Biological Assessment for the Monterey Bay Aquarium Research Institute (MBARI), Monterey Accelerated Research System (MARS) Project, Monterey Bay, California

August 2004

Prepared for:

MONTEREY BAY AQUARIUM RESEARCH INSTITUTE
7700 Sandholdt Road
Moss Landing, CA 95039

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.
350 Sansome Street, Ste 300
San Francisco, CA

Table of Contents

Table of Contents (cont.)

Section **Page**

List of Tables

List of Figures

List of Abbreviations and Acronyms

BA	Biological Assessment
BAS	Burial Assessment Surveys
CBC	Chemosynthetic Biological Communities
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CSLC	California State Lands Commission
CWA	Clean Water Act
D	Delisted ESA
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FE	Federally Endangered
FT	Federally Threatened
FMP	Fishery Management Plan
FSSI	Fugro Seafloor Survey, Inc.
MARS	Monterey Accelerated Research System
MBARI	Monterey Bay Aquarium Research Institute
MBNMS	Monterey Bay National Marine Sanctuary

Table of Contents (cont.)

Section		Page
MLML	Moss Landing Marine Laboratory	
MOU	Memorandum of Understanding	
MSFCMA	Magnunson-Stevens Fishery Conservation and Management Act	
NMFS	National Marine Fisheries Service	
NOAA	National Oceanic and Atmospheric Administration	
NPDES	National Pollutant Discharge Elimination System	
NSF	National Science Foundation	
OOI	Ocean Observatories Initiative	
PLB	Post-Lay Burial	
PLGR	Pre-Lay Grapnel Run	
PLIB	Post-Lay Inspection and Burial	
ROV	Remotely Operated Vehicle	
SPL	Sound Pressure Levels	
USACE	United States Army Corps of Engineers	
USFWS	United States Fish and Wildlife Service	
VICKI	Video Information Capture with Knowledge Inferencing	

1 Introduction

This biological assessment (BA) was prepared to support the permitting and approval process for the proposed construction and operation of the Monterey Bay Aquarium Research Institute's (MBARI) Monterey Accelerated Research System (MARS) Cabled Observatory. The project will provide a continuous monitoring presence in the Monterey Bay National Marine Sanctuary and will provide real time communication and power to suites of scientific instruments used for monitoring sensitive benthic sites and scientific experiments. The BA was prepared to meet substantive and procedural requirements of the Endangered Species Act (ESA) of 1973, as amended (50 Code of Federal Regulations [CFR] 17.11 and 17.12).

This BA provides a project description (Section 2); the environmental setting (Section 3); the effects of the proposed action, conservation measures, take assessment (Section 4); and references (Section 5). Agency and other regulatory correspondence related to this project are included as Appendix A. An Essential Fish Habitat (EFH) assessment has been prepared at the request of National Marine Fisheries Service (NOAA Fisheries) for species that may occur in the project vicinity. The Magnuson-Stevens Act, which was reauthorized and amended in 1996, requires NOAA Fisheries to recommend conservation and enhancement measures for any Federal or State activity that may adversely affect Essential Fish Habitat (EFH). The EFH assessment report is a companion document to this BA and is included in Appendix B.

This BA is prepared in compliance with Section 7 of the ESA. Section 7 assures that, through consultation with the United States Fish and Wildlife Service (USFWS) and the NOAA Fisheries, federal actions do not jeopardize the continued existence of any species listed as, or proposed to be listed as, threatened or endangered, or result in the destruction or adverse modification of designated or proposed critical habitat. Critical habitat includes those areas that will contribute to the recovery and survival of a listed species. The NOAA Fisheries and the USFWS have identified several species within the project vicinity as threatened, endangered or proposed to be listed as such. A complete discussion of these species and their habitats is included in this BA.

In compliance with 50 CFR 402, this BA evaluates the effects on federally listed and proposed species of constructing and operating the proposed MARS cable. Where appropriate, conservation measures are identified that would minimize or avoid the adverse effects of the proposed project on the listed species and critical habitat. This BA is intended to assist in fulfilling the requirements for consultation under Section 7 (a)(4) of the ESA.

For purposes of this BA, proposed project or project area refers to all activities associated with the construction and operation of the MARS cable including all areas where effects, potential effects and cumulative effects would be discernable. The proposed MARS project will be located near Moss Landing (Monterey Bay, California) and will consist of both onshore and offshore facilities. The proposed onshore facilities will be located just north of MBARI at Moss Landing, west of Highway 1 and south of Elkhorn Slough. The offshore facilities consist of approximately 31.6 miles (51 kilometers) of submarine cable along the route extending northwest to the north of Monterey Canyon and along the continental margin out to the proposed location of an observatory node on the southeastern part of the Smooth Ridge feature at a depth of 891 meters. Conservation measures are identified in this BA to avoid or minimize any adverse effects of the proposed project on listed species or their habitat.

MBARI currently conducts any and all research within the Monterey Bay National Marine Sanctuary (MBNMS) under MBNMS permit No. MBNMS-2000-016, issued on July 17, 2000 and last amended on February 04, 2004 in accordance with the National Marine Sanctuaries Act (NMSA) 16 USC §1431 et seq., and regulations there under (15 CFR Part 922, subparts A, E, and M).

2 Project Description

2.1 Project Location

The onshore potions of the MARS project will be located in Moss Landing in Monterey County California. The facilities will be located directly west of Highway 1 and south of Elkhorn Slough. The fiber optic cables will be inserted into the existing Duke Energy fuel oil pipeline from the onshore facilities to the terminus of the existing pipeline located at 36 48.719N, -121 48.037W approximately one-tenth of a mile (153 meters) off the coast of Moss Landing. This pipeline is currently maintained by Duke Energy but is no longer being utilized.

Offshore portions of the project will be located within the Monterey Bay National Marine Sanctuary in the region defined between -122.37 to -121.78˚ W, and 36.5 to 36.9˚N. Approximately 31.6 miles (51 kilometers) of submarine cable will be placed from the end point of the existing Duke Energy pipeline, northwest to the north side of Monterey Canyon, south of Cabrillo Canyon and down the neck of the Smooth Ridge along the continental shelf. The MARS node will be located at the terminus of the submarine cable on the southeastern part of the Smooth Ridge at a depth of approximately 891 meters (see Figure 2-1).

2.2 Proposed Action

This project will install an advanced cabled observatory in Monterey Bay that will serve as the test bed for a state-of-the-art regional ocean observatory, currently one component of the NSF Ocean Observatories Initiative (OOI). The MARS cabled observatory represents the next step toward harnessing the promise of new power and communication technologies to provide a remote, continuous, long-term, high-power, large-bandwidth infrastructure for multidisciplinary, in situ exploration, observation, and experimentation in the deep sea. MARS will be located in Monterey Bay offshore the Monterey Bay Aquarium Research Institute (MBARI).

The project area is an important study site that, if connected to a cabled observatory, would enable important long-term data to be collected on benthic communities. Imaging systems and sensors deployed on a cabled observatory would document the behavior of individuals (e.g., clams), the dynamics of populations, and variation in the structure of seep and vent communities. Concurrent monitoring of fluid chemistry and other environmental factors (e.g., current speed), coupled with measurements of the response of the community to experimental manipulation of fluid chemistry, could help define the roles of intrinsic environmental (e.g., fluid chemistry) and biological factors versus external processes (i.e., effects of ocean currents on larval transport).

The MARS cabled observatory will also provide better azimuthal coverage and thereby improve the characterization of moderate to large earthquakes occurring in northern California along the San Andreas system, and will improve knowledge of the deep structure of this plate boundary. Additionally, experience in long-term deployment of broadband systems is crucial for the successful development of long-term global seismic sea floor observatories as advocated by the International Ocean Network.

2.2.1 Onshore Facilities

There are two possible shore landing options for the MARS cable—the existing Duke Energy fuel oil pipeline in the north harbor entrance (the preferred location discussed below), and the planned Moss Landing Marine Laboratories pier south of the canyon head (see Alternatives, Section 2.2.4).

Northern Shore Landing

The northern shore landing site is a currently unused existing fuel oil pipeline owned by Duke Energy and previously used to unload tankers. MBARI has obtained permission from Duke Energy to use this pipeline to land the MARS cable and to install temporary shore facilities at the landing location.

The pipeline extends in a west-northwest direction from the shore to a water depth of roughly 18 meters. The position of the end of the pipeline is 36°48.719' N, –121°48.037' W and is located approximately 153 meters from shore. There is no planned construction through the surf zone for this shore landing. The pipe is 18"–24" carbon steel and has been well maintained by Duke Energy. MBARI will modify the cap at the ocean end of the pipeline to include a seal allowing the MARS cable to enter the pipeline and will design the cap to minimize sea water corrosion.

The cable will run inside the pipeline from the ocean side entrance to a location approximately 1,450 meters away where the pipeline takes a sharp turn towards the south after it surfaces from the harbor water near Highway 1 (see Figure 2-4). A new access port will be installed in the pipeline at this location to allow the cable to be pulled ashore during cable installation. This port will also be used during operations to allow the cable to exit from the pipeline and run though a 2”-diameter conduit that will be installed by MBARI. The conduit will be attached to the side of the existing fuel oil pipeline and will run approximately another 150 meters from the access port to the MARS Shore Facility.

The power conductors and the fiber in the MARS cable will be terminated in the MARS Shore Facility which will be located close to the Duke Energy power breaker panel. The Duke Energy power breaker panel will be connected to and provide power to the MARS Shore Facility.

(Please note: An amendment to the following two paragraphs and any potential effects will be sent shortly, as updated Shore Facility plans are being developed.)

The MARS Shore Facility will include the shore power supplies, breakers, hubs, and other equipment necessary to feed power and communications to the observatory cable. The equipment will be housed in a 6-meter-long iso van (a temporary structure typically used by scientists as portable laboratory space) or a similar modular structure.

Fibers will be run from the MARS Shore Facility to either (a) a location where a microwave dish is mounted with a line of sight to the MBARI building on 7700 Sandholdt Road, Moss Landing or (b) connected to Duke Energy's fiber hub.

MBARI is also requesting the temporary use of a small, flat piece of land adjacent to Highway 1 and identified by the Monterey County Assessor's Office as Parcel # 133181009, owned by Duke Energy for use as a staging site for equipment, which will be used at this location to pull the cable through the pipe and out the port as described above. Use of this site would be limited to the duration of cable installation operations—approximately 3-7 days—after which all equipment would be removed.

2.2.2 Offshore MARS Cable and Facilities

The MARS system consists of a single submarine cable between the onshore facilities in Moss Landing and a trawl-resistant node to be placed on the seabed at the end of the cable on Smooth Ridge. A single Alcatel OALC4 cable, with a 28 mm outer diameter and a galvanized steel wire layer for armoring will be used. Duke Mullberry LLC will be providing power to the system via extension of an existing utility source. The design will meet Duke Energy code and practice standards. The design will also meet the telecommunications industry standard practice for safe working on high voltage cables. This includes a shore side lock out tag system with two-person independent verification.

The trawl-resistant node will be installed at the terminus of the cable in approximately 891 meters depth. The node measures 178” in length, 140” wide, and 50” high.

The estimated length of the cable is 51 kilometers. The maximum water depth is expected to be 891 meters, and cable burial to one meter is proposed for the entire cable length, subject to suitable seabed conditions. Sections 3.2.1 and 3.3.1 (Geophysical and Burial Assessment Surveys) provide a discussion of the seafloor conditions and potential for cable burial along the cable route.

2.2.3 Installation and Operation

Pre-Lay Grapnel Run (PLGR)

Prior to the main lay operation, a pre-lay grapnel run (PLGR) will be carried out by the main lay vessel along the proposed cable route. The PLGR operation will be to industry standards employing towed grapnels. The intention is to attempt clearance of any seabed debris, for example wires or hawsers, fishing equipment etc. that may have been deposited along the route. Any debris recovered during these operations would be taken ashore and discarded appropriately on completion of the operations.

The operation involves the towing of one or an array of grapnels along the length of the route to be plowed. The vessel proceeds at a rate to ensure that the grapnel(s) maintain continuous contact with the seabed. The grapnel is usually a 'sliding prong' type, which can penetrate up to 40 centimeters into the seabed. The grapnel is connected to the towrope or wire by means of a length of 30 meters of chain with a similar length of chain following the grapnel; the chain further assists in keeping the grapnel in contact with the seabed.

As the vessel moves along the route, the towing tension is monitored and the grapnel(s) is recovered if the tension increases indicating that an obstruction has been hooked. As a matter of routine, the grapnels are recovered and inspected at minimum intervals of 15 kilometers along the route. Usually a single tow is made along the route but in areas where other marine activity or debris amounts are high, additional runs may be made.

Main Lay Operations

The purpose of the main lay operation is to directly land the cable at the shore end and to plow bury the cable. The plow is hydraulically operated and is towed by a towrope from the cable installation vessel. The dimensions of the plow proposed for use in this project are 9.4m (length) x 4.4m (base) x 4.2m (height). The plow is primarily intended for use in simultaneous lay and bury operations. The cable is placed on the seabed ahead of the plow, and as the plow moves forward it picks the cable up off the seabed and buries it. Varying the position of the skids and the angle of the plowshare controls the cutting depth of the plow. Rear stabilizers can be used to assist with depth control on soft ground.

The plow is fully remote controlled from a control cabin onboard the vessel while being towed. The plow is equipped with vertical and lateral cable angle sensors and a forward TV camera for visual images. Plow burial will be made along the route sections recommended by the survey and Burial Assessment Surveys (BAS), subject to seabed conditions.

Plowing Operations

When plowing, cable is laid to achieve a touch down just in front of the plow. The plow will be deployed and recovered by means of the 'A' frame located at the stern of the vessel. A 'docking frame' assembly is used to minimize any excessive pendulum motion caused by vessel movement when the plow is being handled out of the water.

The plow will be launched by lifting it from the working deck and moving the 'A' frame slowly outboard until the plow is clear of the stern; pay out will be continued until the plow is a few meters below the surface of the sea. At this stage the plow systems will be checked prior to transferring the weight of the plow to the towline and carefully lowering the plow to the seabed. As the plow is lowered the plow control umbilical with attached recovery line will be simultaneously paid out.

When the plow arrives at the seabed, the laying vessel moves slowly forward paying out cable to maintain tension, and adjustments are made to the tow wire and umbilical line to achieve the optimum towing scope or 'layback' for the plow. While these adjustments are made the plow remains stationary. Just prior to the start of plowing the tow winch rendering is set to avoid excessive towing tensions.

As the plow starts to move, the plow skids will be raised (causing the share to dig deeper into the seabed) and the depressor arm is lowered until the required burial depth is achieved. Cable will be paid out such that the cable reaches the seabed a few meters in front of the plow. This results in minimal residual cable tension measured at the plow.

When the end of the plowed section is reached, the skids are lowered and the depressor arm is raised causing the burial depth to be reduced to a minimum. The lay vessel is stopped and the towing scope is reduced while simultaneously recovering the umbilical and attached recovery line. When the plow lifts clear of the seabed, the lay vessel will move ahead very slowly as the plow is raised to the surface. Lay cable is paid out to maintain appropriate tension. The plow will be held at a point just below the surface while the recovery line is attached to the lift wire, which passes over a sheave at the top of the 'A' frame. The plow is then raised on the recovery/lift line to engage in the docking frame. Finally the 'A' frame is moved inboard, and the plow is lowered to the vessel's deck.

Trawl Resistant Node Frame Deployment

The cable will be installed from the sea towards the shore landing. It is anticipated that the cable will be plow buried throughout most of the cable route and that as the main lay vessel approaches the node installation point the plow will be recovered. It will then surface lay the cable and deploy the trawl resistant node frame on the end of a ground rope and continue surface laying the ground rope. When the trawl resistant node frame is on the seabed, an acoustic release will be activated which will part the ground rope just above the seabed leaving approximately two kilometers of ground rope attached to the node. This two-kilometer section of ground rope would then be recovered using the on-board ROV and a cutting tool and attaching a recovery rope to the ground rope.

The two-kilometer surface laid section of cable would be post-lay buried by jetting.

After the cable and the trawl resistant node frame have been deployed, MBARI's R/V *Point Lobos* will lower the MARS node onto the ocean floor near to the trawl resistant node frame. ROV *Ventana* will then latch onto the trawl resistant node frame, lift it, and then lower it into the trawl resistant node frame. The ROV will then attach the underwater mateable connectors between the node and the trawl resistant node frame to allow the node electronics to be connected to the shore through the cable.

Post-Lay Inspection and Burial (PLIB)

Post lay inspection and burial will be conducted by Alcatel's ROV. This will include the following:

- Initial, final, and intermediate splice positions in the buried sections;
- Burial in the plowed sections (where plow did not bury for operational reasons (i.e. soft conditions, steep slopes, etc.);
- Cable and pipeline crossings; and
- Any unburied sections required as part of the node deployment operation.

In order to minimize the risk to the exposed cable, the Post-Lay Burial (PLB) program will be designed, wherever possible, to closely follow that of the main lay vessel program. The proposals for PLB assume jetting into suitable seabed materials. Rock cutting, trenching, or similar is not proposed. All post lay burial work will be inspected with an allowance for overlaps into adjacent plowed sections.

An ROV capable of 1.0-meter burial and ability to operate in water depths in excess of 1,000 meters will be used. The ROV will be free flying, or tracked, and fitted with lights, cameras, depth sensor, pitch and roll sensor, heading sensor, and other appropriate fittings required to perform the work.

Alcatel proposes to use Makai software during cable installation operations. This sophisticated system is able to model the catenary of the cable and predict the required cable slack, thereby minimizing the risk of installing loops in the cable system.

2.2.4 Alternatives

Southern Shore Landing Alternative

The southern shore landing alternative site runs from a water depth of approximately 16 meters at the estimated position for the end of a planned pier to be constructed by Moss Landing Marine Laboratories (MLML) on the seaward side of the MBARI facilities. The estimated position of the end of the pier is 36°80.266' N, –121°79.111' W. MLML has obtained permits to construct this pier and has given MBARI permission to land the MARS cable through conduit running alongside the pier.

From the pier, the cable will run in the conduit and follow the same path as an existing seawater intake pipe before terminating in a circuit breaker box located inside MBARI Building C.

For this alternative, Building C will serve as the Shore Facility, so no additional structures will be needed. As in the preferred northern Shore Facility, Building C will house all items necessary for cable and node operations including uninterrupted power supply and all command and control equipment. The existing power supply is sufficient to meet cable and node requirements (3 phase, 480-volt, 10kW).

Offshore Cable Route Alternatives

Alternative-1

An alternate route (shown in Figure 2-2) for the MARS cable installation was investigated, but several serious problems were encountered that led to this option being abandoned. The alternate route did not meet all required science needs, the water depth was not sufficient for a deep water test bed node, and installation would have been more difficult than for the northern route due to rock outcrops.

This route cannot reach a location on the western side of the San Gregorian Fault line without crossing the canyon. Experience has shown that equipment or cables placed in the canyon at this location would likely survive less than a year before being destroyed by mass wasting events. One of the scientific aims of the MARS project is to connect to a permanent broadband seismometer located west of the San Gregorian fault line to complement the land-based network of broadband seismic stations. This is crucial to 1) provide better azimuthal coverage and thereby improve the characterization of moderate to large earthquakes occurring in northern California along the San Andreas system, and 2) to improve knowledge of the deep structure of this plate boundary. Also, experience in long-term deployment of broadband systems is crucial for the successful development of long-term global seismic sea floor observatories as advocated by the International Ocean Network.

In addition, there were no active seeps or chemosynthetic biological communities (CBCs) close to the route node location. These are important study sites that, if connected to a cabled observatory, would enable important long-term data to be collected on these benthic communities. Imaging systems and sensors deployed on a cabled observatory would document the behavior of individuals (e.g., clams), the dynamics of populations, and variation in the structure of seep and vent communities. Concurrent monitoring of fluid chemistry and other environmental factors (e.g., current speed), coupled with measurements of the response of the community to experimental manipulation of fluid chemistry, could help define the roles of intrinsic environmental (e.g., fluid chemistry) and biological factors versus external processes (i.e., effects of ocean currents on larval transport). Of the MARS routes investigated, only the currently proposed site provides a node location close to known CBCs and active seeps.

The MARS observatory is a test bed for a deep water cabled observatory, and many of the components and systems to be tested need to be located at a deep-water site. The depth of the alternate site is only 130 meters, and the engineering systems need water depths closer to 1,000 meters. Only the currently proposed route provides access to water with a depth suitable for the engineering tests.

Finally, studies have shown that there are many large rock outcrops on the edge of the continental shelf that would be problematic for cable laying (Eitreim et al. 2004, Allen pers. comm.).

Alternative-2

A second alternative cable route was identified along the south side of the Monterey Canyon (Figure 2-3). This route makes it possible to place the node in the Smooth Ridge location described above and required for scientific study of benthic communities and areas west of the San Gregorian fault line to complement the land-based network of broadband seismic stations. However, this alternative route would require the cable to traverse the Monterey Canyon exposing the cable to strong turbidity currents typical of active canyons.

Monterey Canyon is one of the largest active submarine canyons along the west coast of North America. Landslides and turbidity currents created by mass wasting events steepen the canyon walls, and erode and expose basement and bedrock. Turbidity currents can travel at speeds between 13 centimeters per second (cm/s) and 90 kilometers per hour (km/h) and can spread sediments and materials up to 1,000 km from its original source (Fugro 2004). Methods do not exist for effectively predicting these events, and severe damage to the cable could result. Based on the results of the Fugro BAS (2004), this route is not being retained for further consideration as an alternative cable route for the project.

