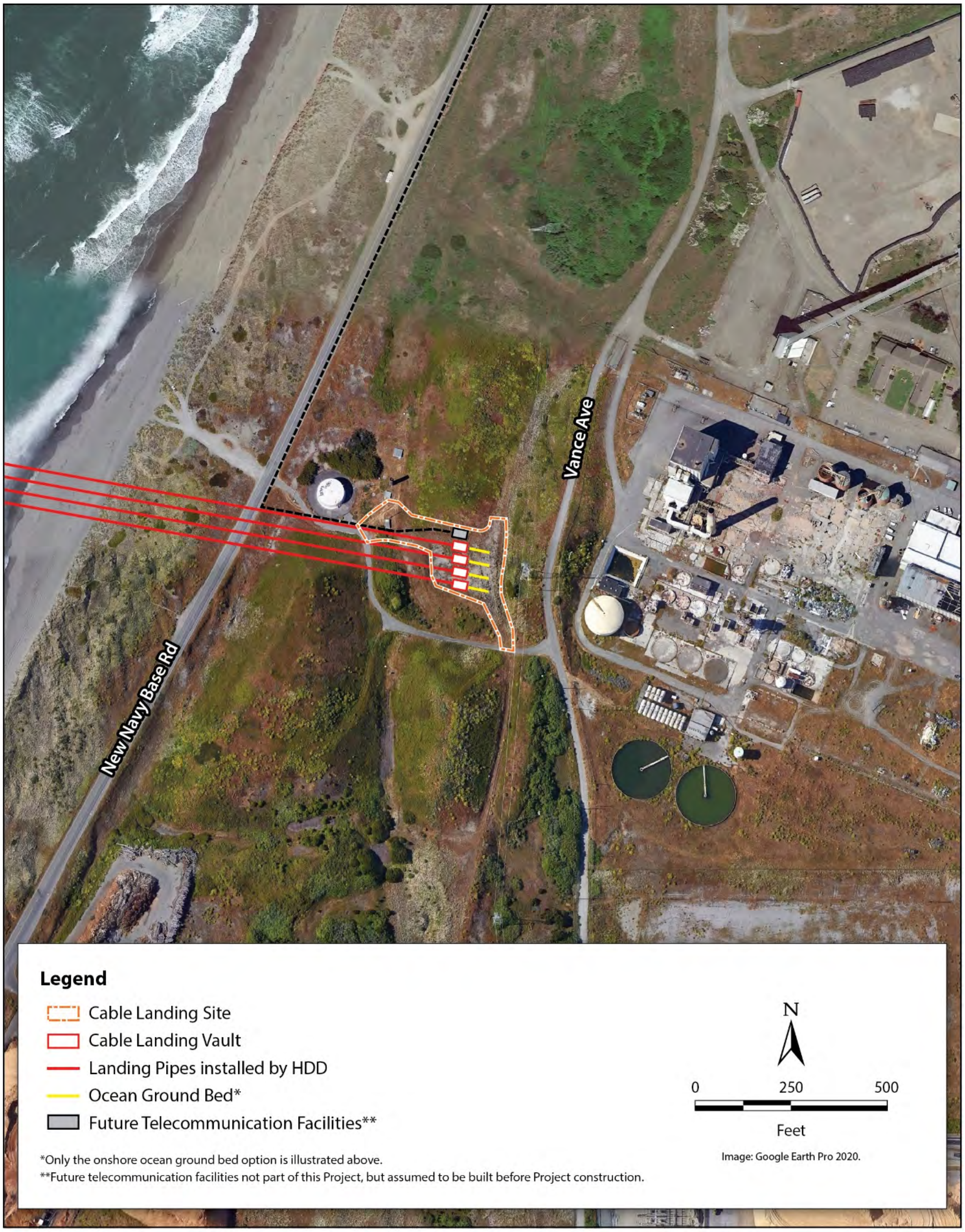


Figure 5. Terrestrial Project Components

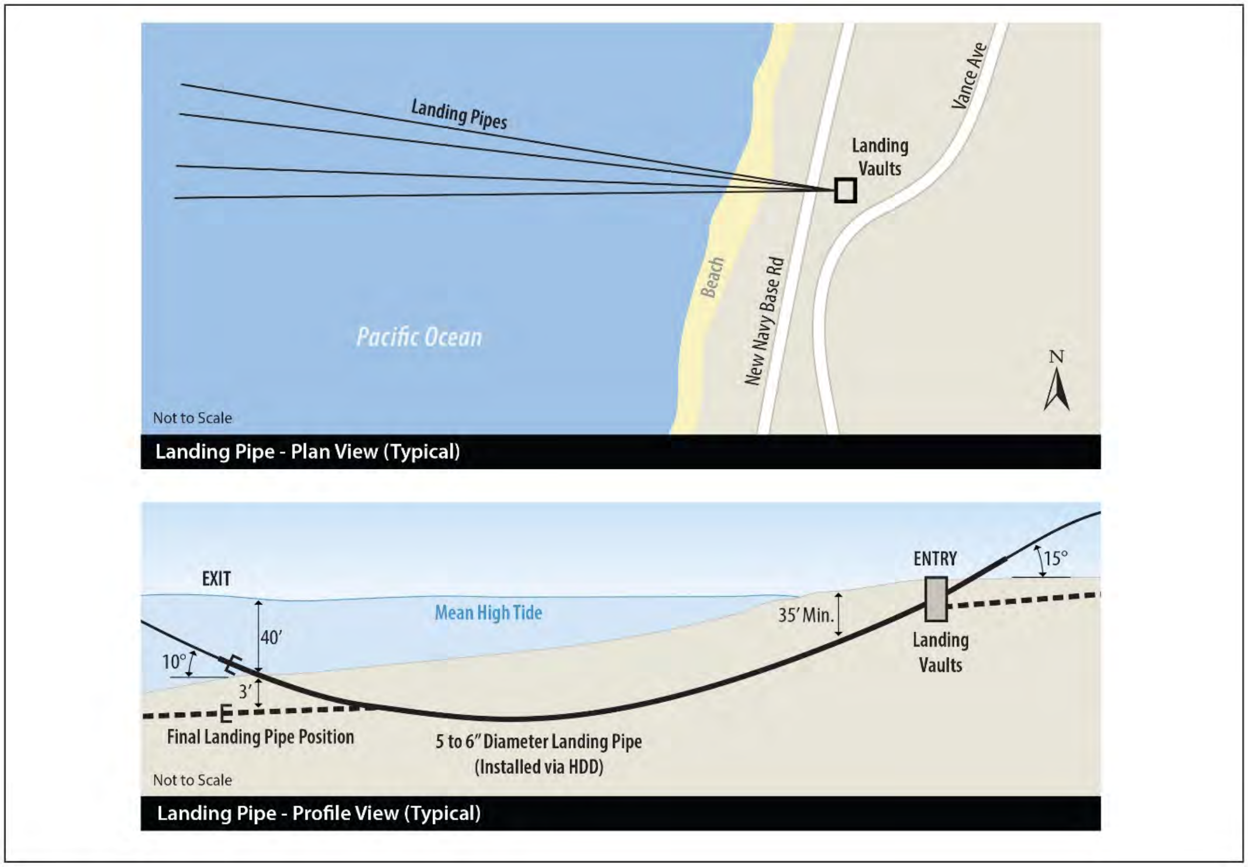


Figure 6. Marine Project Components

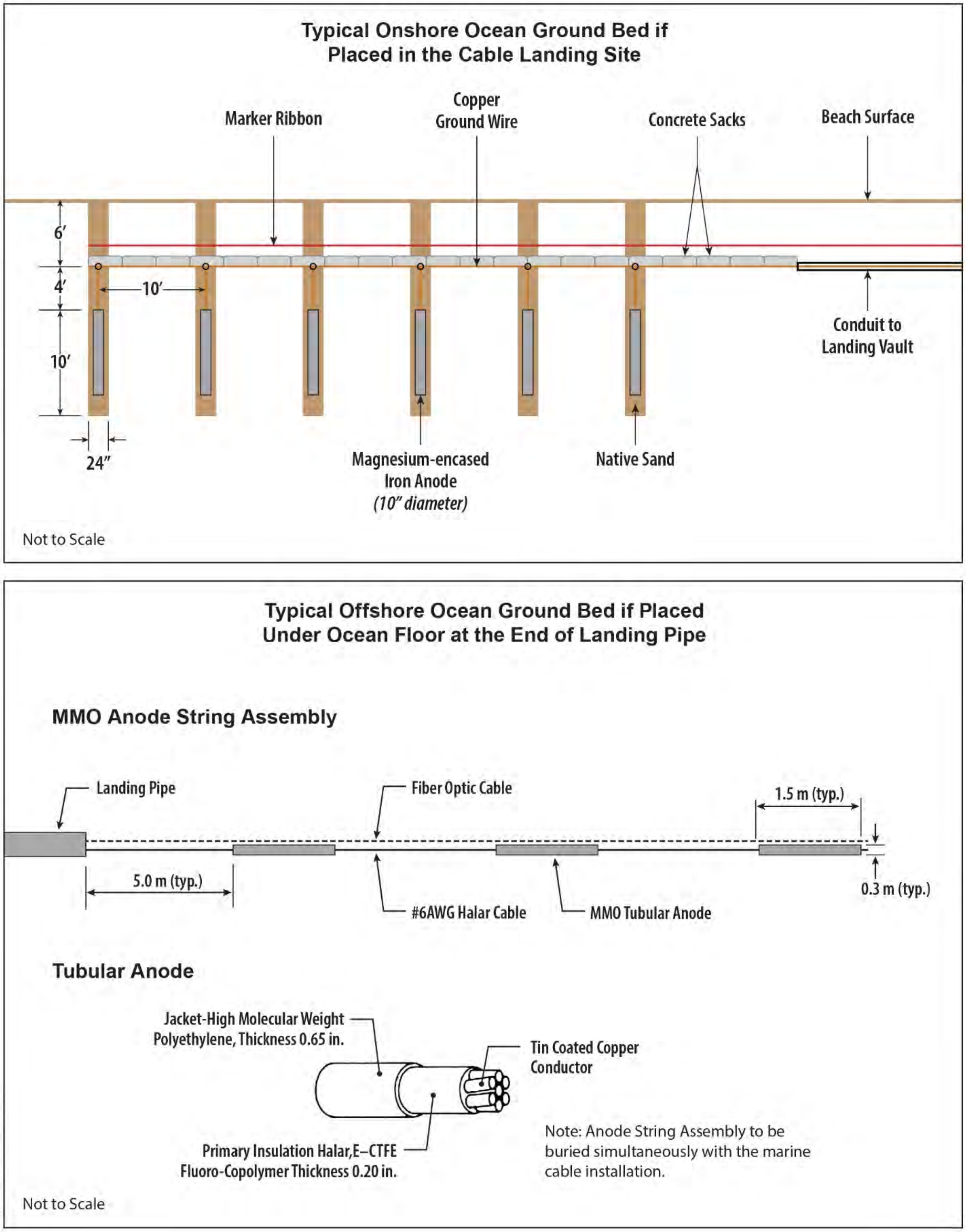


Figure 7. Cross Section of Ocean Ground Bed (Onshore or Offshore)

Terrestrial Connection to Vault and Cable Landing Station. From the cable landing site, each cable would be connected to a single vault (to be provided by the local telecommunications company) along New Navy Base Road (Figure 5). The connection would be provided using a type of HDD (bore) from the LV to the vault along the road. The vault would provide access to an existing conduit system along New Navy Base Road. The conduit would provide a connection to an existing cable landing station in the area. The terrestrial connection to the vault and cable landing station is not part of the Project.

Marine Project Components

Summary of Marine Components

The following marine Project components would be needed to install four cables (coming from Asia or Australia) and their related structures. As mentioned, landing pipes would be installed from the cable landing station and would extend offshore about 3,600 feet (0.6 mile or 0.5 nm), at which point the ocean is a sufficient depth to bury the cables directly on the ocean floor (approximately 40 feet). After that, the cables would continue either under or on the surface of the ocean floor until they reach their intended international destination. The scope of this Project ends 3 nm offshore to correspond with the boundaries of the CSLC jurisdiction. (After 3 nm, the United States assumes jurisdiction over the Pacific Ocean). As such, the marine components of this Project would be activities that occur starting at mean high water of the Pacific Ocean and ending 3 nm from the shoreline.

Landing Pipes. As noted above, four landing pipes (approximately 5 to 6 inches in diameter) would be installed. Each landing pipe would be approximately 4,600 feet long, starting from the LV and ending offshore. The landing pipes would be installed at least 35 feet under the cable landing site and the beach (using the HDD construction method) and exiting at about 3,600 feet (0.5 nm or 0.6 mile) offshore at a water depth of approximately 40 feet. Four cables would be pulled through these landing pipes and brought into their respective LV to ultimately connect with a soon to be built cable from a telecommunications provider to a vault associated with an existing conduit system along New Navy Base Road.

Fiber Optic Cables. The cable lay ship (with the help of a dive support vessel and divers) would bring the cable to the end of the landing pipe at about 3,600 feet offshore or 4,600 feet from the LVs (where the ocean water depth is approximately 40 feet deep). Each cable then would be pulled through its own individual landing pipe (constructed in Phase 1) to its respective LV.

Before reaching the landing pipe, the cable would be installed as follows. In ocean water that is between 40 and 98 feet deep, the cable would be installed by diver-assisted post-lay burial. In water between 98 and 5,904 feet deep, the cable would be buried under the ocean floor by plowing or the post-lay burial method, depending on ocean floor characteristics. The cables would lay directly on the ocean floor in water deeper than 5,904 feet (approximately 32 miles offshore from the LVs at the OCS). [2]

Ocean Ground Beds. An OGB would be installed onshore or offshore (to be determined after the electronic components of the cable system are designed and manufactured) for each cable to ground

[2] U.S. federal jurisdiction extends to the edge of the OCS under the Outer Continental Shelf Lands Act.

the cable. An OGB is crucial for cathodic protection to control corrosion and to provide a ground for the electricity that would travel through the cable to power the marine cable amplifiers.

Detailed Marine Project Components

The marine Project components are segments between the mean high water line and the outer limit of the OCS, at approximately 5,904 feet of seawater depth. The CSLC has jurisdiction from the mean high water line to 3 nautical miles (nm) offshore; the federal jurisdiction is past 3 nm to the OCS. In the CSLC's jurisdiction, the cable would be installed in both soft and hard bottom substrates. The soft bottom substrate predominates, consisting of sand, silt, and clay—with silt and clay components increasing with greater water depth. Some low- to high-relief hard substrates could be present, but they would be avoided, where feasible, using data from the ocean bottom surveys being conducted by the Applicant prior to construction.

Landing Pipes. As noted above, four landing pipes (approximately 5 to 6 inches in diameter) would be installed. Each landing pipe would be approximately 4,600 feet long, starting from the LV and ending offshore. The landing pipes would be installed at least 35 feet under the cable landing site and the beach (using the HDD construction method) and would exit at about 3,600 feet (0.5 nm or 0.6 mile) offshore at a water depth of approximately 40 feet. Four cables would be pulled through these landing pipes and brought into their respective LV to ultimately connect with a soon to be built cable from a telecommunications provider to a vault associated with an existing conduit system along New Navy Base Road.

Marine Fiber Optic Cables. The following two marine fiber optic cable armoring designs (double armor and single armor, illustrated in Figure 8) would be used to provide an appropriate degree of protection from geologic and sedimentary conditions encountered during installation and from potential interactions with fishing gear.

