APPENDIX D

Marine Cultural Resources Report

MARINE CULTURAL RESOURCES TECHNICAL REPORT FOR RTI INFRASTRUCTURE, INC. MANCHESTER SUBSEA CABLES PROJECT

PREPARED FOR:

RTI Infrastructure, Inc.
268 Bush Street
San Francisco, California 94104
Contact: Chris Brungardt
Phone: 916-949-9141

PREPARED BY:

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

October 2018

MARINE CULTURAL RESOURCES REPORT

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

AA	Antiquities Act
AUV	autonomous underwater vehicle
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
B.P.	before present
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CLS	cable landing station
CRHR	California Register of Historical Resources
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
OCS	outer continental shelf
OGB	ocean ground bed
PRC	Public Resources Code
ROV	remotely operated vehicle
RTI	RTI Infrastructure, Inc.
SLC	State Lands Commission
TCP	traditional cultural property
USACE	U.S. Army Corps of Engineers

Introduction and Summary

RTI Infrastructure, Inc. (RTI) proposes to install up to four transpacific submarine cables to land in the unincorporated area of Mendocino County just north of the town of Manchester, California (Figure 1). The project would be implemented in four phases—one phase for each of the four cable systems. Each cable system would entail installing a fiber optic cable system onto the continental shelf, landing in the vicinity of Manchester, and then connecting to a cable landing station (CLS) on land. The CLS would house the necessary telecommunications and system support equipment. A buried terrestrial conduit system would be installed to connect the cable systems to the CLS. The other appurtenant facilities necessary for the cable systems would be installed at various times during various phases of work as described below. The project area is located north of and offshore of Manchester State Park, which is situated along the Mendocino County coast near the town of Manchester and about 5 miles north of the city of Point Arena.

The study area for this project includes those areas extending from the mean high tide line out to the water depth of about 80 fathoms (480 feet or 146 meters) and includes the 3-nautical-mile State waters limit and U.S. territorial waters (Figure 2). The continental shelf off northern California is considerably narrower than the worldwide average and generally occurs at 98 fathoms (581 feet or 180 meters) (Griggs and Hein 1980 in Minerals Management Service 1990:II-48). The prehistoric and historic maritime activities in northern California provide the context for review and analysis of the project.

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. The historic and prehistoric period watercraft came to rest on the ocean floor due to capsizing, foundering, stranding, collision, or other marine casualty during travel across bodies of water. Their remains may currently be partially or wholly obscured by sediments of the ocean floor. The prehistoric period archaeological sites and isolated artifacts were deposited during occupation of what was dry land at the time of deposition but is now ocean floor due to rising sea levels. 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.

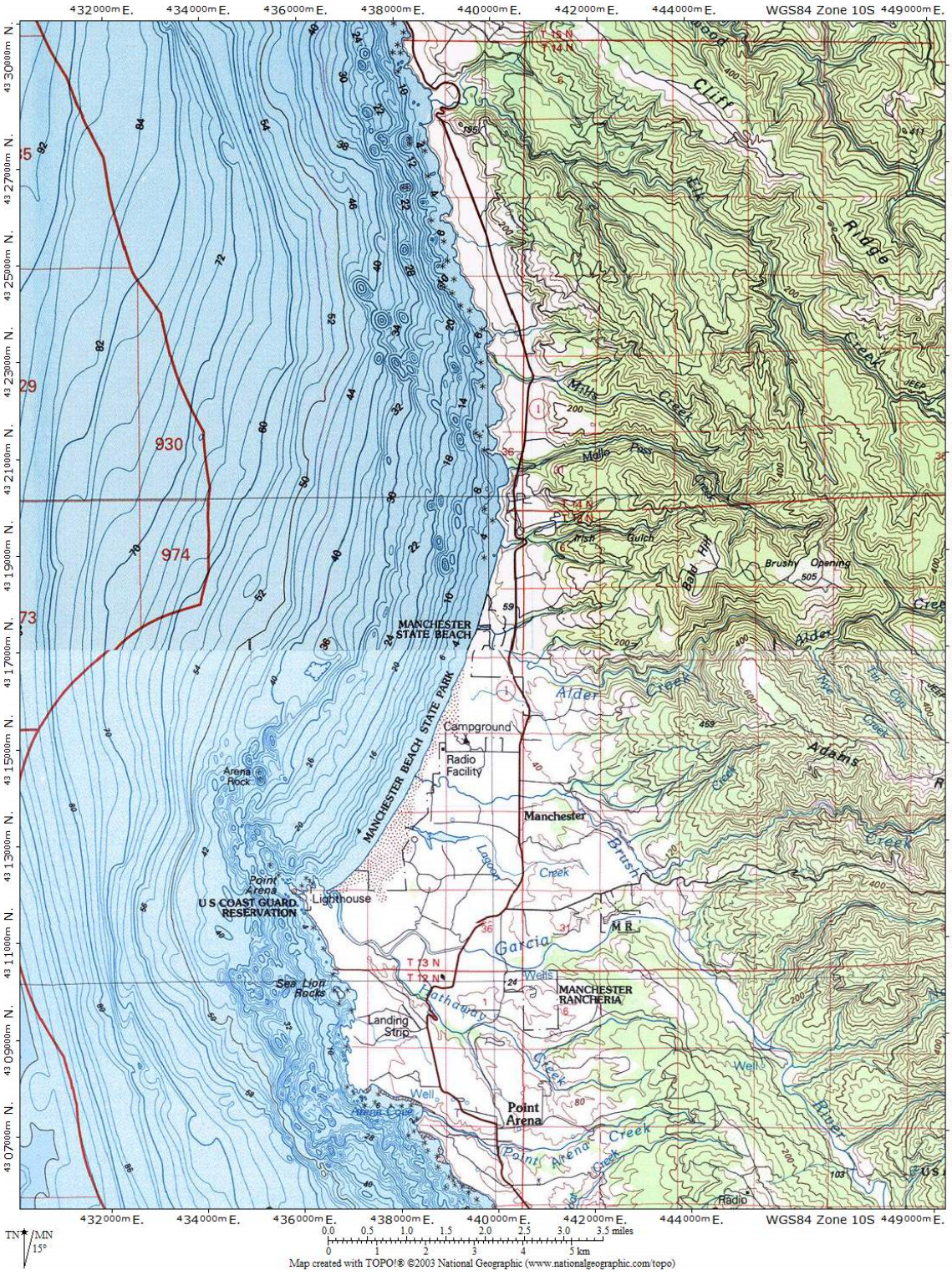

Figure 1. Project Location

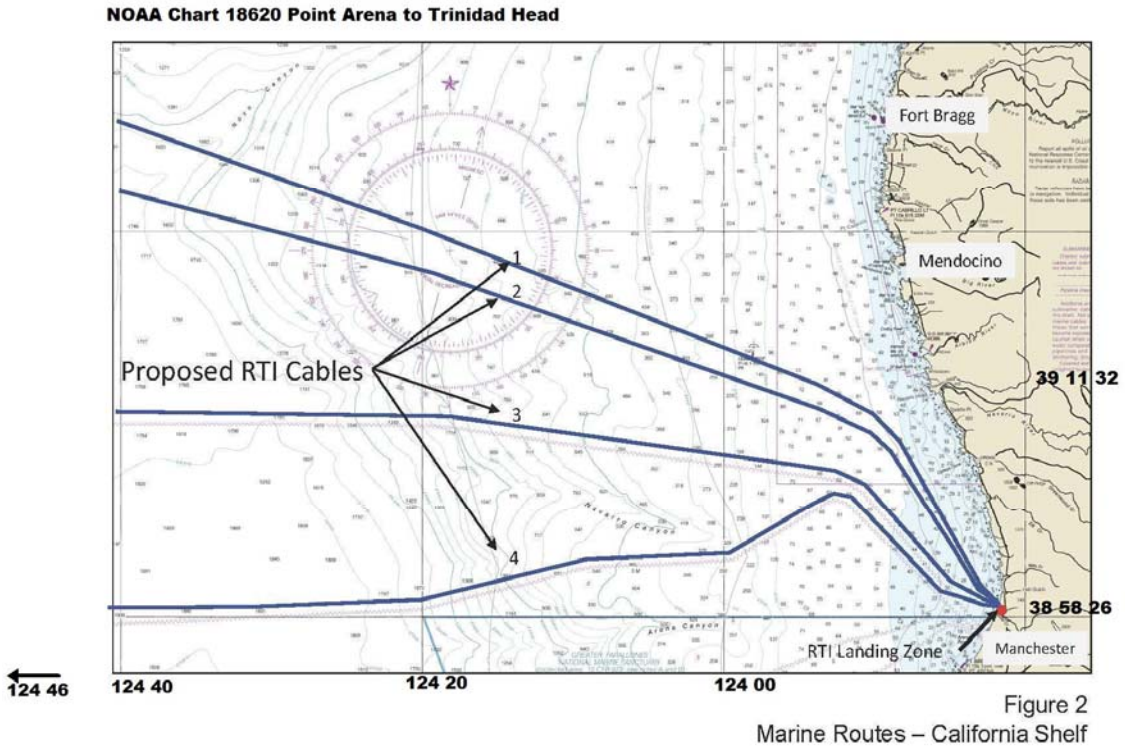

Figure 2. Soundings in Fathoms

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 in this area occur near shore landings, coves and anchorages, wharves, dog-hole “chutes and wharves” and lighthouses. No downed aircraft were noted in the State Lands Commission or Bureau of Ocean Energy Management (BOEM) databases.

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. Coastal Pomo people would make rafts by weaving driftwood together and binding the pieces with plant fibers. These were used for offshore hunting of seals and sea lions and for harvesting mussels. The Clear Lake Pomo people wove boats from bundles of tule reeds and bound them together with the vines. The Yurok people to the north used dugout canoes made from redwood.

During the approximately 13,000 years of Native American navigation through the study area, some native vessels may have been inundated, stranded, or capsized. However, given the fragile nature of these craft in terms of construction methods and perishable materials, it is unlikely that evidence of such vessels would be preserved in the nearshore environment.

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.

Regulatory Background

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 [CFR] 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 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 outer continental shelf (OCS) are subject to federal jurisdiction and triggers other laws, including NHPA. The ***Antiquities Act (AA) 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 federally protected marine areas but has not yet been applied on the OCS outside of such areas (Bureau of Ocean Energy Management 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 to tribal and federal lands, defining federal lands as any land other than tribal lands that are controlled or owned by the U.S. government. Although no case has yet been recorded of 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 (Bureau of Ocean Energy Management 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 (Bureau of Ocean Energy Management 2013:49).

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

State Regulations

California Environmental Quality Act (CEQA) (Public Resources Code [PRC] Section 21000 et seq.). Historical, archaeological, and paleontological resources are afforded consideration and protection by CEQA (PRC Section 21083.2). 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 that 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 Section 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 Section 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 that 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 criterion under which a resource is proposed for nomination (PRC Section 5024.1).

CEQA Guidelines, CCR 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.

PRC Section 5097.5 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 impact paleontological resources shall require reasonable mitigation. These regulations apply to projects located on land owned by or under the jurisdiction of a state or a city, county, district, or other public agency.

PRC Section 5097.9 et seq. (1982) 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 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 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 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 nautical miles 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 (Bureau of Ocean Energy Management 2014:42).

Local Regulations

Manchester State Park General Plan

Manchester State Park General Plan (1992) provides for the discovery and protection or investigation of cultural resources as mandated by CEQA and applicable county ordinances.

Mendocino County General Plan

It is the policy of Mendocino County to provide for the discovery and protection or investigation of cultural resources as mandated by CEQA and applicable county ordinances. This is mandated in the Mendocino County General Plan Coastal Element (1983), part of the Local Coastal Program, that is largely based on the California Coastal Act.