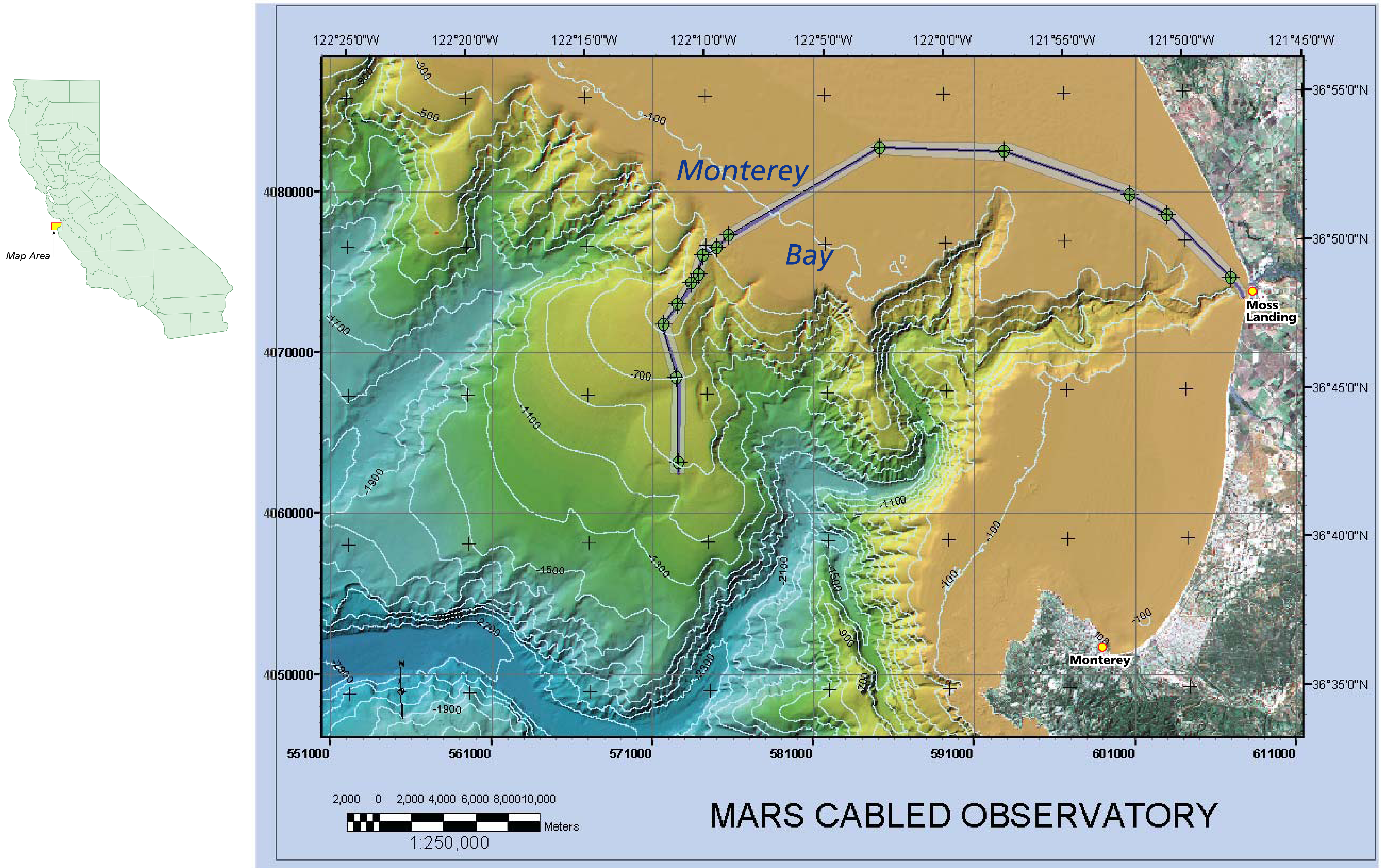


Figure 2-1 **Project Location and Cable Route**

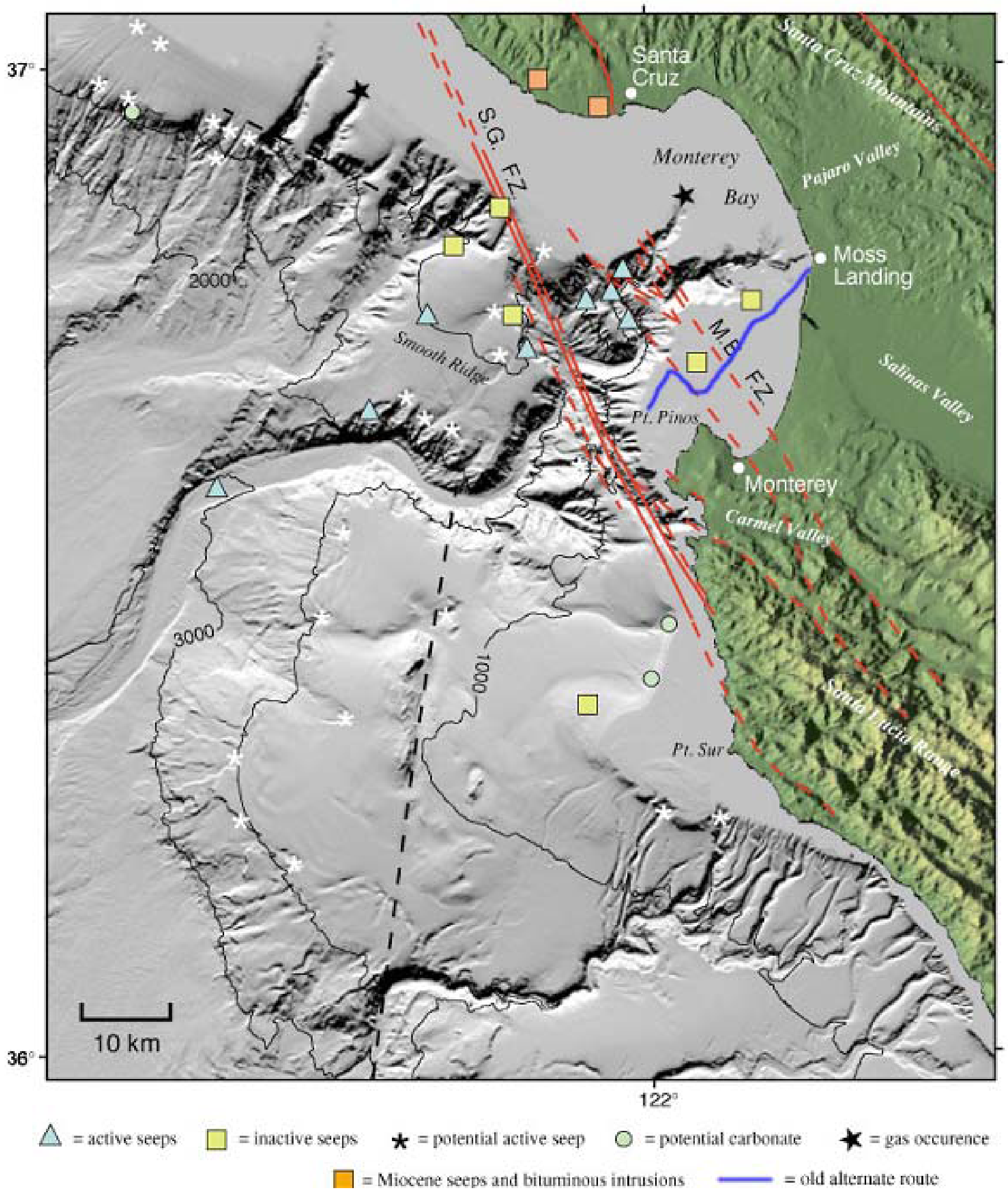


Figure 2-2 **Alternative Cable Route 1**

Map of the Monterey Bay region showing the locations of major fault zones and fluid seep localities. Red lines are active faults, dashed where inferred. Black lines are inactive faults. S.G. F.Z. and M.B. F.Z. indicate San Gregorio and Monterey Bay fault zones, respectively. The blue line represents the old alternative route, which is no longer being considered.

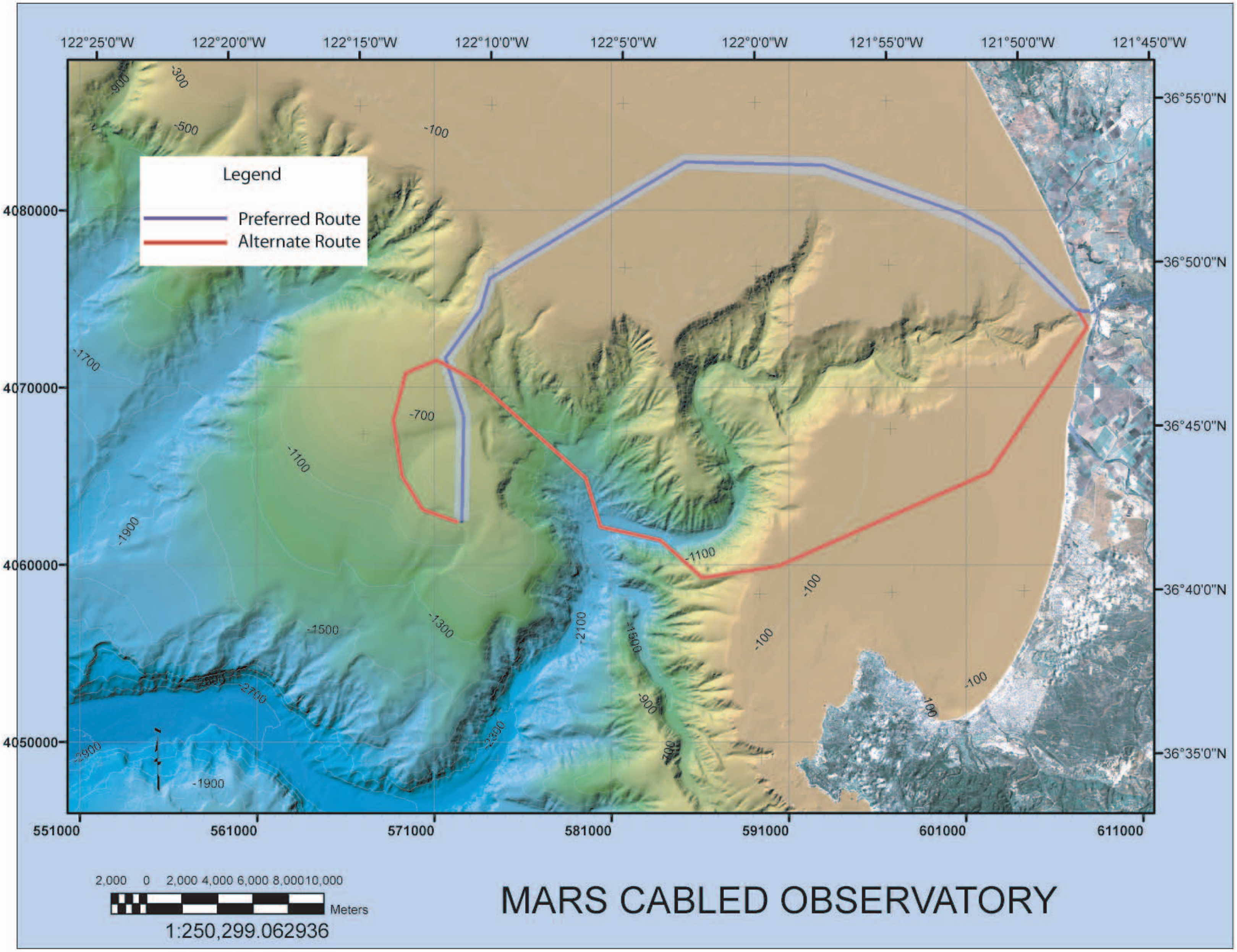


Figure 2-3 **Preferrred and Alternate Cable Route 2 for the MARS Cable**

Figure 2-4 **Existing Duke Energy Pipeline**

1993 USGS aerial photograph of Moss Landing indicating the relative locations of the Duke Energy Power Station and the pipe. The X marks the present location of the main MBARI building.

3 Environmental Setting

3.1 Agency Correspondence Summary

MBARI is working closely with the MBNMS and other agencies, including the California State Lands Commission (CSLC), to acquire all the proper permits to install the cable as well as to ensure the cable does not cause damage to the fragile marine ecosystems within the Sanctuary. A complete list of agency correspondence to date is provided in Appendix A.

3.2 Field Studies and Site-Specific Surveys

In developing the proposed cable route, node location, and onshore facilities, surveys were conducted in order to select a route that accomplishes all of the goals MBARI has set forth for the proposed project including: termination in an area of scientific interest, avoidance of restricted areas and obstructions, avoidance or minimization of impacts on sensitive natural resources and local communities, protection of the cable, and burial to the fullest extent possible along the entire cable route. This section provides a brief summary of the relevant surveys performed in support of these goals.

3.2.1 Geophysical and Burial Assessment Surveys

Fugro Seafloor Survey, Inc. (FSSI) performed a geophysical and a burial assessment survey (BAS) to acquire side-scan imagery and subbottom data, as well as soil condition information to be used for the safe engineering, construction, installation and subsequent maintenance of the MARS cable. Bathymetric data were provided to FSSI by MBARI prior to the offshore operations, and not collected during the surveys. The offshore surveys were conducted on board MBARI's research vessel "R/V Western Flyer", and the data were collected on a 24-hour basis.

For the geophysical survey, side-scan sonar intensity and subbottom profiler data were acquired using a GeoAcoustics Deep Tow 2000 within a 1,000-meter wide corridor and with a 100% side-scan sonar data overlap in water depths greater than 20 meters. In shallower areas the contract required surveying a swath of only 500 meters. The suitability of the cable route was determined onboard the vessel, based upon real-time paper records and existing bathymetric data.

To ground-truth the geophysical data and better assess the seabed conditions and the feasibility for cable burial, a geotechnical survey was conducted immediately after the geophysical survey. It consisted of using the Fugro SeaScout to collect Mini Cone Test (MCT) data at 31 locations along the MARS cable route, between 19 and 888 meters water depth.

3.2.2 ROV Surveys

In an effort to characterize seafloor habitats and determine potential environmental impacts to the benthic communities during cable-laying operations, biological data were obtained at two scales. Epifaunal animals are those large enough to be seen on video footage obtained on ROV surveys of the proposed route. Infaunal animals are small organisms that live in soft sediment.

Benthic Communities

In an effort to characterize benthic infaunal and epifaunal communities along the proposed MARS cable route, MBARI conducted biological surveys in October 2003. During these surveys, Remotely Operated Vehicles (ROVs) were used to collect video data and sediment cores for studies of infaunal diversity and abundance. For this analysis, data was incorporated from video and sediment samples collected during a study of the former proposed MCI cable route that followed a portion of the MARS route.

Sediment Cores

Sediment cores are collected using the ROV, then gently washed through a mesh sieve to recover the animals. Identification of all organisms was performed to the lowest practical taxonomic level, and the mean organism abundance and number of different taxa was reported. Specific survey locations were chosen to target representative substrate and habitat types along the proposed route. A total of 39 hours of video, 67 push cores and nine Smith-McIntyre grabs were collected from 11 stations. A cumulative distance of 55.2 km of seafloor was surveyed at least once. Seventy-six percent (40.2 km) of the 52.9 proposed MARS cable route was observed.

3.3 Baseline Conditions

The entire MARS cable route lies within the Monterey Bay National Marine Sanctuary (MBNMS). The MBNMS was designated in 1992 as a federally protected marine area and is managed by the Monterey Bay Sanctuary Office in Monterey. It stretches offshore of California's central coast from Marin to Cambria, and encompasses a shoreline length of 276 miles and 5,322 square miles of ocean extending an average distance of 30 miles from the shore. See Figure 3-1 for general location map of the MBNMS boundaries.

The MBNMS was established for the purpose of resource protection, research, education and public use. Its natural resources include the nation's largest kelp forest, one of North America's largest underwater canyons and the closest-to-shore deep ocean environment in the continental United States. It is home to one of the most diverse marine ecosystems in the world, including 33 species of marine mammals, 94 species of seabirds, 345 species of fish, and numerous invertebrates and plants.

During consultations prior to preparation of this document, the USFWS and NOAA Fisheries provided the names of several Federally listed species that potentially occur in the project area:

- Santa Cruz long-toed salamander (endangered);
- California tiger salamander (endangered/threatened);
- Smith's blue butterfly (endangered);
- Monterey spineflower (threatened);
- robust spineflower (endangered);
- Yadon's wallflower (endangered);
- sand gilia (endangered);
- beach layia (endangered);
- Tidestrom's lupine or Clover lupine (endangered);
- coastal dunes milkvetch (endangered);
- Yadon's piperia (endangered); and
- Hickman's potentilla (endangered).

Due to the location of the onshore components and given that the project proposes to use the existing Duke Energy pipeline and existing concrete foundation for the MARS Shore Facility (shore power supplies, breakers, hubs, and various support equipment), it is not expected that any of the above species will be present in the project area due to the lack of potential habitat and therefore will not be impacted by the project.

The following sections describe general existing conditions in the project area, including habitat conditions and biota.

3.3.1 Geophysical Survey and Burial Assessment

The FSSI survey data suggests that burial should be easily achieved along the portion of the route that runs across the continental shelf, i.e. between the end of the Duke Energy pipeline and the 90-meter depth contour. Data also suggest that burial may be difficult to achieve in other areas of the route due to exposed rocks or cemented sediment on the seafloor at the continental shelf break and along the Smooth Ridge.

Areas of concern with regard to burial feasibility occur southwest of the San Gorgonio-Palo Colorado Fault on Smooth Ridge (105-405 meters depth) and along a 1-2 kilometer long segment of route up the slope to the nearest fault. Other relatively localized, authigenic hard-ground carbonates also occur in some areas along the route generally associated with cold seeps and fault zones.

3.3.2 Marine Mammals

The waters off California support an incredible abundance and diversity of marine mammals (33 species), primarily because of the numerous upwelling centers that stimulate primary production, the central location between arctic and tropical areas, and the diversity of habitats and prey (Harvey 1998). Some species migrate through the area on their way to summer feeding or winter breeding areas (e.g., gray whales), some spend summer and fall off California feeding (e.g., blue and humpback whales) and others reside in the area year round (e.g., harbor seals and sea otters). All marine mammals are protected by the Marine Mammal Protection Act of 1972, and other species are further protected by the Endangered Species Act or California state laws because their populations are at extremely low levels (e.g., sea otter).

Tables 3-1, 3-2, and 3-3 provide summaries of marine mammal species occurring off central California, including estimated minimum number of individuals off California (or in combination with other places if estimates not possible for CA only; Forney et al. 2000) and federal and state status.

Table 3-1 Pinnipeds Known to Occur off the Central California Coast

Common Name	Scientific Name	Estimated Numbers in California	Status
Northern elephant seal	*Mirounga angustirostris*	51,625	--
Pacific harbor seal	*Phoca vitulina richardsi*	27,962	--
California sea lion	*Zalophus californianus*	109,854	--
Steller sea lion	*Eumetopias jubatus*	2,042	FT
Northern fur seal	*Callorhinus ursinus*	2,336 (CA) 900,000 (AK)	D
Guadalupe fur seal	*Arctocephalus townsendi*	few	ST

Key:

D = Depleted (under the Marine Mammal Protection Act Special Status).
FT = Federally listed threatened.
ST = State listed threatened.

Table 3-2 Cetaceans Known to Occur off the Central California Coast

Common Name	Scientific Name	Estimated Numbers in California	Status
Blue whale	*Balaenoptera musculus*	1,716	FE
Fin whale	*Balaenoptera physalus*	1,044 (CA, OR, WA)	FE
Sei whale	*Balaenoptera borealis*	unknown	FE
Minke whale	*Balaenoptera acutorostrata*	440 (CA, OR, WA)	--
Bryde's whale	*Balaenoptera edeni*	12	--
Humpback whale	*Megaptera novaeangliae*	861	FE
California gray whale	*Eschrichtius robustus*	26,635	

Table 3-2 Cetaceans Known to Occur off the Central California Coast

Common Name	Scientific Name	Estimated Numbers in California	Status
Pacific right whale	*Eubalaena glacialis*	unknown	FE
Sperm whale	*Physeter macrocephalus*	995 (CA, OR, WA)	FE
Pygmy sperm whale	*Kogia breviceps*	2,837 (CA, OR, WA)	--
Dwarf sperm whale	*Kogia simus*	unknown	--
Baird's beaked whale	*Berardius bairdi*	313 (CA, OR, WA)	--
Cuvier's beaked whale	*Ziphius cavirostris*	4,309 (CA, OR, WA)	--
Hubbs' beaked whale	*Mesoplodon carlhubbsi*	unknown	--
Short-finned pilot whale	*Globicephalamacrorhynchus*	717 (CA, OR, WA)	--
Killer whale	*Orcinus orca*	639 (CA, OR, WA)	--
False killer whale	*Pseudorca crassidens*	unknown	--
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	17,475 (CA, OR, WA)	--
Northern right whale dolphin	*Lissodelphis borealis*	10,060 (CA, OR, WA)	--
Risso's dolphin	*Grampus griseus*	13,079 (CA, OR, WA)	--
Short-beaked common Dolphin	*Delphinus delphinus*	318,795	--
Long-beaked common dolphin	*Delphinus capensis*	27,739	--
Bottlenose dolphin	*Tursiops truncatus*	154 (nearshore), 850 (offshore)	--
Striped dolphin	*Stenella coeruleoalba*	17,995 (CA, OR, WA)	--
Dall's porpoise	*Phocoenoides dalli*	81,866 (CA, OR, WA)	--
Harbor porpoise	*Phocoena phocoena*	4,172 (central CA)	--

Key:

FE = Federally listed endangered.

Table 3-3 Mustidae Known to Occur off the Central California Coast

Common Name	Scientific Name	Estimated Numbers in California	Status
Southern sea otter	*Enhydra lutris*	2,100	FT

Key:
FT = Federally listed threatened.

3.3.3 Fish

Historically, Monterey Bay has been one of the most important commercial and recreational fishing areas in California. Nearly 200 species of fish and invertebrates are caught and landed in the area each year by commercial and recreational fisheries. A complete EFH Assessment is provided in Appendix B of this document.