- **Double-Armored Cable.** This design (less than 2 inches in diameter) offers the greatest degree of protection and is recommended to be used in rocky or coarse substrate areas where protection from fishing gear may be warranted. There are two surrounding layers of galvanized wires that are coated with tar to reduce corrosion, two layers of polypropylene sheathing, and an outer layer of tar-soaked nylon yarn.
- **Single-Armored Cable.** This design (less than 2 inches in diameter) is like double-armored cable but with only a single layer of polypropylene sheathing and a single ring of galvanized wires. This cable would be used where there is reduced risk of damage caused by substrate conditions or fishing by burying the cables in soft bottom sediments using a sea plow or ROV.

The marine cable would contain a copper conductor to transmit telecommunication data signals (light pulses). The maximum distance a signal can travel without a regenerator is approximately 35 miles. Therefore, signal regenerators would be required at appropriate intervals in the cables to help transmit the signals from the United States to Asia or Australia.

Signal Regenerators in the Marine Cables

The regenerator equipment would operate from 48 volts of direct current (DC) electricity using DC power feed equipment housed at an existing cable landing station. The marine fiber optic cable would transmit this signal (DC electrical power) to the regenerators. The DC power equipment system is not part of the proposed Project because the closest one to California would be more than

3 nm offshore. The completed system would include protective equipment to detect a sharp decrease or sharp increase in electrical current flow in the cables. If an abnormal current flow is detected in the cable, the DC power system would shut down. The DC power would generate a magnetic field on the order of 5 milligauss at 3.28 feet from the cable. The magnetic field would diminish with distance from the cable (such that, at 33 feet, it would be approximately 0.5 milligauss).[3]

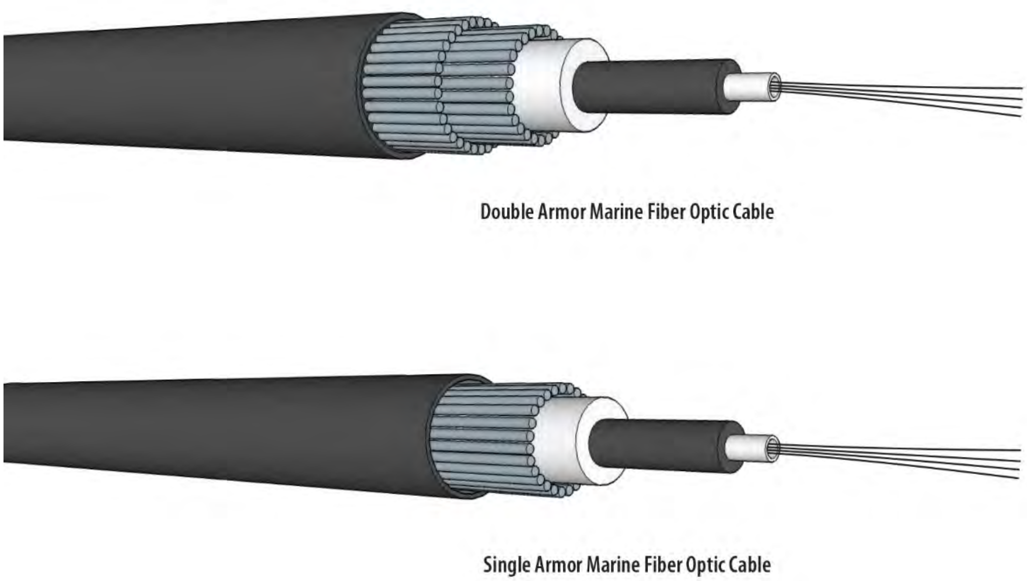


Figure 8. Marine Fiber Optic Cable Designs

Marine Project Construction Methods

Marine Project construction would take place during all Project phases. Overall, marine construction would involve a dive support vessel (primary work vessel), a smaller secondary work vessel, and a cable lay ship (Figure 9). The following text explains the different marine construction methods that typically would be used at different water depths.

[3] The magnetic field strength would not adversely affect marine life. The field strength level at 3.3 feet (5 milligauss) is far below the most protective field strength for human health (833 milligauss from the International Commission on Non-Ionizing Radiation Protect [ICNIRP]) and is the equivalent to the field strength from a personal computer at 3.3 feet.

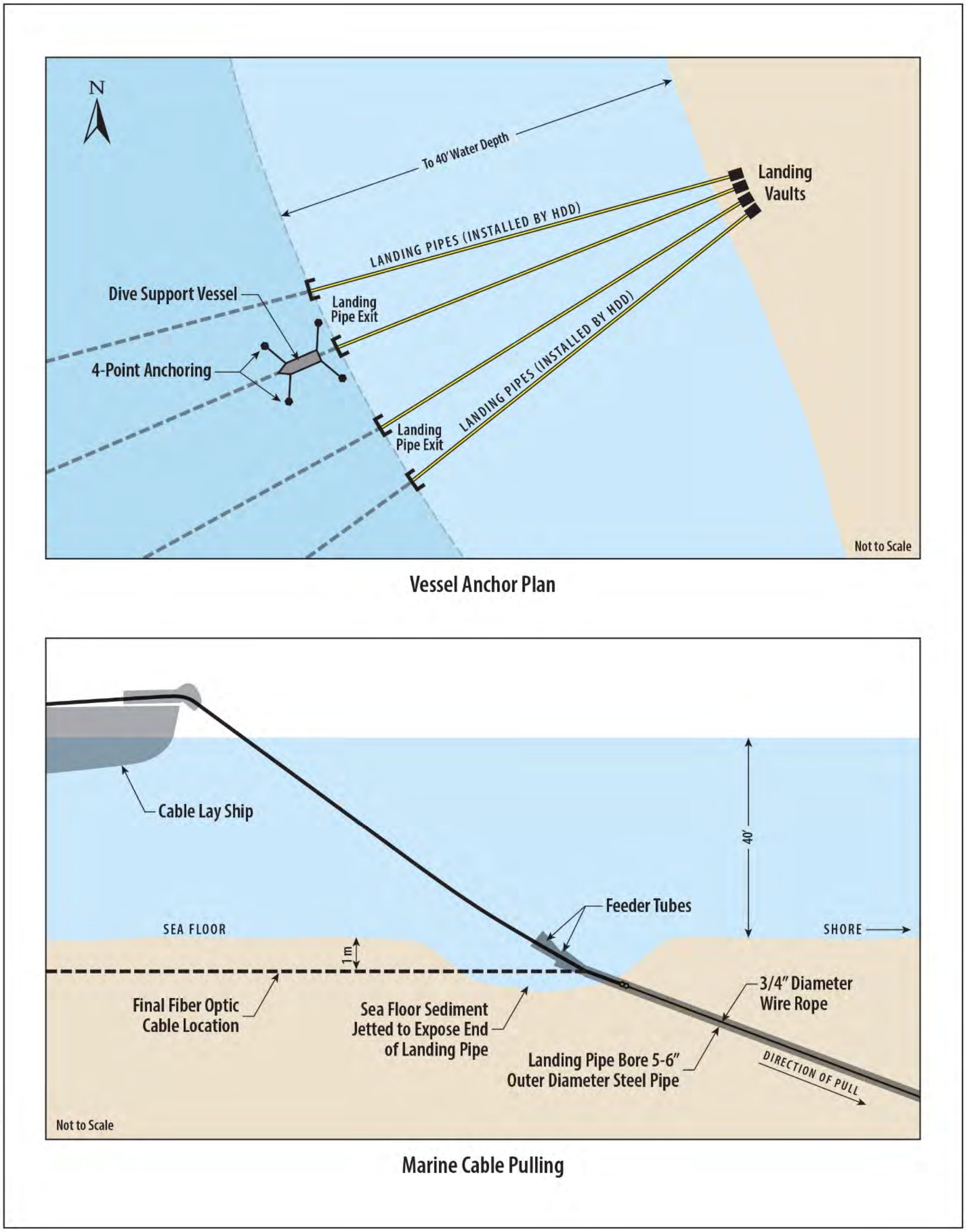


Figure 9. Marine Cable Pulling from Offshore to Onshore

Horizontal Direction Drilling to Install Landing Pipes (LV to approximately 40-foot water depth, up to approximately 0.66 mile offshore)

The first marine Project component would be to install four landing pipes using the HDD method. Once all four landing pipes are installed, the cable lay ship would arrive offshore from Asia or Australia as it lays fiber optic cable in the deep ocean.

Exposing Landing Pipe Exit. At approximately 3,600 feet offshore (where the landing pipes exit) (Figure 9), divers would jet approximately 10 to 15 cubic yards of ocean floor sediment to expose the end of the landing pipe. The divers would remove the drill head from the landing pipe and install a flapper valve on the end of the landing pipe to keep seawater from entering until the cable is installed into the landing pipe.

Dive Support Vessel (Primary Work Vessel). A 100- to 200-foot-long dive support vessel (Figure 9) would arrive and set up on station within about 50 feet of the landing pipe exit point (about 3,600 feet offshore), using a four-point mooring with an anchor spread of 328 feet. A smaller secondary work vessel would be used with the dive support vessel to set and retrieve anchors, and to shuttle crew between the diver support vessel and the shore. All anchors would be set and retrieved vertically to avoid dragging them across the ocean floor. All anchoring would be conducted as described in a Marine Anchor Plan, and the anchor drop zones would avoid hard bottom and existing utilities.

Cable Lay Ship. Once the cable lay ship arrives offshore, it would position itself several hundred feet oceanward of the end of the landing pipe (3,600 feet offshore). The divers would connect the end of the incoming cable to an existing wire rope in the landing pipe,[4] install cable chutes (also known as *feeder tubes* as seen in Figure 9) into the end of the landing pipe, and attach floats to the cable so it can be pulled through the landing pipe and brought onshore in the LV. The cable would be pulled onshore into the LV by a hydraulic winch and anchored behind the LV. Once the cable is secured in the LV, the cable lay ship would move away from that location. Divers would manage and monitor the pulling process from the dive support vessel.

Pre-Lay Grapnel Run (water depths of 40 to 5,904 feet, between approximately 0.66 and 68.4 miles offshore)

Information from the ocean-bottom surveys would be used to assist in this “run.” The purpose of an engineered pre-lay grapnel run is to clear debris on the bottom of the ocean floor (e.g., discarded fishing gear) along the routes where the fiber optic cables would be buried. A grapnel, typically of the flat fish type, would be dragged along the cable route before cable installation to clear out the path for burying cables (Figure 10). The grapnel would be attached to a length of chain to ensure that it touches the bottom of the ocean floor. The cable lay ship or a dive support vessel would tow the grapnel at approximately 1.2 miles per hour (approximately 1 knot per hour). The arms of the grapnel are designed to hook debris lying on the ocean floor or shallowly buried to approximately 1.3 feet. If debris is hooked and towing tension increases, towing would stop, and the grapnel would

[4] A 0.75-inch wire rope or *pull cable* in the landing pipe would be attached to a hydraulic winch in the LV when the landing pipe is installed.

be retrieved by winch. Any debris recovered during the operation would be stowed on the vessel for subsequent disposal in port.

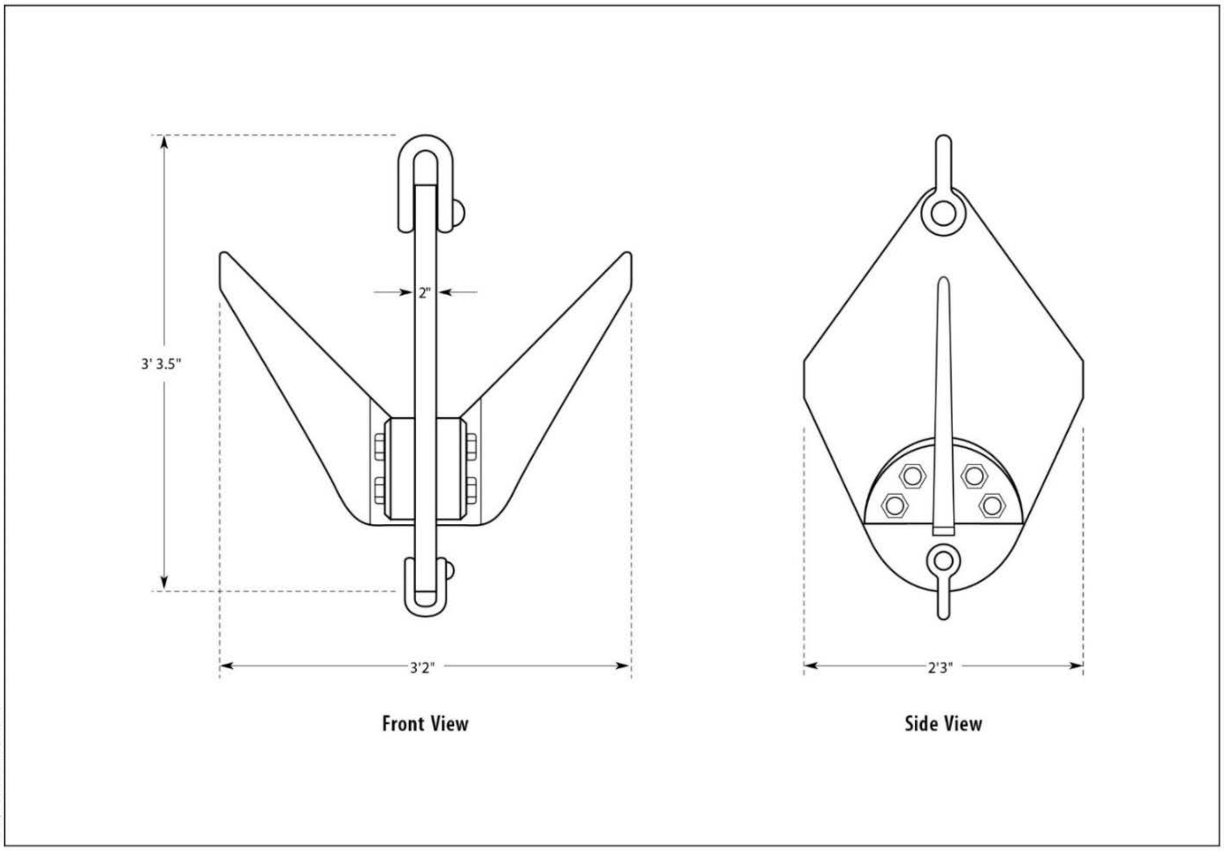


Figure 10. Flat Fish Grapnel to Clear Ocean Bottom Debris

Diver-Assisted Post-Lay Burial (water depths of 40 to 98 feet, between approximately 0.66 and 1.3 miles offshore)

Once the cable has been connected to the LV, the cable lay ship would begin to move west (farther offshore) along the predetermined course, rolling out (paying out) the cable as it goes traveling at approximately 2.3 miles per hour (2 knots per hour). The cable would be temporarily laid directly on the ocean floor and later the divers would bury it, starting from the landing pipes exit point at about 0.66 mile (40 feet water depth) to 1.3 miles (98 feet water depth) offshore. Post-lay burial of the cable by ROV would take place between 1 day and 3 weeks after the cable is first laid on the ocean floor.

Divers would use hand jets to open a narrow furrow beneath the cable, allowing the heavy cable to drop into the furrow. The disturbed sediments then would settle back over the cable, filling the furrow and restoring the surface to original grade. Depending on bottom conditions, the cable would be buried to a depth of approximately 3.3 feet.