Environmental Setting

The project area is located north of and offshore of Manchester State Park. Manchester State Park is situated along the Mendocino County coast near the village of Manchester and about 5 miles north of the city of Point Arena.

The study area for this project includes those areas extending from the mean high tide line through the 3-nautical-mile State waters limit and federal territorial waters to approximately 12 nautical miles offshore and the edge of the continental shelf (Figure 2). The prehistoric and historic maritime activities in northern California provide the context for review and analysis of the project.

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[1] 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.

[1] Abandoned as a result of marine casualty.

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 in this area occur near shore landings, coves and anchorages, wharves, dog-hole chutes and wharves,[2] and lighthouses. No downed aircraft were noted in the State Lands Commission (SLC) or BOEM shipwreck databases.

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. Coastal Pomo people would make rafts by weaving driftwood together and binding the pieces with plant fibers. These were used for offshore hunting of seals and sea lions and for harvesting mussels. The Clear Lake Pomo people wove boats from bundles of tule reeds and bound them together with the vines. The Yurok people to the north used dugout canoes made from redwood.

During the approximately 13,000 years of Native American navigation through the study area, some native vessels may have been inundated, stranded, or capsized. However, given the fragile nature of these craft in terms of construction methods and perishable materials, it is unlikely that evidence of such vessels would be preserved in the nearshore environment.

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.

Study Area

The study area for marine cultural resources consists of the four proposed cable routes and a 10-nautical-mile buffer around each route, beginning at the mean high tide line of Manchester Beach in Mendocino County north of Point Arena 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 includes marine areas within California's jurisdiction that extend 3 nautical miles (4.8 kilometers) from the mean high tide line, as well as marine areas under federal jurisdiction that extend beyond the 3-nautical-mile State jurisdiction on the OCS where the submarine cables will be buried to the extent feasible.

The waters offshore the study area are part of the Point Arena Basin and consist of promontories, embayments, and river mouths (Minerals Management Service 1990:II–53). The Point Arena Basin trends northwest; it is about 140 kilometers long, more than 30 kilometers

[2] The ship landings that developed along the coast were not much more than small coves. These landings were called "dog-holes" because they were so tight that not even a dog could turn around in them.

wide in the south nearest the study area, and 55 kilometers wide in the north. The eastern northern boundaries of the basin are defined by the San Andreas fault zone as it deflects westward along the Mendocino Escarpment (Minerals Management Service 1990:II–66). The proposed cable routes cross Arena and Navarro Canyons and several offshore basins, ridges, and escarpments located on the California continental borderland before reaching the edge of the OCS.

The project area lies within the inferred subaerially exposed continental borderline between 20,000 and 17,000 B.P. (Minerals Management Service 1990:II-4). Physiographically, the Mendocino County coastline has an appearance closely similar to Oregon's coast, with the addition of low-relief coastal plains. The continental shelf off northern California appears similar to that off southern Oregon (Minerals Management Service 1990:II–48). The northern California continental shelf extends seaward from the coast for 10 to 30 kilometers as a smooth plain. The shelf break occurs at a water depth of about 146 meters (480 feet, 80 fathoms) offshore. The shelf at this location is considerably narrower than the worldwide average of 73 kilometers (Minerals Management Service 1990:II–48). Two large submarine canyons (Navarro Canyon and Arena Canyon) occur west of the coast. Further west, the east-west trending Mendocino Escarpment, which can exceed 1,000 meters in relief, coincides with the Mendocino Escarpment and marks the northern terminus of the San Andreas fault.

The continental shelf in this area is relatively flat and featureless, although south of Eel Canyon, the continental shelf is marked by numerous sea stacks, bedrock outcrops, and a thin veneer of unconsolidated sediment cover. Pleistocene sediments off the study area are described as sand and silt interbedded with gravels (Snavely and Macleod 1977 in Minerals Management Service 1990:II–54).

During the Pleistocene periods of lower sea stands, westerly flowing fluvial systems likely incised the exposed continental margin, depositing sediments in floodplain, deltaic, and terraced marine environments. Sediments were reworked into beach and shallow marine deposits, which were reworked again during subsequent transgression. Wave-cut platforms or abrasion platforms developed along the coast as the result of wave abrasion during ancient still stands (Minerals Management Service 1990:II–54). With a change in sea level, platforms may be submerged or raised. Raised platforms are marine terraces. Pleistocene marine terraces occur discontinuously along much of the coast of the study area. The most recent regression affecting the study area started during the onset of the Wisconsin glaciations approximately 30,000 to 35,000 before present (B.P.). Sea level dropped between 21,000 and 18,000 BP to a level about 120 to 130 meters (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 Minerals Management Service 1990:II–69). Holocene stratigraphy of the continental shelf in the study area represents deposits resulting from the eustatic sea level rise, which began about 18,000 years BP in response to climate change. From the onset of the Holocene transgression to about 10,000 to 7,500 years BP, a rapid inundation of the continental shelf 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 Minerals Management Service 1990:II–54). Holocene sediments deposited on the continental shelf vary in thickness and consist mostly of unconsolidated sand, silt, clay, and gravels (Wagner et al. 1972 in Minerals Management Service 1990:II–54). Surficial sediments distribution on the northern California shelf generally can be divided into a nearshore sand and mid- to out-shelf silt and mud in depths of 60 to 80 meters (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 of the Navarro and Garcia Rivers.

The shelf 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 continental shelf. During interglacial periods, the shoreline advanced to near modern levels. These changes in sea level occurred rapidly relative to geologic time and resulted in formation of the broad, gently sloping, sediment-veneered, wave-cut platform that makes up the modern continental shelf.

Prehistoric Setting

Prehistoric Occupation of the Marine Study Area

At the height of the Wisconsin glaciation approximately 18,000 to 24,000 years BP, the sea level was as much as 120 to 130 meters (394 to 427 feet, 66 to 72 fathoms below its present altitude (Milliman and Emery 1968). At that time, the California shoreline was approximately 6 nautical miles offshore from the present shoreline (uncorrected for local offshore deposition or uplift rates) within the study area.

Recent GIS studies summarized in BOEM (2013:21) indicate that the sea level rose an average of 6.3 millimeters per year, or 6.3 meters every 1,000 years, over the 19,000-year period since the Last Glacial Maximum. 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 11,000 years B.P. was at about 46 meters (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 continental shelf, 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 Last Glacial Maximum, prehistoric people moved their sites farther inland to stay above shifting shorelines and to access shifting resource areas (Bureau of Ocean Energy Management 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 are most often 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 continental shelf 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 were once 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) and 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.

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 continental shelf is most likely to have occurred in river floodplains and terraces. Most likely, the prehistoric sites that were not rapidly buried but remained on or near the surface of the Pacific OCS were washed away (Bureau of Ocean Energy Management 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 and 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 Bureau of Ocean Energy Management 2013:26). All of the continental shelf within the study area is located within the subtidal zone; as sea level rose, the intertidal zone migrated landward, leaving behind a layer of sand in the subtidal zone.

BOEM (2013:54, Figure 10) depicts shoreline contours in the study area that were present on the exposed Pacific OCS coastal landscape during the time since the Last Glacial Maximum. Contours depicted include 12,000 BP, 13,000 BP, 14,000 BP, 16,000 BP, and 18,000 BP shorelines west and north 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 to include 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 rates of deposition throughout the marine transgression.

Native American Settlement and Occupation

An analytic framework for interpretation of Mendocino 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 1994), remains the dominant framework for the prehistoric archaeological research in this region (Koenig 2006:4).

The Paleoindian period (10,000 to 6,000 B.C.) was characterized by small, highly mobile groups occupying broad geographic areas. No evidence of Paleoindian occupation has yet been recovered from Mendocino County.

During the Archaic period (Lower Archaic period c. 6,000 to 3,000 B.C.; Middle Archaic period c. 3,000 to 500 B.C.; and, Upper Archaic period c, 500 B.C. to A.D. 1,000) is characterized by geographic mobility and establishment of long-term base camps in localities from which a more diverse range of resource could be exploited. The addition of milling tools and 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 period, 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.

During the Emergent period (A.D. 1,000 to 1,800), 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).

Point Arena is located within a region that was occupied, at the time of contact, by a population defined by Kroeber (1925) and McLendon and Oswalt (1978) as the Central Pomo. The Pomo were thought to be the second most populous group in California, with an estimated pre-contact population of as many as 8,000 (Kroeber 1925:237). Along the coast, the Central Pomo, also called Boya (′bōyä) or “westerners,” tended to establish their village centers at or near the mouths of rivers. The modern-day Manchester Rancheria was originally a village center sited at the mouth of the Garcia River and was called pdáhaw (McLendon and Oswalt 1978:281). The natural resources of Mendocino County provided the Central Pomo with numerous sources of food, and Kroeber indicated that there are no references to famine in the myths or traditions of the Central Pomo (1925:238).

The Central Pomo were relatively more fortunate than groups farther south because the Central Pomo tended to escape the reach of the missionaries and, therefore, were not as severely affected by the diseases that decimated other populations (McLendon and Oswalt 1978:281). By the 1880s, due to an increasing American population, much of the Pomo population in the Point Arena area had moved to the Point Arena Rancheria or to the Manchester Rancheria, located approximately 2 miles northeast of Point Arena (just north of the current study area) (McLendon and Oswalt 1978:281).

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

Historic Setting

Historic Exploration, Settlement, and Commerce

The written history of the area of Mendocino County began in 1579 when Sir Francis Drake briefly visited the Pomo's southern neighbors, the Coast Miwok (Bean and Theodoratus, in Heizer 1978:299). By the late 1700s, the Spanish were raiding southern Pomo territory for potential converts and, about the same time, the Russians began exploiting Pomo territory for furs (Bean and Theodoratus in Heizer 1978:299) and trading with Coast Miwok.

A discussion of the history of Manchester beach is provided in the terrestrial cultural setting. The following is a discussion of the maritime history and cultural setting organized by three historic time periods, specifically the Maritime Exploration period (1579–1775), the Spanish/Mexican period (1769–1846), and the American period, which includes development of the coastline (1846 to the present). A minority of authors have argued that Chinese and Japanese may have visited the coast prior to 1542 (Brooks 1875); however, they have not provided substantive evidence in support of their claims (Bureau of Ocean Energy Management 2013:187).

Maritime Exploration Period (1542–1775)

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; 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; Keistman 1964). 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 the likely landing spot.

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 (Bureau of Ocean Energy Management 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 (Bureau of Ocean Energy Management 2013:188). 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 *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 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.

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.

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

The years of the Spanish-Mexican dominance 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).

The Russian-American Fur Company was established near Fort Ross in 1812 and flourished for 20 years (Minerals Management Service 1990:98). .The sea otter trade, existing roughly from 1784 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 outright illegal or imposed exceedingly high tariffs to protect their economic interests.

For 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 (Minerals Management Service 1987:82). Clipper ships and side-wheel steamers soon eclipsed the outdated sailing brigs, and 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)

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. 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. The lumber trade, one of the initial maritime trades to develop in the aftermath of the Gold Rush, was particularly prevalent in Mendocino County.

Overland transportation remained inefficient with the lack of accessible roads and railroads in the study area. Logging activity flourished and led to development of anchorages, wharves, landings, and dog-hole 'chutes and wharves' with which to take lumber to the ships for trade down coast (Tahja 2008). By the 1860s, Point Arena's timber extraction, milling, and lumber shipment activities made it the second leading town on the northern California coast, followed by Gualala, Mendocino, and Fort Bragg. Lumber, hay, dairy products, produce, and meat were shipped up and down the coast.