Commercial Activities

Little if any bottom contact fishing occurs in areas shallower than 55 meters water depth, with the exception of sea urchin and abalone diving, and crab, lobster and live fish pot fishing. Bottom set gillnetting is prohibited at depths of less than 180 feet (55 meters) along the central California coast. Trawling is prohibited within 3 nautical miles (5.56 km) off the shore. Between the 3-nautical mile inshore trawl boundary and the 200-meter depth contour lies the shallow water trawl, gillnet, and other gear fishing grounds. These grounds generally extend from Monterey Canyon to north of Half Moon Bay and are popular fishing areas for California halibut, sand dabs, sole and white croaker (kingfish).

The deepwater trawl, longline, and occasionally set gillnet fishing grounds occur at the 200 to over 1,400 meter depths. Popular deepwater fishing grounds are located off Point Sur south of Monterey, on the Outer and Inner Teardrop, off the Cement Plant and the Horseshoe, in the Heidi Hole and along the Antlers, and at the Garbage Dump offshore south of Half Moon Bay. These areas produce rockfish, Dover sole, sablefish, Pacific grenadier, and other deep-water species. Several areas farther offshore, off of Monterey and the Teardrop, south of the Cement Plant and offshore of the Antlers are popular for sablefish and Pacific grenadier longlining. Nearly the entire MARS cable route passes through one or more of these popular commercial fishing areas.

Bottom trawling can occur at depths of up to 1,400 meters but review of logbook records indicate that, in the Monterey Bay area, trawl tows at depths over 1,000 meters are rare. Most bottom trawl effort occurs at depths of 50 to 500 meters. In recent years, with every increasing restriction on footrope bobbin diameter and trip limits on rockfish species, the deep-water bottom trawling effort has been further reduced. It is increasingly confined to depths of 50 to 200 meters.

Recreational Activities

Recreational fishing occurring in the Monterey Bay area includes charter bottom fish, salmon and tuna, personal vessel bottom fish and recreational dive fisheries. Off the Monterey – Morro Bay area, approximately 40,000 to 50,000 private boats launch for sport fishing trips each year. Recreational sport fishing occurs year-round but is typically concentrated in the period from May through October in the general project vicinity.

Commonly targeted species of bottom or groundfish, other than halibut, include those in the rockfish complex, lingcod and greenling. Flounders are targeted, but typically only in very near-shore locations usually in less than 30 meters of water. The sport fishing effort for rockfish and lingcod is concentrated around rocky bottom structures at depths of less than 275 meters. Although black rockfish and widow rockfish are sometimes taken in midwater or even near the surface, it is normally done over rocky bottom structures.

Of primary concern to an unburied bottom laid cable is the anchoring of sport fishing vessels while conducting bottom-fishing operations. Depending upon the type of bottom, the size of the vessels and their anchors, and the weather and tide conditions, the anchors may penetrate up to 0.25 meters into the bottom. Anchoring is reported to occur at depths of less than 30 meters on popular rocky fishing areas. On rocky bottom the vessel's anchor typically penetrates little if any depth into the substrate.

3.3.4 Benthic Communities

Infaunal Analysis

The following information was compiled from ROV surveys and sediment core samples taken along the proposed cable route. Section 3.2 above provides details on survey methodology and results analysis.

Polychaete worms were the dominant group both in abundance and taxa richness at most depths. Abundant polychaetes included *Magelona hartmanae*, *M. sacculata* and *Scoletoma luti* (25 m), *Chaetozone lunula*, *Aricidea* (*Acmira*) *catherinae*, and *Mediomastus* spp. (44 m), *A. catherinae* (47 m), *Sternaspis nr. fossor* (60 m), *Mediomastus* spp. and *Spiophanes berkeleyorum* (90 m), *Sphaerosyllis ranunculus* (325 m), *Onuphidae* spp., *Protodorvillea gracilis* and *S. ranunculus* (450 m) and *Cossura pygodactylata* (885 m). *Oligochaetes* dominated at the 885 m station.

Gammarid amphipods were the most abundant organism at the 640 m (*Ampelisca unsocalae*, *Lepidepecreum serraculum*, and *Tiron biocellata*), 770 m (A. *unsocalae*, *Photis typhlops*, and *Byblis barbarensis*), and 795 m (*L. serraculum* and *A. unsocalae*) stations, and most species at 640 and 770 m. Gammarids were relatively abundant (one the top five most abundant taxonomic groups of animals) at all stations.

Other relatively abundant animals include Bivalves (44, 47, 60, 90, 640 m), Nemertea (44, 47 m), Ostracods (44, 47, 325 m), and Ophuroids (60, 90, 450 m). Caprellids (*Tritella tenuissima*) and Tanaids were abundant at the 325 and 450 m stations. Taxa diversity for Gastropods was relatively high at the 60 and 90 m stations, and for Ophuroids at 90 and 325 m. Isopods and Tanaids were diverse at 325 m.

Benthic Megafaunal Analysis

A gradient was observed in the distribution and abundance of benthic megafauna from the shallow, energetic (sand ripples) stations dominated by mobile megafauna and accumulations of drift kelp and other debris, to less physically disturbed (by wave action) sites on the continental shelf (60 – 139 m) that included higher densities of sessile sediment-dwelling megafaunal invertebrates, notably the seapens *Ptilosarcus* and *Pennatula*. Due apparently to chronically higher rates of erosion, the substratum on continental shelf break and upper slope are often rock outcrops, which house a variety of sessile invertebrates and serve as physical structure favored by various mobile fishes and invertebrates. Sedimentary substratum returns deeper (>450 m) on the continental slope where seapens once again are conspicuous members of the benthos, which also includes a variety of anemones and holothurians. The relative abundance of fishes declines with depth, as invertebrates become more abundant.

Depths of 10-24 Meters

Between 10-24 m, there was poor visibility and a rippled sand bottom, with large areas with shell hash, sparse drift kelp and no visible fauna. Other areas in this depth range included patchy accumulations of brown, green and red algae with occasional Cancer crabs, seastars, polychaete worms (*Diopatra ornata*), and small flatfish (*Citharichthys* spp.). Structures at the Kaiser (National Refractories) outfall (12.5 m water depth) and the Duke Energy outfall (18.7 m water depth) supported communities of the small corallimorph, *Corynactis californica*, and large anemones (*Metridium farcimen*).

Depths of 25-39 Meters

At 25-39 m, sand with drift kelp and gastropods were the dominant seafloor features, plus sparse sea pens, flatfish, seastars and drifting eel grass. Between 40 and 59 m there were abundant Ceriantharid anemones, flatfish (*Citharichthys* spp.), the seastar *Luidia foliolata* and the seapen *Stylatula elongata*; the substrate here was silty mud with fine grain sand.

Depths of 60-139 Meters

From 60 to 139 m, *S. elongata*, and the seastar *Rathbunaster californicus* were very abundant. The anemone *Metridium farcimen*, flatfish, seapens *Ptilosarcus gurneyi* and *Pennatula* sp. were also common. There are occasional scoured surfaces and occasional rock outcrops.

Depths of 140-200 Meters

At 140-200 m *R. californicus* was the dominant organism. A few species of rockfish, flatfish and holothurians were present, but not abundant. Shell hash was locally dense in some areas between 175-191 m.

Depths of 280-449 Meters

Rock outcrops became more prevalent from 280-449 m and the substrate surface appeared eroded at around 425m. *Allocentrotus fragilis* (urchin), *Merluccius* *productus* (Pacific Whiting), and *R. californicus* were very abundant. Other species associated with hard substrates (rockfish, sponges, anemones, holothurians, and crinoids) were also present in high numbers. There were numerous rays (primarily *Raja rhina*), catsharks, and several species of flatfish. There was a large aggregation of hermit crabs at 474 m.

Depths of 450-599 Meters

From 450-599 m the seapen *Halipteris californica* was the dominant organism. The *Liponema brevicornis* (an anemone), *M. productus* and the flatfish *Microstomus pacificus* were also present in high abundance.

Depths Over 600 Meters

At depths over 600 m seapens *H. californica*, and *Umbellula lindahli* dominated. The crab *Chionoecetes tanneri*, the rockfish *Sebastolobus*, gastropods and small Mesomyarian anemones were very common.

3.3.5 Sea Turtles

Only three species of sea turtles are observed in Monterey Bay, and only the Leatherback sea turtle is observed in significant numbers. Occurrences of Leatherback, olive ridley, and Green sea turtles have been documented via fishing vessel surveys and beachcast records (Starbird et al. 1993, MLML Stranding Network unpub. data), and more recently by aerial surveys in Monterey Bay and along California's coast (Benson S. pers. comm. 2002). During 1986-1991, five live sightings of olive ridley and Green sea turtles were reported, and between 1993 and 2004, five olive ridley's and four Green sea turtles were found dead on beaches in the area (Starbird et al. 1993, MLML Stranding Network unpub. data). Typically the olive ridley and Green sea turtles observed in the area are displaced from warmer waters in southern California, and are "cold-shocked", or lethargic because of the colder water temperatures (Starbird et al. 1993).

The Leatherback sea turtle, however, is more accustomed to the cold water in Monterey Bay, and migrates here annually to feed on scyphomedusae that aggregate along upwelling fronts in late summer and fall (S. Benson pers. comm.). During 1986-1991, 96 Leatherback turtles were sighted by fishing vessels, and 12 were found stranded (Starbird et al. 1993). During 1993-2004, 20 Leatherbacks were reported stranded on Monterey County beaches to the MLML Stranding Network.

All sea turtles breed in tropical areas, and species observed in Monterey Bay are either migratory (Leatherback) or vagrant (Green and olive ridley). Of the 19 Leatherback sea turtles that have been tagged and tracked in Monterey Bay, most remained in the bay a couple of days before moving further west, however some turtles may remain in the bay for weeks at a time (Benson S. pers. comm. 2002).

Table 3-4 Sea Turtles Potentially Occurring within the Project Area

Common Name	Scientific Name	Status
Leatherback sea turtle	*Dermochelys coriacea*	FE
Olive ridley sea turtle	*Lepidochelys olivacea*	FT
Green sea turtle	*Chelonia mydas*	FT

Key:
FT: Federally listed threatened.
FE: Federally listed endangered.

3.3.6 Marine Birds

Monterey Bay has been identified as an area of biological importance for seabirds, primarily because of the strong upwelling and subsequent primary production (Ainley 1976, Briggs et al. 1987, Benson 2002). The unique bathymetry of Monterey Bay includes a deep submarine canyon that bisects the continental shelf and attracts species to the shallow, nearshore habitat, the productive shelf-edge habitat, and the deep water habitat, all within a few kilometers of shore (Ainley and Terrill 1996).

Some seabird species are resident to the area, whereas others either spend winter in the area or migrate to Monterey Bay to feed on the abundance of prey present during certain times of the year. Nearly one half of the seabirds nesting in California and millions more seasonal migrants are observed in Monterey Bay at various times of the year (Briggs et al. 1987). Mean densities of birds in Monterey Bay are approximately 172.5-birds/km^2 and average approximately 20.5 species/month (Mason 1997). Greatest numbers of seabirds are observed nearshore in mid-fall and early spring, when there is an overlap between wintering birds and the arrival or departure of migratory species (Benson 2002, Henkel 2003).

Seabirds commonly observed in Monterey Bay are discussed below in three groups – resident, wintering, and migratory. A description of each group, as well as common examples of species within each group, is provided.

Resident Seabirds

Resident seabirds are defined here as those species that breed within Monterey Bay, as well as those that breed in the areas surrounding Monterey Bay, and are present throughout the majority of the seasons. Commonly occurring resident seabirds include the Western gull, Caspian tern, pigeon guillemot, marbled murrelet, common murre, Brandt's cormorant and pelagic cormorant (Baltz and Morejohn 1977, Ainley and Hunt 1991, Roberson 2002). The Brandt's cormorant breeds on piers, rocks and other structures and is commonly seen throughout Monterey Bay (within 50 km). The Western gull also breeds coastally on cliffs, islets and rooftops and is one of the most common and conspicuous species in Monterey Bay (Roberson 2002). Common murres breed on islands to the north and south of Monterey Bay, and are observed offshore year round (Mason 1997).

Wintering Birds
A number of seabirds migrate to Monterey Bay in the early fall and remain through the winter, using Monterey Bay as a rest stop and foraging area. Common species include surf scoters, Western/Clark's grebes, brown pelicans, and common loons. Most of these species are more abundant in the nearshore waters of the Bay (within 5 km), and commonly feed in shallow nearshore waters, either plunge or pursuit diving for prey (Henkel 2003).

Migratory Seabirds
Many species of seabirds migrate to Monterey Bay in the late summer and early fall to take advantage of the high productivity in the region. Some species, such as the sooty shearwater, occur in incredibly large numbers in late summer and make up the majority of the birds encountered in Monterey Bay (Briggs et al. 1987, Ainley and Terrill 1996). Common migratory species include the shearwaters, storm-petrels, black-footed albatross, red and red-necked phalaropes, northern fulmars, Hermann's gulls, and rhinoceros auklets. Typically these birds arrive and remain in Monterey Bay for a couple of months, then make the large migration back to their breeding areas in late fall and winter.

3.4 Species of Concern
The following sections discuss the threatened or endangered species potentially occurring within the project area. Information provided includes status, critical habitat (if any), range, and known occurrences in the project area.

3.4.1 Marine Mammals

Stellar Sea Lion
On April 05, 1990, the Steller sea-lion was designated as federally threatened in the entire range, except the population segment west of 1440 W. Long. Within the area covered by this listing, this species is known to occur in: Alaska, California, Oregon, Washington; Canada (B.C.).

The Steller Sea Lion usually stays in the water during poor weather, but otherwise spends much time "hauled out" on rocky shores; it will dive into the sea if a boat approaches. Common foods include fish, including commercially valuable species, such as salmon, squid, clams, and crabs. The Steller Sea Lion usually feeds at night in water less than 180 m deep and within 15–25 km of shore. Steller Sea Lions are believed to range widely during the nonbreeding season. Some females routinely travel 400 km south of their haul-out on six-week foraging trips.

Critical habitat has been designated for this species in California in Aňo Nuevo Island, Southeast Farallon Island, Sugarloaf Island, and Cape Mendocino. These areas include major Stellar sea lion rookeries and associated air and aquatic zones. Critical habitat includes an air zone that extends 3,000 feet (0.9 km) above areas historically occupied by sea lions at each major rookery in California, measured vertically from sea level, as well as an aquatic zone that extends 3,000 feet (0.9 km) seaward in State and Federally managed waters from the baseline of each major rookery.

Northern Fur Seal

Northern fur seals have been delisted. Fur Seals range from the Bering Sea to the waters of northern Japan and southern California in the Pacific Ocean from November to May. This oceangoing fur seal sometimes migrates up to 6,200 miles, returning to land only during the breeding season around May. Currently, in the United States, rookeries exist on several Pacific Islands, including San Miguel Island (since 1968).

Blue Whale

On June 02, 1970, the Blue whale was designated as federally endangered in the entire range. Within the area covered by this listing, this species is known to occur in California and Oceanic regions. They migrate to polar waters in summer for feeding and return to warmer seas in winter for breeding - covering thousands of kilometers every year. This species is rarely seen near the coast and feeds on plankton.

Fin Whale

Fin whales are listed as federally endangered and have been listed since the inception of the ESA (1970). Fin whales may dive to depths of over 100 fathoms and can remain submerged for up to 25 minutes. Typically, fin whales remain near the surface for a series of breaths every 10-12 seconds and will then go into a sounding or terminal dive. They may migrate to subtropical waters for mating and calving during the winter months and to the colder areas of the Arctic and Antarctic for feeding during the summer months.

Sei Whale

On June 02, 1970, the Sei whale was designated as federally endangered in the entire range. Sei whales are found in temperate and sub-tropical waters, and migrate between these areas annually. This species is essentially a dweller of the open ocean, not generally found inshore or in coastal waters. The Sei whale tends to follow shelf contours and plankton gatherings.

Humpback Whale

On June 02, 1970, the Humpback whale was designated as federally endangered in the entire range. North Pacific humpbacks spend their winter months in low-latitude, warm waters where they mate, calve and nurse their young. Hawaii is the primary breeding ground for the North Pacific humpback. Others will migrate to areas south of Japan, and off of mainland Mexico and the Baja peninsula. Feeding areas for the North Pacific stock range from Northern California, up through Alaska and west towards the Aleutian Islands. Humpback whales live at the surface of the ocean, both in the open ocean and shallow coastline waters. When not migrating, they prefer shallow waters.

Northern Pacific Right Whale

The right whale is listed as federally endangered under the ESA of 1973. Migratory patterns of the North Pacific stock are unknown, although it is thought that they inhabit colder waters for feeding in the summer, and then migrate to warmer waters for breeding and calving. Although they may move far out to sea during their feeding seasons, right whales give birth in coastal areas in the winter months. The three most recent sightings of the Northern Pacific Right Whale south of Alaska have occurred in the MBNMS, two of which occurred in the last four years. The entire region is considered to be within the right whales' range.

Sperm Whale

On June 02, 1970, the Sperm whale was designated as federally endangered in the entire range. There are approximately 1231 sperm whales off the coast of California and they usually inhabit open ocean waters, rarely visiting the continental shelf. Sperm whales are the deepest and longest diving of all Cetaceans, but do not bottom feed. They rely solely on squid and octopi found in the water column.

Southern Sea Otter

On January 14, 1977, the Southern sea otter was designated as federally threatened in the majority of its range. The Southern sea otter is found only along the shore of Central California from San Mateo County to south of Point Conception. Migration occurs twice a year in June-November (breeding season) and November-May. They frequent Kelp beds and rocky shores for forage. The project area does not contain habitat (kelp forests of rocky shores) for the southern sea otter.

3.4.2 Fish

Steelhead

The Southern California steelhead ESU was listed as federally endangered under the ESA in October of 1997. The steelhead is an anadromous species found in coastal streams and creeks in California and Oregon. It generally spends from one month to several years in the freshwater streams, migrates to the sea where it spends one to four years, then returns to streams to spawn. Most spawning occurs from December to May but may occur in the fall as well.

Coho Salmon

Central California ESU coho salmon are federally listed as federally threatened under the federal ESA and listed as endangered under the state ESA. They were listed as threatened by federal ESA on December 2, 1996 and listed as endangered by California ESA on December 31, 1995. Coho salmon generally begin their migration in late summer or fall, and spawning is completed by mid-winter.

3.4.3 Benthic Species

Black Abalone (*Haliotis cracherodii*) are found within the high intertidal zone to 6 m depth and Northern abalone (*H. kamchatka*) are found at the high intertidal zone to 15 m depth. These species of concern live in relatively shallow areas with rocky substratum. The MARS cable route consists of sandy beach habitat at the depths these species inhabit. No abalone or abalone habitat were observed during surveys of the project area.

3.4.4 Sea Turtles

Leatherback Sea Turtle

On June 02, 1970, the Leatherback sea turtle was designated as federally endangered in the entire range. Nesting populations of leatherback sea turtles are especially difficult to discern because the females frequently change beaches. However, current estimates are that 20,000-30,000 female leatherbacks exist worldwide. Critical habitat has been designated for this species, however no critical habitat occurs in California. All sea turtles breed in tropical areas, and Leatherbacks observed in Monterey Bay are considered migratory.

Olive Ridley Sea Turtle

Breeding colony populations on the Pacific Coast of Mexico are listed as federally endangered; all others are listed as threatened as of July 28, 1978. The range of the olive ridley is essentially tropical. In the eastern Pacific nesting takes place from southern Sonora, Mexico, and south at least to Colombia. Non-nesting individuals occasionally are found in waters of the southwestern United States. All sea turtles breed in tropical areas. Olive ridley's observed in Monterey Bay are considered vagrant, and sightings are rare.

Green Sea Turtle

The green sea turtle was listed as federally endangered/threatened on July 28, 1978. The breeding populations off Florida and the Pacific coast of Mexico are listed as endangered while all others are threatened. In the eastern North Pacific, green turtles have been sighted from Baja California to southern Alaska. In the central Pacific, green turtles can be found at most tropical islands. The primary nesting site is at French Frigate Shoals. Critical habitat has been designated for this species, but none occurs in California. All sea turtles breed in tropical areas. Green turtles observed in Monterey Bay are considered vagrant, and sightings are rare.

3.4.5 Marine Birds

Short-tailed Albatross

The short-tailed Albatross is a federally threatened species. They breed in large numbers on at least eleven uninhabited remote islands in subtropical waters south of Japan, generally beginning in October. Adults spend summer non-breeding seasons at sea, feeding on squid, fish and other organisms.

California Brown Pelican

The California Brown Pelican is one of six federally endangered sub species of Brown Pelican occurring largely in tropical and subtropical waters of the Pacific

Ocean. Brown Pelicans are colonial nesters and require nesting grounds free of human disturbance and close to adequate food supplies. Generally, Island-type habitat is required at night. The California Brown Pelican ranges along the coast from British Columbia in the north, south to Central America. Breeding colonies were found at Pt. Lobos in Monterey County up until 1959, and are still found from the Channel Islands south to Baja and the Gulf of California.

California Least Tern
On June 02, 1970, the California least tern was designated as federally endangered in the entire range. The historic breeding range of the California least tern extended along the southern California coast between Santa Barbara and San Diego, with some nesting sites documented as far north as San Francisco Bay and as far south as southern Baja California. Today, the breeding range of these terns is limited to San Francisco Bay and a few areas along the coast from San Luis Obispo County to San Diego County (USFWS 2004). During the winter months, they head south to the Pacific coast of Central America. When feeding, California least terns are often seen following schools of fish.

Marbled Murrelet
The marbled murrelet was listed as a federally threatened species in 1972. Marbled murrelet populations range along the Pacific coast from southern Alaska to central California. They are generally found in nearshore waters (within about three miles of shore) near their nesting sites in old-growth forests inland on a year-round basis. There are only three known remaining nesting areas in California.