Cable Plow or ROV-Assisted Post-Lay Burial (approximate water depths of 98 to 5,904 feet; between approximately 1.3 and 68.4 miles offshore)

Sea plow burial would be used beyond water depths of 98 feet to a depth of 5,904 feet. In some locations where plow burial is not possible, the cable would be buried using post-lay burial methods (ROV-assisted post-lay burial) as explained below.

Cable Plow Post-Lay Burial. The cables can be plowed at water depths of approximately 98 to 5,904 feet, from approximately 1.3 to 68.4 miles offshore. A sea plow is a sled-like burial tool that would be deployed by the cable lay ship after the shore-end landing operations are complete (Figure 11). Once the sea plow, supported by two sled outriggers to a total width of approximately 20 feet, was deployed to the bottom, divers would assist with loading the cable into the sea plow's burial shank. The mechanical movements would be controlled by an operator watching the divers through a video camera mounted on the plow. The cable would be buried at the same time as it would continue to feed through the sea plow shank and into the bottom of the furrow, all in a single operation. The 3.3-foot-wide sea plow furrow would naturally close under the weight of the sediments and the plow sled outriggers. The plow would be expected to operate at the rate of approximately 0.6 mile per hour (approximately 0.5 knot per hour).

Remotely Operated Vehicle Cable Post-Lay Burial. At water depths of approximately 98[5] to 328 feet, from 1.3 to 8 miles offshore, or where the sea plow cannot be deployed because of bottom conditions, an ROV (a robotic device operated from the cable lay ship) or a similar vessel would be used to bury the cable (Figure 9). The ROV would move under its own power and would be tethered to and guided from the cable lay ship. ROV jets would loosen the ocean floor sediments beneath the cable, allowing it to settle to the desired depth of 3 to 4 feet. The disturbed sediments would settle back over the area to their original grade, leaving the cable buried. The ROV would operate at a nominal speed of 0.35 mile per hour (0.3 knot per hour) when jetting. However, the overall rate of forward progress would depend on the number of passes needed to attain target burial depths, a variable that is in turn a function of sediment stiffness. The post-lay burial of cable by ROV would disturb about 15 feet of the ocean floor (not the water column).

[5] There is overlap between the ROV and the plow post-lay burial methods (both start at 98 feet). This is because some plows and vessels can deploy at water depths of 98 feet, while others need more depth.

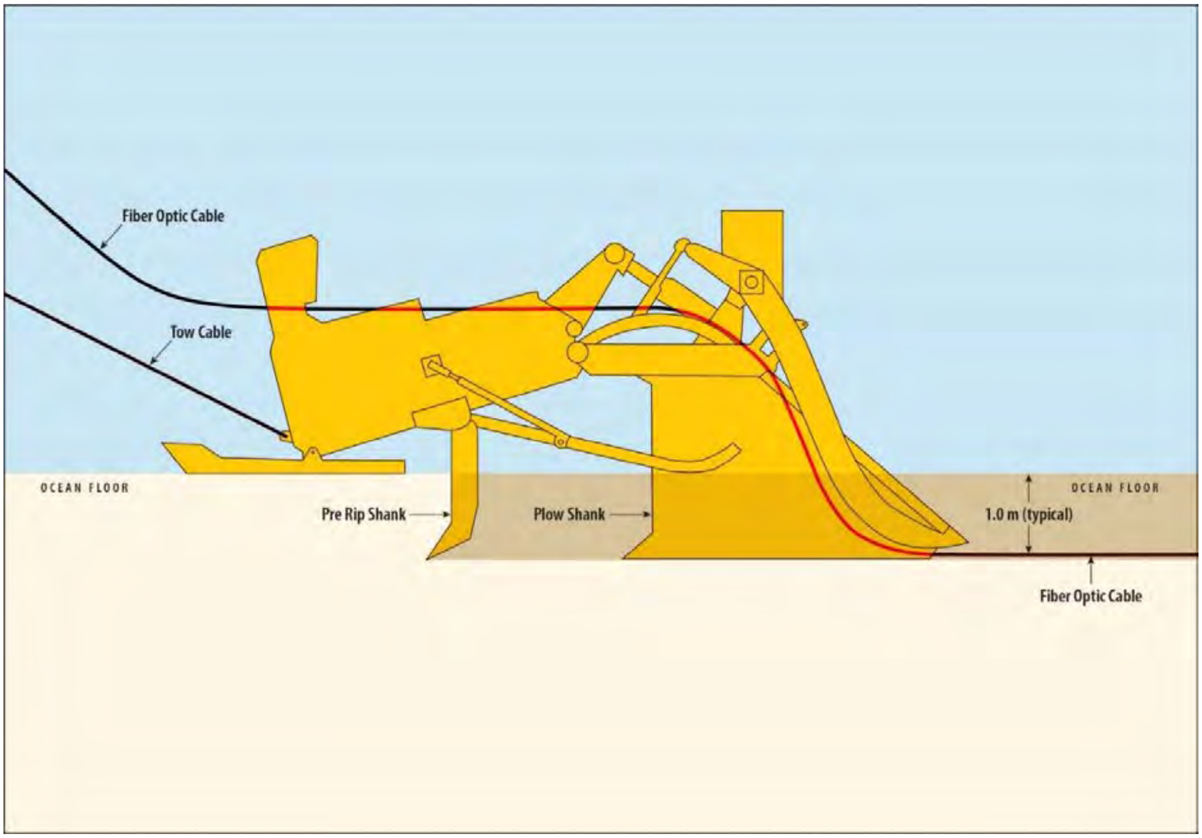


Figure 11. Sea Plow for Burying Marine Fiber Optic Cables on Ocean Floor

Direct-Surface Lay (water depths of more than 5,904 feet; 68.4 miles offshore)

At this depth, the cable lay ship would lay the cable directly on the ocean floor without burial, while maintaining slack control to ensure a straight lay of the cable and ensuring contact with the ocean floor to avoid suspensions.

Federal Regulations

Federal protections for scientifically significant cultural resources primarily derive from the **National Historic Preservation Act (NHPA) of 1966 as amended.** If a project involves a federal property, federal permit, or federal funding, it may be considered a federal undertaking and is required to comply with Section 106 of the NHPA (36 Code of Federal Regulations Part 800). This regulation sets forth the responsibilities that federal agencies must meet in regard to cultural resources. Federal agencies must conduct the necessary studies and consultations to identify cultural resources that may be affected by an undertaking, evaluate those cultural resources to determine whether they are eligible for the listing in the National Register of Historic Places (NRHP), assess the potential of the undertaking to affect NRHP-eligible resources, and take action to resolve any adverse effects that may result from the undertaking. The NRHP eligibility criteria are very similar to those for the California Register of Historical Resources (CRHR) (see below).

The **Outer Continental Shelf Lands Act of 1953** provides that the subsoil and seabed of the OCS are subject to U.S. jurisdiction and triggers other laws, including the NHPA. The **Antiquities Act of 1906**, enacted to protect cultural resources on lands owned or controlled by the federal government, is used to protect important cultural resources on the OCS in national marine monuments and other federal marine protected areas, but the act has not yet been applied on the OCS outside of such areas (BOEM 2013:31–32).

The **Native American Graves Protection and Repatriation Act (NAGPRA) of 1990** was enacted for the protection and repatriation of the remains of Native Americans and associated grave objects. The act applies on tribal and federal lands, defining federal lands as any land other than tribal lands are that controlled or owned by the U.S. government. Although no case has yet been recorded of the application of NAGPRA in the marine context in the study area, it appears reasonable that NAGPRA would apply to the remains of Native Americans and associated objects on the OCS when discovered during intentional excavation and as a result of inadvertent discoveries (BOEM 2013:47–48). It is the opinion of the authors that NAGPRA would provide the authority to protect Native American remains and associated grave objects on the OCS (BOEM 2013:49).

Submerged cultural resources within the waters of the State of California and federal waters from the 3 nm limit to the continental shelf margin are within the jurisdiction of the U.S. Army Corps of Engineers (USACE), Los Angeles District (Section 404, Clean Water Act,) and BOEM. It is the policy of the USACE and BOEM to consult with the appropriate State Historic Preservation Officer regarding all federally permitted offshore activities.

State of California Regulations

California Environmental Quality Act (Public Resources Code § 21000 et seq.). Historical, archaeological, and paleontological resources are afforded consideration and protection by CEQA (Public Resources Code [PRC] Section 21083.2). The State CEQA Guidelines define significant cultural resources under two regulatory designations: historical resources and unique archaeological resources (14 California Code of Regulations [CCR] Section 15064.5).

A historical resource is defined as a "resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources"; or "a resource listed in a local register of historical resources or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code"; or "any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency's determination is supported by substantial evidence in light of the whole record" (14 CCR Section 15064.5[a][1]-[3]). Although traditional cultural properties (TCPs) and cultural landscapes are not directly called out in the state definitions of historical resources, TCPs are places and cultural landscapes are areas, and places and areas are included as types of historical resources. Historical resources that are automatically listed in the CRHR include California historical resources listed in or formally determined eligible for listing in the NRHP and California Registered Historical Landmarks from No. 770 onward (PRC Section 5024.1[d]). Locally listed resources are entitled to a presumption of significance unless a preponderance of evidence in the record indicates otherwise.

Under CEQA, a resource generally is considered historically significant if it meets the criteria for listing in the CRHR. A resource must meet at least one of the following four criteria (PRC Section 5024.1; 14 CCR Section 15064.5[a][3]) for eligibility:

1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.
2. It is associated with the lives of persons important to local, California, or national history.
3. It embodies the distinctive characteristics of type, period, region, or method of construction, or represents the work of a master or possesses high artistic values.
4. It has yielded or has the potential to yield information important to the prehistory or history of the local area, California, or nation.

Historical resources also must possess integrity of location, design, setting, materials, workmanship, feeling, and association (14 CCR 4852[c]).

An archaeological artifact, object, or site can meet CEQA's definition of a unique archaeological resource, even if it does not qualify as a historical resource (14 CCR 15064.5[c] [3]). An archaeological artifact, object, or site is considered a unique archaeological resource if "it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria (PRC Section 21083.2[g]):

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Under California law, cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, and/or scientific importance. All resources nominated for listing in the CRHR must have integrity; the authenticity of a historical resource's physical identity is evidenced by the survival of characteristics that existed during the resource's period of significance. Therefore, resources must retain enough of their historical character or appearance to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. It also must be judged with reference to the particular criteria under which a resource is proposed for nomination (PRC Section 5024.1).

CEQA Guidelines, California Code of Regulations Title 14, Section 15064.5. When an initial study identifies the existence of, or the probable likelihood of, Native American human remains within a project area, a lead agency is directed to work with the appropriate Native Americans as identified by the Native American Heritage Commission (NAHC). The applicant may develop an agreement for treating or disposing of, with appropriate dignity, the human remains and any items associated with Native American burials with the appropriate Native Americans identified as the Most Likely Descendant by NAHC.

Public Resources Code Section 5097.5. This code states that no person shall willingly or knowingly excavate, remove, or otherwise destroy a vertebrate paleontological site or paleontological feature without the express permission of the overseeing public land agency. PRC Section 30244 further states that any development that would adversely affect paleontological resources shall require reasonable mitigation. These regulations apply to projects located on land owned by or under the jurisdiction of the state or a city, county, district, or other public agency.

Public Resources Code Section 5097.9 et seq. (1982). This code establishes that both public agencies and private entities using, occupying, or operating on state property under public permit shall not interfere with the free expression or exercise of Native American religion and shall not cause severe or irreparable damage to Native American sacred sites. This section also creates the NAHC, charged with identifying and cataloging places of special religious or social significance to Native Americans, identifying and cataloging known graves and cemeteries on private lands, and performing other duties regarding the preservation and accessibility of sacred sites and burials.

California Coastal Act of 1976. This act establishes policies pertaining to cultural resources investigations conducted for impact analysis pursuant to CEQA, the National Environmental Policy Act, and NHPA Sections 106 and 110. The act provides that "[w]here development would adversely impact archeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required" (PRC Section 30244). Anyone who proposes any development in the coastal zone must secure a Coastal Development Permit from the California Coastal Commission.

The **Abandoned Shipwreck Act** enacted by Congress in 1987 transferred ownership of submerged historic shipwrecks embedded in the bottomlands of a state's waters to the state. Under this law, submerged historic shipwrecks occurring within 3 nm of a state's shoreline are owned by that state. The act provides authority for states to protect and manage submerged, abandoned shipwrecks through state law (BOEM, 2014:42).

The CSLC administers the **California Shipwreck and Historic Maritime Resources Program** under PRC Sections 6309, 6313, and 6314. The CSLC maintains a list of known shipwrecks in State waters and seeks and provides information about historic shipwrecks and sunken aircraft. Any shipwreck sunk for more than 50 years is presumed to be of archaeological or historical significance and is protected under State law.

Local Regulations

Humboldt County. Along with the unincorporated towns of Samoa and Fairhaven, the North Spit of Humboldt Bay is under the jurisdiction of the County of Humboldt and is not within the direct jurisdiction of the City of Eureka. The following documents include local regulations applicable to the proposed Project:

- The County of Humboldt, General Plan, Chapter 6 Cultural Resources (6-1 through 6-7) cites relevant federal and state Policies regarding cultural resources; and the County Framework Plan establishes policies for identification, protection, and mitigation of cultural resources, consistent with federal and state regulative framework.
- Humboldt Bay Management Plan, Section II-Chapter 2.0 Humboldt Harbor Setting May 2007
- The General Plan Update contains policies CU-P1 through P5, which establish that the County will scrutinize development projects to identify and protect cultural resources, as well as cooperate with Native American groups where potential Native American resources could be affected by development proposals
- (https://humboldtgov.org/DocumentCenter/View/58843/Section-314-Cultural-Resources-Revised-DEIR-PDF.)

City of Eureka. The City of Eureka 1997 General Plan includes goals and policies regarding Historic Preservation and the protection of Archaeological Resources. These policies and goals have been incorporated into the Historic Preservation Option Element to the General Plan. In addition, the following documents and regulations are relevant to the proposed Project:

- Chapter 9 City of Eureka Historic Preservation Element (Heald et al. 2003.)
- Under California Government Code Section 37361, the City of Eureka is provided broad local authority to impose conditions to protect and enhance cultural resources. The Historic Preservation Ordinance established a Local Register of Historic Places; identified criteria for inclusion on the Local Register of Historic Places; and created an administrative body, the Historic Preservation Commission, to review projects subject to the ordinance.
- Humboldt Bay Management Plan 14–11 HBHRCD Draft Environmental Impact Report RKA 05 03 (April 2006).

Town of Samoa. The Samoa Master Plan area is located within the coastal zone (pursuant to the California Coastal Act of 1970), and is subject to the regulations of the Coastal Act, under the jurisdiction of the California Coastal Commission (Samoa Town Master Plan – Samoa, California, Recommendations for Sustainable Site Analysis, Final March 2, 2009.)

ENVIRONMENTAL SETTING

The study area is located within and offshore of Samoa, California (Figures 1, 2, and 3). Samoa is a census-designated place in Humboldt County, California. It is 1.5 miles northwest of Eureka, at an elevation of 23 feet. Samoa is in the northern peninsula of Humboldt Bay. Samoa Beach is the long strand of beach on the ocean side of the Samoa peninsula historically known as the northern spit of the Humboldt Bay bar. The study area includes offshore waters extending from MHW out to the edge of the OCS at a water depth of approximately 5,904 feet (1,800 m [984 fathoms]). This area includes the 3-nm State waters and waters of the U.S. Territorial Sea and U.S. Contiguous Zone. The prehistoric and historic maritime activities in northern California provide the context for review and analysis of this Project.