Residents along the northern coast of California depended on salmon fishing, oyster harvesting, fur trade, whaling, and maritime shipping and travel throughout the 19th century (Bureau of Ocean Energy Management 2013 :100–101). Logging activity flourished during the second half of the 19th century in the coastal forests of Point Arena, Gualala, Mendocino, and Fort Bragg; and numerous dog-hole wharves and chutes were prevalent along the headlands both north and south of the study area. Shipping was the main method of transporting lumber and other goods and people. As noted earlier, the ship landings that developed along the coast were not much more than small coves and were called "dog-holes" because they were so tight that not even a dog could turn around in them. Undertows, shallow reefs, thick kelp, swells, and hidden rocks were ever-present hazards. Schooners were developed as vessels used for short hauls. 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, with shallower hull depths (draft), and generally weighed less than 200 tons. Smaller vessels (or lighters) to bring cargo and passengers to or from vessels anchored offshore where the shoreline was accessible. Lindstrom (2013) indicates that, from 1860 to 1884, about 70% of vessels built were sail-powered only; 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.

One landing was located at Arena Cove or Point Arena just south of the CLS. Between Point Arena Cove and Gualala to the south, were 10 lumber chutes and landings: Buster's or France's Landing; Scotts Landing or Slick Rock; BeeBee's Landing; Saunder's or Hearns; Fish Rock or Fishing Rock or Haven's; Nip and Tuck or Phelp's, Peter's and Beadle's; Hard Scatch or Steens and Signal Point; Collin's Landing or St. Ore's, Bowen's Landing; Gualala Mill or Robinson's; and Bourn's Landing (Jackson 1969:18-20).

North of Arena Cove and wharf were New Haven, Hoag's Landing (also known as Field's, Bridgeport, and Kimble's), Abe's landing, Greenwood wharf, Cuffey's Cove wharf, Navarro wharf, Salmon Creek or Whitesboro, Hadley's, Albion wharf, Big Gulch or Pullen's Landing, and Little River—first known as Bell's and Kent's Landing (or Kent's Point) (Jackson 1969:18–20; Tahja 2008). Jackson (1969:18–20) lists an additional 19 landings, wharves, and dog-hole chutes and wharves' north of Mendocino.

The two main methods of loading and unloading schooners, with or without a wharf present as the use of a slide or apron chute and a wire chute (Jackson 1969:14). The apron chute was composed of an A frame supporting a wooden trough, with cables and a system of pulleys and wires that allowed the chute to be raised and lowered so that gravity could move cargo onto a ship. The length of the chute depended on how far away from shore a schooner could safely anchor for loading. The wire chute consisted of a wire cable run from shore to some type of anchorage where the ship was moored. For transport to vessels, cargo was strapped to the wire or people were put in a trapeze sling, and the weight of the load caused the sling to descend toward the ship; a breaking mechanism controlled the rate of descent. Once loaded, a system of rope/wires and pulleys would return the sling to land.

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 Minerals Management Service 1987:82). 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 around 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 were later 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 were gradually supplanted by Portuguese and Italian fisherman, and finally were displaced altogether when World War II brought about Japanese-American relocation (Bureau of Land Management 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 (Minerals Management Service 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.

U.S. Navy fleet vessels include all vessels built for or used by the U.S. Navy during World War I or World War II that were decommissioned and converted for pleasure, fishing,

transport, survey, or other uses and were lost offshore in northern California. Although not apparent by their use at the time of their loss, some of these vessels may have battle stars or other historic associations that may require further research to determine their significance and eligibility for the listing in the NRHP. Vessels built or commissioned by the U.S. Navy have not been identified by current research in the study area.

Historical Sea Routes and Shipwreck Distribution

Coastal and overseas routes in use in northern California 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 egrees of latitude), and the Japanese west- to east-flowing Kuroshio or Japanese current. While traversing coastal waters without stops, motorized ship traffic moves within the established shipping lanes. These routes are compiled from descriptions in the historic record and idealized depictions taken from route charts published by various shipping lines (Minerals Management Service 1987:85). Sailing ships running down the coast usually will not tack or jibe because they are running before the wind. Sailing vessels, however, must constantly tack and jibe in order to make headway up the coast because of the prevailing northwesterly wind pattern.

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 outside of the shipping lanes to reduce running time. Although historical shipping lanes can be plotted, they were not always adhered to; and vessel losses may have occurred within the lanes or shoreward. The density of losses increases with the occurrence of natural hazards, such as rocky shoals, headlands, reefs, and other hazards 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 area. A large number of vessels whose coordinates remain unknown were lost en route 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 meters deep [394 feet, 66 fathoms] and areas of potentially high shipwreck density as determined by historical data). The planned cable routes cross these documented areas that are sensitive for the occurrence of shipwrecks and known historical shipping lanes. Although most shipwrecks in the study 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). The sea lanes established historically are still in use today and appear on modern navigational charts.

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.

Local Maritime History

Manchester State Beach

Manchester State Beach is located at 44500 Kinney Lane off State Route 1, 0.5 mile north of the town of Manchester. The beach line curves to form a “catch basin” for sea debris such as the high volume of driftwood present. Five miles of gentle sandy beach stretches southward toward the Point Arena Lighthouse, Brush Creek, and Alder Creek.,

Although Manchester Beach is not cited historically as a landing site where vessels anchored offshore lightered in cargo via smaller craft, that possible usage cannot be eliminated.

Manchester Beach history is further discussed in the terrestrial resources section.

Impact Analysis

The impact analysis for marine cultural resources discusses the methodology and significance thresholds, and identifies impacts and mitigation measures.

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 or isolated artifacts were listed. The inventory completed for the study area covers the four potential routes plus a 10-nautical-mile 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 SLC, BOEM Pacific OCS Region (Bureau of Ocean Energy Management 2013 and Bureau of Ocean Energy Management Shipwreck Database; 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 and books also were consulted.

Other sources consulted include the USACELos 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, 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, Westport Village Historical Society, and published references.

Results

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 that there is a recognized potential for the remains of prehistoric and historic sites, artifacts, and Native American watercraft to be present offshore, although there is a lower potential for their preservation in-situ.

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.

Historic period shipwrecks are characterized by inaccuracies in their reported locations. 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, it is likely that one or more may be found by site-specific remote sensing surveys for each of the four routes.

The 10-nautical-mile buffer was included in the study area records search and reflects the most conservative interpretation of the potential accuracy of the shipwreck location reporting. Databases of the SLC, BOEM, National Oceanic and Atmospheric Administration (NOAA) Automated Wreck and Obstructions Information System (AWOIS), and in-house shipwreck databases were checked for listings within the study area.

Although the majority of shipwrecks of known approximate location (i.e., accurate from within 1 mile to within 10 miles) 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-mile State limit and beyond to the continental shelf. 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 SLC shipwreck listings were added back into the data..

Shipwrecks tend to concentrate along approaches to historical 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 factors suggest that the highest density of shipwrecks are expected to occur close to shore, given the number of anchorage, dog-hole chutes, wharves, and landings in the study area. Shipwrecks could have occurred anywhere within State waters, however, and high priority should be given to collecting additional side-scan sonar and magnetometer data from project routes within this area.

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 accidental 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 go 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 and a loss of information on a site or sites significant in the history of California.

Shipwrecks were mapped in relation to the alternate cable routes based on their reported coordinates or other relevant information. Centered on the Manchester Beach cable origin, the study area extends 10 nautical miles north to include waters offshore of Cuffey's Cove and 10 miles south to just north of Gualala. Table 1 presents the 162 shipwrecks reported lost within the study area. Thirty-seven of these shipwrecks are reported lost south of the Point Arena headland and are considered less likely to occur within the planned cable routes.

None of these shipwrecks have been 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 except those few cited in the AWOIS database (NOAA 1988).

Fifty-two shipwrecks are reported by vessel name with the location noted as Mendocino County (Table 2). An additional 11 shipwrecks are reported off the northern California coast (Table 3). These shipwrecks 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.

Table 1. Shipwrecks Offshore of Study Area

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
A.F. Jordon	Schooner, 2 Masted,								181			Wrecked		1878		At Cuffeys Cove
A.J. Mouje	Schooner											Stranded; Ashore and lost	04 17	1869		Off Whale Watch Inn, Havens Anchorage; Lost at Bowen's Landing
Adelaide	Schooner, 2 Masted,							96.5 x 28.25	130	1883		Parted lines; wrecked	08 02	1889		Near shore N of Iversen Point; Jackson 1969 cites New Haven
Aeriel	Schooner											Lost, Total loss	09 15	1888		Near Fish Rock at Point Arena
Agnes Nicholaisen	Schooner, 2 Masted,								68	1876		Struck Rock, lost rudder		1886		Near shore south of Little River Golf Course
Ajax	Schooner, 2 Masted,								74			Wrecked (SLC Parted moorings) Stranded	1223	1869		Point Arena Beach (Jackson 1969); SW Gualala
Albert and Edward	Schooner, 2 Masted,								96	1877		Stranded	04 18	1875		Off of Little Salmon Creek Near Whitesboro
Albert Walter	Schooner											Abandoned and wrecked	12 06	1889		N of Point Arena Lighthouse
Albion	Schooner				R			80.5 x 27 x 4.5	79	1886		Ashore	05 11	1887		Navarro Beach
Albion	Steam screw, Collier				R			120 x 31	202	1861	1	Grounded, Ashore; Capt Hansen Drowned		1893		Albion River Near Schooner's Landing Marina
Albion	Schooner, Steam screw											Wrecked	03 21	1913		At Bowen's Landing
Alcatraz	Schooner, Steam screw								255	1887		Stranded		1917		Inshore at Greenwood Cove; South of River, South of St Anthonys Point
Alcazar	Schooner, Steam screw											Lost	06 10	1907		On Needle Rock near Point Arena
Alliance No. 2 [Charles Levi Woodbury]	Schooner, 2 Masted, Power		173	1059		4	C	180	105	1899 (MMS 1889)	14	Foundered; struck Malpas Rock	1018	1915		6 miles north of Point Arena, Cooindates verified in Awois Record 50018

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Alviso	Schooner, 2 Masted,											Wrecked	09	1883		South of Point Arena
Amazone	Schooner, 2 Masted,				R							Ashore, Refloated/PS	04 18	1869		South of Point Arena
Amazone	Schooner, 2 Masted,											Parted moorings		1876		North of Manchester Beach State Park
Andrew Pearson	Schooner, 3 Masted											Wrecked		1905		Albion River at bend S of Sponner'sLanding Marina
Anna	Schooner, 2 Masted,											Wrecked	04	1855		Near shore between Mendocino and Little River
Anne	Schooner											Wrecked	09 11	1877		At Rough and Ready
Annie	Schooner											Wrecked		1874	North of Point Arena Lighthouse), Sea Ranch?	
Annie Iverson	Schooner, 2 Masted,								42			Ashore, TL; Stranded (SLC)	12 10	1873		West of Point Arena Lighthouse; At Point Arena
Archie & Fontie	Unknown											Wrecked	03 31	1902		Fish Rock
Arctic	Ship, cargo											Foundered	7	1945		Coordinates verified in Awois Record 50029
Arctic	Schooner, Steam screw,							145 x 30	373	1901		Grounded		1922		Off Fish Rock Anchor Bay
Arispe	Steam screw							131.3 x 30	280 (336)	1853		Stranded, struck at Fort Ross, drifted to Havens Anchg, Grounded	05 26	1854		Havens Anchorage, Near Gualala
Arizona	Schooner											Lost	02 15	1876		At Bridgeport
Artful Dodger	Schooner, 2 Masted,								53			Stranded	02 26	1877		Havens Anchorage; At Bowen's Landing
B.F. Lee	Schooner, 2 Masted,				R/PS				98			Wrecked, sunnk in collision; Refloated/PS (SLC Collision)		1871		South of Point Arena; At Cuffey's Cove
Barbara	Schooner, 2 Masted,							89 x 28	113	1877		Wrecked		1901		North of Point Arena Lighthouse