Western Snowy Plover
The Western snowy plover was listed as federally threatened in March 1993. Twenty-eight (28) areas along the coast of California, Oregon, and Washington have been identified as critical habitat for the Pacific coast population. Specifically, critical habitat has been designated at Elkhorn Slough/Mudowski Beach/Mud Flat Slat Pond, Moss Landing for winter nesting grounds.

The Pacific coast population breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico. One-hundred-and-thirty-three (133) historical snowy plover breeding or wintering locations have been identified in California. The majority of wintering (non-breeding season) plovers concentrate on sand spits and dune-backed beaches. Some also occur on urban and bluff-backed beaches, which are rarely used for nesting. The breeding season for western snowy plovers extends from early March to late September.

California Clapper Rail
The California clapper rail was listed federally endangered on October 13, 1970. The breeding season of California clapper rails begins by February. Nesting starts in mid-March and extends into August. The end of the breeding season is typically defined as the end of August, which corresponds with the time when eggs

laid during re-nesting attempts have hatched and young are mobile. Clapper rails are most active in early morning and late evening, when they forage in marsh vegetation in and along creeks and mudflat edges. They often roost in dense vegetation at high tide during the day.

Throughout their distribution, California clapper rails occur within a range of salt and brackish marshes, however, California clapper rails are now restricted almost entirely to the marshes of San Francisco estuary, where the only known breeding populations occur.

Table 3-5 Threatened or Endangered Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Federal Status	Likelihood of Occurrence in Project Area
Stellar sea lion	*Eumetopias jubatus*	Threatened	Moderate
Northern fur seal	*Callorhinus ursinus*	Delisted	Moderate
Blue whale	*Balaenoptera musculus*	Endangered	High
Fin whale	*Balaenoptera physalus*	Endangered	Moderate
Sei whale	*Balaenoptera physalus-borealis*	Endangered	Moderate
Humpback whale	*Megaptera novaeangliae*	Endangered	High
Pacific right whale	*Eubalaena japonica*	Endangered	High
Sperm whale	*Physeter catodon (=macrocephalus)*	Endangered	High
Southern sea otter	*Enhydra lutris nereis*	Endangered	Moderate
Leatherback turtle	*Dermochelys coriacea*	Endangered	High
Olive Ridley sea turtle	*Lepidochelys olivacea*	Threatened	Low
Green sea turtle	*Chelonia mydas*	Threatened	Low
Short-tailed albatross	*Phoebastria albatrus*	Endangered	High
California brown pelican	*Pelecanus occidentalis californicus*	Endangered	High
California least tern	*Sterna antillarum browni*	Endangered	High
Marbled murrelet	*Brachyramphus marmoratus marmoratus*	Threatened	Moderate
Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened	High
California clapper rail	*Rallus longirostris obsoletus*	Endangered	Low
Steelhead	*Oncorhynchus mykiss*	ESU- Endangered	Low
Coho salmon	*Oncorhyncus kisutch*	ESU- Threatened	Low

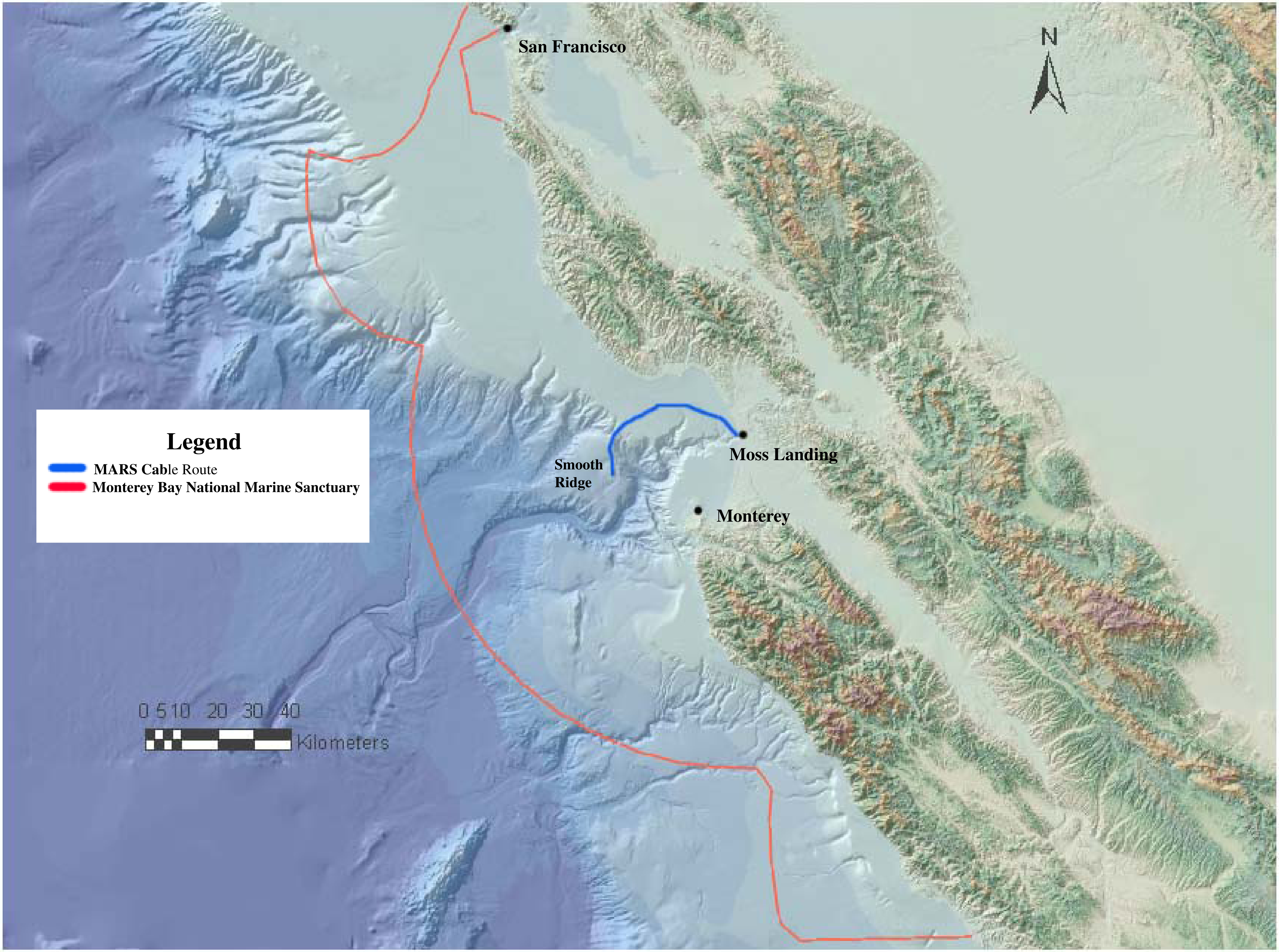


Figure 3-1 **Monterey Bay National Marine Sanctuary Boundaries**

4 Effect of Action, Conservation Measures, and Take Assessment

4.1 Effects of Action

The effects of the project to habitat in the project action area are discussed below, in terms of temporary construction impacts, permanent effects of the project and the cumulative effects of past, current, and future projects in the project area. This section discusses potential impacts from construction and operation of the project, the conservation measures that would be employed to eliminate or reduce potential adverse impacts resulting from project activities, an assessment of "take" for each species of concern, and a preliminary determination of effect.

Take is defined by the ESA, Section 3(19), to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." USFWS regulations (50 CFR 17.3) define the terms harass and harm further, as follows:

> *Harass means an intentional or negligent act or omission that creates the likelihood of injury to wildlife from being annoyed to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering.*
>
> *Harm is an act that actually kills or injures wildlife. Such acts may include significant habitat modification or degradation when wildlife are actually killed or injured by significantly impairing essential behavior patterns including breeding, feeding, or sheltering.*

4.2 Marine Mammals

Disturbance of any marine mammals is unlawful without a permit (Marine Mammal Act of 1972), and NOAA Fisheries is authorized to issue permits or place requirements on activities that may take (i.e. harass, hunt, capture, harm, or kill) marine mammals.

Federally listed threatened or endangered marine mammals potentially occurring within the project area include the Stellar sea lion, Northern fur seal, blue whale, fin whale, sei whale, humpback whale, Pacific right whale, sperm whale, and southern sea otter.

The placement of fiber-optic cables on the sea floor in the nearshore environment (e.g., within 50 km of shore) has the possibility of disturbing marine mammals via the presence of vessels and noise during placement or the possibility of harming individuals via entanglement with the cable or collisions with the vessels. Marine mammals potentially could be affected by the cable-placement process via (1) entanglement with the cable or other lines in the water, (2) collisions with vessels, (3) visual disturbance, or (4) acoustic disturbance. Additionally, the cable once placed on the seafloor could affect marine mammals. However, because the proposed MBARI cable will be buried to 1.0 meter depth to the fullest extent possible along the entire route, it is unlikely there will be any negative impacts to marine mammals once the cable is in place.

Effects of Entanglements

Marine mammals can become entangled in underwater cables. Thirteen cases of entanglement in cable by sperm whales have been reported (Slijper 1962). Eight entanglements occurred in the North Pacific, one off Nova Scotia, one in the Persian Gulf, one off Brazil, and two off South America. In six of these cases sperm whales were caught in cable in 450 fathoms (about 225 m) of water, in the other cases the cable was 50 to 175 fathoms deep (Slijper 1962). One humpback was reported entangled in cable in 60 fathoms of water off Alaska. All of these whales became entangled in cables after the cable was placed on the sea floor. Sperm whales, which dive to great depths during foraging, have become entangled probably while actively searching or chasing squid, their primary prey. Because sperm whales can dive to depths of 2000 m, cables placed on the continental shelf and slope potentially can entangle sperm whales. Humpback whales, and all baleen whales, do not dive as deep as sperm whales, hence only unburied cables placed at depths less than 200 m would pose a potential danger of entanglement.

<u>Conservation Measures:</u>

- The cable will be buried to a target depth of one meter for the entire route except where hard bottom seafloor prevents it. It is expected that most of the cable will be easily buried to the target depth.

- Timing of the cable installation during off-peak marine mammal seasons will reduce the potential for entanglement with the cable during installation. Based on the migratory patterns of the species known to occur in the project area, it is expected that the installation activities be performed during late summer - after gray whales have migrated through the area, and before the influx of large baleen whales (e.g., humpback, blue, and fin whales) and oceanic dolphins.

- NOAA Fisheries-approved marine mammal monitors will be present during cable-laying activities to ensure that any marine mammal entering the established (minimum) 500-foot safety zone is sighted. (See Effects of Noise for safety zone establishment.)

Take Assessment: After implementation of the conservation measures, no take is expected.

Effects of Collisions

Because marine mammals must breathe at the ocean's surface, fast traveling vessels may collide with marine mammals while they surface to breathe. Three humpback whales (between 1993 and 1997), four blue whales (between 1980 and 1993), and three fin whales (between 1991 and 1997) were struck by vessels off the west coast of the U.S. (Forney et al. 2000). During 2,259 hours of cable-placement activities off Morro Bay, California in 2001, only three large whales came within 100 m of a cable-placement vessel (Harvey et al. 2001). However, one of these individuals, a single gray whale calf, probably encountered the vessel's propellers and lost its entire flukes section.

Conservation Measures:

- Cable-laying vessel speed limits of generally less than two knots will be established and enforced. Smaller support vessels will also be required to maintain moderate speeds (3-5 knots) during installation and operation/maintenance activities.

- NOAA Fisheries-approved marine mammal monitors will be present during cable-laying activities to ensure that any marine mammal entering the established (minimum) 500-foot safety zone is sighted. (See Effects of Noise for safety zone establishment.)

- Timing of the cable installation during off-peak marine mammal seasons will reduce the potential for vessel collisions. Based on the migratory patterns of the species known to occur in the project area, it is expected that the installation activities be performed during late summer - after gray whales have migrated through the area, and before the influx of large baleen whales (e.g., humpback, blue, and fin whales) and oceanic dolphins.

Take Assessment: After implementation of the conservation measures, no take is expected.

Effects of Disturbance

Marine mammals are somewhat susceptible to disturbance when humans approach them. In fact, the NOAA Fisheries uses 100 meters as the closest distance persons can approach a cetacean without possibly causing a change in its behavior (i.e. considered a take under the MMPA). This is also true of pinnipeds. Vessels that approach within 100 meters of harbor seals often cause the animals to enter the water or at least become alert (Bowles and Stewart 1980, Allen et al. 1984). The direction of travel, speed, type of vessel, and changes in speed and direction can cause varying responses by harbor seals ashore.

The presence and operation of vessels can either attract or repel some cetaceans. Dall's porpoise and some species of dolphins (e.g., common, Pacific white-sided, and northern right whale dolphins) are attracted to vessels, and will ride the bow wake of rapidly moving vessels (Würsig et al. 1998). Typically, harbor porpoise will avoid vessels, often reacting dramatically if the vessel is within 30 meters (Harvey pers. obs.). Large whales, including gray whales, generally avoid vessels when they are migrating or feeding. Gray whales in the breeding lagoons, however, may approach idling outboard motors (Jones and Swartz 1984). Although gray whales encounter a great deal of vessel traffic during their migration, they act cautiously near vessels and tend to dive and move around (generally remaining 20-40 meters away) vessels (Harvey pers. obs.). Generally, marine mammals are wary of humans and vessels, and will alter their path or vacate an area if the amount of disturbance is excessive.

<u>Conservation Measures</u>:

- Timing of the cable installation during off-peak marine mammal seasons will reduce the potential for disturbances and avoidance behaviors. Based on the migratory patterns of the species known to occur in the project area, it is expected that the installation activities be performed during late summer - after gray whales have migrated through the area, and before the influx of large baleen whales (e.g., humpback, blue, and fin whales) and oceanic dolphins.

- NOAA Fisheries-approved marine mammal monitors will be present during cable-laying activities to ensure that any marine mammal entering the established (minimum) 500-foot safety zone is sighted. (See Effects of Noise for safety zone establishment.)

<u>Take Assessment</u>: After implementation of the conservation measures, no take is expected.

Effects of Noise

Marine mammals use sound via echolocation and passive listening, to communicate between conspecifics and to determine information about their environment (e.g., depth, presence and position of prey or predators, and location of conspecifics). The effects of anthropogenic noise are (1) interference or masking of marine mammal communication, (2) interference or masking of the ability of marine mammals to sense their environment, (3) disturbance that changes the behavior of marine mammals, and (4) temporary or permanent hearing loss (Moore and Schusterman 1987, Kastak and Schusterman 1996).

The negative effects of noise can cause temporary hearing loss of certain frequencies (i.e. temporary threshold shifts) or permanent hearing loss (i.e. permanent threshold shifts), depending on the intensity, duration, and frequency of the noise.

Anthropogenic noise is produced by many sources, such as: aircraft, vessels, geophysical surveys (e.g., airguns and explosives), dredging, and construction. The larger the vessel usually the greater the noise, supertankers and container ships can produce sounds of 40-70 Hz with source levels of 180-198 dB (re 1 µPa). Three cable-placement vessels (Global Sentinel, Seaspread, and Nexus) off Morro Bay, California produced estimated noise of 9 to 20 Hz peak frequency at 180 – 198 dB (re 1 µPa). Modeled sound pressure levels (SPLs) indicated noise levels were 120 db (re 1 µPa) at a distance of 3.2 km from the cable vessel with a source level of 190 db (re 1 µPa; Harvey et al. 2001).

Underwater audiograms of harbor seals indicated hearing sensitivity was good from 1 to 60 kHz (Ketten 1998). California sea lions can hear effectively sounds of 0.5 to 30 kHz, but they are most sensitive to sounds at 2 kHz in water and 8 to 16 kHz in the air (Moore and Schusterman 1987). Pinnipeds are more sensitive to sounds underwater than in air, the upper cutoff for hearing in air for California sea lions is about 32-36 kHz (similar to underwater), whereas is it 20 kHz for the harbor seal (Schusterman 1974, Richardson et al. 1991). Baleen whales, are thought to be most sensitive to low frequency sounds (e.g., less than 1 kHz). Playback studies indicated that gray whales will react to received levels of 115 to 120 dB (re 1 µPa) for continuous underwater sounds and will react to levels of 160 to 170 dB (re 1 µPa) for pulsed sounds that were broadband sounds with a peak frequency of 100 Hz (National Research Council 1994). Odontocetes, however, have the ability to produce and hear an extensive range of frequencies (40 Hz to 150 kHz). An audiogram of a harbor porpoise indicated sensitivity between 1 and 150 kHz (Richardson et al. 1991). These data indicate that marine mammals are sensitive to anthropogenic noise and exposure can cause short-term or long-term changes in behavior or hearing sensitivity.

Sounds that penetrate the water (e.g., aircraft noise) or sounds produced in water can affect cetaceans in various ways. Gray whales reacted to noise produced by helicopters by avoiding sounds of 115 to >127 dB (re 1 µPa), however, the reaction of gray whales to vessels is varied with individuals attracted to idling outboard motors and avoiding larger vessels that are within 200 to 300 m (Richardson et al. 1991). Fifty percent of gray whales exposed to playbacks of industrial noises while migrating along the California coast responded when received levels exceeded 120 dB (re 1 µPa; Malme et al. 1983, 1984). Humpback whales off Hawaii, however, did not respond to an M-sequence (75 Hz) sound source when received levels exceeded 120 dB (re 1 µPa; Frankel and Clark 1998). Behaviors of bowhead whales did not change noticeably when exposed to noise from seismic vessels (i.e. airguns) that were > 6 km distance, but there were some subtle changes in dive cycles (Richardson et al. 1986). Toothed whales have a varied response to underwater noise, beaked whales and some species of dolphins and porpoise (e.g., harbor porpoise) will generally move away from vessels, whereas some species (e.g., bottlenose dolphin, Dall's porpoise) are attracted to vessel and will ride the bow wave (Würsig et al. 1998). Cetaceans can become habituated, like all marine mammals, to the continual presence of noise, as some large whales no longer react much to vessel noise off Cape Cod (Watkins 1986).

Conservation Measures:

- A minimum 500-foot safety zone, which would include all areas where underwater sound pressure levels are anticipated to equal or exceed 160 dB re 1 uPaRMS, would be established for marine mammals. If marine mammals are sighted within the established safety zone, operations would be delayed until they move out of the area or by waiting until enough time has elapsed (15 minutes) to assume that the individual has moved beyond the safety zone.

- Marine mammal monitors will be present during cable-laying activities to ensure that any marine mammal entering the established (minimum) 500-foot safety zone is sighted.

- Vessel operators will reduce or minimize propeller noise and other noises associated with cable-laying activities to the extent possible.

Take Assessment: After implementation of the conservation measures, no take is expected.

4.3 Fish

Federally listed threatened or endangered fish species are not present in the project area. See the EFH Assessment provided in Appendix B for a complete summary of fish species potentially occurring in the project area.

4.4 Benthic Species

Federally listed threatened or endangered benthic species are not present in the project area.

4.5 Sea Turtles

Leatherback sea turtles are listed as a Federal endangered species, while Green and olive ridley sea turtles are listed as Federally threatened. All three species may be found in the project area, however, only the Leatherback occurs regularly or in significant numbers.

Effects of Entanglement

Sea turtles have a long history of incidental catch in fisheries as well as entanglement in abandoned fishing gear including gill nets, longlines, and lobster/crab gear (NRC 1990, Eckert et al. 1999). Often, when entangled in abandoned gear with attached buoys, turtles cannot submerge to forage and end up with severe abrasions into the flippers and may eventually lose an entire flipper if entanglement persists (E. Phillips pers obs.) The potential for entanglement while laying the cable is relatively low. This is especially true for the deep-diving Leatherback sea turtle, which can reach depths up to 1,000 m.

Conservation Measures: Cable-laying activities will occur during May or June, or early summer, when there are generally fewer sea turtles.

Take Assessment: After implementation of the conservation measures, no take is expected.

Effects of Collisions

Sea turtles must come to the surface to breathe, making vessel collision at the surface a possibility. After a deep dive turtles can be observed resting or "logging" at or just below the surface, often unaware of surrounding boat activity. Stranding data from other parts of the U.S. have shown that boat strikes can be an important source of mortality for sea turtles (Lutz and Musick 1997). This is especially true for boats moving at high speeds and with the propeller engaged (PSTRT 1998). The potential for collision with an individual sea turtle during cable-laying operations exists, but can be minimized by maintaining a slow speed (3-5 knots). In this case, the vessel's presence and noise will be useful in alerting the turtle to the vessel's approach.

Conservation Measures: Actively observing for turtles in the area and moving at a slow speed (3-5 knots for support vessels and 2 knots for cable laying vessels), the potential for interactions will be reduced.

Take Assessment: After implementation of the conservation measures, no take is expected.

4.6 Marine Birds

Federally threatened or endangered marine bird species potentially occur in the project area include the Short-tailed albatross, California Brown Pelican, California least tern, Marbled murrelet, and the Western snowy plover.

Because the cable will pass through the beach area in an existing pipe, there should be no disturbance to snowy plovers or other shorebirds on the beaches. Brown pelicans could be disturbed as they rest on the water but the maintaining a slow vessel speed (3-5 knots) will allow ample time for pelicans and other birds to vacate the area before any potential collisions.

Effects of Entanglement

Diving seabirds are subject to by catch in various fisheries, especially the gillnet fisheries in Monterey Bay (Melvin and Parrish 2001, Forney et al. 2002). There is potential for entanglement with the cable as it is being laid, but this is probably negligible. It is not proposed that any monofilament lines or nets will be used during the installation of the cable.

Conservation Measures: Potentially entangling monofilament lines and nets (if any are used) will be periodically checked for entangled animals (every 1-2 hours).

Take Assessment: After implementation of the conservation measures, no take is expected.