Geology and Oceanography

Northern California Coast

The offshore study area for this Project is located within the waters of the Eel River Basin and situated between two large submarine canyons: Trinity or Trinidad Canyon to the north and the Eel River Canyon to the south. The offshore Eel River basin extends northward from near Cape Mendocino to Cape Sebastian, Oregon, and from the coastline seaward to the upper continental slope, an average distance of about 38 nm (70 kilometers [km]) (Field et al. 1980:3–4).

The northern California coastline has a physiographic appearance closely similar to Oregon's coastline, with the occasional addition of low-relief coastal plains (e.g., at the mouth of the Mad and Eel Rivers). Southward of Humboldt Bay, narrow beaches backed by steep headlands dominate the coastline (BOEM 2013:13).

The OCS off northern California is relatively flat and featureless, and is the southern extension of the Eel River Basin. The Eel River Basin trends north to northwest and extends north from south of Eureka, California to the southern Oregon OCS. The OCS extends seaward from the coast 10 to 30 km (5.4 to 16.2 nm) as a smooth plain (MMS 1990:II-48). The shelf break generally occurs at 180 m. The OCS off northern California is narrower than the worldwide average (Griggs and Hein 1980 in MMS 1990:II-48). The OCS off northern California south of Heceta Head, Oregon and north of Cape Mendocino has an average width of less than 25 km (13.5 nm).

Two large submarine canyons are located west of the northern California coast (MMS 1990:II-48). Trinity Canyon heads below the shelf break on the continental slope at approximately 750 m (410 fathoms) depth. Eel Canyon is steep, narrow, and meandering; it has incised the OCS and heads at nearly 150 m (82 fathoms) depth. Trinity Canyon is described as broad and bowl-shaped, and has developed a tributary network (Filed et al. 1980). It is also identified as Trinidad Canyon.

The modern coast varies considerably in topography; it is relatively straight and unprotected. South of Trinidad Head, California, the coastal terrace is less rugged; and a low-relief, extensive coastal plain has developed at the mouth of the Eel and Mad Rivers (MMS 1990, EE-45). The coastal plain of the Eel and Mad Rivers is dissected by meandering rivers and streams. Humboldt Bay is the only major estuary in this region (Figure 3).

Humboldt Bay

Humboldt Bay is located along the coastal margin of the northern Coastal Ranges geomorphic province of California. Sediment in the Entrance Channel, North Bay Channel, and Samoa Channel is predominantly sand. Jacoby and Freshwater Creeks discharge into Arcata Bay on the north; and Elk River and Salmon Creek discharge into the central portion of Humboldt Bay and into South Bay, respectively. These streams and sloughs are tidal from 1 to 2 miles inland of their mouths. The floodplains are grasslands, marshlands, and mudflats.

The climate of the Humboldt Bay area consists of cool summers, with fog occurring from July through September; and severe storms, winds, and squalls occurring frequently along the coast. The Humboldt Bay area temperatures are moderated by the ocean. The average annual mean temperature is 52 degrees (Fahrenheit), with a variance of only 10 degrees from summer to winter along the coast.

Humboldt Bay is a natural embayment and a multi-basin, bar-built coastal lagoon located on the coast of Humboldt County, in the Redwood Empire Region of California. The largest city adjoining the bay is Eureka, the regional center and county seat of Humboldt County, followed by the northern town of Arcata.

Humboldt Bay consists of two large bays connected by a long thalweg.[6] The estuary is separated from the Pacific Ocean by two long sand spits varying in width from 1/8 to1 mile. The present entrance to Humboldt Bay is formed by two rubble mound-type jetties about 2,000 feet (366 m) apart. From the entrance, the Bay extends north and south for a distance of about 26 km (14 miles), varying in width from 0.5 to 4 miles and covering an area of over 17,000 acres. The tidal range between mean lower low water and mean higher high water is about 5.4 feet (1.7 m) at the south jetty and 6.7 feet (2.1 m) at Eureka. The entrance channel is exposed to high waves, at times exceeding 30 feet (9 m) in height during winter months. The Bay is part of a coastal terrace, at the foot of the surrounding steep mountains and narrow valleys. The landscape is typical of the northern California coast. Much of the surrounding lands is covered by dense forests of California redwoods and Douglas fir. Humboldt Bay is the only harbor with deep draft channels between San Francisco 225 nm (259 statute miles [417 km]) to the south and Coos Bay Oregon 156 nm (180 statute miles [289 km]) to the north.

The 10-mile long North Spit of the Humboldt Bay bar separates Humboldt and Arcata Bays from the ocean. Dunes extend the length of the spit. The Nature Conservancy Lanphere-Christensen Dun Preserve protects 213 acres of undisturbed dunes, some as tall as 80 feet (24.4 m) and 123 acres of salt marsh (CCC 1987:103). Portions of the spit have been industrialized for over 100 years.

The Humboldt Bay Bar and Entrance Channels are dredged to a depth of 48 feet (14.6 m) at mean lower low water. The Bay has four channels: North Bay Channel, Samoa Channel and Turning Basin, Eureka Channel, and Fields Landing Channel. The permanently designated Humboldt Open Ocean Disposal Site is used for placement of dredged materials offshore.

A gradual diminution in the size of the Bay has occurred in recent geologic history as various estuaries have filled with sediment and extended the east Bay margin westward. The majority of shoaling in the navigation channels results from material carried to the Bay entrance by longshore

[6] Thalweg means "valley course." In geography and fluvial geomorphology, a thalweg or talweg is the line of lowest elevation within a valley or watercourse (Richards 2005; Wikipedia https//en.wikipedia.org/wiki/Thalweg).

drift along the Pacific Coast. The primary sources of sediment are the Eel River, about 10 miles (16 km) south of the inlet to the Bay and the Mad and Little Rivers, about 14 and 20 miles (22.5 and 32 km). respectively, north of the inlet.

The local seismic history is event active.

A discussion of the history of Humboldt Bay is provided in the terrestrial cultural setting. The following is a discussion of the cultural setting and maritime history organized by three historic time periods, the Maritime Exploration period (1579 to 1775); the Spanish/Mexican period (1769 to 1846); and the American period, which includes development of the coastline (1846 to the present). It was known that Japanese vessels had drifted across the northern Pacific and washed ashore on the northwest coast (MMS 1990:IV 44). A minority of authors have argued for Chinese and Japanese pre-Columbian transpacific voyages prior to 1542 (Brooks 1875; Davis 2000) to account for a similarity of certain physical characteristics of North American Indians and those of Asian populations (BOEM 2013:187).

Paleogeography

Marine deposition, coastal sedimentation, and the resulting landforms on the northern California coast have been dominated by the combined effects of climatic and tectonic patterns. The coastal margin off northern California is an active depositional regime (Field et al. 1980 in MMS:II-51). Pleistocene sediments off the northern California coast are described as sand and silt inter-bedded with gravels (Snavely and Macleod 1977 in MMS 1990: II-54). While the early and middle Pleistocene were times of folding and major tectonic activity in California, the late Pleistocene was dominated by erosional and depositional events related to sea level fluctuations responding to glacial and interglacial stages. During the Pleistocene period of lower sea stands, a westerly-flowing fluvial system likely incised the exposed continental margin, depositing sediments in floodplain, deltaic, and shallow-water environments. Sediments then were reworked into beach and shallow marine deposits, which were reworked again during subsequent transgressions. Wave cut platforms or abrasion platforms developed along the coast as the result of wave abrasion during ancient still stands (MMS 1990:II-54). With a change in sea level, platforms may be submerged or raised. These subsequently raised Pleistocene marine terraces occur discontinuously along the coast at elevations up to 400 m (1,312 feet). The late Pleistocene/Wisconsin sediments (30,000–18,000 before present [B.P.]) probably are preserved on the present-day continental slopes only below 120 m (394 feet [66 fathoms]) or as early fill in some of the submarine canyons, slope gullies, or deep shelf river channels (MMS 1987:38).

The study area is located within waters of the Eel River Basin and situated between two large submarine canyons: Trinidad Canyon to the north and Eel River Canyon to the south of the study area. The area is located within the accretionary complex[7] associated with the Cascadia Subduction Zone. The offshore Eel River Basin extends northward from near Cape Mendocino to Cape Sebastian, Oregon; and from the coastline seaward to the upper continental slope, an average distance of about 70 km (Field et al. 1980:3–4). The continental margin off northern California has developed in response to late Tertiary and Quaternary tectonic plate motion. North of Cape Mendocino, the margin is composed of the OCS (0 to 200 m), plateau slopes (200 to 500 m), marginal plateaus (50 to

[7] In geology, an *accretionary complex* is a former accretionary wedge typically made up of a mix of turbidites of terrestrial material, basalts from the ocean floor, and pelagic and hemipelagic sediments.

1,000 m), and continental slope (1,000 to 3,000 m). The Eel River Basin extends from 50 km inland in the lower Eel River and Humboldt-Arcata Bay area, offshore across the shelf, plateau slope, and the Eel and Klamath Plateaus. The plateau and plateau slope are incised by two large submarine canyons, Eel and Trinity or Trinidad Canyons.

Late Quaternary faulting affecting northern coastal California near Humboldt Bay is described as the southernmost extensive of the forearc contraction with the Cascadia Subduction Zone (Kelsey and Caver 1988 in MMS 1990:II-47). Movement of the Cascadia Subduction Zone seafloor spreading along the Gorda Ridge causes the Gorda Plat to move beneath the Northern American Plat to its southern limit at Cape Mendocino. Neotectonic stresses cause relatively rapid uplift (ca. 4 millimeters [mm]/year) in the immediate vicinity of the Mendocino Fault—caused by frictional loading where the southern edge of the Gorda Plate moves westward past the eastward-travelling Pacific Plat along the Mendocino Fracture Zone. Elsewhere in California, uplift is less than 1 mm/year.

Holocene sediments deposited on the OCS vary in thickness and, like Pleistocene sediments cited above, consist mostly of unconsolidated sand, silt, clay, and gravels (Wagner et al. 1972 in MMS 1990:II-54). The majority of the northern California OCS is covered by at least 10 m (33 feet) of sediment. Two isolated depocenters[8] occur off Humboldt Bay and southwest of Crescent City, California to the north. Field et al. (1980 in MMS 1990:II-57) reports the sediment off Humboldt Bay to be greater than 50 m (164 feet) thick. Areas devoid of Holocene sediment include areas offshore of rocky headlands, some submarine canyons, the innermost shelf, and some structural highs.

The most recent regression affecting the study area began during the onset of the Wisconsin glaciations, approximately 30,000 to 35,000 Before Present (B.P.). Sea level dropped from a level near or slightly below present sea level about 30,000 B.P., between 21,000 and 18,000 B.P., to a level about 120 to 130 m (394 to 427 feet [66 to 72 fathoms]) below the present level, exposing Late Pleistocene deposits (Curray 1965; Bloom 1977; Bloom et al. 1974 in MMS 1990:II-69). Holocene stratigraphy of the OCS in the study area represents deposits resulting from the eustatic sea level rise, known as the Flandrian Transgression, which began about 18,000 years B.P. in response to climate change. From the onset of the Holocene transgression to about 10,000 to 7,500 years B.P., a rapid inundation of the OCS occurred. The rate of sea level rise has since slowed and has been stable or fluctuating slightly during the past 3,000 years (Kulm et al. 1968 in MMS 1990:II-54). The maximum late Pleistocene lowstand is found at a depth of about 120 m (394 feet [66 fathoms]).

Paleoshoreline in the study area parallels the modern coast. The 7,500 B.P. shoreline is plotted within 5 to 7 km (2.7 to 3.7 nm) of the present shoreline. The shelf break at Eel River Canyon marks the southern end of the Eel River Basin. In the study area, this paleochannel system is coincident to the most likely locations of ancient bays and estuaries.

As the Flandrian Transgression pushed the shore easterly, valleys incised during the glacial lowstand began to back-fill with fluvial sediments, which in turn were covered with marine post-Wisconsin deposits as sea level was reaching its present level.

Distribution of surficial sediments on the northern California shelf can be described as a relatively thick accumulation that thins seaward and cite maximum sediment thickness if greater than 33 m. Holocene sediments generally can be divided into a nearshore sand and mid- to outer-shelf silt and

[8] In geology, a *depocenter* is an area or site of maximum deposition, or the geographic location of the thickest part of any geographic unit in a depositional basin.

mud in depths of 60 to 80 m (197 to 263 feet [33 to 44 fathoms]). Sources of overlying sediments in the study area can be attributed to river outflows of suspended sediments. The OCS in the study area has been controlled by four major cycles of shoreline advance and retreat. During glacial periods, the shoreline retreated to near the edge of the modern OCS. During interglacial periods, the shoreline advanced to near-modern levels. These changes in sea level occurred rapidly relative to geologic time and resulted in the formation of the broad, gently sloping, sediment-veneered, wave-cut platform that makes up the modern OCS.

This area of the Pacific OCS has a moderately narrow coastal landscape marked by steeply sloping surface gradients and characterized by paleoshoreline contours that primarily parallel the modern coastal shoreline during Last Glacial Maximum (LGM) time. South of Eureka, California, the Pacific OCS paleolandscape narrows considerably, lying just within and a short distance beyond the State water limit. Eel River Basin sediments above the Holocene unconformity consist of approximately 492 feet (150 m) of non-marine clay, silt, sand, and gravel (Field et al. 1980:3-4, Figures 3 and 4)

Prehistoric Setting

Prehistoric Occupation of the Marine Study Area

At the height of the Wisconsin glaciation at approximately 18,000 to 24,000 years B.P., the sea level was as much as 120 to 130 m (394 to 427 feet [66 to 72 fathoms]) below its present altitude (Milliman & Emory 1968). At that time, the California shoreline was near the edge of the OCS, approximately 6 nm offshore from the present shoreline (uncorrected for local offshore deposition or uplift rates) within the study area.

Recent GIS studies summarized in Bureau of Ocean Energy Management (BOEM) (2013:21) indicate that the sea level rose an average of 6.3 mm per year (or 6.3 m every 1,000 years) over the 19,000-year period since the LGM. This rate was not constant but varied over time. Sea level continues to rise incrementally along the California coast.

Human populations have occupied the California coast for at least the past 13,000 years and have enjoyed the products of the littoral zone for much of that time. The littoral zone includes the nearshore intertidal area where many edible resources, including shellfish, can be harvested. Sea level at 11,000 years B.P. was approximately 46 m (151 feet [25 fathoms]) below present level. It is reasonable to assume that prehistoric occupation sites, where debris from villages and campsite accumulated as far out as what is now the OCS, were abandoned as they were inundated by the rising sea level during the Holocene transgression (Nardin et al. 1981; Richards 1971; Bloom 1977). As sea levels rose after the LGM, prehistoric people moved their sites farther inland to stay above shifting shorelines and to access shifting resource areas (BOEM 2013:21).

If the preference for site locations remained the same over time, even as the sea level rose, we would expect to find inundated prehistoric period archaeological sites offshore in places where former streams once came together to flow into larger stream and rivers, and where they entered the ocean as they crossed bluffs and beaches (Stright 1987). Former estuaries, bay mouth bars, tombolos (a bar of sand or shingle joining an island to the mainland), and backshore beaches as well as nearby bluffs also would be sensitive locations for offshore prehistoric archaeological sites.