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Barbara Fritchie	Schooner, 2 Masted,								56	1880		Wrecked		1880		Point Arena
Barbara Hernster	Schooner /Whaler				R				148	1887	1	Wrecked, Refloated	01 24	1901		Between Point Arena and Garcia River
Bill the Butcher	Schooner, 2 Masted,							84.5 x 25.5	85			Parted lines;wrecked	06 15	1893	0	At Bowen's Landing
Boblink [aka Bobolink]	Schooner, 2 Masted					2		104.5 x 29.25	170	1868	1	Wrecked	03 22 (03 24)	1898		At Kent's Point
Brilliant	Schooner											Ashore/Stranded (SLC)	110	1872		Between Mendocino City and Little River
C.A. Drew	Schooner											Stranded; Ashore and wrecked	04 21	1872	0	At Albion
C.W. Gunnel	Schooner											Stranded, TL; Wrecked; Ashore and lost	12	1862		Coordinates between Point Arena and Garcia River; At Pooint Arena
California	Schooner, 2 Masted, Pilot							95.5 x 28	119	1869		Wrecked; ashore and wrecked	01 22	1880	0	At Bowen's Landing
Casco	Steam screw								533	1906		Stranded	0 627	1913		Point Arena (Point Piedras Blancas)
Caspar	Schooner, Steam 250 horsepower engine							132.5 x 33	3	1887		Grounded during gale, wrecked	10 22	1897		On Saunder's Reef
Celilo	Steam screw				R				943	1913		Abandoned at Oakland Creek, Refloated		1919		Between Pt Arena and Garcia River
Champion	Schooner, 2 Masted, Wooden								42	1867		Stranded; wrecked	05 08	1887		At the Albion river
Champion	Schooner											Wrecked	05 19	1897		At Albion
Charles and Edward	Schooner								50			TL (SLC Stranded) Wrecked	01 10	1858		Between Point Arena and Garcia River; At Point Arena (White 2014:109)
Charles G. White	Steam screw schooner, wooden											Ashore and Wrecked	02 15	1884		At Bridgeport
Charles Nelson	Steam screw				R				630	1898		Refloated		1910		Between Point Arena and Garcia River
Charlotte	Schooner, 2 Masted,									1861		Wrecked		1889	0	On Fish Rock

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Charlotte #2	Schooner							67 21 5.5	48	1880		Wrecked	03 02	1899		Fish Rock, Point Arena
Clatsop	Oil screw	219922							48	1920		Foundered	04 13	1962	0	At Point Arena
Cocheif	Schooner											Wrecked	03 30	1889		Fish Rock, Point Arena
Cochief	Schooner											Wrecked	01 30	1863		Fish Rock, Point Arena
Columbia	Schooner, 2 Masted,								59	1865		Wrecked	03 16	1868	0	At Cuffey's Cove
Constantine	Schooner											Ashore, Wrecked	11	1862	0	At Cuffey's Cove
Coquille	Schooner, 2 Masted, Steam screw (or Gas screw?)							92.7 x 29.5	118	1883		Abandoned; ashore and lost	05 21	1923		Manchester Beach
Cossack	Schooner											Wrecked	12 22	1880		Lost at Cuffey's Cove
Crescent City	Schooner, Steam							147.3 x 21		70	1882		Stranded	01 30	1903	On Fish Rock
Cuautemoc	Gas screw	23010							79	1916		Stranded	09 03	1924		Point Arena Cove
Cuffeys Cove	Schooner, 2 Masted,											Wrecked		1861	0	Lost at Cuffey's Cove
Curlew	Brig											Abandoned and wrecked enroute SF/San Pedro (SLC listts Stranded)	01 20	1875		Between Point Arena and Garcia River; At Point Arena
David and Ettie	Schooner											Lost	12 22	1880		At Cuffey's Cove
Del Norte [Del Norte #2]	Steam screw	157295			R			158 x 32	450 (SLC 301)	1890		Stranded; Ashore and wrecked	07 29	1917		Between Point Arena and Garcia River; Near Point Arena
Del Notre (Norte?)	Steam screw											Stranded	07 29	1927		Point Area
DOROTHY WINTERMORE [LAKE CAYUGA]	Steamship, Steel; Lumber Carrier	216385					C		2010	1918		Foundered	917	1938	270	Fish Rock, 10 miles south of Point Arena (Coordinates verified in Avois Record 50096 at 45 fathoms.)
Dunkerque	Schooner, 5 Masted, steam screw; 2 Auxillary Triple Expansion Engine			0		4		260	3000	1818		Sunk (SLC Wrecked)		1918		Between Point Arena and Garcia River

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
East Port	Steam screw								450	1873		Struck reef , wrecked		1875		North of Point Arena
Elaine B	Oil screw	259787							11	1944		Destroyed by storm	09 29	1962		Off Point Arena
Eliza Miller	Schooner, 2 Masted,					4						Wrecked (MMS Sunk)	10 05	1880		Wash Rock, North of Point. Arena
Ella Florence	Schooner, 2 Masted								67			Parted Moorings, Wrecked	02	1872		At Kint's Point
Ellen Adelia	Schooner											Wrecked	01	1890		At Bowen's Landing
Elsie Iverson #2	Schooner, 2 Masted,								77	1884		Total Loss, Wreck sold for $199	1207	1886		Between Point Arena and Garcia River
Emily Schroeder	Schooner											Wrecked		307	1871	Between Pt Arena and Garcia River; At Point Arena
Emily Stevens	Schooner, 2 Masted,								98	1879		Capsized, 10 miles out enroute Mendocino/ SF	10 05	1882	0	South Of Navarro
Fairy Queen	Schooner, 2 Masted,								99	1869		Stranded during storm; Wrecked	11 24	1885		At Whitesboro
Fannie Jane	Schooner											Stranded, lost		1872		At Navarro
Fanny A. Hyde	Schooner, 2 Masted,								90			Wrecked	12 19	1886	At Point Arena, Sea Ranch?	
Fanny Jane	Schooner											Lost	02 21-22	1872		At Navarro
Fideliter	Schooner, Steam screw								175	1860		Dragged moorings, lost	10 24	1876	0	At Cuffeys Cove
Flying Mist	Schooner											Wrecked	09	1867	0	At Bowen's Landing
Francis Helen	Schooner											Stranded	10 06	1863		At Little River
Galveston	Brig											Stranded	05 21	1863		At Kent's Point
General Ord	Schooner, 2 Masted, Lumber							87.5 x 25	88 (SLC 93)	1869		Ashore enroute Pt. Arena/SF (SIC Stranded); Aground	02 25	1889		Between Point Arena and Garcia River
Georgia R. Higgins	Schooner, 2 Masted,								95	1875		Stranded	01 27	1887		At Whitesboro
Girlie Mahoney	Schooner, Steam screw							141 x 34	382	1904		Dragged Anchor;Wrecked	12 23	1919	0	At Albion
Golden Rule	Schooner, 2 Masted,								72	1860		Parted moorings; Ashore and wrecked	06 12	1882	0	At Albion
H. Bendel	Schooner, 2 Masted, Scow							71.5 x 25.5	73	1874		Driven ashore, Went ashore, total loss; sold for $100	02 14	1888		On Fish Rock, Between Point Arena and Garcia River

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Hannah Madison	Schooner, 2 Masted,								134	1876		Ashore and Wrecked	11	1885	0	At Navarro
Harmony	Gas screw	220646							23	1920		Foundered	04 17	1964	0	At Point Arena
Helen	Schooner, 2 Masted,								121	1863 (SLC 1864)		Total loss, ashore (SLC Stranded)	11 17	1865		Between Pointt Arena and Garcia River; At Point Arena (White 2014:114)
Horace Templeton	Schooner	95249							42	1873		Stranded (SLC Parted Moorings)	06 22	1920		Off Point Arena
Hyde	Schooner											Sunk; wrecked	12	1886	Off Point Arena, Sea Ranch?	
Iaqua	Unknown				R/PS							Refloated in 1903 at Punta Gorda		1913	Between Point Arena and Garcia river, Sea ranch (?)	
Ida Florence	Schooner, 2 Masted,								56	1869		Parted cables; ashore and wrecked	12 02	1890	0	At Iverson's Landing
Irma	Schooner, 2 Masted,											Storm	12 27	1887		At Whitesboro
J.F. Lunt	Schooner											Wrecked	10 13	1878		At Navarro
J.S. Higgins	Steam Schooner.								392	1908		Stranded;wrecked	12 23	1919	0	At Albion
Jack Hays	Sloop											Ashore (SLC Stranded)	01	1858		Between Point Arena and Garcia River
James Townsend	Schooner, 3 Masted							107 x 29	168	1868		Ashore (SLC Parted tow)	808	1895		Point Arena Lighthouse
Jerry 10	Oil screw	251385							10	1944		Foundered	11 11	1949	0	At Point Arena Cove
Joanne	Schooner											Ashore and wrecked	10 26	1877		At Little River
John McCullough	Schooner, 2 Masted,							75.5 x 24	72	1873		Parted lines; Lost		1893		On rocks at Point Arena
Judson	Schooner, 2 Masted,											Wrecked	02 21	1858	0	At Albion
Kitty Stevens	Schooner											Ashore and wrecked	12 10	1883		At Albion
Little River	Schooner									1869		Parted lines; wrecked		1885		At Whitesboro
Lizzie Madison	Schooner, 2 Masted,							93 x 29	131	1876		Parted moorings; lost	11 28	1885	0	At Navarro

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Lizzie Merrill	Schooner, 2 Masted,								80	1884		Stranded; wrecked		1884		At Whitesboro
Lottie Collins	Schooner											Ashore and Wrecked	12 10	1883		At Bowen's Landing
MARION R.	Oil screw	258294							13	1949		Foundered	1009	1950		Off coast of Calif. near Point Arena
Martha and Elizabeth	Schooner											Wrecked	11 04	1877		At Bowen's Landing
Mary and Gilbert	Schooner											Ashore and Wrecked	12 04	1887		At Albion
Maryland	Unknown											Wrecked on the rocks	10 07	1862		Bowen's Landing
Mendocino	Schooner											Total Loss;; Wrecked	04 11	1867		Point Arena;At Whitesboro
Napa City	**Schooner /Whaler**											**Capsized and sank**				**Off Point Arena**
Nordic Pride	Oil screw/ Purse seiner								105	1941	10	Foundered, wreckage reported	10 01	1941		10 miles off Point Arena
North American	Schooner, 2 Masted,											Wrecked		1859		Fish Rock, Poiint. Arena
Noyo	Schooner, Steam screw	130395							316	1887		Hit submerged snag, keeled over; Foundered (Gibbs, 300tons./1888)	02 26	1918		6 mi. off coast, 10 miles South of Point Arena
NOYO [ADMIRAL GOODRICH] [GRIFFDO]	Steamship, Steel	211426			R			224.4 x 16.6 (Gibbs, 1418)	1419 (Gibbs 1418)	1913		Stranded; refloated (SLC Stranded in Fog)	06 10	1935		Between Point Arena and Garcia River
Oceaola	Schooner								45			Wrecked	12 22	1880		At Rough and Ready
Olivia Schultz [Annie Forbes]	Schooner, 2 Masted conversion/ x-River steamer											Total loss, ashore on rocks (SLC Parted lines)	03 27	1883		Between Point Arena and Garcia River; At Rough and Ready
Orteric	Steam screw/ Freight/ Tramp Steamer	British						412 x 55	6696	1919		Grounded enroute SF/Eureka, broke in half	12 11	1922		Fish Rock, Point Arena
PACIFIC ENTERPRISE	Ship (SLC Freighter)	British		1982		4		454 x 60	6736	1927		Stranded (SLC Grounded)	09 09	1949		Near Point Arena
Phoenix	Wood Steam Schooner/ Lumber				R						3	Boiler Exploded; refloated/PS	08 13	1910		Point Arena; Towed by SEAFOAM to San Francisco
Point Arena	Unknown				R							Wrecked		1904		Between Point Arena and Garcia River
Quoddy Belle	Schooner											Ashore and lost				At Navarro