Effects of Vessel Lighting

Some seabirds are attracted to lights at night, including the storm petrels and Cassin's auklet, and will fly into boats after becoming confused by external lighting or foggy conditions (Weise et al. 2001, E. Phillips pers. obs.). If birds do fly into and hit lights, injury or death is likely (Reed et al. 1985). If cable-laying activities are conducted solely during daylight hours the risk of seabird collisions with the vessel likely will be minimized.

Conservation Measures: Reduction of the amount of external lighting if installation activities are conducted at night, and shielding lights downwards will drastically minimized any marine bird-vessel collisions.

Take Assessment: After implementation of the conservation measures, no take is expected.

Effects of Disturbance

The presence of the cable-laying vessel, as well as the increased sound created by the vessel, has the potential to disturb birds away from the vessel and affect foraging efforts, but is probably not significant. Birds roosting on the surface or foraging near the vessels could be disturbed. The likely consequence would be that the birds would fly away from the vessel or dive in response to the presence of the vessel.

Conservation Measure: No conservation measures are necessary as any disturbance is insignificant and temporary.

Take Assessment: No take is expected.

Effects of Oil or Hazardous Material Release

The most obvious effects of oil spills on wildlife are the deaths that occur immediately after the spill, due to coating of animal feathers with oil and exposure to high concentrations of the toxic components of crude oil. Any sort of oil spill can be harmful to diving birds and nearshore species (e.g., snowy plovers and the California Brown Pelican).

Conservation Measures: A site-specific Spill Prevention Control and Countermeasure Plan will be developed and implemented during all cable laying and operation/maintenance activities.

Take Assessment: After implementation of the conservation measures, no take is expected.

Table 4-1 contains a summary of mitigation measures incorporated into the project as described in the above sections to reduce eliminate any potential impacts to Federally listed threatened or endangered species potentially occurring within the project area.

Table 4-1 Mitigations Included in Project to Reduce Impacts

Mitigation Measure	Intended Purpose
Cable will be buried to a target depth of one meter for the entire route except where hard bottom seafloor prevents it. It is expected that most of the cable will be easily buried to the target depth.	Reduces potential for entanglement for marine mammals.
Timing of the cable installation during off-peak marine mammal seasons will reduce the potential for entanglement with the cable during installation. Based on the migratory patterns of the species known to occur in the project area, it is expected that the installation activities be performed during late summer - after gray whales have migrated through the area, and before the influx of large baleen whales (e.g., humpback, blue, and fin whales) and oceanic dolphins.	Reduces potential for entanglement, potential collisions, and noise disturbances for marine mammals.
NOAA Fisheries-approved marine mammal monitors will be present during cable-laying activities to ensure that any marine mammal entering the established (minimum) 500-foot safety zone is sighted.	Reduces potential for entanglement, potential collisions, and noise disturbances for marine mammals.
Cable-laying vessel speed limits of generally less than two knots will be established and enforced. Smaller support vessels will also be required to maintain moderate speeds (3-5 knots) during installation and operation/maintenance activities.	Reduces the potential for marine vessel collisions with marine mammals, sea turtles, and seabirds.
A minimum 500-foot safety zone would be established for marine mammals. If marine animals are sighted within the established safety zone, operations would be delayed until they move out of the area.	Reduces potential for entanglement, potential collisions, and noise disturbances for marine mammals.
Vessel operators will reduce or minimize propeller noise and other noises associated with cable-laying activities to the extent possible.	Reduces potential effects of noise disturbances for marine mammals.
Potentially entangling monofilament lines and nets (if any are used) will be periodically checked for entangled animals (every 1-2 hours).	Reduces the potential for sea turtle and marine bird entanglements.
Reduction of the amount of external lighting at night, and shielding lights downwards will drastically minimized any marine bird-vessel collisions.	Reduces the potential for marine bird-vessel collisions.
A site-specific Spill Prevention Control and Countermeasure Plan will be developed and implemented during all cable laying and operation/maintenance activities.	Reduces the potential for accidental release of petroleum or other hazardous materials into the water and reduces potential effect to sea turtles and marine birds that would be exposed to these materials if a release occurred.

4.7 Cumulative Effects

Cumulative effects are defined as the effects of future state, local, or private activities (non-federal) that are reasonably certain to occur in the project's action area. A discussion of potential cumulative effects from these projects along with the proposed MARS project is also provided. All cable and pipeline information relevant to the MARS survey area were taken from FSSI database or from the nautical charts available for the Monterey Bay region.

Cables

There are currently no installed cables, either active or retired, in the immediate vicinity of the MARS route. Only one fiber optic cable, known as Southern Cross Segment F and linking Kahe Point (Hawaii) to Monterey Bay, was planned to run in the vicinity of MARS. The latest information suggests, however, that this route has been abandoned and that the cable was instead redirected towards a landing in Oregon.

At least one other cable exists in the southern part of Monterey Bay, near the Naval Postgraduate School. This structure has no impact, however, on the routing of MARS. In addition, in order to check for other possible uncharted military cables in the Bay, the MARS route was submitted for approval to the United States Navy, who expressed no concern with the route as presently planned (FSSI 2004).

Pipelines, Ducts and Sewer Outfalls

Several ducts and sewer outfalls exist in the vicinity of Moss Landing. They are displayed on the nautical charts available for the Monterey Bay area. Most of these structures do not impact the MARS project, except for three pipelines in the vicinity of the cable route, which are detailed below. Two of these structures are located south of Moss Landing Harbor:

The southern one is a 51-inch ID pipe that belongs to Kaiser National Refractory and runs from the shore towards the northwest to a water depth of 26 meters (MBARI data; not displayed on survey charts). It is misidentified on NOAA Chart 18685 as a sewer pipe. The position of the offshore end of this pipe is located at approximately: 36°48.145'N – 121°47.486'W.

The northern structure is an outfall pipe for seawater used for cooling at the Duke Energy power plant. The water intake is located in Moss Landing Harbor and the outfall extends offshore due west to a depth of approximately 21.5 meters (MBARI data; not displayed on survey charts). NOAA Chart 18685 shows two pipes at this location. The approximate position of the offshore end of these pipes is: 36°48.258'N – 121°47.454'W.

The third pipeline runs to the north of the two structures described above. From a landing at the eastern end of the harbor entrance channel, it extends towards the west-northwest across the harbor turning basin, under the dunes, and to a water depth of approximately 18 meters (MBARI data, see Chart as001). MBARI indicated that this structure is an old fuel oil line owned by Duke Energy formerly used to unload tankers. The position of the offshore end of this pipeline corresponds approximately with the starting point of the MARS cable route. Its digitized position off NOAA Chart 18685 is: 36°48.719'N – 121°48.037'W. As discussed later in Section 5, the pipeline was in fact identified in the vicinity of the MARS cable route during the FSSI offshore surveys.

4.8 Preliminary Determination of Effect on Species of Concern

The USFWS and NOAA Fisheries have published guidelines for making determinations of effect for listed species protected under the federal ESA. A determination of ***"no effect"*** is the appropriate conclusion when "the proposed action will not affect listed species or critical habitat." A determination of ***"may affect, not likely to adversely affect"*** is "the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial." A ***"likely to adversely affect"*** determination is "the appropriate conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial".

Based on USFWS guidance for preparation of BAs, the determination of effects for each species of concern addressed in the draft BA is one of the following: no effect; may affect, not likely to adversely affect; may affect, likely to adversely affect; likely to adversely affect; and take. Table 4-2 presents the preliminary determination of effects resulting from the construction and operation of the MBARI MARS project.

Table 4-2 Determination of Effects Evaluation for Sensitive Species; Biological Assessment

Common Name	Scientific Name	Federal Status	Determination of Effect
Stellar sea lion	*Eumetopias jubatus*	Threatened	May affect, not likely to adversely effect
Northern fur seal	*Callorhinus ursinus*	Delisted	May affect, not likely to adversely effect
Blue whale	*Balaenoptera musculus*	Endangered	May affect, not likely to adversely effect
Fin whale	*Balaenoptera physalus*	Endangered	May affect, not likely to adversely effect
Sei whale	*Balaenoptera physalusborealis*	Endangered	May affect, not likely to adversely effect
Humpback whale	*Megaptera novaeangliae*	Endangered	May affect, not likely to adversely effect
Pacific right whale	*Eubalaena japonica*	Endangered	May affect, not likely to adversely effect
Sperm whale	*Physeter catodon (=macrocephalus)*	Endangered	May affect, not likely to adversely effect
Southern sea otter	*Enhydra lutris nereis*	Endangered	May affect, not likely to adversely effect
Leatherback turtle	*Dermochelys coriacea*	Endangered	May affect, not likely to adversely effect
Olive Ridley sea turtle	*Lepidochelys olivacea*	Threatened	No effect
Green sea turtle	*Chelonia mydas*	Threatened	No effect
Short-tailed albatross	*Phoebastria albatrus*	Endangered	May affect, not likely to adversely effect
California brown pelican	*Pelecanus occidentalis californicus*	Endangered	May affect, not likely to adversely effect

Table 4-2 Determination of Effects Evaluation for Sensitive Species; Biological Assessment

Common Name	Scientific Name	Federal Status	Determination of Effect
California least tern	*Sterna antillarum browni*	Endangered	May affect, not likely to adversely effect
Marbled murrelet	*Brachyramphus marmoratus marmoratus*	Threatened	May affect, not likely to adversely effect
Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened	May affect, not likely to adversely effect

Direct Effects

Direct effects on the species of concern involve disturbance and temporary loss of habitat. There is minor potential for the proposed project to directly impact (harm or harass) several species of marine mammals including sei whales, humpback whales, Pacific right whales, sperm whales, southern sea otters; leatherback sea turtles; and marine birds including the short-tailed albatross, California brown pelican, California least tern, marbled murrelet, and the western snowy plover. This impact would include disturbance from noise and human presence and temporary loss of benthic species used for forage.

Timing of the cable installation during off-peak marine mammal seasons will reduce the potential for entanglement with the cable during installation, vessel collisions, and noise disturbances during installation. Based on the migratory patterns of the species known to occur in the project area, installation activities will be performed during late summer - after gray whales have migrated through the area, and before the influx of large baleen whales (e.g., humpback, blue, and fin whales) and oceanic dolphins. A (minimum) 500-foot safety zone would be established around the cable-laying vessel, and NOAA Fisheries-approved monitors would be present on the cable-laying vessel. Additionally, the duration of installation activities would be short (3-7 days), and any impacts to marine mammal or sea turtle species would be temporary. No long-term impacts are expected from these actions.

The loss-of-habitat effect includes the temporary displacement or burial of benthic organisms within the footprint of the trawl along the cable route and in the footprint of the trawl-resistance node on the Smooth Ridge. This disturbance results primarily from displacement of sediments and crushing of a minimum number of benthic organisms within the footprint of the trawl and node. Many of these invertebrate species provide forage for other species of fish and marine mammals. It is anticipated that benthic invertebrates would rapidly reoccupy the area once cable and trawl resistant node installation activities are complete. No long-term impacts are expected from these actions. Depending on bottom currents, sessile filter-feeding invertebrates located beyond the cable laying footprint may be impacted by the sediment plume generated by the cable-laying plow. These impacts include burial or partial burial.

Indirect Effects

Indirect effects are those effects caused by or resulting from the proposed action, occur later in time, and are reasonably certain to occur. There would be a temporary disturbance to the benthic invertebrate population at the project site. This disturbance results primarily from the trawling and cable burial in the project site. Many of these invertebrate species provide forage for other species of fish and marine mammals. It is anticipated that benthic invertebrates would rapidly reoccupy the area once cable and trawl resistant node installation activities are complete.

The cable once placed on the seafloor could affect marine mammals through potential entanglements with exposed cable. However, because the proposed MBARI cable will be buried to 1.0 meter depth to the fullest extent possible along the entire route, it is unlikely there will be any negative impacts to marine mammals once the cable is in place.

No other indirect effects of the proposed actions were identified.

Interrelated/Interdependent Effects

Interrelated actions include actions that are part of a larger action and depend on the larger action for justification. Interdependent actions are defined as actions with no independent utility apart from the proposed action. This action has no interrelated or interdependent effects.

Conclusion

After evaluating the potential effects and available scientific data, we conclude that the proposed actions related to the installation of the MARS cable and terminal trawl-resistant node may adversely affect marine mammal, sea turtle, and marine bird species discussed in Sections 4.2, 4.5, and 4.6 respectively. Direct impacts to these species are related to the installation of the buried cable and placement of the trawl-resistant node on the Smooth Ridge. The proposed action would potentially cause impacts from disturbances (noise), potential collisions with the cable-laying vessel, and potential entanglements with the cable during installation. It is anticipated that any potential impacts will be significantly reduced through the implementation of the above described mitigation measures.

The proposed onshore facilities and components for the proposed project will not have any adverse effects on any Federally listed threatened, endangered, or Proposed species.

5 References

Adams, P.B. and J.L. Butler, C.H. Baxter, T.E. Laidig, K.A. Dahlin, W.W. Wakefield, 1995. Population estimates of Pacific coast groundfishes from video transects and swept-area trawls. Fishery Bulletin 93(3): 446-455.

Advanced Research Projects Agency (ARPA), 1995, FEIS/FEIR for the California Acoustic Thermometry of Ocean Climate Project, Arlington, VA; cited in Morro Group, Inc., 1999.

Ainley, D.G. 1976. The occurrence of seabirds in the coastal region of California. W.Birds 7(2): 33-68.

Ainley, D.G. and G.L. Hunt, Jr. 1991. Status and conservation of seabirds in California. In Seabird Status and Conservation: A supplement, edited by J.P. Croxall. International Council for Bird Preservation, Cambridge: Tech. Pub. No. 11.

Ainley, D.G and S.B. Terrill. 1996. Site characterization of MBNMS: Seabirds & shorebirds. http://www.mbnms.nos.noaa.gov/sitechar/bird.html (17 July 2004).

Baltz, D.M. and G.V. Morejohn. 1977. Food habits and niche-overlap of seabirds wintering on Monterey Bay, California. Auk 94: 526-543.

Battelle Ocean Sciences (Battelle) 1990, California OCS Phase II Monitoring Program. Year-Three Annual Report, Volume 1, prepared for the Minerals Management Service. Contract No. 14-12-0001-30262.

Bence, J.R., D. Roberts, and W.H. Lenarz, 1992, "An Evaluation of Spatial Distribution of Fishes and Invertebrates off Central California in Relation to EPA Study Areas with Emphasis on Midwater Ichthyofauna."

Benson, S.R. 2002. Ecosystem studies of marine mammals and seabirds in Monterey Bay, CA, 1996-99. Moss Landing Marine Laboratories, SJSU.

Briggs, K.T., W.B. Tyler, and D.B. Lewis. 1987. Bird communities at sea off California: 1975-1983. Stud. Avian Biol. 11: 1-74.

California Coastal Commission (CCC), 1991, California Coastal Access Guide, University of California Press.

CNDDB, 2004, California Natural Diversity Data Base, search of Monterey Quadrangle, data from July 2004.

Cross, J.N. and L.G. Allen, 1993, Fishes. Ecology of the Southern California Bight: A Synthesis and Interpretation. M.D. Dailey, D.J. Reish and D.W. Anderson (eds.), University of California Press, Berkeley, CA; cited in Morro Group, Inc., 1999.

Eitreim, S.L., Anima, R.J., Stevenson, A.J., Wong, F.L. Seafloor Rocks and Sediments of the Continental Shelf From Monterey Bay to Point Sur, California. http://geopubs.wr.usgs.gov/map-mf/mf2345/. Last modified Aug 22, 2003. Viewed August 02, 2004.

Forney, K.A., J. Barlow, M.M. Muto, M. Lowry, J. Baker, G. Cameron, J. Mobley, C. Stinchcomb, and J.V. Carretta. 2000. US Pacific Marine Mammal Stock Assessments: 2000. US Department of Commerce. NOAA Technical Memorandum NMFS-SWFSC-300.

Fugro Seafloor Surveys, Inc. (FSSI), 2004, Monterey Accelerated Research System (MARS) Geophysical and Burial Assessment Surveys, Final Report, Survey Results Volume 1 & 2. Prepared for MBARI, February 2004.

Harvey, J.Y. 1998. Marine Mammals. Site Characterization of Monterey Bay National Marine Sanctuary. http//montereybay.nos.noaa.gov/sitechar/mamm.html.

Henkel, L.A. 2003. The distribution and abundance of marine birds in nearshore waters of Monterey Bay, California. Moss Landing Marine Laboratories, CSU Monterey Bay.

Jones and Stokes Associates, Inc., 1981, Ecological Characterization of the Central and Northern California Coastal Region, U.S. Fish and Wildlife Service, Office of Biological Services, and Bureau of Land Management, Pacific Outer Continental Shelf Office, Washington, D.C. FWS/OBS-80/46.2.

Kogan, I., C.K. Paull, L. Kuhnz, E.J. Burton, S. Von Thun, H.G. Greene and J.P. Barry, 2003, Environmental Impact of the ATOC/Pioneer Seamount Submarine Cable, MBARI, Moss Landing, CA.

Lutz, P.L. and J.A. Musick (Editors). 1997. The Biology of Sea Turtles. CRC Press, Inc, Boca Raton, Florida.

Mason, J.W. 1997. Distribution and abundance of seabirds in Monterey Bay, California. Moss Landing Marine Laboratories, CSU Fresno.

Melvin, E.F. and J.K. Parrish, Eds. 2001. Seabird Bycatch: Trends, roadblocks, and solutions. University of Alaska Sea Grant, Alaska.

National Marine Fisheries Service (NMFS), 1999. Essential Fish Habitat Consultation Guidance. Office of Habitat Conservation.

National Research Council (NRC). 1990. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington, D.C.

Natural Diversity Data Base (NDDB). 1999. State of California, The Resources Agency, Department of Fish and Game Natural Diversity Data Base: Special Animals. http://www.dfg.ca.gov/endangered/special_animals.html. (18 July 2004).

Pacific Fishery Management Council (PFMC), 1993. Pacific Coast Groundfish Plan, Fishery Management Plan for the California, Oregon and Washington Groundfish Fishery as amended through Amendment 7, July 1993.

Pacific Sea Turtle Recovery Team (PSTRT). 1998. Recovery plan for U.S. Pacific populations of the Leatherback turtle (Dermochelys coriacea). Silver Spring, Md.: U.S. Dept. of Commerce, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service; Portland, Or.: U.S. Dept. of the Interior, U.S. Fish and Wildlife Service; Bethesda, Md.: May be purchased from Fish and Wildlife Reference Service,

Reed, J.R., J.L. Sincock, and J.P. Hailman. 1985. Light attraction in endangered procellariiform birds: reduction by shielding upward radiation. Auk 102: 377-383.

Report to U.S. Environmental Protection Agency, Region IX. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Tiburon Laboratory, Southwest Fisheries Science Center, Tiburon, California, 234 pp; cited in Morro Group, Inc., 1999.

Roberson, D. 2002. Monterey Birds, 2nd Edition. Monterey Peninsula Audubon Society, Carmel, CA.

Slijper, E.J. 1962. Whales. Hutchinson & Co., London. 511p.

Starbird, C.H., A. Baldridge, and J.T. Harvey. 1993. Seasonal occurrence of Leatherback sea turtles (Dermochelys coriacea) in the Monterey Bay region, with notes on other sea turtles, 1986-1991. Calif. Fish and Game 79(2): 54-62.

US Fish and Wildlife Service (USFWS). 2004. Threatened and Endangered Species System (TESS). http://ecos.fws.gov/tess_public/TESSWebpageVipListed?code=V&listings=0#B (19 July 2004).

Wiese, F.K., W.A. Montevicchi, G.K. Davoren, F. Huettmann, A.W. Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the North-west Atlantic. Marine Pollution Bulletin 42(12): 1285-1290.