Prehistoric archaeological sites are formed from the accumulation of layers of soil and debris from daily activities that have been deposited over time. Typically, the longer the period of occupation and the larger the group of people, the greater the accumulation of debris. Archaeological sites at or near the shoreline most often are characterized by concentrations of whole and fragmentary seashells, while archaeological sites that are more distant from the shoreline most often lack such concentrations of shell and include the debris from the exploitation of inland habitats. Such debris may include stone tools and the remains of animals that were hunted, butchered, and cooked, as well as tools for grinding nuts and seeds. Archaeological sites on the OCS may be composed of a series of deposits that document the sea level rise and resulting change in the relative distance of the site from the sea. As the sea level rose, sites that once were used for exploitation of terrestrial resources may have become bases for exploitation of intertidal resources before being abandoned as the sites became inundated. As stated in BOEM (2013:23), the order of site occupations recorded in such layered archaeological sites can reveal the sequences of environmental changes associated with rising sea levels and the resulting changes in human behavior and resource preferences.

Not all prehistoric sites would have been well preserved. Prehistoric sites on the paleolandscape of the Pacific OCS would have been subjected to the erosive effects of water as rising sea levels advanced the shoreline of the Pacific Ocean to the east. Inman (1983) suggests that erosion would be widespread and sites may not have been preserved except in exceptional circumstances—where conditions on the landscape, such as clusters of plants and trees, or rocky overhangs, would have protected such deposits from erosion. Such conditions might be expected in the ecological and geomorphic contexts associated with lagoons and terraces. Snethkamp et al. (1990:111–102; Bickel 1978,1988) suggest that the same classes of physiographic locations with a high potential for site preservation on land may have offered the highest potential for preservation during and following the process of inundation. More recently, Gusick and Faught (in Bicho et al. 2011:27) noted that in areas such as the Northwest Coast isostatic rebound outpaced sea level rise, leaving Pleistocene coastal landscapes inland from the current shoreline.

Site preservation depended on at least three factors: degree of protection of site deposits by overlying sedimentation prior to inundation, duration of exposure to increased forces of erosion associated with time spent in the intertidal zone during the transgression, and intensity of wave energy. As is true of sites on dry land, rapid burial of sites prior to inundation would have created the best conditions for preservation during inundation. An example of rapid burial on dry land occurs when a river overflows its banks and leaves behind a thick layer of sediment and debris on the surrounding landscape. The burial of sites on the OCS is most likely to have occurred in river floodplains and terraces. Prehistoric sites that were not rapidly buried but that remained on or near the surface of the Pacific OCS most likely were washed away (BOEM 2013:25). The erosive effects of the Pacific's wave actions on buried archaeological sites would have been reduced through time, as the sea level continued to rise and the depth of the water increased.

The subtidal zone includes all of the seafloor below the normal reach of high wave energy; it offers a more stable environment conducive to preservation of inundated sites, especially if they had been buried beneath sediments prior to inundation (Snethkamp et al. 1990:111–105 in MMS 1990; BOEM 2013:26). All of the OCS within the study area is located within the subtidal zone and, as sea level rose, the intertidal zone migrated landward leaving behind a layer of sand in the subtidal zone.

BOEM (2013:54, Figure 16) depicts shoreline contours in the study area that were present on the exposed Pacific OCS coastal landscape during the time since the LGM. Contours depicted include 12,000 B.P., 13,000 B.P., 14,000 B.P., 16,000 B.P. and 18,000 B.P. shorelines west of the study area. It is also possible that inundated prehistoric sites on the Pacific OCS that may have been preserved along the margins of paleochannels or intervening buried landforms were buried under a substantial layer of sediment and are deep enough to remain unaffected by the proposed Project. However, the depth of such protective sedimentation compared with the depth of anticipated Project-related ground disturbance has not yet been analyzed.

In summary, the study area has the potential for as yet undiscovered prehistoric archaeological deposits. Zones within the study area of moderate to high potential for such deposits are highly localized; identification of these localities would require a sophisticated analysis of the pre-submergence landscape within the study area, and modeling of subsequent conditions of submergence and rate of deposition throughout the marine transgression.

Native American Settlement and Occupation

An analytic framework for interpretation of Humboldt County prehistory is provided by Frederickson (1973), who divided human history in California into three broad periods: the Paleoindian period, the Archaic period, and the Emergent period. This scheme uses sociopolitical complexity, trade networks, population, and the introduction and variations of artifact types to differentiate between cultural units; the scheme, with minor revisions (Frederickson 1984), remains the dominant framework for the prehistoric archaeological research in this region.

The Paleoindian period (12,000 to 8,000 B.P.) was characterized by small, highly mobile groups occupying broad geographic areas. No evidence of Paleoindian occupation has yet been recovered from Humboldt County. Frederickson’s Paleoindian occupation falls within BOEM’s (2013:83) Terminal Pleistocene/Early Holocene (14,000 to 8,000 B.P.), the earliest sites of which are represented largely on the northern Channel Islands, as very few sites of this period have been identified in northern California (BOEM 2013:84).

During the Archaic period (Lower Archaic period c. 8,000 to 5,000 B.P., Middle Archaic period c. 5,000 to 2500 B.P., and Upper Archaic period c. 2500 B.P. to 1,000 A.D.) is characterized by geographic mobility and establishment of long-term base camps in localities from which a more diverse range of resources could be exploited. The addition of milling tools, obsidian and chert concave-base points, and the occurrence of sites in a wider range of environments suggest that the economic base was more diverse (Koenig 2006:5). By the Upper Archaic, mobility was being replaced by a more sedentary adaptation in the development of numerous small villages, and the beginnings of a more complex society and economy began to emerge. Frederickson’s Lower, Middle, and Upper Archaic periods roughly correspond to BOEM’s (2013) Middle Holocene (8,000 to 3,000 B.P.) and a portion of the Late Holocene.

During the Emergent period (1,000 A.D. to 1,800 A.D.), social complexity developed toward the ethnographic pattern of large, central villages where political leaders resided, with associated hamlets and specialized activity sites. Artifacts associated with the period include the bow and arrow, small corner-notched points, mortars and pestles, and a diversity of beads and ornaments (Frederickson 1994). The Emergent period whole falls within BOEM’s (2013:86) Late Holocene (3,000 B.P. to contact). By the Late Holocene there is evidence for fully developed fishing and marine mammal hunting along south, central, and northern California coasts (Moratto 1984).

MMS 1990:III-31 indicates that archaeological research has been particularly sparse on the coast of northern California, but that substantial investigations concentrated mainly in the Humboldt area and King Range.

Peoples that settled north of the Eel complex watersheds are grouped together as northwest California cultures that include the Hokan- and Algonquian-speaking tribes, as well as the Hoopa, Chilula, and Whilkut. Villages clustered around lagoons, sloughs, and river mouths along the coast. Native Americans in the Humboldt Bay region were from the Yurok, Kanuk, Wiyot, Chilula, Whilkut, and Hupa tribes who settled on the Pacific coast and along the banks of the Trinity and Klamath Rivers.

Humboldt Bay is located within a region that was occupied, at the time of contact, by a population defined by Kroeber (1925, 1970 Ed.:112) as the Wiyot. Kroeber describes the Wiyot as a small body of shore-dwelling people that with the Yurok constitutes the Algonquins of California. The Wiyot are the farthest southwest people whose language has Algonquian roots. Wiyot (meaning "where you site and rest") coastal territory ranged from the lower Mad River through Humboldt Bay and south along the lower basin of the Eel River. Their territory fell into three natural divisions: lower Mad River, Humboldt Bay, and lower Eel River—known as Batawat, Wiki, and Wiyot, respectively. Wiyot, however, is used for the entire stock by most of the neighboring groups.

Wiyot villages occurred along Humboldt streams, along the Bay shore, or in tidewater networks and waterways. Village sites may have been located around the wetland areas that are now Cooper and McFarlan Gulches, as well as Martin Slough and Elk River, Ryan's Slough, and Freshwater Creek. Many of the resources of their homeland were destroyed before much was understood about Wiyot culture, or were disturbed by commercial, industrial and residential development from the settlement period through the present day.

Systematic anthropological and archaeologist investigation was initiated by L.L. Loud of the University of San Francisco in 1918. Loud (1918) recorded 172 sites in the lower reach of the Mad and Eel Rivers. Loud identified 14 village sites located on Humboldt Bay and conducted excavation on Gunther Island at CA-Hum-167, the Wiyot village of Tolowot. H.H. Stuart's additional excavations at CA-HUM-167 were examined later by Heizer and Elsasser (1964).

Archaeologically, the settlement of the region by Wiyot and Yurok is marked by the emergence and development of the "Gunther Pattern" as seen at CA-Hum-67 on Gunther Island in Humboldt Bay. This pattern consisted of assemblages of harpoon points, woodworking tools, Dentalium shells, and other distinctive artifacts—such as ceremonial red and black obsidian bifaces and well-made ground-stone zoomorphs of these coastal and riverine cultures (Moratto 1984:484). A second Wiyot village is cited by Kroeber (1925, 1970 Ed.:115) as Tabayat or Witki situated on the North Spit of Humboldt Bay north of the study area.

Whistler (1979a in Moratto 1984:483) dates the Wiyot entry into their neighboring Karok and later arriving Yurok territory during the Frederickson's Emergent period (500 to 1,850 AD) at about 900 A.D.

A more complete discussion of the Wiyot may be found in the terrestrial cultural resources portion of the CEQA document.

Historic Setting

Historic Exploration, Settlement, and Commerce

Juan Rodriguez Cabrillo, a Portuguese pilot and navigator, commanded an expedition to explore the California coast north of Cedros Island in Baja California. With the hope of locating the fabled northwest passage, the “Strait of Annan,” and determining whether Asia could be reached by following the Pacific Coast north, he departed Navidad near Acapulco in June 1542, in the San Salvador and the Victoria (Bancroft 1886:1). Cabrillo’s was the first European expedition to explore along the California coast. Cabrillo died during the voyage, and his remains are believed to be buried on one of the Channel Islands, possibly San Miguel Island (Moriarty and Keistman 1973). When Cabrillo died, Bartolome Ferrer assumed command of the expedition and led it as far north as the southern Oregon border.

Other explorers followed the Cabrillo expedition, including Pedro de Unameno, who opened the Acapulco-Manila trade route between the Philippines and Mexico in 1565, allowing Spain to realize Columbus' dream of a new trade route with the Indies. The Manila galleon trade lasted until 1815 (Shurz 1939; Gearhart et al. 1990: IV, 5). Another expedition led by Sebastian Vizcaino in 1602 produced fairly accurate charts of the coast and harbors of southern and central California.

During circumnavigation of the world by sea in 1579, Sir Francis Drake is believed to have landed on the west coast of North America. Drakes Bay near Point Reyes is considered as the likely landing spot.

The development by Spain of the Manila galleons in 1565, which transported Chinese porcelain, silk, ivory, spices, and other exotic goods from Asia to Spanish settlements in Mexico, resulted in the inclusion of the West Coast into global trade (BOEM 2013:188).

The Manila galleons sailed annually from the Philippines bound for Acapulco. The sailing masters steered the galleons as near to 30 degrees north latitude as possible, often having to travel farther north to find favorable winds. After the long trip across the Pacific, the ships turned south upon seeing the first indications of land and thus avoiding the uncharted hazards of the California coast (MMS 1987). If all went well, the first land seen by the sailors would be the tip of the Baja peninsula. The ship then sailed to Acapulco. Many galleons never made it to safe harbor in Acapulco. Some of these included the Capitana (unknown location, circa 1600); Nuestro de Senora Aguda (Catalina Island, circa 1641); and the Francisco Xavier (Columbia River, Oregon, circa 1707). Galleons also fell prey to pirates such as Sir Francis Drake and Thomas Cavendish (Santa Ana, off the tip of Baja, 1587), and George Compton (San Sebastian, aground on Catalina Island, 1754) (Schurz 1939; Bancroft 1886; Meighan and Heizer 1952). The Manila galleon trade lasted until 1815 (Shurz 1939; Gearhart et al. 1990: IV, 5).

The European and Euro-American presence in the Pacific Northwest remained sparse along the coastline in the 19th century. When Spain finally colonized California, all Spanish ships sailing along the California coast, including the Manila galleons, were required to stop at Monterey. Schurz (1939) states that more than 30 Manila galleons were lost over the 250 years of trade. A few were wrecked on the westward passage and others shortly after leaving Manila. At least a dozen remain unaccounted for.

Spanish (1769–1818) and Mexican Colonial Period (1818–1848)

The years of the Spanish-Mexican hegemony in California saw increasing numbers of vessels arriving on the California coast. These engaged in the sea otter fur trade, smuggling, and the legal trade of China's goods in exchange for California's abundant hides and tallow from the vast herds of cattle kept at various private ranchos (Ogden 1923, 1941).

Although explorers Juan Rodriquez Cabrillo and Sir Francis Drake had sailed the Humboldt County coastline, it was not until 1775 that a Spanish vessel captained by Juan Francisco de Bodega landed at Patricks Point in Trinidad and claimed the land for the King of Spain. Trinidad Bay located north of the Project area served as a port for fur trading and Chinese trade expeditions.

The first significant contacts by Europeans with the Indians of northwestern California by Juan Francisco de la Bodega y Quadra in 1775 and George Vancouver in 1793 was with the Yurok Indians, the northern coastal neighbors of the Wiyot. Not until 1806 was Humboldt Bay, the approximate center of Wiyot territory, entered by White explorers. It was not until 1851 that deliberate observations and written reports on the Wiyot were made by Redick McKee and George Gibbs, both representing the U.S. government. Several archaeological village sites are situated along east-facing beaches of the North Spit of Humboldt Bay. Wiyot territory extended from north of Bear River to south of Little River.

During the following period of Spanish rule, George Vancouver, an Englishman, explored much of the Pacific coast between 1791 and 1795; this was the last documented exploration of coastal California by ship.

The Russian-American Fur Company was established near Fort Ross in 1812 (MMS 1990:98). The sea otter trade began in 1784 and continued roughly from 1874 to 1848, although declining markedly after 1830; and the hide and tallow trade of the 1830s and 1840s were the major international commercial activities that brought ships to California until the Gold Rush of 1849. Although certain Spanish and later Mexican citizens were authorized to conduct business on behalf of the government, most commerce consisted largely of smuggling by Yankee ships from East Coast ports. Spanish and later Mexican authorities made trading except through specified ports either outright illegal or imposed exceedingly high tariffs to protect their economic interests.

To the inhabitants of colonial locations like California, participating in these smuggling ventures was the only way to acquire some common conveniences and luxury goods. Smugglers in the otter trade would buy as many skins as possible in California and then sail to China and trade them for goods that brought high prices in New England or Europe. Otter furs initially were supplied by Native Americans working for the missions. Later, Aleut Islanders from Alaska working for the Russians competed for this lucrative trade.

The hide and tallow trade consisted of buying cattle hides from the vast ranchos in California and shipping them to New England's expanding industrial base for the production of leather goods for domestic use and export. Most of the hide and tallow trade took place in southern California. The Mexican-American War of 1846 and the Gold Rush of 1849 permanently changed the character of California shipping (MMS 1987:82). Clipper ships and side-wheel steamers soon eclipsed the outdated sailing brigs. What had in Hispanic times been a sparsely populated coast with a livestock-raising economic base supplemented by some fur trading was transformed into a thriving, densely populated, American state with a diverse economy.