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
R.C. Slade	Schooner, 4 Masted								673	1900		Sunk;Ashore and wrecked	06 17	1917		Between Point Arena and Garcia River; Near Point Arena
Reliance	Schooner											Wrecked	01 20	1886		At Point Arena
Reliance #1	Schooner, 2 Masted,							69 x 24	54 (SLC 65)	1880		Wrecked	01 22	1885		Between Point Arena and Garcia River;At Point Arena
Rio Rey	Schooner, 2 Masted,							79 x 25	80	1880		Wrecked		1901		Fish Rock, Point. Arena
Robert E. Lee	Schooner, 2 Masted,											Wrecked	11 07	1870		Between Pt Arena and Garcia River; At Point Arena
Rosalie	Schooner											Wrecked	01	1862		Between Point Arena and Garcia River
San Benito	Steam Collier			2109	R	4	C	350 x 42	2811	1884, 1896	6	Struck rocks, broke in half; R/PS (SLC Stranded)	11 22	1896		Between Poiint Arena and Manchester State Beach Park; 6 miles North of Point Arena. Wreck, Submerged, Coordinates verified in AWOIS Record 50229 with 1 to 3 mile accuracy.
Sea Foam	Schooner, Steam screw	201861						127 x 32	339 (SLC 205)	1905 (SLC 1904		Stranded (SLC Grounded)	02 23	1931		Between Point Arena and Garcia River; At Point Arena
Sheriff	Schooner												Storm, Sank	11 29	1852	At Kent's Point
Shna Yak	Unknown											Wrecked		1908		Between Point Arena and Garcia River
Shubbrick	Steam screw			0	R								09 08	1867		Between Point Arena and Garcia River
Silas Coombs	Schooner, 2 Masted										1875	Wind died; Becalmed	07 03	1875		At Little River
Sine Johnson	Schooner											Lost	4 11	1867		Near the Navarro River
Sovereign	Schooner, 2 Masted,											Parted moorings; Wrecked	12 27	1862	0	At Navarro
Speedwell	Barque	British Registry										Ashore, TL	03 09	1872		Between Point Arena and Garcia River

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Star of the Sea	Oil screw/ Fishing	230081							242	1930		Foundered	10 04	1962		About 4 miles 035 deg. True Point Arena Light, off coast of Calif.
Sunol	Schooner, Steam							132 x 33	Sail	258	1890		Burned, wrecked	10 24	1900	At Little River
T. Starr King	Schooner											Ashore and wrecked	01 08	1869		At Albion
Theresa B. Free	Ship											Wrecked	02 22	1891		**At Point Arena**
Three Sisters	Schooner, 2 Masted,								62			Dragged anchor; wrecked	10 01	1880	0	At Gualala
Truckee	Schooner											Wrecked	12 16	1886		At Point Area
Unknown	Barge						C						919	1952		Marshall (1978) Near Point Arena. Fish Rock, 10 miles south of Point Arena Wreck, Submerged. Location verified in AWOIS Record 50357. Accurate from 1 to 3 miles.
Unknown	Unknown						C									Coordinates verfied in AWOIS Record 50358
Unknown Wreck	Unknown											Whrecked		N.D.		Offshore Manchester Beach Park
Unknown Wreck	Unknown											Wrecked		N.D.		Offshore Manchester Beach Park
Unknown Wreck	Barge													N.D.		Point Arena Cove
Unknown Wreck	Unknown													N.D.		Offshore Manchester Beach Park
Unknown Wreck	Unknown													N.D.		Offshore Manchester Beach Park
Vagabond	Gas screw	249609							10	1918		Foundered	04 20	1958	0	Near Point Arena
Vanguard	Unknown											Wrecked		1930's		Point Arena
Venus	Schooner, 2 Masted,								118	1875		Parted lines; Ashore and wrecked	01 25	1881	0	**At Navarro Beach**
Verson	Schooner											Sunk	12	1886		Point Arena
W.H. Krager	Steam screw	81683							469	1899		Foundered	01 11	1906		Off Point Arena
West Coast	Steamer, 40 hp							112.3 x 31.25	179	1885	10	Wrecked; Aground and lost	12 21	1891		At Point Arena

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE	MERCHANT VESSEL OR LLYODS REGISTRY	BLM	MMS	R/S	CR	Accuracy	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH DAY	YEAR LOST	WATER DEPTH (Feet)	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Whittier	Steam Tanker (SLC Twin Triple Expansion)							240 x 32	1295	1903		Grouded, wrecked	05 01	1922		On Saunder's Reef
William H. Kruger	Unknown											Sunk		1906		Point Arena
WINNEBAGO	Schooner, Steam screw, Triple Expansion	81871						200 x 39	1065	1903		Stranded; wrecked	07 31	1909	0	At Point Arena
Wolcott	Brig											Lost	05 18	1863		At Bowen's Landing
Z.B. Heywood	Schooner, 2 Masted,									1873		Wrecked	01 02	1888	0	At Navarro River

Table 2. Mendocino County Coastal Shipwrecks

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE[a]	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH/ DAY	YEAR LOST
C.H. Merithew	Schooner, 2 Masted	84 x 22.3	95	1875		Parted lines		1887
C.P. Huestes	Schooner		57	1862		Capsized		1868
Caroline	Schooner, 2 Masted		80			Wrecked		1863
Carolinine Medan	Schooner, 2 Masted		73			Wrecked		1887
Carrie Heywood	Schooner, 2 Masted					Wrecked		
Conna Maria [Donna May]	Brig					Grounded		1954
Curacao	Brig					Stranded		1862
Davison	Schooner					Wrecked		1903
Del Monte #3	Oil screw		50	1939		Stranded		1950
Don Leandro	Schooner, 2 Masted		86			Wrecked		1885
Ella Florence	Schooner					Stranded		1868
Elveria	Schooner, 2 Masted	98 x 30	148	1872	1897	Stranded		
Escola	Unknown					Wrecked in storm		
Esmeraldo	Gas Screw		92	1918		Wrecked		1943
Fannie Jane	Schooner					Stranded, lost		1872
Far West	Schooner, 2 Masted					Stranded in gale		1863
Golden Rule #2	2 Masted Schooner		118	1866		Grounded		
H.H. Brigs	Schooner, 2 Masted			1887		Sunk, Wrecked		
H.L. Tiernan	Schooner, 2 Masted	90 x 27.5	153	1867		Parted moorings		1869
Helen Kimball	Schooner, 2 Masted	112 x 31	192	1881		Wrecked		1882
Humboldt	Schooner, 2 Masted		138	1874		Parted lines in storm		1885
Invincible	Schooner					Wrecks		1854
Isabella Ebbetta	Schooner, 2 Masted					Wrecked		1858
J Eppinger#1	Schooner, 2 Masted		63	1885		Parted lines in storm		1887
J.R. Whiting	Schooner, 2 Masted					Disapeared		1865
J.S. Cabot	Schooner					Capsized		1860
JE Murdock	Schooner					Stranded		1864
Jewel	Schooner, steam		265	1888		Grounded	03 22	1899
JF Lunt	Schooner, 2 Masted					Driven ashore by storm		1878
L.C. Lane	Schooner					Collision		1868
Lightwing	Schooner					Wrecked		1873
Lourakis	Oil screw			1931	57	Stranded		1951
Mary Hart	Schooner, 2 Masted					Foundered		1878
Metis	Unknown							1917
Ontario	Brig					Scuttled at Breakwater		1853
Pacific	Schooner					Stranded		1875

VESSEL [FORMER NAMES] (STEEL, *Iron,* Wood)	RIG/ SERVICE[a]	DIMENSIONS (FT.)	TONS	DATE BUILT	LIVES LOST	LOSS SITUATION/ CASUALTY	MONTH/ DAY	YEAR LOST
Quddy Bell	Brig					Stranded in Storm		1868
Restless	Schooner, 2 Masted		78			Parted Lines		1886
Rosalie	Schooner					Stranded		1883
S.F. Blunt	Schooner, 2 Masted					Wreck		1868
Santa Rosalia	Oil Screw, diesel, Sardine Fishing Boat					Stranded		
Sarah Alexander	Schooner, 2 Masted	55.5 x 19.3	51`	1883		Parted lines		1889
Sarah Louise	Schooner	68 x 22	49	1863		Dragged Anchor		1875
Skylark	Schooner					Stranded		1876
Solano	Schooner, 2 Masted	74 x 25	67	1865		Stranded		1877
Stina Nicolaisen	Schooner, 2 Masted		45			Collision		1918
Stranger	Schooner, Scow					Wrecked		1882
Susie Merrill	Schooner, 3 Masted		148	1866		Wrecked		1866
T.C. Condor	Oil screw, diesel		60			Stranded		1936
W.H. Dreugher	Steam Schooner		469	1899		Foundered		1906
Wellingsley	Brig					Ashore and lost		1857
Zulu	Schooner, 2 Masted					Wrecked		Unknown

[a] The terms “brig” and “bark” (or barque) generally indicate a difference in rigging from a brigantine or barkentine (or barquentine).

Table 3. Shipwrecks Offshore of the Coast of Northern California

VESSEL [FORMER NAMES] (STEEL, *Iron*, Wood)	RIG/ SERVICE[a]	LOSS SITUATION/ CASUALTY	MONTH/ DAY	YEAR LOST	LOSS LOCATION REPORTED, NEAREST POINT TO COORDINATES
Discovery	Barque	Lost	01	1896	Off the northern California coast
Elida	Schooner	Lost		1874	Off the northern California coast
Eliza Walker	Schooner	Lost	12	1867	Off northern California coast
Ella Francis	Barque	Abandoned and sunk	01	1866	Off northern California
Emily R. Farnham	Schooner	Capsized and lost	11	1874	Of the coast of northern California
Forest Monarch	Ship	Foundered	08	1859	Off the coast of northern California
Ida McKay	Schooner	Capsized and lost	02 02	1912	Off northern California
Maxim	Schooner	Lost	01	1907	Off the coast of northern California
Neriede		Lost		1823	Off the California coast
San Mateo	Schooner	Foundered	02	1854	Off the coast of northern California
George P. Haub	Schooner	Lost	4	1878	Of the coast of northern California

[a] The terms “brig” and “bark” (or barque) generally indicate a difference in rigging from a brigantine or barkentine (or barquentine).

The distribution of the types of vessels in the study area and their range of built and loss dates are presented in Table 4. The distribution of the types of shipwrecks and their range of built and loss dates reported lost off Mendocino County are presented in Table 5.

Seventy-three of the 162 shipwrecks reported lost within the 10-nautical-mile buffer of the planned cable routes from their point of origin at Manchester Beach Park northwest to the point at which they cross the boundary of U.S. territorial waters are considered in the analysis as more likely to occur in the vicinity of the four planned cable routes. They are presented in Table 6.

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 be located within the maximum 10-nautical-mile buffer of the proposed routes. The Minerals Management Service (1987, 1990) databases discuss eligibility for listing in the CRHR only in terms of historical significance. Unfortunately, the three levels of significance related to the NRHP: 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.