A Regulatory and Resource Agency Correspondence

Agency	Permit	Specific Requirements	Agency Contact	Date
Moss Landing Harbor District	Special Activities Use Permit	No specifc comments have been received.	Moss Landing Harbor District Linda Mcintyre 7881 Sandholdt Road Moss Landing, CA 95039 Phone: (831) 633-5417	06.07.04
USACE	Section 10 Permit (as required under Nationwide 12)	See Details Below.	Project reference File #28786S, Bob Quebedeaux(poc)/Ed Wiley, Section Chief, San Francisco District Regulatory Branch, 333 Market Street, San Francisco, CA 94105-2197, 415.977.8446	05.20.04
USACE	Section 404 Permit (as required under Nationwide 12)	The USACE confirmed that a Biological Assessment (BA) is required for this project.	Project reference File #28786S, Bob Quebedeaux(poc)/Ed Wiley, Section Chief, San Francisco District Regulatory Branch, 333 Market Street, San Francisco, CA 94105-2197, 415.977.8446	05.20.04
USACE	Nationwide Permit #12, Utility line activities	If during the USACE review of the application, the USACE determined that the project would involve more than minimal impacts, the project would not be authorized under a Nationwide Permit 12, but would instead have to apply for an application for an Individual Permit.	Project reference File #28786S, Bob Quebedeaux(poc)/Ed Wiley, Section Chief, San Francisco District Regulatory Branch, 333 Market Street, San Francisco, CA 94105-2197, 415.977.8446	05.20.04
RWQCB	NPDES Permit	NPDES Permit will not be required.	Chris Adair, Senior Water Resource Control Engineer, Central Regional Water Quality Control Board, 895 Aerovista Place, Suite 101, San luis Obispo, CA 93401, 805.549.3761	05.19.04
RWQCB	Section 401 Water Qualtiy Certificate	Permit will be required in conjuction with the ACOE Section 404, but RWQCB recommends submitting Section 401 application after ACOE has determined they are ready to issue a Section 404 Permit for the project (or after BA is prepared).	Chris Adair, Senior Water Resource Control Engineer, Central Regional Water Quality Control Board, 895 Aerovista Place, Suite 101, San luis Obispo, CA 93401, 805.549.3761	05.19.04
SWRCB	Section 401 Water Qualtiy Certificate	Specific comments not yet received.	Stan Martinson, Division Chief, State Water Resources Control Board, 1001 I Street, Sacramento, CA 95814, 916.341.5458	No Reply as of 05.27.04
CCC	Coastal Development Permit, Federal Consistancy Certification	State and Federal Permits can be submitted, but cannot be acted on by CCC until CSLC has approved the EIS/EIR.	Alison J. Dettmer, Manager, Energy and Ocean Resources Unit 45 Fremont Street, Suite 2000 San Francisco, CA 94105-2219 Phone: (415) 904-5205	05.026.04
Air Resources Board	Air Quality Authorization	Permit may or may not be required. Suggested vessel emmision specs can be provided and dialog via e-mail can begin immediatley.	David Craft, Air Quality Engineer, Air Resources Control Board- Monterey Unified APCD, 24580 Silver Cloud Ct., Monterey, CA 93940-6536, 831.647.9418 (ext. 218)	05.26.04
SHPO, Office of Historic Preservation	Consultation and MOU, Historic Resources Update	As the Federal Lead Agency, MBNMS is required to comply with Section 106 as defined in 36 CFR Part 800. It is an option to coordinate Section 106 within the NEPA process for consolidation. Consultations with SHPO can be initiated immediately.	Hans Kreutzberg, Unit Supervisor Project Review and Compliance Unit, Office of Historic Preservation, P.O. Box 942896, Sacramento, 94296-0001, 916.953.9107	05.26.04

Agency	Permit	Specific Requirements	Agency Contact	Date
CHRIS, Northwest Information Center	Consultation and MOU, Historic Resources Update	CHRIS, NIC provided a record search to MBARI (NIC letter data 04.14.04). NIC noted that consultations with SHPO under section 106 compliance should be initiated if impacts are expected.	E. Timothy Jones, Researcher II, California historical Resources Information System, Northwest Information Center, Sonoma County University, 1303 Maurice Avenue, Rohnert Park, California 94928-3609, 707.664.0880	04.14.04
CDFG	Letter of Concurrence (under Section 7 ESA)	Concurrence with Section 7 is required. CDFG will review materials from MBARI and respond with a letter describing how to proceed and what will be required. BA will likely be required.	George Isaac 20 Lower Ragsdale Drive, Suite 100 Monterey, CA 93940 Phone: (831) 649-2813	05.21.04
USFWS	Letter of Concurrence (under Section 7 ESA)	On 07.21.04 R.Root provided E & E with species list (via telephone) to be addressed in BA.	Dave Pereksta/Roger Root Ventura Field Office 2493 Portola Road, Suite B Ventura, CA 93003-7726 Phone: (805) 644-1766 FAX: (805) 644-3958	05.27.04 07.21.04
NOAA Fisheries	EFH Consultation (Pacific Fisheries Management Council)	Will need to review BA and EIR prior to issuing letter of concurrence. On 06.22.04, M.DeAngelis provided E & E with potential issues/species to be adressed in BA and for project.	Monica DeAngelis, Southwest Regional Office Protective Resources Division 501 West Ocean Boulevard, Suite 4200 Long Beach, CA 90802 Phone: (562) 980-3232	05.21.04 06.22.04
Other Consultations				
Authorization for land use	California State Parks, Monterey District	No Permits will be required from State Parks.	Ken Gray, Senior Resource Ecologist California State Parks 2211 Garden Road Monterey, CA 93940 Phone: (831) 649-2862	05.18.04
Co-Lead Agency	California State Land Commission (Co-Lead Agency)		Dwight Sanders, Chief, Division of Environmental Planning and Management Nancy Quesada, Public Land Management Specialist (Project Manager) Michelle Brown, Environmental Scientist 100 Howe Avenue, Suite 100-South Sacramento, CA 95825 Phone: (916) 574-1880 FAX: (916) 574-1885	
Co-Lead Agency	Monterey Bay National Marine Sanctuary		Bill Douros, Sanctuary Manager Deirdre Hall, Permit Coordinator 299 Foam Street Monterey, CA 93940 Phone: (831) 647-4201	

B Essential Fish Habitat (EFH) Assessment

Essential Fish Habitat Assessment

MARS Cable Installation and Operation

July 23, 2004

Prepared for:

Monterey Bay Aquarium Research Institute
7700 Sanholdt Road
Moss Landing, CA 95039

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.
San Francisco, California

This document was prepared by:

David L. Trimm, CFP

M.S., Invertebrate Zoology/Marine Biology
B.S., Aquatic Biology/Chemistry

An AFS Certified Fisheries Professional (CFP), Mr. Trimm has 25 years of experience in marine, estuarine, and aquatic resource investigation and project management. He has led and participated in ecological risk assessments (ERAs), implemented biological monitoring programs on behalf of federal and state agencies, and completed wetland delineations and impact assessments including use of the USFWS Habitat Evaluation Procedure (HEP). During 11 years with federal (NMFS) and state (TPWD) resource agencies, he was involved in cooperative federal/state biomonitoring, research, and resource management projects related to commercial and recreational fisheries in Texas, Louisiana, Mississippi and Florida. In addition, as an environmental consultant, he has completed marine, estuarine, and aquatic biology/ecology investigations, impact evaluations, and monitoring to support environmental assessments related to pipeline and energy corridors, wetlands, oil spills, and hypoxic waters throughout the southern United States. He has participated in habitat mitigation/restoration, shrimp mark/recapture programs, and pelagic fish bioprofiling and has helped provide QA/QC for contract laboratory data analyses.

Table of Contents

Table of Contents (cont.)

Section **Page**

List of Tables

List of Figures

List of Abbreviations and Acronyms

CBC	Chemosynthetic Biological Communities
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CNDDB	California Natural Diversity Database
CSLC	California State Lands Commission
CWA	Clean Water Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMP	Fishery Management Plan
PLGR	Pre-Lay Grapnel Run
PLIB	Post-Lay Inspection and Burial
MARS	Monterey Accelerated Research System
MBARI	Monterey Bay Aquarium Research Institute
MBNMS	Monterey Bay National Marine Sanctuary
MLML	Moss Landing Marine Laboratory
MOU	Memorandum of Understanding
MSFCMA	Magnunson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NSF	National Science Foundation
OOI	Ocean Observatories Initiative
ROV	Remotely Operated Vehicle
USACE	United States Army Corps of Engineers
VICKI	Video Information Capture with Knowledge Inferencing

Preface

As a result of the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Department of Commerce's regulations (50 CFR 600.905-930), all activities or proposed activities, authorized, funded, or undertaken by a federal agency must consider adverse impacts to essential fish habitat (EFH). The National Marine Fisheries Service (NMFS) has provided guidance for agencies in their *November 1999 EFH Consultation Guidance* document (NMFS 1999; Guidance). This Guidance does not set absolute criteria for EFH consultation, but does suggest how the requirements should be met by NMFS and Federal action agencies. As provided in the Guidance document, five approaches are provided to meet consultation requirements: 1) use of existing procedures, 2) general concurrences, 3) programmatic consultations, 4) abbreviated consultation, and 5) expanded consultations.

The following document, *Essential Fish Habitat Assessment for Adverse Impacts from the MARS Cable Project*, provides an analysis of the effects from construction and maintenance operations on EFH, which will be traversed by the cable route. This assessment is provided as support documentation for a US Army Corps of Engineers individual Section 404 permit that will be sought. As directed by the Guidance, this assessment includes:

- A description of the proposed action;
- An analysis of the effects of the action on EFH;
- The Federal action agency's views on those effects; and
- Proposed mitigation (as applicable).

1 Proposed Action

MARS will be located in Monterey Bay offshore MBARI. It will consist of 51 kilometers of submarine cable and a science node located approximately 891 meters below the ocean surface. The node will have eight separate science ports (docking stations) for oceanographic instruments. Each port will support bi-directional data transfers of up to 100 Mbits per second. The cable and node will have the ability to supply up to 10 kilowatts of power to the instruments, much more power than could be supplied using batteries alone. The system will make use of the tools, techniques, and products developed over the last several decades for high reliability submarine telecommunication and military systems to ensure that this system can operate over a 25-year lifetime.

MBARI, along with the University of Washington, Jet Propulsion Laboratory, and Woods Hole Oceanographic Institution have received a grant from NSF to design and install the cabled observatory in Monterey Bay. Within the MARS team, Woods Hole Oceanographic Institution is developing the communications and command/control systems. The University of Washington and Jet Propulsion Laboratory are working on the power supply system. A private company, Alcatel, will be overseeing the actual construction and installation of the cable wet plant. MBARI will also team up with the Monterey Bay Aquarium to make scientific results from the MARS project available to students and the general public.

MBARI will provide the shore base for the network and will be involved in project management and engineering, including the permitting and environmental review process. This last element is critical to make sure the cable does not damage fragile marine ecosystems within the Monterey Bay National Marine Sanctuary.

In addition to supporting oceanographic research within Monterey Bay, MARS will serve as a testing ground for technologies to be used in more ambitious undersea networks, such as the NEPTUNE project (http://www.neptune.washington.edu).

1.1 Location and Vicinity

The entire cable route and node will be located within the boundaries of the Monterey Bay National Marine Sanctuary. Figure 1 shows the cable route in relation to MBNMS borders.

There are two possible shore landing locations, the Duke Energy oil pipeline located north of the Monterey Canyonhead (referred to as the "northern alternative") and the Moss Landing Marine Laboratories (MLML) pier to be built south of the Monterey Canyonhead (referred to as the "southern alternative"). Complete survey data has been collected for both landing locations and is presented in the MBARI application to the CSLC. At this time, MBARI is seeking approval to use either of the landing locations for the MARS cable route.

1.2 Cable Transmissions

The MARS cable will terminate in a node housed within a trawl resistant bottom mount. The node will have eight separate ports (docking stations) for oceanographic instruments. Each port will support bi-directional data transfers of up to 100 Mbits per second. The cable will also supply up to 10 kilowatts of power to the instruments, several orders of magnitude more power than could be supplied using batteries alone. Scientific data will be the typical data transmitted through the cable.

1.3 Cable Alternatives

There are two potential alternatives for the shore landing location, the northern alternative (landing the cable at the Duke Energy pipeline) and the southern alternative (landing the cable at the MLML pier). In the event that the southern landing is chosen, it will be routed from the pier northward until it joins with the northern alternative route. From this point, the two routes are identical.

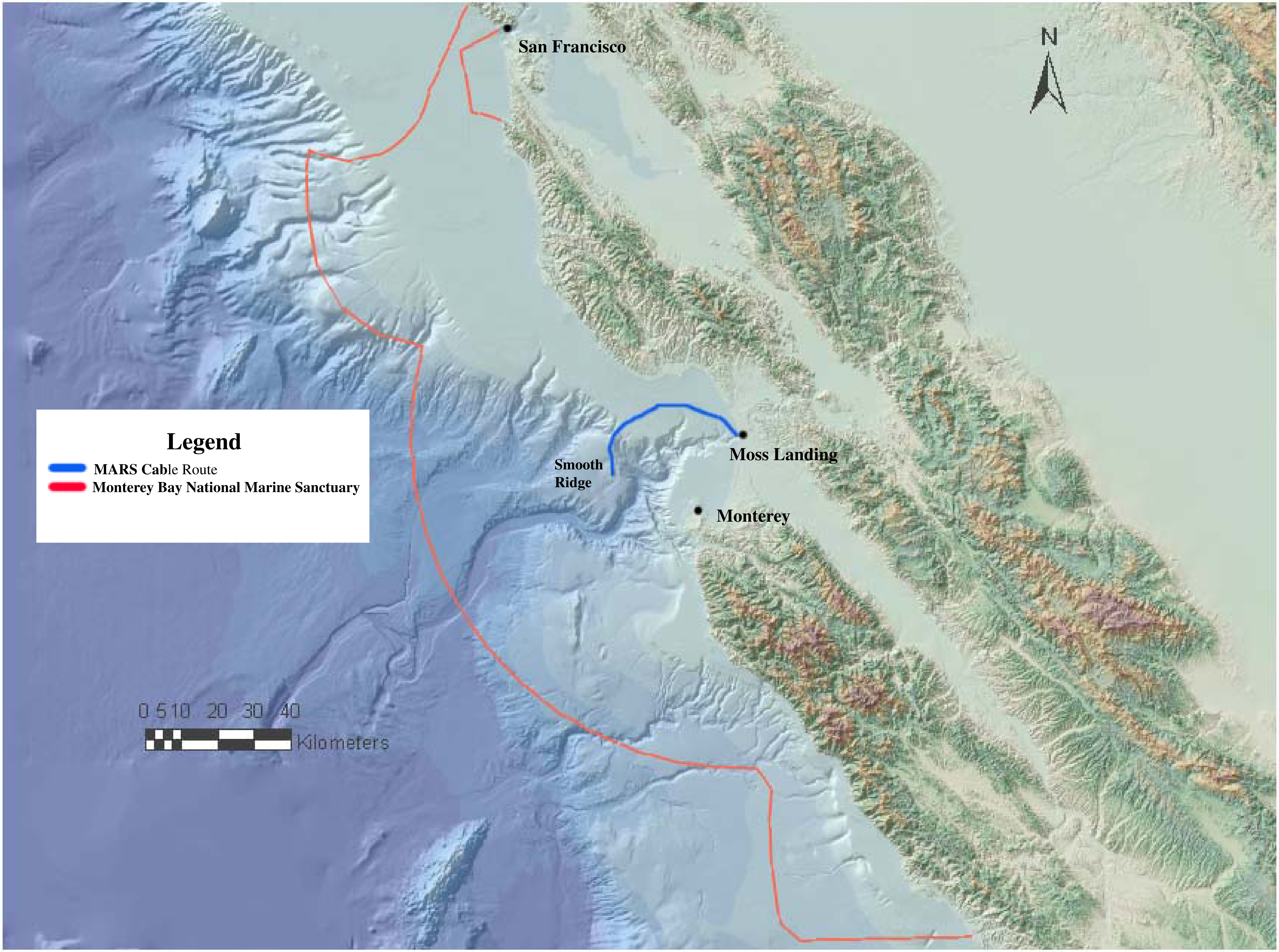


Figure 1 **Monterey Bay National Marine Sanctuary Boundaries**

An alternate route for the MARS cable installation was investigated, but several serious problems were encountered that led to this option being abandoned. The alternate route did not meet all of our science needs, the water depth was not sufficient for a deep water test bed node, and installation would have been more difficult than for the northern route due to rock outcrops.

This route cannot reach a location on the western side of the San Gregorian Fault line without crossing the canyon. Experience has shown that equipment or cables placed in the canyon at this location would likely survive less than a year before being destroyed by mass wasting events. One of the scientific aims of the MARS project is to connect to a permanent broadband seismometer located west of the San Gregorian fault line to complement the land-based network of broadband seismic stations. This is crucial to 1) provide better azimuthal coverage and thereby improve the characterization of moderate to large earthquakes occurring in northern California along the San Andreas system, and 2) to improve knowledge of the deep structure of this plate boundary. Also, experience in long-term deployment of broadband systems is crucial for the successful development of long-term global seismic sea floor observatories as advocated by the International Ocean Network.

The MARS observatory is a test bed for a deep-water cabled observatory, and many of the components and systems to be tested need to be located at a deep water site. The depth of the old alternate node is only 130 meters, and the engineering systems need water depths closer to 1,000 meters. Only the currently proposed route provides access to water with a depth suitable for the engineering tests.

There are no active seeps or chemosynthetic biological communities (CBCs) close to the alternative route node location. These are important study sites that, if connected to a cabled observatory, enable important long-term data to be collected on these benthic communities. Imaging systems and sensors deployed on a cabled observatory would document the behavior of individuals (e.g., clams), the dynamics of populations, and variation in the structure of seep and vent communities. Concurrent monitoring of fluid chemistry and other environmental factors (e.g., current speed), coupled with measurements of the response of the community to experimental manipulation of fluid chemistry, could help define the roles of intrinsic environmental (e.g., fluid chemistry) and biological factors versus external processes (i.e., effects of ocean currents on larval transport). Of the MARS routes investigated, only the currently proposed site provides a node location close to known CBCs and active seeps.

Finally, studies have shown that there are many large rock outcrops on the edge of the continental shelf that would be problematic for cable laying.

2 Project Purpose and Overview

The goal of this project is to design and install an advanced cabled observatory in Monterey Bay that will provide a continuous monitoring presence in the Monterey Bay National Marine Sanctuary, as well as serve as the test bed for a state-of-the-art regional ocean observatory, currently one component of the National Science Foundation (NSF) Ocean Observatories Initiative (OOI). The test bed will provide real time communication and continuous power to suites of scientific instruments enabling monitoring of biologically sensitive benthic sites and to allow innovative scientific experiments to be performed.

The Monterey Bay Aquarium Research Institute, along with the University of Washington, Jet Propulsion Laboratory, and Woods Hole Oceanographic Institution have received a grant from NSF to design and install the cabled observatory in Monterey Bay. This observatory, the Monterey Accelerated Research System (MARS), will consist of an undersea cable and node that will provide power and high-speed data links for a variety of oceanographic devices.

MBARI's close relationship with the Monterey Bay Aquarium places it in a unique position to employ MARS as an educational tool for the public. The Monterey Bay Aquarium is one of the world's leading organizations devoted to teaching the public about the ocean. MBARI will bring MARS science and technology to the public through the Aquarium's world-class facility, drawing on the expertise of the MBA's staff of 420 employees and 900 volunteers.

Enhancing resource protection and preserving the natural beauty and bounty of the marine ecosystems within its boundaries is the purpose of the Monterey Bay National Marine Sanctuary. This can be accomplished by improving the understanding of the Sanctuary environment, resources, and qualities. The results of research conducted utilizing MARS can be used to make management decisions about resource protection, to develop and improve educational programs, and to help MBNMS, and similar agencies, fulfill their missions.

By supplying both data links and electrical power, this network will allow real-time, continuous, and long-term monitoring of conditions beneath the surface of the bay. Currently such information can only be gathered during intermittent ship cruises or using temporary devices that must eventually be retrieved when their batteries are depleted.

MARS will be located in Monterey Bay offshore MBARI. It will consist of 51 kilometers of submarine cable and a science node located approximately 891 meters below the ocean surface. The node (Figure B-1) will have eight separate science ports (docking stations) for oceanographic instruments. Each port will support bi-directional data transfers of up to 100 Mbits per second. The cable and node will have the ability to supply up to 10 kilowatts of power to the instruments; much more power than could be supplied using batteries alone. (See Appendix D for examples of instrumentation.)

The system will make use of the tools, techniques, and products developed over the last several decades for high reliability submarine telecommunication and military systems to ensure that this system can operate over a 25-year lifetime.

Within the MARS team, Woods Hole Oceanographic Institution is developing the communications and command/control systems. The University of Washington and Jet Propulsion Laboratory are working on the power supply system. A private company, Alcatel, will be overseeing the actual construction and installation of the cable wet plant.

MBARI will provide the shore base for the network and will be involved in project management and engineering, including the permitting and environmental review process. This last element is critical to make sure the cable does not damage fragile marine ecosystems within the Monterey Bay National Marine Sanctuary. MBARI will also team up with the Monterey Bay Aquarium to make scientific results from the MARS project available to students and the general public.

In addition to supporting oceanographic research within Monterey Bay, MARS will serve as a testing ground for technologies to be used in more ambitious undersea networks, such as the NEPTUNE project (http://www.neptune.washington.edu).

The broader implication of installing MARS is that the oceanographic community will be a giant step closer to providing real-time, continuous access to unprecedented power and communications capability underwater on a regional scale. This type of ocean observatory will revolutionize the way researchers study the ocean and the seafloor beneath. Benefits will include more cost-effective collection of much larger amounts of integrated, multidisciplinary data relevant to important scientific and societal issues, such as natural hazards, the climate system, the carbon cycle, and other biologically mediated processes in the ocean. In addition, researchers will use such facilities to explore entirely new classes of problems currently unapproachable with existing methods and instrumentation.

MBARI is planning to contract with Alcatel to install the cable. Alcatel is currently processing data from the recent route survey (see Fugro 2004) to devise a work plan for MARS. This information can be provided as soon as it becomes available. Construction is planned for July 2005.

3 Onshore and Nearshore Facilities

3.1 Shore Landings

There are two possible shore landing options for the MARS cable—the Duke Energy fuel oil pipeline in the north harbor entrance, and the planned Moss Landing Marine Laboratories pier south of the canyon head.

Northern Shore Landing Alternative

The northern shore landing site is an existing fuel oil pipeline owned by Duke Energy and previously used to unload tankers. MBARI has obtained permission from Duke Energy to use this pipeline to land the MARS cable and to install temporary shore facilities at the landing location.

The pipeline extends in a west-northwest direction from the shore to a water depth of roughly 18 meters. The position of the end of the pipeline is 36°48.719' N, –121°48.037' W and is located approximately 153 meters from shore. The pipe is 18"–24" carbon steel and has been well maintained by Duke Energy. MBARI will modify the cap at the ocean end of the pipeline to include a seal allowing the MARS cable to enter the pipeline and remain sealed for corrosion protection. Duke Energy has reviewed their records and do not believe the pipeline is currently under lease with the State Lands Commission.

The cable will run inside the pipeline from the ocean side entrance to a location approximately 1,450 meters away where the pipeline takes a sharp turn towards the south after it surfaces from the harbor water near Highway 1. A new access port will be installed in the pipeline at this location to allow the cable to be pulled ashore during cable installation. This port will also be used during operations to allow the cable to exit from the pipeline and run though a conduit that will be installed by MBARI. The conduit will be attached to the side of the existing fuel oil pipeline and will run approximately another 150 meters from the access port to the MARS Shore Facility.

The power conductors and the fiber in the MARS cable will be terminated in the MARS Shore Facility which will be located close to the Duke Energy power breaker panel. The Duke Energy power breaker panel will be connected to and provide power to the MARS Shore Facility.