American Period (after 1848)

Due to the combination of geographic features and weather conditions that concealed the narrow bay entrance from view and despite the documented 1806 sighting by Russian explorers, Humboldt Bay was not known by Europeans until an 1849 overland exploration provided a reliable account of its exact location (Davidson 1891:16). The first American ship to land on the Humboldt coast was the Lelia Byrd. Humboldt Bay was found in 1806 by an exploration party from the O'Cain, a vessel jointly commissioned by the Winship brothers from Boston and the Russian-American Fur Company; but the Bay itself was not mapped (Humboldt Bay Harbor, Recreation & Conservation District 2019).

With the discovery of gold in California in 1848, the primacy of San Francisco as the principal port on the West Coast was confirmed, as thousands of vessels made their way to San Francisco as part of the Gold Rush. Dr Josiah Gregg, a supply company merchant in search of gold, and his party traveled west on foot from the Trinity Mines and found Humboldt Bay in 1849, approximately 43 years after the first American ship entered Humboldt Bay. By 1850, a dozen expeditions sailed from San Francisco to search for the port at Humboldt Bay. The Laura Virginia captained by Douglas Ottinger found the entrance to the Bay in 1850. A small boat was launched and sailed into the natural harbor by the ships First Mate H.H. Buhne. The Bay was christened "Humboldt" after the popular naturalist and author Baron Alexander von Humboldt. Warnersville, Humboldt County's first town was established on Trinidad Bay 4 days later, and Humboldt City and the towns of Union (now Arcata) and Eureka soon followed.

After 4 years of its founding, seven of nine mills processing timber to marketable lumber on Humboldt Bay were located at Eureka. A year later, 140 lumber schooners operated in and out of Humboldt Bay moving lumber from mills to Pacific Coast cities.

The paddle-wheel steamer Santa Clara arrived from San Francisco in 1852. The Santa Clara was beached at Eureka on the later site of the town foundry, and the paddles were removed and connected by belt to a small sawmill constructed adjacent to the vessel. The large marine steam engines provided enough power to run the entire mill.

By the 1880s, railroads brought production of hundreds of mills in the region to Eureka for shipment through its port. Humboldt Bay shipyards include the historic H.D. Bendixsen and Rolph Shipbuilding.

Salmon fisheries along the Eel River were established as early as 1851, with processing plants on Eureka's wharf in 1858. The first of many ships built in Eureka was launched, establishing Eureka's shipbuilding industry. Eureka also became the West Coast's largest oyster farming operation in the 19th century.

In 1872, Danish Immigrant Hans Bendixsen built a shipyard on the eastern side of the Spit that was in use through 1920. Lumber processing facilities were built in 1892, leading to the construction of shipping docks and establishment of the towns of Manila, Samoa, and Fairhaven (CCC 1987:103). Samoa was formerly a lumberjack town where families lived in company housing and worked in the mills or lumberjacking. In 1892, Vance Lumber Company purchased the Humboldt Bay frontage from the Samoa Land and Improvement Company. The Eureka and Klamath River Railroad was chartered in 1893 to connect the Samoa sawmill and associated worker housing facilities to the city of Arcata and timberlands near the Mad River. The Samoa sawmill was purchased by Andrew B. Hammond in 1900. Hammond Lumber Company built an emergency shipyard during World War I, and seven wooden steamships were built at Samoa between 1917 and 1919. Samoa was formerly known as Brownsville until formation of the Samoa Land and Improvement Company in 1889.

Closer to the Project area, the US Navy Cruiser, Milwaukee—a 9,700-ton and 426-foot long vessel with large boilers and propelled by steam, went aground on the North Spit of the entrance at Humboldt Bay. Salvage operations were carried out by the local Mercer-Fraser Company under contract to the Navy. Salvage required construction of a railroad trestle for moving the heavier objects from the vessel to a newly constructed “Camp Milwaukee” located adjacent to the site and near the Hammond Lumber Company cookhouse (Hillman 1944 in Simpson 2001).

Although local Native American relations were at first friendly with Dr. Gregg, they later became increasingly hostile as settlers overwhelmed the Wiyot and cut off access to ancestral sources of food by theft of land. Increased hostilities led to the building and equipping of Fort Humboldt in 1853. Of all the native groups of northwestern California, the Wiyot have suffered most in terms of dispossession and displacement during the past 100 years (Elasser in Heizer 1978:161). The 1860 Wiyot Massacre took place on Gunther “Indian” Island when a local group identified as primarily Eureka businessmen massacred the Wiyot. Several famous generals of the Civil War, including Ulysses S. Grant, served at the Fort. In addition to miners and soldiers, commercial trades of farming, shipping, shipbuilding, fishing, and brewing of steam beer were developed at this time. Eureka’s charter was granted in 1856.

The Pacific depended on ships bringing raw and manufactured goods, immigrants, and capital until completion of the transcontinental railroad in 1869 offered an alternative method of transportation for commerce (Delgado 1990:8). California waters were soon alive with clipper ships and side-wheel steamers. Lumber, bricks, food, machinery, and labor were provided by vessels because San Francisco and the rest of California had only scarce agricultural and industrial output. Soon, however, reciprocal trade burgeoned with the establishment of lumber mills, farms, factories, and ranches.

Schooners were developed as vessels used for short hauls that could maneuver in the close quarters required at smaller landings. Generally having two masts, schooners were faster, easier to handle, needed smaller crews, could be made of wood, and were less expensive to operate than other sailing ships (Lindstrom 2013). The schooners were shorter and wider, their hull depths (draft) shallower, and they generally weighed less than 200 tons. Lindstrom (2013) indicates that from 1860 to 1884 about 70% of vessels built were sail powered only, and after 1884 most vessels had steam engines or were converted to steam power. Steam allowed the boats to move even without wind and allowed vessels to move up rivers. In addition, steam schooners still had sails in case the engine or boiler failed. As can be attested to by the number of shipwrecks reported in the study area, loss of vessels through stranding, grounding, or other damage was common. Steam schooners became prevalent by 1897. Far fewer losses of steam-powered schooners are listed than the earlier schooners.

Coastal trade in California continued to grow with the expansion of mining, agriculture, fishing, and manufacturing. California’s burgeoning economy, coupled with the natural physical barrier of the mountains of the Sierra Nevada to terrestrial commerce, resulted in coastal growth at an unparalleled rate (Caughey 1970 in MMS 1987:82). Rapid industrial growth and the advent of rapid technological development in the shipping industry in the latter half of the 19th century resulted in larger and larger wood, iron, and steel ships. Southbound side-wheel steamers carried gold shipments from the gold fields.

Spanish ships bringing grain from Chile were common during the last half of the 19th century. In the last quarter of the 19th century, lumber schooners were bringing lumber and railroad ties from the north, while huge British iron barks were bringing rails and heavy machinery round the horn (Caughey 1970).

With the development of agriculture in California, barks could carry grain out instead of sailing "in ballast" (without any cargo). Steamships and schooners were being built on this coast, and steel-hulled ships were being built on the East Coast and elsewhere. The increasing need for coal brought in British ships from Newcastle, which later were used along with San Francisco ferryboats as fishing barges up and down the coast. Others were converted into cargo barges for use in the coastal trade. A large percentage of these ships sank along the California coast and constitute a significant element of the cultural resources that may be found in the study area.

From the latter quarter of the 19th century, the Japanese dominated the California fishing industry with vessels of traditional Japanese design. During the first quarter of the 20th century, the Japanese fishing communities gradually were supplanted by Portuguese and Italian fishermen; finally they were displaced altogether when World War II brought about Japanese-American relocation (BLM 1979:IV-115).

Coastal growth resulted in ships of all kinds from all over the world bringing in a variety of goods and distributing California products to ports worldwide (MMS 1987:82). The latter half of the 19th century saw rapid industrial growth and the advent of rapid technological development within the shipping industry. Larger and larger wood, iron, and steel ships appeared. By the end of the 19th century, steamships were replacing sailing vessels as the primary mode of transportation, and the Pacific Coast became prominent in shipbuilding. By World War I, the diesel engine and the oil-burning steam turbine had replaced sail for all but bulk cargoes. As steam replaced sail, the internal combustion engine became popular. California became the American gateway to the Pacific world; and virtually every type of ship, large and small, was seen in California waters.

Historic Sea Routes and Shipwreck Distribution

Coastal and overseas routes in use north of Point Conception originally followed the southbound longshore California current, the North Pacific current (sometimes called the North Pacific Drift, a slow warm water current that flows west to east between 30 and 50 degrees of latitude), and the Japanese west- to east-flowing Kuroshio or Japanese current. While traversing coastal waters without stops, motorized ship traffic travels within the established shipping lanes. Sailing vessels, however, must constantly tack and jibe in order to make headway up the coast because of the prevailing northwesterly wind pattern. Sailing ships running down the coast usually will not tack or jibe because they are running before the wind. These routes are compiled from descriptions in the historic record and idealized depictions taken from route charts published by various shipping lines (MMS 1987:85).

Branching of shipping lanes to reach local ports varies with the point of origin, destination, and direction and force of the wind, which changes with the seasons. Ships often take shortcuts to reduce running time outside of the shipping lanes. Historic shipping lanes can be plotted, but they are not always adhered to; and vessel losses may occur both within the lanes or shoreward. The density of losses increases with the occurrence of natural hazards such as rocky shoals, headlands, and reefs, in addition to inclement weather in the vicinity of ports of call. Ports of call continue to be accessed from the coastal shipping lane. This configuration has little changed since the first Spanish explorations and the Philippine Manila galleon trade.

Numerous vessels have been reported lost in the study region. A large number of vessels whose coordinates remain unknown were lost enroute along the California coast. BOEM generally has confined archaeological search to the areas considered most sensitive (i.e., waters less than or equal to 120 m deep ([394 feet, 66 fathoms]) and areas of potentially high shipwreck density as determined by historical data. The planned cable routes cross through these documented areas that are sensitive for the occurrence of shipwrecks and known historic shipping lanes. Although most shipwrecks in the study area may be anticipated to be located near shore, any of these vessels may be located within or near the deeper water portion of the study area. Although the distribution of shipwrecks is influenced by environmental factors (e.g., wind; current; weather; and nearshore hazards such as sandbars, rocks, and reef areas), it is influenced even more by vessel traffic patterns.

Because of the vagaries of wind and weather, these sea routes could include a “sea lane” (an established sea route). Coastal and overseas routes in the Santa Maria and Eel River Basins were established by the Spanish (MMS 1987:84). As noted earlier, while motorized vessels can readily maintain travel within these shipping lanes, sailing vessels must constantly tack and jibe in order to make headway of the coast due to prevailing northwesterly wind patterns. Sailing ships running down coast usually do not have to tack and jibe because they are running before the wind (MMS 1987:84). The sea lanes established historically are still in use today and appear on modern navigational charts. Transit to local ports branch off from the established sea lanes, which increases traffic and collisions as does seasonal fog of varying densities.

The nine Manila galleons reported lost offshore of California could be located anywhere in the Pacific; however, given the southerly destination of Mexican ports and probable use of the North Pacific current, there is a potential that they may be encountered within the proposed cable routes in the study area.

Marine Cultural Resources Categories

Three broad categories of marine cultural resources are considered in this study, all of which are currently submerged and may be encountered during the marine installation of the Project: (1) historic period shipwrecks (including downed aircraft and unidentified debris); 2) prehistoric period watercraft, and (3) prehistoric archaeological resources, both in situ site deposits and isolated artifacts. The historic and prehistoric period watercraft came to rest after they were abandoned during travel across bodies of water, and they currently may be partially or wholly obscured by sediments of the ocean floor. No downed aircraft have been reported in the study area. The prehistoric period archaeological sites and isolated artifacts were deposited during occupation of what is now ocean floor, but what was dry land at the time of their deposition. These sites and isolated artifacts may be buried at varying depths depending on their age and the depositional history of the location in which each is found.

Historic Period Shipwrecks

For purposes of this study, historic period shipwrecks consist of the remains of watercraft that were used as early as the 16th century to cross the waters of the study area, remains of downed aircraft, and unidentified debris. Many of the shipwrecks offshore the northern California coast may occur near shore rocks, coves, historic landings, anchorages, wharves, and lighthouses; but in Humboldt County, most occur near Humboldt and Trinidad Bays. They also may occur in lesser numbers in deeper waters offshore. These historic period watercraft came to rest on the ocean floor due to marine casualties such as foundering (casualties due to leaking or capsizing of vessels, vessels lost at sea not due to collision or burning, and vessels not reported after sailing), stranding (casualties due to vessels running aground or striking rocks, reefs, or bars), colliding (collision between vessels), or burning (casualties due to fire and explosion) and were abandoned (abandonment at sea not due to age) during travel on the Pacific Ocean. Currently, their remains may be partially or wholly obscured by sediments and in rocky strata along the ocean floor. Not all marine casualties result in shipwreck sites as they also may represent the location where vessels wrecked but later were returned to service or removed for salvage, leaving behind jettisoned or lost cargo, ballast, or rigging.

Debris may include flotsam (debris scattered due to the process of wrecking), jetsam (items such as cargo or other ships equipment purposely jettisoned or accidentally lost from traveling vessels), and items deposited on the seafloor through salvage of vessels or their cargoes and past economic activities such as fishing or marine exploration. Cargo or ballast jettisoned offshore or lost comprises a class of historic archaeological sites that need not entail the wrecking of a vessel.

Prehistoric Period Watercraft

Native Americans used watercraft for transportation and fishing in salmon streams and lakes, and for hunting offshore and in seal and sea lion rookeries. The Humboldt Bay area was home to the Wiyot, an Algonquian-speaking group thought to have entered from the Columbia Plateau circa 900 A.D. according to carbon-14 dating (Elsasser in Heizer 1978:255). The local Wiyot of the Humboldt Bay area were littoral or “tidewater” peoples; and their subsistence practices reflected this habitat, which included fishing, mollusk collecting, and sea mammal hunting. Much of Wiyot technology reflected these practices as well, including redwood dugout canoes, weirs, platforms, traps, nets, spears, and harpoons.

The Wiyot practiced both surf and other saltwater fishing, with a heavy emphasis on anadromous[9] salmon, the main source of animal protein for the Wiyot (Elsasser in Heizer 1978:158). The Wiyot made their dugout canoes from redwood logs. It has been noted that only peoples who lived in an area of redwood forests that grew close to the water made these canoes. The redwood log was dug out using fire and tools made of stone and mussel shell. The front and back of the boat generally were blunt (shovel-shaped) and square. The canoes, which sometimes were as long as 18 feet, were used both in the ocean and in the rivers and bays.

During the approximately 13,000 years of Native American navigation through the study area, some native vessels may have been inundated, stranded, or capsized. When the wood—specifically redwood and Douglas fir—that was used in construction of their vessels is submerged in a saltwater environment, it will decay through time. While submersion in saltwater initially allows wood to absorb considerable quantities of salt, rendering the wood resistant to microbial colonization and decay, the wood remains susceptible to leaching through time that will degrade its resistance to decay (Schneider et al. 1996). Given the fragile nature of these craft, in terms of construction methods and perishable materials, it would be rare or unlikely that evidence of such vessels would be preserved in the nearshore environment.