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

Table 4. Types of Vessels in Study Area

Number	Rig/Service[a]	Built Dates	Loss Dates
1	Barge		1952
2	Barge wreckage		Unknown
1	Barque	Unknown	1872
3	Brigs	Unknown	1863–1875
3	Gas screw	1916–1920	1924–1964
4	Oil screw	1920–1949	1824–1964
`	Oil screw fishing	1930	1953–1962
1	Oil screw purse seiner	1941	1941
42	Schooner	1873–1887	1862–1920
3	Schooner power	1889	1815
2	Schooner whaler	1887	1901
1	Schooner lumber	1869	1889
44	Schooner 2 masted	1860–1887	1855–1901
1	Schooner 2-masted lumber	1869	1889
1	Schooner 2-masted pilot	1869	1880
1	Schooner 2-masted power	1889	1815
1	Schooner 2-masted scow	1874	1888
	Schooner 2-masted steam screw	1883	1923
1	Schooner 2-masted conversion	Unknown	1883
1	Schooner 3 masted	1868	1895–1905
1	Schooner 4 masted	1900	1917
1	Schooner 5-masted steam screw	1818	1918
24	Steam screw	1853–1918	1821–1938
2	Steam screw collier	1861	1893
4	Steam screw lumber	1918	1910
1	Steam screw tanker	1903	1922
1	Steam screw freighter/tramp	1919	1922
`	Ship	Unknown	1864–1891
1	Ship freighter	1927	1949
1	Ship cargo	Unknown	1945
1	Sloop	Unknown	1868
5	Unknown	Unknown	1862–1937
3	Unknown wreckage	Unknown	Unknown

[a] The terms “brig” and “bark” (or barque) generally indicate a difference in rigging from a brigantine or barkentine (or barquentine).

Table 5. Types of Vessels Lost Offshore of Mendocino County

Number	Rig/service	Date Built	Loss Date
13	Schooners	1862–1863	1854–1904
1	Schooner scow	Unknown	1882
1	Schooner steam screw	1888–1889	1899–1906
24	Two-masted schooners	1866–1887	1858–1918
1	Three-masted schooners	1866	1866
5	Brigs		1857–1854
1	Gas screws	1918	1943
2	Oil screws	1931–1939	1950–1951
1	Oil screw diesel	Unknown	1936
1	Oil screws diesel sardine fishing	Unknown	Unknown
2	Unknown	Unknown	1917

Table 6. Most Likely Shipwrecks in the Study Area

Vessel [Former Names] (STEEL, *Iron,* Wood)	Rig/ Service[a]	Merchant Vessel Registry	BLM	MMS	Refloated (R)/ Salvaged(S)/ Partial Salvage(PS)	CR	Dimensions (Ft.)	Tons	Date Built	Lives Lost	Loss Situation/ Casualty	Month/ Day	Year Lost	Water Depth (Ft.)	Loss Location
Albert and Edward	Schooner, 2 Masted,								96	1877	Stranded	04 18	1875		Off of Little Salmon Creek Near Whitesboro
Albert Walter	Schooner										Abandoned, wrecled	12 06	1889		At Point Arena; north of Point Arena Lighthouse
Alfred	Schooner (2 Masted)							88	1870		Wrecked (SLC Parted moorings)	01 20	1886		Edge of US Territorial Sea
Alliance No. 2 [Charles Levi Woodbury]	Schooner, 2 Masted, Power		173	1059		C	180	105	1899 (MMS 1889)	14	Foundered; struck Malpas Rock	1018	1915		6 miles north of Point Arena, Cooindates verified in Awois Record 50018
Amazone	Schooner, 2 Masted,										Parted moorings		1876		North of Manchester Beach State Park
Anna	Schooner (2 Masted)										Wrecked	4	1855		At edge of US Territorial Sea
Annie	Schooner										Wrecked		1874		At Point Arena; north of Point Arena Lighthouse
Annie Iverson	Schooner, 2 Masted,							42			Ashore, TL; Stranded (SLC)	12 10	1873		West of Point Arena Lighthouse; At Point Arena
Arctic	Ship, cargo										Foundered	7	1945		Coordinates in study area verified in Awois Record 50029
Barbara	Schooner (2 Masted)						89 x 28	113	1877		Wrecked		1901		North of Point Arena Lighthouse
Barbara Fritchie	Schooner, 2 Masted,							56	1880		Wrecked		1880		Point Arena
Barbara Hernster	Schooner /Whaler				R			148	1887	1	Wrecked, Refloated	01 24	1901		Between Point Arena and Garcia River
C.W. Gunnel	Schooner										Stranded, TL; Wrecked; Ashore and lost	12	1862		Coordinates between Point Arena and Garcia River; At Pooint Arena
Casco	Steam screw							533	1906		Stranded	0 627	1913		Point Arena (Point Piedras Blancas)
Caspar	Schooner, Steam 250 horsepower engine							132.5 x 33	3	1887	Grounded during gale, wrecked	10 22	1897		On Saunder's Reef
Celilo	Steam screw				R				943	1913	Abandoned at Oakland Creek, Refloated		1919		Between Point Arena and Garcia River

Vessel [Former Names] (STEEL, *Iron,* Wood)	Rig/ Service[a]	Merchant Vessel Registry	BLM	MMS	Refloated (R)/ Salvaged(S)/ Partial Salvage(PS)	CR	Dimensions (Ft.)	Tons	Date Built	Lives Lost	Loss Situation/ Casualty	Month/ Day	Year Lost	Water Depth (Ft.)	Loss Location
Charles and Edward	Schooner							50			Wrecked (Jackson 1969) I Ship and Cargo, TL (SLC Stranded)	01 10	1858		Between Point Arena and Garcia River
Charles and Edward	Schooner								50		TL (SLC Stranded) Wrecked	01 10	1858		Between Point Arena and Garcia River; At Point Arena (White 2014:109)
Charles Nelson	Steam screw				R				630	1898	Refloated		1910		Between Point Arena and Garcia River
Coquille	Schooner, 2 Masted, Steam screw (or Gas screw?)							92.7 x 29.5	118	1883	Abandoned; ashore and lost	05 21	1923		Manchester Beach
Curlew	Brig										Abandoned and wrecked enroute SF/San Pedro (SLC listts Stranded)	01 20	1875		Between Point Arena and Garcia River; At Point Arena
Del Norte [Del Norte #2]	Steam screw	157295			R			158 x 32	450 (SLC 301)	1890	Stranded; Ashore and wrecked	07 29	1917		Between Point Arena and Garcia River; Near Point Arena
Del Notre (Norte?)	Steam screw										Stranded	07 29	1927		Point Area
Dunkerque	Schooner, 5 Masted, steam screw, 2 Auxillary Triple Expansion Engines						260	3000	1818		Sunk (SLC Wrecked)		1918		Between Point Arena and Garcia River
East Port	Steam screw							450	1873		Struck reef		1875		North of Point Arena
Elaine B	Oil screw	259787						11	1944		Destroyed by storm	09 29	1962		Off Point Arena
Eliza Miller	Schooner 2 Masted										Wrecked (MMS Sunk)	10 05	1880		Wash Rock, north of Point Arena
Elsie Iverson #2	Schooner, 2 Masted,								77	1884	Total Loss, Wreck sold for $199	1207	1886		Between Point Arena and Garcia River
Emily Schroeder	Schooner										Wrecked	3 07	1871		Between Point Arena and Garcia River

Vessel [Former Names] (STEEL, *Iron,* Wood)	Rig/ Service[a]	Merchant Vessel Registry	BLM	MMS	Refloated (R)/ Salvaged(S)/ Partial Salvage(PS)	CR	Dimensions (Ft.)	Tons	Date Built	Lives Lost	Loss Situation/ Casualty	Month/ Day	Year Lost	Water Depth (Ft.)	Loss Location
Emily Stevens	Schooner, 2 Masted,								98	1879		Capsized, 10 miles out enroute Mendocino/ SF	10 05	1882	South Of Navarro
General Ord	Schooner (Lumber)							88	1869		Enroute Pt. Arena/San Francisco, went ashore				On the north side of Point Arena
General Ord	Schooner, 2 Masted, Lumber							87.5 x 25	88 (SLC 93)	1869	Ashore enroute Pt. Arena/SF (SIC Stranded); Aground	02 25	1889		Between Point Arena and Garcia River
Helen	Schooner, 2 Masted,								121	1863 (SLC 1864)	Total loss, ashore (SLC Stranded)	11 17	1865		Between Pointt Arena and Garcia River; At Point Arena (White 2014:114)
Horace Templeton		95249						42	1873		Stranded, Pated Moorings	6 22	1920		Off {pomt Arema
Horace Templeton	Schooner	95249							42	1873	Stranded (SLC Parted Moorings)	06 22	1920		Off Point Arena
Iaqua	Unknown				R/PS						Refloated in 1903 at Punta Gorda		1913		Between Point Arena and Garcia river, Sea ranch (?)
Jack Hays	Sloop										Ashore (SLC Stranded)	01	1858		Between Point Arena and Garcia River
James Townsend	Schooner (3 Masted)										Ashore	08 08	1885		Near Point Arena Lighthouse
Jeanie	Packet								1883		Unknown		1900		Enroute San Francisco/ Nome; near Point Arena
John McCullough	Schooner, 2 masted						75.5 x 24	72	1873		Parted lines, lost		1893		On rocks at Point Arena
John McCullough	Schooner, 2 Masted,							75.5 x 24	72	1873	Parted lines; Lost		1893		On rocks at Point Arena
MARION R.	Oil screw	258294						13	1949		Foundered	10 09	1950		Off coast of California. near Point Arena
MARION R.	Oil screw	258294							13	1949		Foundered	1009	1950	Off coast of Calif. near Point Arena
Mary Zephyr	Schooner										Wrecked (Jackson 1969)		1881		Near by Point Arena
Mendocino	Schooner										Total Loss;; Wrecked	04 11	1867		Point Arena, At Whitesboro

Vessel [Former Names] (STEEL, *Iron,* Wood)	Rig/ Service[a]	Merchant Vessel Registry	BLM	MMS	Refloated (R)/ Salvaged(S)/ Partial Salvage(PS)	CR	Dimensions (Ft.)	Tons	Date Built	Lives Lost	Loss Situation/ Casualty	Month/ Day	Year Lost	Water Depth (Ft.)	Loss Location
Napa City	Schooner, Whaler										Capsized and sank				Off Point Arena
Napa City	Schooner, Whaler										Capsized and sank				Off Point Arena
Nordic Pride	Oil screw. (Purse Seiner)							105	1941	10	Foundered, wreckage reported	10 01	1941		10 mi. of Point Arena places it in study area
Noyo	Schooner, Steam screw	130395							316	1887	Hit submerged snag, keeled over; Foundered (Gibbs, 300tons./1888)	02 26	1918		6 mi. off coast, 10 miles South of Point Arena
NOYO [ADMIRAL GOODRICH] [GRIFFDO]	Steamship, Steel	211426			R			224.4 x 16.6 (Gibbs, 1418)	1419 (Gibbs 1418)	1913	Stranded; refloated (SLC Stranded in Fog)	06 10	1935		Between Point Arena and Garcia River
Olivia Schultz [Annie Forbes]	Schooner, 2 Masted conversion/ x-River steamer										Total loss, ashore on rocks (SLC Parted lines)	03 27	1883		Between Point Arena and Garcia River; At Rough and Ready
PACIFIC ENTERPRISE	Ship (SLC Freighter)	British		1982		4		454 x 60	6736	1927	Stranded (SLC Grounded)	09 09	1949		Near Point Arena
Point Arena	Unknown									3	Wrecked		1904		Between Point Arena and Garcia River
Reliance	Schooner										Wrecked	01 20	1886		At Point Arena
Reliance No. 1	Schooner, 2 Masted						69 x 24	54	1880		Wrecked		1901		Between Point Arena and Garcia River
Robert E.Lee	Schooner, 2 masted										Wrecked	11 07	1870		Between Point Arena and Garcia River
S.F. Blunt	Unknown										Unknown	05 30	1868		Near by Point arena
San Benito	Steam Screw (Collier)			2109	R/S		350 x 42	2811	1884 (1886)	6	Struck rocks, broke in half; R/PS (SLC Stranded)	11 22	1896		At Point Arena; between Point Arena and Manchester State Park
San Benito	Steam screw, Collier			2109	R	C	350 x 42	2811	1884, 1896	6	Struck rocks, broke in half; R/PS (SLC Stranded)	11 22	1896	`	Between Poiint Arena and Manchester State Beach Park; 6 miles North of Point Arena. Wreck, Submerged, Coordinates verified in AWOIS Record 50229 with 1 to 3 mile accuracy.