The MARS Shore Facility will include the shore power supplies, breakers, hubs, and other equipment necessary to feed power and communications to the observatory cable. The equipment will be housed in a 6-meter-long iso-van, which is a temporary structure typically used by scientists as portable laboratory space.

Fibers will be run from the MARS Shore Facility to either (a) a location where a microwave dish is mounted with a line of sight to the MBARI building on 7700 Sandholdt Road, Moss Landing or (b) connected to Duke Energy's fiber hub.

MBARI is also requesting the temporary use of a small, flat piece of land adjacent to Highway 1 and identified by the Monterey County Assessor's Office as Parcel # 133261001, owned by the State of California. This area will be used as a staging site for equipment to pull the cable through the pipe and out the port as described above. Use of this site would be limited to the duration of cable installation operations—approximately 7 days—after which all equipment would be removed.

Southern Shore Landing Alternative

The southern shore landing alternative site runs from a water depth of approximately 16 meters at the estimated position for the end of a planned pier to be constructed by Moss Landing Marine Laboratories (MLML) on the seaward side of the MBARI facilities. The estimated position of the end of the pier is 36°80.266' N, –121°79.111' W. MLML is in the process of obtaining permits to construct this pier and has given MBARI permission to land the MARS cable through conduit running alongside the pier.

From the pier, the cable will run in the conduit and follow the same path as an existing seawater intake pipe before terminating in a circuit breaker box located inside MBARI Building C.

For this alternative, Building C will serve as the Shore Facility, so no additional structures will be needed. As in the northern Shore Facility alternative, Building C will house all items necessary for cable and node operations including uninterrupted power supply and all command and control equipment. The existing power supply is sufficient to meet cable and node requirements (3 phase, 480-volt, 10kW).

4 MARS Installation Procedures

The MARS system consists of a single submarine cable between a shore station in Moss Landing and a node to be placed on the seabed at the end of the cable on Smooth Ridge. The estimated length of the cable is 51 kilometers. A target burial depth of 1.0 meter by plow is proposed, subject to suitable seabed conditions. As the maximum water depth is expected to be 891 meters, burial is proposed throughout the whole route, where burial is possible with the plow.

4.1 Pre-Lay Grapnel Run (PLGR)

Prior to the main lay operation, a pre-lay grapnel run (PLGR) will be carried out by the main lay vessel along the proposed cable route. The PLGR operation will be to industry standards employing towed grapnels. The intention is to attempt clearance of any seabed debris, for example wires or hawsers, fishing equipment etc. that may have been deposited along the route. Any debris recovered during these operations would be discharged ashore on completion of the operations.

The operation involves the towing of one or an array of grapnels along the length of the route to be plowed. The vessel proceeds at a rate to ensure that the grapnel(s) maintain continuous contact with the seabed. The grapnel is usually a 'sliding prong' type, which can penetrate up to 40 centimeters into the seabed. The grapnel is connected to the towrope or wire by means of a length of 30 meters of chain with a similar length of chain following the grapnel; the chain further assists in keeping the grapnel in contact with the seabed.

As the vessel moves along the route, the towing tension is monitored and the grapnel(s) is recovered if the tension increases indicating that an obstruction has been hooked. As a matter of routine, the grapnels are recovered and inspected at minimum intervals of 15 kilometers along the route. Usually a single tow is made along the route but in areas where other marine activity or debris amounts are high, additional runs may be made.

4.2 Main Lay Operations

The proposals for the main lay operation is to directly land the cable at the shore end and to plow bury the cable.

The plow is hydraulically operated and is towed by a towrope from the cable installation vessel. The cutting depth of the plow is controlled by varying the position of the skids and the angle of the plow share. Rear stabilizers can be used to assist with depth control on soft ground. The plow is fully remote controlled from a control cabin onboard the vessel, while being towed. The plow is equipped with vertical and lateral cable angle sensor and visually by means of a forward TV camera.

Plow burial will be made along the route sections recommended by the survey and BAS, subject to seabed conditions.

4.3 Plowing Operations

When plowing, cable is laid to achieve a touch down just in front of the plow as described below:

The plow will be deployed and recovered by means of the 'A' frame located at the stern of the vessel. A 'docking frame' assembly is used to minimize any excessive pendulum motion caused by vessel movement when the plow is being handled out of the water.

The plow will be launched by lifting it from the working deck and moving the 'A' frame slowly outboard until the plow is clear of the stern; pay out will be continued until the plow is a few meters below the surface of the sea. At this stage the plow systems will be checked prior to transferring the weight of the plow to the towline and carefully lowering the plow to the seabed. As the plow is lowered the plow control umbilical with attached recovery line will be simultaneously paid out.

When the plow arrives at the seabed, the laying vessel moves slowly forward paying out cable to maintain tension, and adjustments are made to the tow wire and umbilical line to achieve the optimum towing scope or 'layback' for the plow. While these adjustments are made the plow remains stationary. Just prior to the start of plowing the tow winch rendering is set to avoid excessive towing tensions.

As the plow starts to move, the plow skids will be raised (causing the share to dig deeper into the seabed) and the depressor arm is lowered until the required burial depth is achieved. Cable will be paid out such that the cable reaches the seabed a few meters in front of the plow. This results in minimal residual cable tension measured at the plow.

When the end of the plowed section is reached, the skids are lowered and the depressor arm is raised causing the burial depth to be reduced to a minimum. The lay vessel is stopped and the towing scope is reduced while simultaneously recovering the umbilical and attached recovery line. When the plow lifts clear of the seabed, the lay vessel will move ahead very slowly as the plow is raised to the surface. Lay cable is paid out to maintain appropriate tension. The plow will be held at a point just below the surface while the recovery line is attached to the lift wire, which passes over a sheave at the top of the 'A' frame. The plow is then raised on the recovery/lift line to engage in the docking frame. Finally the 'A' frame is moved inboard, and the plow is lowered to the vessel's deck.

4.4 Trawl Resistant Node Frame Deployment

The cable will be installed from the sea towards the shore landing. It is anticipated that the cable will be plow buried throughout most of the cable route and that as the main lay vessel approaches the node installation point (approx. two times the water depth or two kilometers away), the plow will be recovered. It will then surface lay the cable and deploy the trawl resistant node frame on the end of a ground rope and continue surface laying the ground rope. When the trawl resistant node frame is on the seabed, an acoustic release will be activated which will part the ground rope just above the seabed leaving approximately two kilometers of ground rope attached to the node. This two-kilometer section of ground rope would then be recovered using the on-board ROV and a cutting tool and attaching a recovery rope to the ground rope.

The two-kilometer surface laid section of cable would be post-lay buried by jetting.

After the cable and the trawl resistant node frame have been deployed, MBARI's R/V *Point Lobos* will lower the MARS node onto the ocean floor near to the trawl resistant node frame. ROV *Ventana* will then latch onto the trawl resistant node frame, lift it, and then lower it into the trawl resistant node frame. The ROV will then attach the underwater mateable connectors between the node and the trawl resistant node frame to allow the node electronics to be connected to the shore through the cable.

4.5 Post-Lay Inspection & Burial (PLIB)

Post lay inspection and burial will be conducted by MBARI's ROV Ventana. This will include the following :

- Initial, final, and intermediate splice positions in the buried sections
- Burial in the plowed sections (where plow did not bury for operational reasons (i.e. soft conditions, steep slopes, etc.)
- Cable and pipeline crossings
- Any unburied sections required as part of the node deployment operation

In order to minimize the risk to the exposed cable, the PLB program will be designed, wherever possible, to closely follow that of the main lay vessel program.

The proposals for PLB assume jetting into suitable seabed materials. Rock cutting, trenching, or similar is not proposed.

All post lay burial work will be inspected with an allowance for overlaps into adjacent plowed sections.

An ROV capable of 1.0-meter burial and ability to operate in water depths in excess of 1,000 meters will be used. The ROV will be free flying, or tracked, and fitted with lights, cameras, depth sensor, pitch and roll sensor, heading sensor, and other appropriate fittings required to perform the work.

Alcatel intend to use Makai software during cable installation operations. This sophisticated system is able to model the catenary of the cable and predict the required cable slack, thereby minimizing the risk of installing loops in the cable system.

5 Required Permits

The list of permits required prior to project initiation are provided in Table 5-1.

Table 5-1 Required Permits for MARS Cable Project

Agency	Permit/Authorization/Consultation
Monterey Bay National Marine Sanctuary (MBNMS)	Special Use Permit
National Oceanic and Atmospheric Administration (NOAA)	National Environmental Policy Act (California Environmental Quality Act) Review
US Army Corps of Engineers	Nationwide 12 Permit (Section 10 of Rivers and Harbors Act and Section 404 of Clean Water Act)
US Fish and Wildlife Service	Letter of Concurrence (under Section 7, Endangered Species Act)
NOAA Fisheries - National Marine Fisheries Service	Letter of Concurrence (under Section 7, Endangered Species Act)
California State Lands Commission (CSLC)	Lease of State Lands
California Coastal Commission (CCC)	Coastal Development Permit Federal Consistency Certification
State Water Resources Control Board	National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activities
California Department of Fish & Game	Letter of Concurrence (under Section 7, Endangered Species Act)
California Department of Parks and Recreation (CDPR) Office of Historic Preservation	Consultation and Memorandum of Understanding (MOU) (under Section 106 of the National Historic Preservation Act)
Air Resources Board or Monterey Bay Unified Air Pollution Control District	Air Quality Authorization

Table 5-1 Required Permits for MARS Cable Project

Agency	Permit/Authorization/Consultation
Central Coast Regional Water Quality Control Board	Quality Certificate (under Section 401 of the CWA)
Northwest Information Center	Consultation and Historic Resources Update
Moss Landing Harbor District	Special Activities Use Permit or similar
Monterey County Planning and Building Department	Building Permit, if necessary

6 Proposed Schedule

The proposed schedule is to begin installation in the summer of 2005. The duration of each activity is noted below in Table 6-1.

Table 6-1 Proposed Schedule

Project Component	Target Start Date	Duration
Project Preparations	June 1, 2005	5 weeks
Ile de Re Preparations	June 15, 2005	4 weeks
Ile de Re Main lay and burial	July 2, 2005	2 weeks
Shore-end works	July 2, 2005	1 week
Ile de Re Completion	July 15, 2005	2 weeks
Reporting	June 1, 2005	11 weeks

7 Collection of Supporting Offshore Field Data

A great deal of time has been spent reviewing data to select a route that accomplishes all the goals MBARI has set forth including: termination in an area of scientific interest, avoidance of restricted areas and obstructions, avoidance or minimization of impacts on sensitive natural resources and local communities, protection of the cable, and burial to the fullest extent possible along the entire cable route.

The overall purpose of the cable is to supply power and bandwidth to a scientific node, which will allow researchers to gather data from instruments in unprecedented volumes for extended periods of time. The site for this node was carefully selected. It is an area where science working-groups would like to establish time series instrumentation to further our understanding of poorly constrained oceanographic and geological processes. The node will be located at the end of the cable route. This location is on Smooth Ridge, a site important for scientific studies.

The proposed route has also been selected to avoid restricted areas and obstructions. Restricted areas include military zones (i.e. mainly navy and submarine exercise areas and firing range areas), protected areas such as marine sanctuaries or reserves, anchorage areas, and shipping lanes. Obstructions include buoys, rocks and shoals, wrecks, dumping areas, unexploded ordinance, and any other risks to a submarine cable.

To avoid or minimize impacts on sensitive natural resources, we have chosen the most direct route possible while still achieving MBARI's goal to place the node in an area of scientific interest. This, coupled with burial, should assist in keeping impacts to a minimum. Burial will also serve to avoid conflicts with fisheries equipment and will help to protect the cable.

Additional factors were considered to protect the cable, including areas where burial difficulties may be encountered. Specifically, it will be problematic to bury cable due to substrate morphology along the entrance to Smooth Ridge. In areas where the route may encounter steep slope gradients, the route was designed to run as perpendicular as possible to slopes and to avoid possible areas of sediment slump or slides. Also, to allow better control during cable laying/burial operations, turns in the route are kept to a maximum of 10º.

7.1 Biological Surveys

In an effort to characterize benthic infaunal and epifaunal communities along the proposed Monterey Accelerated Research Program (MARS) cable route, MBARI conducted biological surveys in October 2003. During these surveys, Remotely Operated Vehicles (ROVs) were used to collect video data and sediment cores for studies of infaunal diversity and abundance. For this analysis, data from video and sediment samples collected was incorporated during a study of the former proposed MCI cable route that followed a portion of the MARS route. Generally, polychaete worms were the most abundant and species diverse group of infaunal organisms. Seapens were present on a large portion of the route, and were found in high density in many areas. Most of the fauna on the cable route are sedentary or functionally sedentary (i.e. very limited mobility). There are large numbers of suspension and filter feeders.

Methods

Shallow (23-573 m) areas of the 52.9 km-long MARS cable route were investigated with the MBARI *R/V Point Lobos* using the *ROV Ventana. Ventana* is equipped with a Sony HDC-750A high definition camera with HA10X5.2 Fujinon Zoom Lens. Deeper habitats (576-972 m) were surveyed with MBARI *R/V Western Flyer* using the *ROV Tiburon. Tiburon* is equipped with a Panasonic WVE550 3-chip camera. Lasers mounted on the ROVs were used to define the size of the area viewed in video images. Two lasers were mounted on the ROVs with beams parallel and spaced 30.5 cm apart. Over 38 hours of video was recorded using Sony Digital Betacam tapes as our recording media.

Additional surveys were conducted in 1999 from 47-450 m using the 100-foot vessel *Deanna Lee* equipped with a Phantom DS4 ROV. This portion of the survey line followed the former proposed MCI cable route (Towers 2003). Personnel from Oceaneering International, Inc. operated the ROV. The Phantom was equipped with a Benthos Model 387 35-mm camera and a Simrad Color Zoom Video camera model OE1366, and two lasers spaced 30 cm apart. The video feed from the Simrad camera was analog (composite); recordings were made to digital (miniDV) tape.

Specific sampling locations were chosen along the route to target representative depths (24, 44, 47, 640, 770, 795 and 885 m), and unique substrate and habitat types (e.g. sand, mud, hard substrates). Quantitative video transects and infaunal sampling was conducted at each of 11 pre-defined stations (Figure 2).

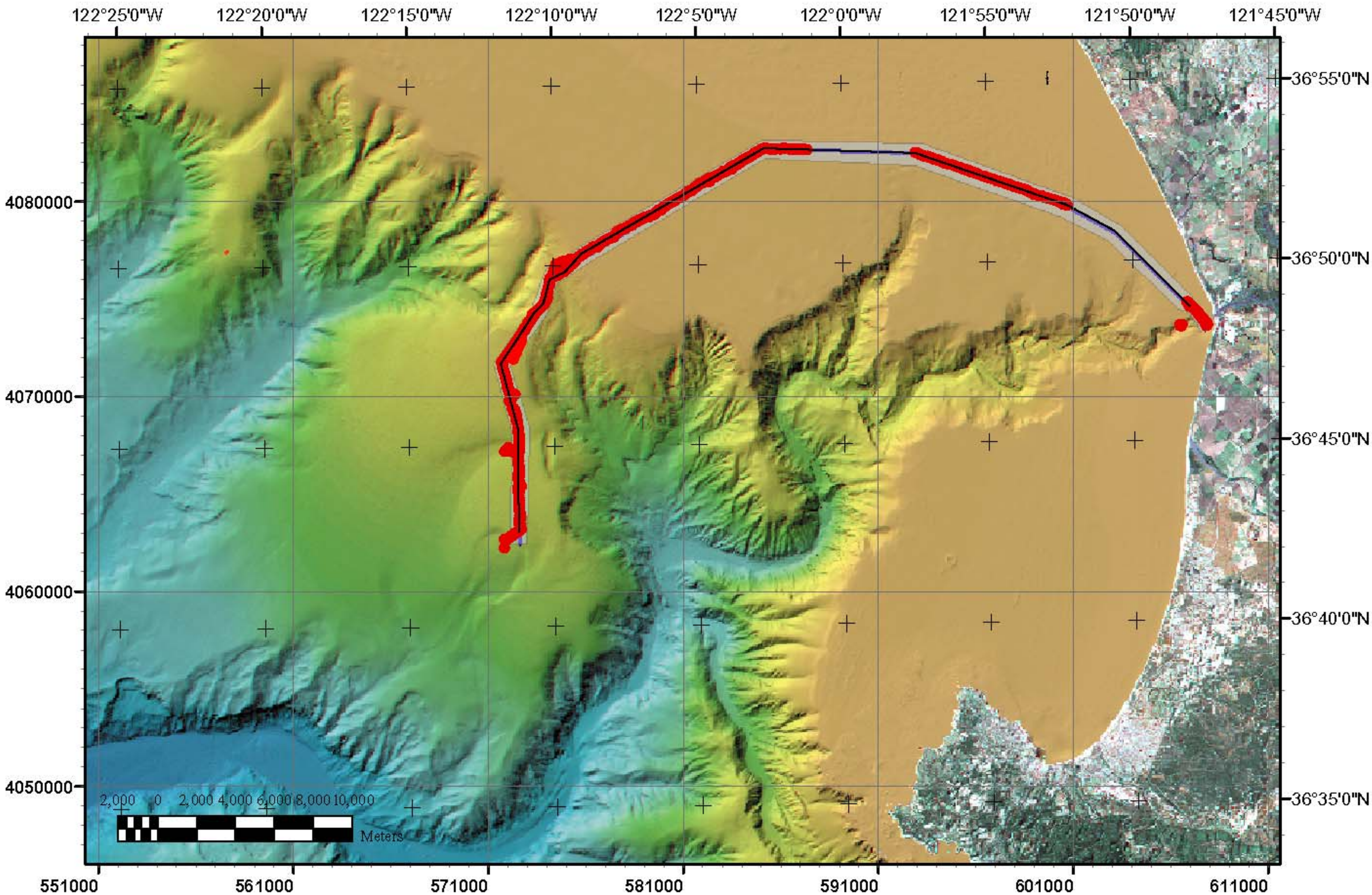


Figure 2. Extent of biological surveys (red) along the proposed MARS cable route (blue). ROVs were used to characterize the habitat and biota.

Infaunal Analysis
In order to characterize macrofaunal communities at the 24, 44, 47, 640, 770, 795 and 885m stations, the ROV was used to collect samples of seafloor sediments with 7.5 cm diameter push cores (0.0044 m^2). Cores collected from each station were spaced approximately five meters apart. Sediment from the top 5 cm of the core was washed gently through a 0.3 mm mesh sieve using cold seawater. Macrofauna at the 60, 90, 325 and 450 m stations were collected with a Smith-McIntyre grab. This is a common grab sampler for collecting quantitative seafloor samples (Lie, 1970), which was lowered from the ship to the seafloor on a cable. The grab collects 0.1 m^2 of bottom sediments to a depth of ~10 cm.

Epifaunal Analysis
Video footage was annotated and analyzed to assess megafaunal communities present on the seafloor along the proposed route. Megafauna are defined as epifaunal animals large enough to be seen on video recordings, a distinction that provides almost no overlap with the macrofauna portion of the study. All available video footage was annotated using MBARI's computer annotation application Video Information Capture with Knowledge Inferencing (VICKI). Video transects surrounding sampling stations were annotated quantitatively.

ROV Surveys of Megafaunal Abundance
Taxonomic identification was performed to the lowest practical taxonomic level. To assess the patchiness and dispersion of megafauna, transects at each station were subdivided into 25 m subsections, which were considered as replicate sample units. The length of replicates was determined using several criteria: 1) maximizing the number of replicates within each transect, 2) minimizing the number of replicates with zero taxa, and 3) choosing a replicate size above the resolution of ROV navigation. Organisms were grouped into major taxonomic groups, within which the abundance and number of lesser taxa were determined for each 25m replicate along each transect. The mean and variance of the number and abundance of taxa were determined for each major group along each transect.

7.2 Results and Interpretation

Infaunal Analysis
A total of 67 push cores and nine Smith-McIntyre grab samples were collected. Polychaete worms were the dominant group both in abundance and taxa richness at most depths. Abundant polychaetes included *Magelona hartmanae, M. sacculata and Scoletoma luti* (25 m), *Chaetozone lunula, Aricidea (Acmira) catherinae,* and *Mediomastus* spp. (44 m), *A. catherinae* (47 m), *Sternaspis nr. fossor* (60 m), *Mediomastus* spp. and *Spiophanes berkeleyorum* (90 m), *Sphaerosyllis ranunculus* (325 m), *Onuphidae* spp., *Protodorvillea gracilis* and *S. ranunculus* (450 m) and *Cossura pygodactylata* (885 m). Oligochaetes dominated at the 885 m station. Gammarid amphipods were the most abundant organism at the 640 m (*Ampelisca unsocalae, Lepidepecreum serraculum* and *Tiron biocellata*), 770m (*A. unsocalae, Photis typhlops* and *Byblis barbarensis*), and 795 m (L. *serraculum*

and *A. unsocalae*) stations. Gammarids were relatively abundant (one the top five most abundant taxonomic groups of animals) at all stations. Other relatively abundant animals include Bivalves (44, 47, 60, 90, 640 m), Nemertea (44, 47 m), Ostracods (44, 47, 325 m), and Ophuroids (60, 90, 450 m). Caprellids (*Tritella tenuissima*) and Tanaids were abundant at the 325 and 450 m stations. Taxa diversity for Gastropods was relatively high at the 60, and 90 m stations, and for Ophuroids at 90 and 325 m. Isopods and Tanaids were diverse at 325 m.

Benthic Megafaunal Analysis

MBARI surveyed 55.2 km of benthic habitat during this investigation. Some of the 52.9 km proposed MARS cable route was overlapped during 10 ROV dives; 76% percent of the 52.9 km route was observed. Thirty-nine hours of video footage were annotated and analyzed.