[9] *Anadromous* refers to fish born in fresh water that spend most of their life in the sea and return to fresh water to spawn. Salmon, smelt, shad, striped bass, and sturgeon are common examples.

Prehistoric Archaeological Resources

Prehistoric archaeological resources include places where Native Americans lived, performed activities, altered the environment, and created art before they sustained contact with Europeans. Prehistoric resources contain features left behind by these activities as well as artifacts and subsistence remains. Additionally, they may contain human remains in the form of burials, cairns, or cremations. Although originally deposited on a non-marine landscape (dry land), changes in sea level have resulted in such resources currently being submerged. Such sites may date from the terminus of the Pleistocene through Holocene periods. These sites and isolated artifacts may be buried at varying depths, depending on their age and the depositional history of the location in which each is found.

Marine Cultural Resources Study Area

The study area for marine cultural resources consists of the four proposed cable routes and a 10-nm buffer around each route, beginning at the mean high tide line of the North Spit of the Humboldt Bay Bar situated between Fairhaven and Samoa and westward to the continental shelf break. The broad-scale buffer zone allows for inaccuracies inherent in the reported locations of historic shipwrecks. There is some overlap in the buffers around each route. The study area for this report includes marine areas within the CSLC jurisdiction that extend 3 nm miles (4.8 km) from the mean high tide line, as well as marine areas under federal jurisdiction that extend beyond the 3-nm State jurisdiction on the OCS where the submarine cables would be buried to the extent feasible.

Remote sensing survey data indicate that the study area has a flat topography devoid of old freshwater courses or terraces that were suitable for human habitation. It is likely, however, that sediments would have covered the original ground surfaces, and the probability of finding preserved archaeological sites remains problematic.

A previous archaeological survey using magnetometer and side scan sonar that was completed by Land and Sea Surveys in 1990 under contract to the USACE (Macfarlane 1991) reports numerous magnetic and sonar anomalies identified in the Humboldt Open Ocean Disposal Site area offshore Humboldt Bay. Three of the identified seafloor features were interpreted as potential shipwreck locations, and avoidance was recommended during disposal of dredge materials for maintenance dredging projects. Additionally, one magnetic anomaly of consequence was interpreted as the location of a potential shipwreck remaining near the western end of the Bar and Entrance Channel (Humboldt Bay Harbor Recreation and Conservation District and USACE, San Francisco District 1994). Additional investigation was recommended at that time but does not appear to have been conducted.

Shipwrecks are submerged maritime resources with the potential to provide information not available in the written record on historic ship construction, trade, commerce, industry, military history, and maritime lifeways.

The impact analysis for marine cultural resources discusses methodology and significance thresholds, and identifies impacts and mitigation measures. Potential impacts on extant cultural resources were based on marine Project construction methods.

Methodology

Marine Cultural Resources Records Search

Research methods were limited to an archival and records search to inventory marine cultural resources. All marine cultural resources cited consisted of shipwrecks. No downed aircraft or prehistoric archaeological sites and isolated artifacts were listed. The inventory completed for the study area covers the four potential routes plus a 10-nm buffer. No remote sensing survey of the ocean floor for shipwrecks and other debris or predictive modeling for prehistoric archaeological resources has yet been completed for the marine portion of the study area. Sources consulted included cultural resource inventories (shipwreck and downed aircraft listings) provided by the CSLC, BOEM Pacific OCS Region (BOEM 2013; former Bureau of Land Management Pacific OCS Region [Stickel & Marshack] 1979), the Minerals Management Service (MMS 1990 [Gearhart et al.]), and the National Oceanic and Atmospheric Administration (NOAA) Automated Wreck and Obstructions Information System (AWOIS) database (1988). The NRHP, California Historical Landmarks, California Inventory of Historical Resources, and local archives also were consulted.

Other sources consulted include the USACE, Los Angeles and San Francisco Districts; National Maritime Museum in San Francisco; Los Angeles Maritime Museum; Commerce Department files at the National Archives in Washington D.C. and San Bruno; Regional Records Centers at Laguna Nigel and San Bruno; The Huntington Library in San Marino; the published volumes of Lloyds of London Ships Registry1850–1980 and 1885–1950; the U.S. Department of Commerce Merchant Vessels of the United States 1867–1933; and the U.S. Coast Guard Merchant Vessels of the United States 1933–1982 and Supplements 1982–1988 at the University of California Library, University of California at Santa Barbara and Long Beach Library, and the State Library and State Archives and Records Office. More recent sources included Jackson (1969) and White (2014), shipwreck locations documented on NOAA Navigation Charts 18620 and 18622, and literature on file at the Humboldt Bay Maritime Museum in Eureka and Humboldt Bay Museum in Samoa, California.

Submerged Prehistoric Resources (Offshore)

The records search yielded no maritime finds of prehistoric origin within the study area. All known underwater prehistoric resources on file appear to be located in Oregon and southern California waters. It should be noted, however, that there is a recognized potential for the remains of prehistoric and historic sites, artifacts, and Native American water craft to be present offshore—although there is a lower potential for their preservation in-situ. Preservation of sites and artifacts in-situ may occur in undersea environments protected from wave action during inundation (e.g., in the lee of reefs, sand bars or other landforms) or buried beneath significant sediment cover.

Submerged Historic Resources (Offshore)

Historic submerged cultural resources include historic period shipwrecks. No evidence of downed aircraft in the study area was found in the archival search.

Locations of Shipwrecks

The reported locations of historic period shipwrecks are characterized by inaccuracies. Many, if not most, vessels reported as lost in the study area have not been accurately located or assessed for eligibility for listing in the CRHR. Therefore, the potential for the Project to affect these shipwrecks cannot be accurately assessed. However, given the large number of shipwrecks reported within or near the study area prior to 1950, it is likely that one or more may be found by site-specific remote sensing surveys conducted for each of the four subsea cable corridors.

A 10-nm buffer was included in the study area records search due to the general lack of specific coordinates for the majority of shipwrecks reported. This buffer reflects the most conservative interpretation of the potential accuracy of the shipwreck locations reported. Databases of the CSLC, BOEM, NOAA AWOIS, and in-house shipwreck databases were checked for listings within the study area. Published sources (White 2014; Jackson 1969) provided additional information on extant resources, in addition to the state and federal databases.

Although the majority of shipwrecks of known approximate location (i.e., accurate from within 0.91 nm [1.7 km] to within 10 nm [18.5 km]) are close to shore, numerous shipwrecks are reported that may fall within or near the cable routes as they pass through offshore waters to the 3-nm state waters limit and beyond to the OCS and slope. To further verify locations of the vessels reported lost within the study area, original sources were reviewed; and information such as “at,” “near,” and “off” a land reference that had been removed from CSLC and BOEM shipwreck listings were added back into the data.

Shipwrecks tend to concentrate along approaches to historic harbors and landings. Shipwrecks also are concentrated along the shoreline, especially along treacherous points of land because of dense fog or other sea conditions. These data indicate that the highest density of shipwrecks generally are expected to occur close to shore. The most treacherous location in the study area is the Humboldt Bay Entrance Channel itself, which often is obscured by dense fog and heavy seas that drive vessels onto the adjacent sand bars north and south of the narrow channel. While the majority of shipwrecks in the study area appear to cluster around the Entrance Channel and adjacent sand bars, shipwrecks may occur anywhere within state and federal waters. Collecting additional side-scan sonar and magnetometer data from Project routes within this area should be given high priority.

Fewer shipwrecks are expected to occur in extremely deep waters outside of the normal lanes of traffic. Shipwrecks in deep water generally are thought to be the result of marine casualty or purposeful sinking.

One or more shipwrecks may be documented by site-specific remote sensing surveys using both side-scan sonar and magnetometer. The presence or absence of the older more fragile shipwreck localities can be determined only by magnetometer survey. Without magnetometer survey, such resources may be undetected and may be disturbed, damaged, or destroyed during the pre-lay grapnel run or during cable installation and burial. In the case of historic wooden shipwrecks, disturbance of any portion of the shipwreck or overlying substrate would facilitate a more rapid decomposition through physical, chemical, and biological processes, with a consequent loss of information on a site or sites significant in the history of California.

As part of this analysis, shipwrecks were mapped in relation to the alternate cable routes based on their reported coordinates or other relevant information. Centered on the North Spit of Humboldt Bay cable origin, the study area extends 10 nm (18.5 km) north to include waters offshore of Camel Rock south of Trinidad Head, excluding the immediate inshore area of that location and southward to the Eel River.

Documented Historic Period Shipwrecks

In summary, a total of 146 documented shipwrecks, unknown wreckage, and debris locations are reported within the study area. The majority of these vessels were built between 1838 and 1899. No record could be found in the historic literature of any historic landings along the North or South Spits of the Humboldt Bay Bar where vessels offshore would have anchored and lightered in their cargoes. The references consulted as part of the records search for submerged historic period cultural resources provided information on shipwrecks, unknown wreckage, and debris locations. As previously referenced, these historic period watercraft came to rest on the ocean floor due to marine casualties such as foundering (casualties due to leaking or capsizing of vessels, vessels lost at sea not due to collision or burning, and vessels not reported after sailing), stranding (casualties due to vessels running aground on a sandbar or reef, striking rocks, or becalming),[10] colliding (collision between vessels), burning (casualties due to fire and explosion), or that were abandoned (abandonment at sea not due to age) during travel on the ocean. Vessels that foundered are those that took on water and sank below the surface of the water.

Vessels reported as lost ranged in size from 6 to 9,700 tons, except for one wood tugboat that was lengthened and converted to a cruiser. There was no information on conversion of older vessels to barges or pleasure vessels prior to their loss. Table 1 lists the shipwrecks that, based on accuracy of location and other criteria, are likely to occur within or near the four proposed cable corridors with landing sites at Samoa.

The accuracy of the coordinates provided for the shipwrecks varies. Neither the accuracy of location nor the significance of the vessels listed by the CSLC and MMS 1990 or BOEM 2013 has been evaluated. All resources that could be placed to within 10 nm of each of the proposed routes have been included for consideration and are listed in Table 1. Many of the resources listed contain information that, regardless of the documented coordinates, places the vessels near or west of the Samoa landing. This information can neither be verified nor denied based on the information available. Considerably more research will need to be conducted as part of the remote sensing surveys to validate the locations cited.

The Humboldt Bay Entrance Channel is exposed to high waves produced by local coastal storms accompanied by high winds and is exposed to high waves and swells generated by distant Pacific storms. The shifting sandbar across the Entrance Channel historically has seriously impaired the movement of ships in and out of the Bay. The entrance to the Bay is 0.25 mile wide. The reason for the numerous shipwrecks is the horrific ocean currents that constantly flow past the entrance of the

[10] *Stranding* is often misused by mariners to indicate running out of fuel, engine trouble, or trouble with the ship's machinery rather than the vessel itself.

bay running north and south. They forced the ships trying to enter the bay onto the ocean beaches north and south of the entrance, wrecking them. Ships wrecked included sailing ships from the 1800s, several Navy ships including destroyers and submarines, and coast guard ships, passenger vessels, cruise ships, freighters, fishing vessels etc.

Most wrecks have occurred as ships try to cross the sandbar and enter the Bay.

During World War II, the USACE built two long jetties out into the ocean from both sides of the mouth of the Bay, using huge quarried rocks brought in by trucks to facilitate allowing ships to enter the Bay between the jetties, despite the heavy currents rushing past. The jetties are about 0.25 mile in length. The sea wall and South Spit jetty are considered historic resources as their construction by the USACE began in 1889. Both Humboldt Harbor jetties are registered as California Historic Civil Engineering Landmarks, and the Humboldt Harbor Historical District is listed as California Historic Landmark Number 882. The jetties are two of the oldest man-made structures on the Pacific Coast subject to extreme wave action (BLM 2002).

There have been fewer shipwrecks in the recent past. The U.S. Coast Guard maintains a Life-Saving Station beside the Bay just north of the entrance on Samoa Road. The NRHP lists the Humboldt Bay Life-Saving Station (October 30, 1979 #79000477) and includes the 1875/1936 Coast Guard Building.

For the purposes of this analysis, shipwrecks are divided by the physical description of reported casualty location. Except where there is an agreement between cited locations and coordinates, coordinate locations largely are ignored as the majority of locations cite the coordinates for the harbor mouth and are clearly at odds with the physical descriptions of the wrecking situations or locations.

Eleven of these shipwrecks are reported to be within Humboldt Bay, and two specifically are associated with the Eureka Harbor Dock and Mooring Basin. All 11 of these shipwrecks can be eliminated from the analysis.

Seven shipwrecks are reported to have occurred at the entrance to Humboldt Bay, and 23 are reported as having occurred south of the South Jetty and the South Spit of the Humboldt Bay Bar or near the Eel River. These 30 shipwrecks therefore are considered less likely to occur within the four planned cable routes as none of the proposed routes extend in a southerly direction. The most well known of these shipwrecks are the USS H-3, a submarine formerly named Garfish, that ran aground on the Humboldt Bay bar while trying to enter Humboldt Bay; and the USS Milwaukee that grounded while attempting to salvage the H-3 and broke up in the pounding surf. The USS H-3 was removed, decommissioned, and scrapped the following year.

Twelve shipwrecks are reported to have occurred on the North Spit of the Humboldt Bay Bar, with three specifically located at Samoa Beach. These shipwrecks include two potentially significant shipwrecks. The Brooklyn, a 333-ton single-ender steamer was stranded after striking the Humboldt Bay bar at Samoa Beach in heavy seas in 1930; and the Commodore Prebel, a 282-ton sidewheel (aka paddlewheel) steamer built in 1844 was stranded on the North Spit in 1851. All 12 shipwrecks are considered to be potentially located in nearshore waters along the North Spit in the vicinity of the cable landing.

An additional 43 shipwrecks are reported to have occurred at, on, or off the Humboldt Bay Bar with no specific reference to the North or South Spit. Without additional information, all of these shipwrecks are considered to be potentially located within the vicinity of the cable landing.

Twenty-six shipwrecks are reported to have occurred at or off Eureka/Humboldt Bay. Lacking additional information, all 28 shipwrecks are considered to be potentially located in the study area.

Seventeen of the shipwrecks listed are reported as having been removed or refloated. Their coordinates remain in the shipwreck tables because cargo or associated machinery may still exist at the loss location.

The remaining 15 shipwrecks are reported to have occurred within the deeper waters of the offshore study area directly west of Humboldt Bay. Remains of these shipwrecks may occur within or near the four cable routes.

None of the 146 shipwrecks have been previously evaluated for their significance or importance in California history. No degree of accuracy of location has been evaluated previously for any of the shipwrecks reported in the study area. Table 2 lists these shipwrecks by their type (rig and service) and their range of built and loss dates.

An additional 31 shipwrecks (Table 3) are reported by vessel name as off the coast of northern California. Lacking a specific location, these are not considered in the analysis but may be used to identify a specific shipwreck site if one should be found in the individual remote sensing surveys of the four cable routes. Table 4 lists these shipwrecks by their type (rig and service) and their range of built and loss dates.

Additional research for subsequent remote sensing surveys may provide additional information on the accuracy of the coordinates recorded. The following describes the shipwrecks anticipated to occur within the maximum 10-nm radius of the proposed routes. The MMS (1987, 1990) databases discuss eligibility for listing in the CRHR only in terms of historical significance. Unfortunately, these three levels of significance, insignificant (not eligible for listing in the NRHP), moderate (potentially eligible for listing in the NRHP), and significant (eligible for listing in the NRHP), were not assigned to listings available for the study area.