Vessel [Former Names] (STEEL, *Iron*, Wood)	Rig/ Service[a]	Merchant Vessel Registry	BLM	MMS	Refloated (R)/ Salvaged(S)/ Partial Salvage(PS)	CR	Dimensions (Ft.)	Tons	Date Built	Lives Lost	Loss Situation/ Casualty	Month/ Day	Year Lost	Water Depth (Ft.)	Loss Location
Shna Yak	Unknown										Wrecked		1908		Point Arena
Shubbrick	Steamer, Lighthouse Tender (Iron construction)				R						Unknown	09 08	1867		At Point 30 miles south of Cape Mendocino, (SCL Point Arena)
Simla	Unknown				R						Wrecked, Refloated		1917		At Punta Gorda? (Coordinates indicate 7 miles north of Point Arena
Speedwell	Barque	British Registry									Ashore, TL	03 09	1872		Between Point Arena and Garcia River
Star of the Sea	Oil screw (Fishing)	230081						242	1930		Foundered	10 04	1962		About 4 miles 035 degrees true of Point Arena Light, off coast of California
Unknown	Unknown					C									Coordinates verfied in AWOIS Record 50358
Unknown Wreck											Wrecked		N.D.		Offshore Manchester Beach Park
Unknown Wreck											Unknown		N.D.		Offshore Manchester Beach Park
Unknown Wreck											Unknown		N.D.		Offshore Manchester Beach Park
Vagabond	Gas Screw	249609						10	1918		Foundered	04 20	1958		Near Point Arena
W.H. Krager	Steam Screw	81683							1899		Foundered	01 11	1906		Off Point Arena
W.H. Krager	Steam screw	81683							469	1899	Foundered	01 11	1906		Off Point Arena
Walter Claxton	Barque									16	Capsized enroute Mendocino/ San Francisco	04 21	1854		10 miles out; coordinates places it in study area
Whittier	Steam Tanker (SLC Twin Triple Expansion)							240 x 32	1295	1903	Grouded, wrecked	05 01	1922		On Saunder's Reef

[a] The terms “brig” and “bark” (or barque) generally indicate a difference in rigging from a brigantine or barkentine (or barquentine).

Summary

In summary, numerous shipwrecks and maritime shoreline resources consisting of destroyed historic wharves, landings, anchorages, and dog-hole chutes are known to be in the study area (Jackson 1978:18). Although no record of Manchester Beach having served as an historical landing where vessels offshore would have anchored and lightered in their cargoes was found, that usage is not beyond the realm of possibility and is considered in the analysis. None of the known historic sites associated with coves, anchorages, river mouths, and headlands occur within the project cable routes.

The references consulted as part of the records search for submerged historic period cultural resources provided information on shipwrecks, unknown wreckage, and debris locations. Causes of losses include fire, explosion, collision, capsizing, wrecking, stranding, and foundering. Stranding generally occurs when a vessel runs aground, becomes caught on a sandbar or reef, is becalmed, runs out of fuel, or has engine trouble—although this term often is misused by mariners to indicate trouble with the engine or ship machinery, rather than with the vessel itself. Vessels that foundered are those that took on water and sank below the surface of the water.

A total of 214 shipwrecks and unknown wreckage or debris locations have been reported between 1853 and 1962 offshore of Mendocino County. One-hundred sixty-two of these sites have coordinates or associated landfall locations within the study area. Vessels reported as lost ranged in size from 42 to 6,696 tons. Thirty-four vessels reported as grounded, on the rocks, or ashore may be excluded from the analysis except for shipwreck *General Ord*, an 88-ton lumber schooner built in 1869 reported ashore on the north side of Point Arena. Nineteen of the vessels lost in the study area are reported as having been removed or refloated. Their coordinates remain in the shipwreck tables because cargo or associated machinery may remain at the loss location.

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 routes with landing sites at Manchester State Beach. Only two of the shipwrecks listed are located west of the boundary of territorial State waters. Located at the most northwest corner of the KMZ, they are the *Alfred* built in 1870 and lost in 1886 and the *Anna* lost in 1885.

The accuracy of the coordinates provided for the shipwrecks varies. Neither the accuracy of location nor the significance of the vessels listed by the SLC and Minerals Management Service (1990) or BOEM (2013) have been evaluated. All resources that could be placed to within 10 nautical miles 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, place the vessels north of the northernmost Route 1. Based on the information available, this information cannot be verified or denied. Considerably more research will need to be conducted as part of the remote sensing surveys to validate the locations cited.

With additional information, several more shipwrecks could be eliminated from the numbers cited above; however, without confirmation of the accuracy of the coordinates cited, they cannot be completely eliminated.

Eligibility for Listing in the California Register of Historical Resources

With reference to their potential eligibility for listing in the NRHP and, by extension, the CRHR, the Minerals Management Service (1987 Appendix 2:1; 1990:VI-84), and BOEM (2013) no longer reference the terms "significant," "probably significant," and "not significant" originally referenced in Bureau of Land Management (1979:VIII.B-598). Alternative terminology, used by the more recent Minerals Management Service (1987 Appendix 2:1; 1990:VI-84) and BOEM (2013), 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 potentially 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 built date, or date of loss. The following six shipwrecks reported have the potential for eligibility for listing in the NRHP solely based on loss of life:

- *Sine Johnson, a* schooner, was lost in 1867 with all hands. The vessel later drifted ashore bottoms up near Navarro.
- *Emily Stevens*, a 98-ton, two-masted schooner, was built in 1879. The vessel capsized 10 miles out en route from Mendocino to San Francisco in 1882 with all seven hands lost.
- *Alliance No.2* (*Charles Levi Woodbury*), a 105-ton, two-masted schooner, was built in 1889. The 180-foot vessel foundered with 14 lives lost after striking Malpas Rock.
- *H. Eppinger* No. 1, a vessel of unknown type, was built in 1885. The vessel later ran ashore between San Francisco and Navarro in 1887, with four lives lost.
- *Nordic Pride,* a 105-ton, oil screw-powered purse seiner, was built in 1941. The vessel foundered about 10 miles off Point Arena in 1941, with 10 lives lost.
- *West Coast,* a 179-ton, 112.3- x 31.25-foot, 40-horsepower steam screw, was built in 1885. The vessel ran aground at Point Arena in 1891, with 10 lives lost.

Of the 169 resources that may fall within the study area, only the seven cited above are considered potentially eligible for listing in the NRHP without further information. As noted, any resource eligible for listing in the NRHP is also eligible for listing in the CRHR. The eligibility of the remaining 162 shipwrecks listed remains undetermined.

The majority of recent (post-1950s) shipwrecks in the Bureau of Ocean Energy Management (2013) database are included as a means of eliminating them from consideration should they appear in the results of sonar, magnetometer, autonomous underwater vehicle (AUV), or multibeam surveys.

It is unusual and pertinent to the historic lumber, freight, and fishing industry in the study area that as many as 77 of the dated vessels were lost between 1855 and 1900 and only 24 were lost between 1900 and 1962. 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 other historic association also may be evaluated as "potentially significant" (Bureau of Land Management VIII.B-598) and "eligible for listing in the NRHP" (Minerals Management Service 1987 Appendix 2:1; Minerals Management Service

1990:VI-84; Bureau of Ocean Energy Management 2013:154). These vessels could include workboats used after 1950 that were built as part of the World War II effort and converted to pleasure craft, passenger transport, fishing boats, or other workboats. 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 (Minerals Management Service 1987 Appendix 2; Bureau of Ocean Energy Management 2013 Shipwreck Database). 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 interpretation of side scan sonar, magnetometer, AUV, and multibeam records. Vessels reported lost in the study area that were built between 1940 and 1945 may be associated with the war effort and may bear battle stars or have other historic associations that have not yet been evaluated. In addition, vessels built prior to 1953 for the Korean War effort also may bear battle stars 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. 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 cultural resource if it would:

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

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

Impacts and Mitigation Measures

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.

RTI proposes to install up to four transpacific submarine cables to land in the unincorporated area of Mendocino County just north of the town of Manchester, California. The project would be implemented in four phases, one phase for each of the four 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 continental shelf, where seawater depth is approximately 5,904 feet (1,800 meters). They consist of the marine conduit, cables, splice boxes, and cable

regenerators. Cables consist of (1) a double-armored design used in rocky areas or coarse substrates and where protection from fishing gear may be warranted; and (2) a light-weight armored cable, similar to the doubled-armored cable 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.

The following project activities have the potential to affect submarine archaeological resources. All of these activities could result in potentially significant impacts on identified resources.

Marine Directional Bores. Four marine directional bores would be conducted, one for each of the four cable systems, to provide a housing for the fiber-optic conduit. Each directional bore would extend approximately 4,000 feet offshore into the Pacific Ocean.

Impacts from directional bore are anticipated to result from anchoring activities. A work boat would be anchored to the seafloor via a four-point mooring with an anchor spread of 328 feet (100 meters). A smaller secondary work boat would set and retrieve anchors. All anchors would be set and retrieved vertically to avoid dragging them across the seafloor.

Pre-Lay Grapnel Run. Impacts may result during the pre-lay grapnel run to clear debris, such as discarded fishing gear, from the seafloor along corridors where the cables are to be buried. A grapnel, typically of the flatfish type, would be dragged along the cable routes prior to cable instillation. The grapnel would be attached to a length of chain to ensure contact with the seafloor and towed by the cable ship or a work boat at a speed of about 1.2 miles per hour (about 1 knot or 1.9 kilometers per hour). The arms of the grapnel are design to hook debris laying on the seafloor or shallowly buried to about 1.3 feet (0.4 meter). Any debris hooked would be retrieve by winch, stowed on the vessel, and subsequently disposed of onshore.

Cable Laying and Plowing. At the end of the bore pipe, the cable would be temporarily laid directly on the seafloor to a water depth of approximately 328 feet until it can be post-lay buried by divers or by an ROV. Cable plowing can be used between water depths of 328 and 3,037 feet. A cable plow is a burial tool consisting of a large sled that is deployed by the main cable ship. Divers assist with loading the cable into the plow's articulated feed chute and burial shank. As it is towed by the ship, the plow slices a narrow furrow through ocean floor sediments about 3.3 feet (1 meter) wide and mechanically feeds and buries the cable to its desired depth. The plow, supported by two outriggers, would disturb a total width of approximately 20 feet (6.1 meters). Together, the weight of the soil and the sled serve to fully close and compact the furrow. The plow operates at 0.6 mile per hour (about 0.5 knot or 0.95 kilometer per hour).

Diver-Assisted Post-Lay Burial. This technique can be used in shallow depths between 33 and 98 feet (10 and 30 meters). Divers using hand jets open a narrow furrow beneath the cable, the cable drops into the furrow as it is opened, and disturbed sediments settle back over the cable. The cable would be buried to a 3.3-foot (1.0-meter) water depth where feasible based on localized bottom conditions. Between depths of 98 feet (30 meters) and 328 feet (100 meters), an ROV would be used to bury the cable (see below). Sections of cable not buried would be laid temporarily on the ocean floor by the cable ship with post-lay burial at a later date.