With additional information, several more shipwrecks could be eliminated or added from the numbers cited above; however, without confirmation of the accuracy of the coordinates cited, they cannot be completely eliminated. Digital newspaper repositories are a likely source for additional information on study area shipwrecks. The California Digital Newspaper Collection has digitized numerous historical newspapers from California. These collections can be accessed at the University of California Davis and the University of California Riverside Libraries, along with the Sonoma County Library and the San Francisco Public Library Historical Digital Newspaper Collections. BOEM (2013:229) also cites other digital newspaper archives, including Ancestry.com, Newspaper Archive, com, and the Library of Congress' Chronicling America website.

Eligibility for Listing in the NRHP and CRHR

For the purposes of this study, any property listed in the NRHP also is eligible for listing in the CRHR. None of the shipwrecks listed in the CSLC or BOEM databases and in the study area have been evaluated for their eligibility for listing in the NRHP.

With reference to their potential eligibility for listing in the NRHP and, by extension, the CRHR, the MMS 1990 reference uses the terms "significant," "probably significant," and "not significant." Alternative terminology, used by the BOEM 2013 reference, includes "probably eligible," "may be eligible," and "not eligible" for inclusion in the NRHP. Unless the resource has been evaluated according to the criteria established for inclusion in the NRHP, these statements of significance and eligibility remain informal suggestions. Based on previous evaluations, all those shipwrecks with loss of life generally are evaluated as significant. Significance also may be accrued based on the importance of the ship's designer or builder, materials, type of engine or other equipment, association with an early build date, or date of loss.

Of the shipwrecks documented within the study area, 12 potentially may be eligible for listing in the NRHP based on age of construction and lives lost. As noted, any resource eligible for listing in the NRHP also is eligible for listing in the CRHR. The eligibility of the remaining 134 shipwrecks reported in the study area remains undetermined. Of the 12 vessels only 2, the Albert & Edward and the Brooklyn, have been previously evaluated as moderately significant.

Shipwrecks that are tentatively evaluated as potentially significant based on the present research include the Albert & Edward, Brooklyn, Chilcot, Corinthian, Fidelity, Lili of Elsffeith, Laura Pike, Maxim, Mexican, Weott, Willimantic, and an unknown brig:

- Albert & Edward was a 96-ton two-masted schooner built in 1875 that capsized on the Humboldt Bar in 1876 with five lives lost.
- Brooklyn was a 333-ton single-ender steamer built in 1901 that stranded when striking a sand bar at Samoa Beach in heavy seas in 1930, with 17 lives lost.
- Chilcat was a 215-ton ship that sank on Humboldt Bar in 1899 with 10 lives lost.
- Corinthian was a 94-ton two-masted gas screw schooner built in 1892 that stranded on Humboldt Bar in 1906 with 12 lives lost.
- Fidelity was a three-masted schooner that capsized in 1889 at Humboldt Bar in 1889, with eight lives lost.
- Laura Pike, a vessel of unknown type and service, wrecked on the Humboldt Bar in 1878 with seven lives lost.
- Lili of Elsffeith, a 1,609-ton barque, grounded on the rocks off Eureka in 1878 enroute to San Francisco, with seven lives lost.
- Maxim was a two-masted 117-ton schooner built in 1876 that foundered in 1901 on Humboldt Bar, with six lives lost.
- Mexican was a vessel of undocumented rig or service that wrecked in 1853 on the Humboldt Bar with four lives lost.
- Weott was a 557-ton steamship of unknown construction that sank off the Humboldt Bar while carrying general cargo in 1899, with two lives lost.
- Willimantic, a 176-ton brig built in 1848, wrecked at Humboldt Bar in 1875 with eight lives lost. Remains later washed ashore on Gold Beach north of the study area.
- An unknown brig was reported to a Captain Terry as sinking in 1852 at Humboldt Bay with five lives lost.

The majority of recent (post-1950s) shipwrecks in the BOEM (2013) database are included as a means of eliminating them from consideration should they appear in the results of sonar, magnetometer, autonomous underwater vehicle, or multibeam surveys. Fifty of the vessels represented are of this more recent vintage.

It is pertinent to the historic lumber, freight, and fishing industry in the study area that as many as 60 of the dated vessels were lost between 1838 and 1899, and 34 between 1900 and 1950. A total of 54 vessels were recent losses dating between 1951 and 1980. Dated vessels built prior to 1950 should be evaluated for significance to the extent possible, but that effort is not within the range of the present scope of work. Vessels lost after 1950 with an early building date, a specific or unusual design, are associated with significant loss of life, or with other historic association also may be evaluated as potentially significant (MMS 1990) and "probably eligible for listing in the NRHP" (BOEM 2013). These vessels may include workboats used after 1950 that were built as part of the World War II effort and converted to pleasure craft, passenger transport, fishing boat, or other workboat. However, none of the vessels in the study area are believed to be associated with World War II.

For the most part, vessels built after 1950 have been recommended as not eligible for listing in the NRHP (MMS 1987). The majority of these vessels are diesel-, gas-, or sail-powered vessels of wood, fiberglass, and steel construction. These vessels were included in the updated BOEM 2013 shipwreck database so that they could be eliminated as potential historic cultural resources during the interpretation of side scan sonar, magnetometer, autonomous underwater vehicle, and multibeam records. Vessels reported lost in the study area that were built between 1940 and 1945 may be associated with the World War II effort and may bear battlestars or have other historic associations that have not yet been evaluated. In addition, vessels built prior to 1953 for the Korean War effort may bear battlestars or have other historic associations that have not yet been evaluated.

Significance Thresholds

Under CEQA, lead agencies are to protect and preserve resources with cultural, historic, scientific, or educational value. State CEQA Guidelines Section 15064.5 provides significance criteria for determining a substantial adverse change to the significance of a cultural resource. In addition, Appendix G of the State CEQA Guidelines provides additional guidance in determining a project's impact on cultural resources. The information provided in the State CEQA Guidelines has been used to develop the significance criteria for cultural resources for the proposed Project. State CEQA Guidelines also require reasonable mitigation measures for impacts on archaeological resources that result from development on public lands.

A Project activity would result in a significant impact on a cultural resource if it would:

- Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5 and PRC Section 21083.2.
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5 and PRC Section 21083.2.

Until identified cultural resources can be evaluated for their eligibility for nomination to the NRHP and CRHR, they all must be considered potentially significant until otherwise eliminated by additional research, avoidance, or a program of data recovery.

Impacts and Mitigation Measures

RTI proposes to install four transpacific subsea cables to land at Samoa, located on the North Spit of Humboldt Bay Bar. The Project would be implemented in four phases—one phase for each of the cable systems. The marine segments of the cable systems refer to those segments between the mean high water line and the outer limit of the OCS, where seawater depth is approximately 5,904 feet (1,800 m). They consist of the marine conduit, cables, splice boxes, and cable regenerators. Cables consist of a double-armored design, used in rocky areas or coarse substrates and where protection from fishing gear may be warranted; and a light-weight armored cable, similar to the doubled-armored cable that is used where the risk of damage due to substrate conditions or fishing is reduced by burial of the cable in soft-bottom sediments using a seaplow or remotely operated vehicle (ROV). Both cables are less than 2 inches (5 centimeters in diameter).

Impact: Project-related ground-disturbing activities have the potential to disturb or destroy previously unknown or inaccurately recorded submerged prehistoric archaeological resources or historic shipwrecks.

Impacts associated with the onshore portion of the installation are discussed in the terrestrial archaeological survey report submitted under separate cover. The following marine Project activities, as described above under Detailed Marine Project Components, have the potential to affect submarine archaeological resources by disturbing or degrading the seafloor or seafloor sediments:

- Marine directional bores
- Anchoring activities
- Pre-lay grapnel run
- Diver-assisted post-lay burial
- Cable plow-assisted post-lay burial
- ROV-assisted post-lay burial
- Cable plow post-lay burial
- ROV cable post-lay burial
- Direct surface lay

Emergency cable repair, retirement, abandonment, or removal of the cable systems are likely to result in impacts similar to those of installation. If significant impacts are identified, the types of measures proposed to mitigate installation impacts also could mitigate removal impacts to a less-than-significant level.

As identified in the above discussion of construction techniques, marine construction activities have the potential to disturb, disrupt, or degrade extant cultural resources such as prehistoric watercraft and historic shipwrecks on the seafloor or within seafloor sediments from the mean high water line to the outer limit of the OCS. Prehistoric archaeological sites associated with buried late Pleistocene and Holocene paleolandforms in the study area are unlikely to be disturbed during construction, operation, or repair of the four RTI cables proposed. Such resources, should they be present, would have a significant covering of marine sediments up to 30 m thick. Subsurface disturbance of a potentially significant or a significant shipwreck may result from anchoring activities associated with directional boring through nearshore sediments from the LV to water depths of 30 feet (9.2 m); from diver-assisted burial at water depths between 40 and 98 feet (12 to 30 m); from cable plow, or diver or ROV-assisted post-lay burial in water depths of 98 to 5,904 feet (30 to 1,800 m), and from direct surface lay in water depths greater than 5,904 feet (1,800 m).

Additionally, although cable-laying and support vessels would be dynamically positioned rather than requiring anchoring or anchor mooring systems at locations along the proposed cable routes, anchoring may be anticipated to occur for reasons such as bad weather, repair, or other problems. These unanticipated anchoring activities also have the potential to disturb, disrupt, or degrade extant cultural resources.

Mitigation Measures MM-1 through MM-3 are recommended to reduce potential impacts to a less-than-significant level. Implementation of these measures would require identification of resources and avoidance of any potentially significant resources by rerouting the cable.

Mitigation Measures

MM-1: Conduct a Pre-Construction Offshore Archaeological Resources Survey

Use the results of an acoustic survey (e.g., a CHIRP system survey) for evidence of erosion/incision of natural channels; the nature of internal channel-fill reflectors; and overall geometry of the seabed, paleochannels, and the surrounding areas for their potential to contain intact remains of the past landscape with the potential to contain prehistoric archaeological deposits (e.g., Schmidt et al. 2014 in BOEM 2015:09). *CHIRP* is an acronym for compressed high-intensity radar pulse. CHIRP sub-bottom profilers achieve very high-resolution imaging of the upper regions of the sub-surface but do not penetrate as deeply into the sub-bottom strata as Boomer or Sparker type systems. The analysis will include core sampling in various areas, including but not limited to, paleochannels to verify the seismic data analysis. Based on the CHIRP and coring data, a Marine Archaeological Resources Assessment Report shall be produced by a qualified maritime archaeologist and reviewed by the California Coastal Commission or the State Historic Preservation Officer to document effects on potentially historic properties.

MM-2: Conduct a Pre-Construction Offshore Historic Shipwreck Survey

A qualified maritime archaeologist, in consultation with the lead agency, shall conduct an archaeological survey of the proposed cable routes. The archaeological survey and analysis shall be conducted following current CSLC, BOEM, and USACE (San Francisco and Sacramento Districts) standard specifications for underwater/marine remote sensing archaeological surveys (Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 Code of Federal Regulations Part 585).

The archaeological analysis shall identify and analyze all magnetic and side scan sonar anomalies that occur in each cable corridor, defined by a lateral distance of 0.5 km on each side of the proposed cable route. This analysis shall not be limited to side scan and magnetometer data, and may include shallow acoustic (sub-bottom) data as well as autonomous underwater vehicle and multibeam data that may have a bearing on identification of anomalies representative of potential historic properties. The analysis shall include evaluation to the extent possible of the potential significance of each anomaly that cannot be avoided within the cable corridor. If sufficient data are not available to identify the anomaly and make a recommendation of potential significance, the resource(s) shall be considered as potentially eligible for listing in the NRHP and CRHR, and shall be treated as a historic property. If any cultural resources are discovered as the result of the marine remote sensing archaeological survey, the proposed cable route or installation procedures shall be modified to avoid the potentially historic property. BOEM administratively treats identified submerged potentially historic properties as eligible for inclusion in the NRHP under Criterion D and requires project proponents to avoid them unless the proponent chooses to conduct additional investigations to confirm or refute their qualifying characteristics. BOEM typically determines a buffer (e.g., 50 m) from the center point of any given find beyond which the project must be moved, in order to ensure that adverse effects on the potential historic property will be avoided during construction.

MM-3: Prepare and Implement an Avoidance Plan

Pursuant to Section 30106 and 30115 of the Coastal Act of 1976, "where developments would adversely impact archaeological…resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required" (PRC Section 30244). An Avoidance Plan, therefore, shall be developed and implemented to avoid all documented resources from the Marine Archaeological Resources Assessment Report and the Offshore Historic Shipwreck Survey Report, addressing discoveries of as yet unidentified resources encountered during planned marine survey and construction, and providing mitigation monitoring if deemed necessary during construction to ensure compliance.

Cumulative Effects

Introduction

Cumulative impacts on cultural resources take into account the impacts of a project in combination with those of other past, present, and reasonably foreseeable projects. The geographic extent of cumulative analysis for cultural resources encompasses a large region due to the interrelated nature of the region's prehistoric, historic, and ethnographic resources. The geographic area for the analysis of cumulative impacts for submerged cultural resources includes the offshore submerged lands beneath the Arena Basin. For purposes of this cumulative analysis, impacts on cultural resources could result at any time throughout the life of the Project, but are most likely during ground-disturbing activities associated with construction.

This report provides a historical background for the study area and describes the inventory of known cultural resources in the area. The types of resources that are found within the study area are similar to those found within the broader geographic region considered for the cumulative analysis.

The condition of these cultural resources varies considerably, and depends on the types and extent of human and natural factors that may have affected the integrity of individual resources or group of resources. Construction activities offshore can destabilize sediments, thereby increasing erosion at archaeological sites. Many shipwrecks in the offshore environment are buried or partially buried in sediments. The portions of the vessel under sediments are protected from sediment shifting, active biological predation, and chemical processes that degrade exposed portions of the shipwreck.

Exposure of even a small portion of a shipwreck to aerobic seafloor conditions can very quickly degrade wood-hulled shipwrecks such as those prevalent in the study area.

Project Contribution to Cumulative Impacts

Direct impacts on marine cultural resources may be avoided through adequate site identification and mandated avoidance as the preferred mitigation. Similar to construction of the proposed Project, should resources be discovered during the construction of current and future projects, they would be subject to legal requirements designed to protect them, thereby reducing the effect of encountering unknown cultural resources. Because of the planning of the marine cable routes to avoid cultural resources that may exist on the sea floor, as well as implementation of recommended Mitigation Measures MM-1 through MM-3, the Project would be unlikely to make a substantial contribution to cumulative impacts on marine cultural resources.

The isolated prehistoric artifacts that have been recovered from the seabed north of the study area by divers and current archaeological research support the assessment that there is the potential to encounter prehistoric archaeological sites during construction of the submerged portion of the cables. The same is true for historic shipwrecks. A number of shipwrecks have been reported within the study area; however, the level of accuracy of these reports is not adequate to determine with certainty that any of the cables will encounter a shipwreck.

Mitigation measures require identification of areas with high potential for specific submerged cultural resources, which would reduce any impact to a less-than-significant level. No past projects have reported encountering submerged historic shipwrecks or prehistoric archaeological resources in the study area, and currently no proposed projects have the potential to disturb or destroy such resources. Therefore, the Project’s contribution to cumulative impacts on marine cultural resources would not be significant.

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