Remotely Operated Vehicle Post-Lay Burial. Between water depths of 98 feet and 328 feet, or where the cable plow cannot achieve the targeted burial depth, an ROV would be used to bury the cable. The ROV would loosen the seafloor sediments beneath the cable, allowing it to settle to the desired depth. The sediments would then settle back over the area, burying the

cable. The typical width of disturbance would be 15 feet (4.6 meters). The ROV operates at an average rate of speed of 0.12 mile per hour (about 0.1 knot or 0.19 kilometer per hour). The ROV moves at a rate of 0.36 mile per hour but may take up to three passes to complete the burial.

Emergency Cable Repair, Retirement, Abandonment, or Removal or Cable System. Emergency cable repair, retirement, abandonment, or removal of the cable systems are likely to result in impacts similar to the impacts of installation. If significant impacts are identified, the types of measures proposed to mitigate installation impacts also could mitigate impacts associated with removal to less-than-significant levels.

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 continental shelf.Prehistoric archaeological sites associated with buried late Pleistocene and Holocene paleo-landforms in the project 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 meters thick. Subsurface disturbance of a potentially significant or significant shipwreck may result from anchoring activities associated with directional boring through nearshore sediments from the LMH to water depths of 30 feet (9.2 meters); from diver-assisted burial at water depths of 49 to 98 feet (12 to 30 meters); from cable plow, diver-assosted ,or ROV-assisted post-lay burial in water depths of 98 to 3,937 feet (30 to 1,200 meters); and from direct surface lay in water depths greater than 3,937 feet (1,200 meters).

Additionally, although cable-laying and support vessels would be dynamically positioned rather than requiring permanent anchoring or anchor mooring systems at locations along the proposed cable routes, temporary anchoring may be anticipated to be required 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 potentially significant 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

Using 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 will be analyzed 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 Bureau of Ocean Energy Management 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 subsurface but do not penetrate as deeply into the sub-bottom strata as Boomer or Sparker type systems. The analysis will entail 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 SLC, 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 CFR 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 kilometer on each side of the proposed cable route. This analysis shall not be limited to side scan, and magnetometer data may include shallow acoustic (sub-bottom) data as well as AUV 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 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 meters) from the center point of any given find beyond which the project must be moved, to ensure that adverse effects on the potential historic property will be avoided during construction.

Based on the survey data, an Offshore Historic Shipwreck Survey 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-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, provide for addressing discoveries of as yet unidentified resources encountered during planned marine survey and construction, and provide mitigation monitoring if deemed necessary during construction to ensure compliance.

Cumulative Effects

Introduction

Cumulative impacts on cultural resources take into account the impacts of the project in combination with those of other past, present, and reasonably foreseeable projects. The geographic extent of the 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 considered most likely during ground-disturbing activities associated with construction.

This report provides a historical background for the project area and describes the inventory of known cultural resources in the area. The types of resources that are found in the project 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 cause degradation of 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, resources discovered during construction of future projects 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 known 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 the potential exists 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 would encounter a shipwreck.

Mitigation measures that require identification of areas with high potential for specific submerged cultural resources would reduce any potentially significant 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 no projects currently are proposed with the potential to disturb or destroy such resources. Therefore, the project's contribution to cumulative impacts on marine cultural resources would not be significant.

References

Bancroft, Hubert Howe. 1886. *History of California.* Vols. I–VII. Wallace Hebberd, 1963 and 1970, Santa Barbara. [Originally published by The History Company, San Francisco.]

Bean, Lowell John and Dorothea Theodoratus. 1978. Western Pomo and Northeastern Pomo. In: R.F. Heizer, 1978 *Handbook of North American Indians*: California Vol. 8. pp. 289–305. Smithsonian Institution, Washington D.C.

Bickel, Polly. 1978. Changing Sea Levels along the California Coast: Anthropological Implications. *Journal of California Anthropology* Vol. 5, No. 1, pp. 6-20.

_____. 1988. Corrections to Sea Level Article. *Journal of California Archaeology, 5:296–297.*

Bloom, A.L. 1977. Pleistocene Shorelines: A New Test of Isostasy. *Bulletin, Geological Society of America*, 78:1477–1494.

Brooks, C.W. 1875. Report of Japanese Vessels Wrecked in the North Pacific Ocean, from the Earliest Records to the Present Time. *Proceedings of the California Academy of Sciences*, Vol. 6, pp. 50–66.

Caughey, J.W. 1970. *California: A Remarkable State's Life History.* Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Curray, J.R. 1965. Late Quaternary History, Continental Shelves of the United States. In: *The Quaternary of the United States*, pp. 723-725. Princeton University Press.

Delgado, James. 1990. *To California by Sea: A Maritime History of the California Gold Rush.* University of South Carolina Press, Columbia, South Carolina.

Frederickson, D.A. 1973. Early Cultures of the north Coast Ranges, California. Ph.D. Dissertation. Department of Anthropology, University of California, Davis.

_____. 1984. The North Coastal Region. In: Moratto, M.J., California Archaeology. Academic Press, New York.

Heizer, R.F. 1978. *Handbook of North American Indians*: California Vol. 8. Smithsonian Institution, Washington, D.C.

Inman, D.L. 1983. Application of Coastal Dynamics to the Reconstruction of Paleocoastlines in the vicinity of La Jolla, California. In: *Quaternary Coastlines and Marine Archaeology*, P.M. Masters and N.C. Flemming, editors, pp. 1-50 Academic Press, New York.

Jackson, Walter A. 1969. The Doghole Schooners. Bear and Stebbins, Mandocino, California. Republished 1977.

Koenig, Heidi. 2006. Archaeological Survey and Evaluation Report for 43400 Hathaway Crossing (APN 27-211-02) Point Arena, Mendocino County, California.

Kroeber, A.L. 1925. Handbook of the Indians of California. Smithsonian Institute, *Bureau of American Ethnology Bulletin* 78. Washington, D.C.

Kulm, L.D., D.F. Heinricks, R.M. Buehrig, and D.M. Chambers. 1968. *Preliminary Economic Evaluation of Continental Shelf Placer Deposits of Cape Blanco, Rogue River, and Umpqua River. Oregon.* Department of Geology, Mineral Industries, Open-File Report.

Lindstrom, Harry. 2013. Lumber Landings, Doghole Schooners and Shipwrecks.

Lloyds of London, 1850–1980. *Ships Registry.*

Lloyd's Register of Shipping 1885–1950.

Marshall, Don B. 1978. *California Shipwrecks. Footsteps in the Sea.* Superior Publishing Company, Seattle, Washington.

McLendon, S. and R.L. Oswalt. 1978. Pomo: Introduction. In: R.F. Heizer, vol.ed., *Handbook of North American Indians*, California 8:274–288. Smithsonian Institute, Washington, D.C.

Meighan, C.W. and R.F. Heizer. 1952. Archaeological Exploration of Sixteenth Century Indian Mounds at Drakes Bay, California. *California Historical Society Quarterly* 31(2):98–108

Milliman, J. and K.O. Emery. 1968. Sea Level Changes during the Past 35,000 Years. Science 162:1121–1123.

Moriarty, J.R. and M. Keistman. 1973. Cabrillo's Log 1542–1543, a Voyage of Discovery. In Dr. James R. Moriarty, III, editor. Cabrillo Gravestone Seminar, Cabrillo National Monument, San Diego.

Nardin, T.R., R.H. Osborne, D.J. Bottjer, and R.C. Scheidemann, Jr. 1981. Holocene Sea-Level Curbes for Santa Monica Shelf, California Continental Borderland. *Science*, 213:331–333.

National Oceanic and Atmospheric Administration. 1988. *Automated Wreck and Obstruction Information System.*. Database, Records 50018, 50029, 50096, 50229, 50357, and 50358. Rockville, Maryland.

Ogden, Adele. 1923. The Californias in Spain's Otter Trade: 1775–1795. *Pacific Historical Review*, Vol. 1:447–452.

_____. 1941. The California Sea Otter Trade, 1784–1848. *University of California Publications in History*, Vol. 26. Berkeley.

Richards, Horace C. 1971. Sea Level during the Past 11,000 Years as Indicated by Data from North and South America. Quaternaria 14:7–15.

Schmidt, J.S., K.A. Ryberg, D.A. McCullough, M. Williams, G. Brooks, and R. Larson. 2014. Marine Archaeological Resources Assessment. Virginia Offshore Wind Technology Advancement Project. Prepared for Dominion Resources, Inc. under Contract to Tetra Tech, Inc. by R. Christopher Goodwin & Associates, Inc. Appendix N of Research Activities Plan. 417 pp.

Shurz, W.L. 1939. *The Manilla Galleon.* E.P. Dutton & Company, Inc., New York.

Snavely, P.D., Jr. and N.S. Macleod. 1977. Evolution of Eocene Continental Margin of Western Oregon and Washington. *Geological Society of America Abstracts with Program* 9(7):1183.

Snethkamp, P.G., G. Wessen, A.L. York, J.H. Cleland, S.D. Hoyt, and R.L. Gearhart II. 1990. California, Oregon, and Washinton Archaeological Resource Study. Vol III: Prehistory. Prepared under Minerals Management Service Contract 14-35-0001039438 by Espey, Huston and Associates, Inc., Austin Texas.

Stright, Melanie, in Minerals Management Service, U.S. Department of the Interior. 1987. *Archaeological Resource Study: Morro Bay to Mexican Border* (Contract No. 14-12-0001-30272). Prepared by Pierson, Shiller and Slater. Minerals Management Service, Los Angeles.

Tahja, Katy M. 2008. Mendocino Coast. Arcadia Publishing, Charleston, South Carolina.

U.S. Department of Commerce, Coast Guard. 1933–1982 *Merchant Vessels of the United States.* Government Printing Office, Washington.

_____. 1982–1988 *Supplements. Merchant Vessels of the United States.* Government Printing Office, Washington.

U.S. Department of Commerce, Customs Bureau. 1867–1933. *Merchant Vessels of the United States.* Government Printing Office, Washington.

U.S. Department of the Interior, Bureau of Land Management. 1979. *An Archaeological Literature Review and Sensitivity Zone Mapping of the Southern California Bight, 2 volumes* (G. Stickel and Marshack, Editors). National Technical Information Service, Department of Commerce, Washington, D.C.

U.S. Department of the Interior, Bureau of Ocean Energy Management. 2013. Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific Outer Continental Shelf. , Pacific OCS Region.

_____. 2015. Finding of No Adverse Effect for the Virginia Offshore Wind Technology Advancement Project on the Outer Continental Shelf Offshore Virginia. https://www.boem.gov/VOWTAP-RAP-Documentation-in-Support-of-a-Finding-of-No-Adverse-Effect/.

U.S. Department of the Interior, Minerals Management Service. 1987. *Archaeological Resource Study: Morro Bay to Mexican Border* (Contract No. 14-12-0001-30272). Prepared by Pierson, Shiller and Slater. Minerals Management Service, Los Angeles.

_____. 1990. *California, Oregon and Washington Archaeological Resource Study,* 5 volumes. Prepared under Minerals Management Service Contract 14-35-0001-30439 by Espey Huston & Associates, Inc., Austin, Texas and Dames & Moore, San Diego, California.

Wagner, H.C., S.C. Wolf, D.S. McCulloch, E.A. Silver, J.G. Greene and K.G. Blom. 1972. U.S. Geological Survey Administrative Report. Prepared and Furnished to the U.S. Bureau of Reclamation for the California Undersea Aqueduct Study.

Westport Village Society. N.D. Mendocino Coast Shipwrecks.xls. www.westportvillagesociety.org/Data/Shipwrecks.pdf

White, Michael D. 2014. Shipwrecks of the California Coast: Wood to Iron, Sail to Steam. History Press. Charlestone, South Carolina.