Some species were not represented in quantitative video samples. There was a gradient in the distribution and abundance of benthic megafauna from the shallow, energetic (sand ripples) stations dominated by mobile megafauna and accumulations of drift kelp and other debris, to less physically disturbed (by wave action) sites on the continental shelf (60 – 139 m) that included higher densities of sessile sediment-dwelling megafaunal invertebrates, notably the seapens *Ptilosarcus* and *Pennatula.*

Due apparently to chronically higher rates of erosion, the substratum on continental shelf break and upper slope are often rock outcrops, which house a variety of sessile invertebrates and serve as physical structure favored by various mobile fishes and invertebrates. Sedimentary substratum returns deeper (>450 m) on the continental slope where seapens once again are conspicuous members of the benthos, which also includes a variety of anemones and holothurians. The relative abundance of fishes declines with depth, as invertebrates become more abundant.

Between 10-24 m, there was poor visibility and a rippled sand bottom, with large areas with shell hash, sparse drift kelp and no visible fauna. Other areas in this depth range included patchy accumulations of brown, green and red algae with occasional *Cancer* crabs, seastars, polychaete worms (*Diopatra ornata*), and small flatfish (*Citharichthys* spp.). Structures at the Kaiser (National Refractories) outfall (12.5 m water depth) and the Duke Energy outfall (18.7 m water depth) supported communities of the small corallimorph *Corynactis californica* and large anemones (*Metridium farcimen)*. At 25-39 m, sand with drift kelp and gastropods were the dominant seafloor features, plus sparse sea pens, flatfish, seastars and drifting eel grass. Between 40 and 59 m there were abundant Ceriantharid anemones, flatfish (*Citharichthys* spp.), the seastar *Luidia foliolata* and the seapen *Stylatula elongata;* the substrate here was silty mud with fine grain sand. From 60 to 139 m, *S. elongata,* and the seastar *Rathbunaster californicus* were very abundant. The anemone *Metridium farcimen,* flatfish, seapens *Ptilosarcus gurneyi* and *Pennatula sp*. were also common. There are occasional scoured surfaces and occasional rock outcrops. At 140-200 m *R. californicus* was the dominant organism. few species of rockfish, flatfish and holothurians were present, but not abundant. Shell hash was locally dense in some areas between 175-191 m. Rock outcrops became more prevalent from 280-449 m and the substrate surface appeared eroded at around 425m. *Allocentrotus fragilis* (urchin), *Merluccius productus* (Pacific Whiting), and *R. californicus* were very abundant. Other species associated with hard substrates (rockfish, sponges, anemones, holothurians, and crinoids) were also present in high numbers. There were numerous rays (primarily *Raja rhina*), catsharks, and several species of flatfish. There was a large aggregation of hermit crabs at 474 m. From 450-599 m the seapen *Halipteris californica* was the dominant organism. The *Liponema brevicornis* (an anemone)*, M. productus* and the flatfish *Microstomus pacificus* were also present in high abundance. At depths over 600 m seapens *H. californica*, and *Umbellula lindahli* dominated. The crab *Chionoecetes tanneri*, the rockfish *Sebastolobus*, gastropods and small Mesomyarian anemones were very common.

Quantitative Transects

Within the ROV survey areas, MBARI analyzed 10 quantitative transects ranging from 250 to 1675 m. The total footage covered 7,825 m of benthic habitat. Quantitative transects were not possible at 25 m due to low visibility. Seapens (*Pennatulacea*) were the most abundant and most species diverse megafaunal organism on the proposed MARS cable route. A dense assemblage of *H. californica* was present at 885 m; this species was also very abundant at the 640 and 795 m stations. *U. lindahli* was very abundant at all stations from 640 to 885 m. In shallower water (47, 60 and 90m), *S. elongata* was present in high numbers. Other relatively abundant organisms (top five most abundant taxa) included gastropods (44, 47 and 450 m), ceriantharids (47, 450, and 640 m), *R. californicus* and *A. fragilis* (325 m), the anemone *Liponema brevicornis* (450 m), *Sebastolobus*, *C. tanneri* (640, 795 m) and the holothurian *Pannychia moseleyi* (885 m). Sponges (Porifera) were only found on hard substrates from 90 to 450 m. Anemones (Actinaria) were observed at most stations as were crabs (Brachyura), and seastars (Asteroidea). Corallimorphs were found primarily at deeper depths.

Due to poor visibility, none of the fishes at the 44 m station were identifiable to species. Pleuronectiformes (unidentifiable flatfish) and flatfish from the families Bothidae and Pleuronectidae) were found at all stations. Bothids were most abundant at the 60 and 90 m. Hagfish (Myxinidae) were consistently present from 450 to 885 m. Sebastolobus (Scorpaenidae) was present from 640 to 885 m. Zoarcids were represented at all stations from 325 to 885 m. The highest total megafaunal abundance/m was at the 885 m station and 325 m stations, where invertebrates taxa (mainly seapens) accounted for the majority of the megafauna observed. The richness of megafaunal taxa was greater at mid depths for both invertebrates and demersal fishes, with the highest diversity at the 325 m stations. A higher number of invertebrate taxa were present at all depths except at the 60 m station where more species of demersal fish were present.

Summary and Discussion

A total of 39 hours of video, 67 push cores and nine Smith-McIntyre grabs were collected from 11 stations. A cumulative distance of 55.2 km of seafloor was surveyed at least once. Seventy-six percent (40.2 km) of the 52.9 proposed MARS cable route was observed.

Polychaete worms were the most abundant and species diverse group of infaunal organism. Seapens were present on a large portion of the route and we found in high density in many areas. Most of the fauna on the cable route are sedentary or functionally sedentary (i.e. very limited mobility). There are large numbers of suspension and filter feeders. Avoidance of the ROV by some invertebrates and especially fishes may have led to a conservative bias for taxa richness, while attraction to the ROV lights may have overrepresented it. Adams et al. (1995) found that Pacific whiting (*Merluccius productus*) was strongly attracted to an ROV while sablefish (*Anopoloma fimbria*) and catsharks (Scyliorhinidae) showed a strong avoidance response. All three of these fishes were represented in our study.

8 Potential for EFH Adverse Impacts

This document addresses potential impacts to essential fish habitat (EFH) within California state waters (shore to 3 nautical miles) and to the outer limit of the Exclusive Economic Zone (EEZ; ~200 nautical miles). The geographic scope will facilitate consistency with permitting requirements of the California Coastal Commission (CCC) and the U.S. Army Corps of Engineers (USACE).

For the Pacific region, EFH has been identified for 89 species (Table 8-1) covered by three fishery management plans (Coastal Pelagics FMP, Pacific Salmon FMP, and Pacific Groundfish FMP) under the auspices of the Pacific Fishery Management Council. The ecologically diverse area encompassed by identified EFH includes those essential for fish spawning, breeding, feeding, or growth to maturity. The maintenance of a healthy and viable benthic community is recognized as critical to supporting most, if not all, of the life history requirements previously mentioned. This biological impact assessment for the proposed project focuses on determination of long and short-term impacts to benthic communities, with an understanding that significant impacts to these communities may cause adverse effects to fishery communities which are dependent on those resources.

Table 8-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Coastal Pelagics FMP
Northern anchovy - *Engraulis mordax*
Pacific sardine - *Sardinops sagax*
Pacific (chub) mackerel - *Scomber japonicus*
Jack mackerel - *Trachurus symmetricus*
Market squid - *Loligo opalescens*
Pacific Salmon FMP
Chinook salmon – *Oncorhynchus tshawytscha*
Coho salmon - *Oncorhynchus kisutch*
Pink salmon - *Oncorhynchus gorbuscha*

Table 8-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Pacific Groundfish FMP
Butter sole - *Isopsetta isolepis*
Curlfin sole - *Pleuronichthys decurrens*
Dover sole - *Microstomus pacificus*
English sole - *Parophrys vetulus*
Flathead sole - *Hippoglossoides elassodon*
Pacific sanddab - *Citharichthys sordidus*
Petrale sole - *Eopsetta jordani*
Rex sole - *Glyptocephalus zachirus*
Rock sole - *Lepidopsetta bilineata*
Sand sole - *Psettichthys melanostictus*
Starry flounder - *Platichthys stellatus*
Arrowtooth flounder - *Atheresthes stomias*
Ratfish - *Hydrolagus colliei*
Finescale (Mora) codling - *Antimora microlepis*
Pacific (Roughscale) rattail - *Coryphaenoides acrolepis*
Leopard shark - *Triakis semifasciata*
Soupfin shark - *Galeorhinus galeus*
Spiny dogfish - *Squalus acanthias*
Big skate - *Raja binoculata*
Longnose skate - *Raja rhina*
Pacific ocean perch - *Sabastes alutus*
Shortbelly rockfish - *Sebastes jordani*
Widow rockfish - *Sebastes entomelas*
Aurora rockfish - *Sebastes aurora*
Bank rockfish - *Sebastes rufus*
Black rockfish - *Sebastes melenops*
Black-and-yellow rockfish - *Sebastes chrysomelas*
Blackgill rockfish - *Sebastes melanostomus*
Blue rockfish - *Sebastes mystinus*
Boccaccio - *Sebastes paucispinis*
Bronzespotted rockfish - *Sebastes gilli*
Brown rockfish - *Sebastes auriculatus*
Calico rockfish - *Sebastes dallii*
California scorpionfish - *Scorpaena guttata*
Canary rockfish - *Sebastes pinniger*
Chilipepper - *Sebastes goodei*
China rockfish - *Sebastes nebulosus*
Copper rockfish - *Sebastes caurinus*
Cowcod rockfish - *Sebastes levis*
Darkblotched rockfish - *Sebastes crameri*

Table 8-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Pacific Groundfish FMP (cont.)
Flag rockfish - *Sebastes rubrivinctus*
Gopher rockfish - *Sebastes carnatus*
Grass rockfish - *Sebastes rastrelliger*
Greenblotched rockfish - *Sebastes rosenblatti*
Greenspotted rockfish - *Sebastes chloroatictus*
Greenstriped rockfish - *Sebastes elongatus*
Harlequin rockfish - *Sebastes variegatus*
Honeycomb rockfish - *Sebastes umbrosus*
Kelp rockfish - *Sebastes atrovirens*
Mexican rockfish - *Sebastes macdonaldi*
Olive rockfish - *Sebastes serranoides*
Pink rockfish - *Sebastes eos*
Quillback rockfish - *Sebastes maliger*
Tiger rockfish - *Sebastes nigrocinctus*
Treefish - *Sebastes sericeps*
Vermillion rockfish - *Sebastes miniatus*
Yelloweye rockfish - *Sebastes ruberrimus*
Yellowmouth rockfish - *Sebastes reedi*
Yellowtail rockfish - Sebastes flavidus
Longspine Thornyhead - *Sebastolobus altivelis*
Tiger rockfish - *Sebastes nigrocinctus*
Treefish - *Sebastes sericeps*
Vermillion rockfish - *Sebastes miniatus*
Yelloweye rockfish - *Sebastes ruberrimus*
Shortspine Thornyhead - *Sebastolobus alascanus*
Cabezon - *Scorpaenichthys marmoratus*
Kelp greenling - *Hexagrammas decagrammus*
Lingcod - *Ophiodon elongatus*
Yellowmouth rockfish - *Sebastes reedi*
Yellowtail rockfish - Sebastes flavidus
Longspine Thornyhead - *Sebastolobus altivelis*
Redstripe rockfish - *Sebastes proriger*
Rosethorn rockfish - *Sebastes helvomaculatus*
Rosy rockfish - *Sebastes rosaceus*
Rougheye rockfish - *Sebastes aleutianus*
Sharpchin rockfish - *Sebastes zacentrus*
Shortracker rockfish - *Sebastes borealis*
Silvergrey rockfish - *Sebastes brevispinis*
Speckled rockfish - *Sebastes ovalis*
Splitnose rockfish - *Sebastes diploproa*
Squarespot rockfish - *Sebastes hopkinsi*

Table 8-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Pacific Groundfish FMP (cont)
Starry rockfish - *Sebastes constellatus*
Stripetail rockfish - *Sebastes saxicola*
Pacific cod - *Gadus macrocephalus*
Pacific whiting - *Merluccius productus*
Sablefish - *Anoplopoma fimbria*

9 Analysis of Effects

9.1 Setting

The approach used in this analysis to establish the setting and collect information to assess project impacts consists of the following steps:

1. Initial review of existing biological information. In order to determine the presence (or absence) of sensitive species and/or habitats within the project area, as well as the information developed from field surveys/reconnaissance, the following materials were reviewed:

   - Pacific Fishery Management Council Fishery Management Plans;
   - California Natural Diversity Data Base (CNDDB) search for Monterey Quad, Monterey County; and
   - Environmental Assessment of the ATOC/Pioneer Seamount Submarine Cable (Kogan et al. 2003).

2. Consultation with local biologists. In order to verify biological information derived from the above sources, contact was made with scientists possessing specific knowledge of marine species/habitats within the project area.

Marine habitats, species of concern, and areas of concern are described in the following sections.

9.2 Marine Habitats

The primary areas of analysis for marine resources are those portions of the intertidal, subtidal, and pelagic zones that constitute the project area and are considered EFH for groundfish, coastal pelagic species, and salmon. Emphasis is given to these areas along the cable burial route.

Intertidal Zone

The intertidal zone is the area affected by tidal flows and wave action. Near the shore landing, this zone consists primarily of sandy, rockless substrate. Sand is a difficult substrate to occupy and few species do so successfully. Invertebrates that inhabit the sandy intertidal area regions have evolved such adaptive features as thick shells, sand-filtering papillae and burrowing mechanisms rather than the strong attachment devices of rocky intertidal species. Sandy beaches also provide foraging habitat for shorebirds, especially gulls, sandpipers, and plovers.

Common invertebrates of the upper intertidal area are various species of amphipods (genus *Orchestoidea)*; the predatory isopod, *Excirolana chiltoni*; and various species of polychaetes, such as *Euzonus mucronata* and *Hemipodus borealis*. The middle intertidal area is characterized by species such as the sand crab, *Emerita analoga*, and the polychaete, *Nephtys californiensis*. The sand crab is generally the most abundant of the middle intertidal organisms, often comprising over 99 percent of the individuals on a given beach (Straughan 1983). The low intertidal area is typically dominated by polychaetes and nemerteans (Straughan 1983).

Subtidal Zone (Soft Bottom Habitats)

In general, Monterey Bay supports a highly diverse and abundant array of benthic infauna (biota that live in the sediments) and epifauna (biota that reside on the substrate). Typically, the soft bottom epifaunal and infaunal assemblages in the nearshore and offshore regions are highly variable and can depend on depth, sediment type, nutrients, dissolved oxygen levels, temperature, and turbidity (Battelle 1990). Yet broad trends in species distribution and composition persist. The highest soft bottom species densities occur in the nearshore shelf habitat and decline between the shelf and upper slopes, remaining relatively constant on the mid-slope, and slightly increasing on the deep slope and basin in this region (Battelle 1990).

Nearshore shelf [<30 meters (100 feet)] soft bottom infaunal assemblages are predominantly composed of polychaetes, amphipods and molluscs. The polychaete (marine worm) fauna in this habitat is largely composed of deposit feeders and carnivores, yet relatively few filter feeders. The lack of abundance of filter feeders may be an indication that the near bottom water is turbid with resuspended sediments to a level that would interfere with the ability of filter feeding polychaetes to persist in higher numbers. Soft bottom epifaunal assemblages in the nearshore shelf consist predominantly of crustaceans, polychaetes, and echinoderms. The distribution and abundance of these species varies seasonally and these changes tend to shift with the oceanographic seasons.

The soft bottom infaunal assemblage associated with the offshore shelf [49-147 meters (160-483 feet)] habitat is composed of ophiuroids, polychaetes, sipunculids, crustaceans, gastropods, and bivalves (Battelle 1990). The upper slope [209-221 meters (685-727 feet)] is dominated by crustaceans, polychaetes, echinoderms, bivalves, and gastropods (Batelle 1990). Infaunal species composition on the slope between 201 meters (660 feet) and 314 meters (1,030 feet), described as the "northern upper slope," is dominated by crustaceans, bivalves, and polychaetes. In some regions, the lower end of this depth range [274-396 meters (900-1300 feet)], described as the "mid-slope," assemblage is dominated by gastropods, ostracods, and polychaetes. The deep slope [305-951 meters (1,000-

tropods, ostracods, and polychaetes. The deep slope [305-951 meters (1,000-3,120 feet)] has relatively low species density and varies in composition but is dominated primarily by polychaetes, bivalves, and amphipods.

Hard Bottom Habitats
Hydrographic surveys conducted for the project identified rock outcrops in the vicinity of the cable route. These were found in deeper waters. The features were found to be of low relief and silt covered. Associated fauna typically includes anemone, *Metridium farcimen*; cup coral, *Paracyathus stearnsi;* sea cucumber, *Parastichopus* spp.*;* sea star, *Stylasterias forreri;* and species of rockfish.

Pelagic Zone
The open water, or pelagic zone, consists of the entire water column from the air-sea interface to the sea bottom. As the depth of water increases in this zone, light, temperature, and dissolved oxygen decrease, while pressure increases. Oceanic waters up to depths of approximately 200 meters (656 feet) are referred to as the epipelagic zone. These waters are well lit, well mixed, and support photosynthetic algal communities. Water from 200 to 1,000 meters (656-3,280 feet) deep is referred to as the mesopelagic zone. The area below 1,000 meters (3,280 feet) is referred to as the bathypelagic zone, which is characterized by complete darkness, low temperature, low oxygen concentrations, and high pressure.

Fish species distribution is heavily governed by the environmental factors characteristic to the zones listed above; they can be described according to zonation. Demersal fish are those that live on or near the seafloor. Representative species common to Central California are summarized in Table 9-1.

Table 9-1 Depth Distribution of Demersal Fish Common to Central California

Water Depth			
50 - 200 m (66-656 ft)	200 - 500 m (656-1640 ft)	500 - 1,200 m (1640-3936 ft)	1,200 - 3,200 m (3936-10496 ft)
Sanddabs *Citharichthys sordidus*	Sablefish *Anoplopoma fimbria*	Thornyheads *Sebastolobus* spp.	Rattails *Coryphaenoides* spp.
English sole *Parophrys vetulus*	Pacific hake *Merluccius productus*	Pacific hake *Merluccius productus*	Thornyheads *Sebastolobus* spp.
Rex sole *Glyptocephalus zachirus*	Slickhead *Alepocephalus tenebrosus*	Slickhead *Alepocephalus tenebrosus*	Finescale codling *Antimora microlepis*
Rockfish *Sebastes* spp.	Eelpouts *Lycodes* spp.	Rattails *Coryphaenoides* spp.	Eelpouts *Lycodes* spp.
Pink surfperch *Zalembius rosaceus*	Rockfish *Sebastes* spp.		
Plainfin midshipman *Porichthys notatus*	Thornyheads *Sebastolobus* spp.		
White croakers *Genyonemus lineatus*			
Source: Morro Group 1999.			

Pelagic fish, those associated with the ocean surface or water column, can also be described according to depth zonation. The distribution of pelagic fish is extensive and incorporates much of coastal California. Pelagic species common to the area are grouped according to depth zone and summarized in Table 9-2.

Table 9-2 Depth Distribution of Pelagic Fish Common to Central California

Epipalagic Fish <200 m (61 ft)	Mesopelagic Fish 200-1,000 m (61-305 ft)	Bathypelagic Fish >1,000 m (305 ft)
Mackerel (*Scomber japonicus)*	Black smelt (*Bathylagus milleri*)	Dragonfish (*Idiacanthidae* ssp.)
Salmon (*Onchorhyncus* spp.)	Viperfish (*Chauliodontidae* ssp.)	Hatchetfish (*Sternoptychidae* ssp.)
Pacific herring (*Clupea pallasii*)	Lanternfish (*Myctophidae* ssp.)	Bristlemouth (*Gonostomatidae* ssp.)
Northern anchovy (*Engraulis mordax*)		
Rockfish *(Sebastes* spp.)		
Medusafish (*Icichthys lockingtoni*)		
Pacific sardine (*Sardinops sagax*)		
Pacific saury (*Cololabis saira*)		
Pacific argentines (*Argentina sialis*)		
Tuna (*Thunnus* spp.)		
Blue shark (*Prionace glauca*)		
Sevengill shark (*Notorhyncus cepedianus*)		
Sixgill shark (*Hexanchus griseus*)		

Source: Bence et al. 1992; ARPA 1995; Ferguson and Cailliet 1990; Cross and Allen 1993

10 Biological Resources Impacts

10.1 Introduction

The following describes the potential impacts the proposed project may have on EFH biological resources within the project area. Impacts were evaluated by identifying potential effects on biota and determining the significance of these effects.

10.2 Significance Criteria

Project impacts on biological resources are considered significant if:

- A population of a threatened, endangered, regulated or other sensitive species is adversely affected, for example, by reduction in numbers: alteration in behavior, reproduction, or survival; or loss or disturbance of habitat. Any "take" of a listed species is considered significant.

- There is a substantial adverse effect on a species, natural community or habitat that is specifically recognized as biologically significant in local, state or federal policies, statutes or regulations.

- Any alteration or destruction of habitat that prevents reestablishment of biological communities that inhabited the area prior to the project.

- Extensive alteration or loss of biological communities in high-quality habitat that lasts longer than one year.

Installation involves cable laying and burial. Offshore operation includes the presence of the cable on the seafloor and repair of the cable should it become damaged. Based on these activities, this analysis evaluates the potential for the project to have the following effects on offshore biological resources:

- Disturbance to benthic biota during cable installation.

- Effects of oil on biological resources in the event of a release during installation.

- Adverse effects to benthic organisms during repair.

- Effects of oil on biological resources in the event of a release during repair.

Installation Impacts

The pre-lay grapnel run, cable laying and burial, and diver activity during cable pull will temporarily disturb the sediments and resident benthic communities along the cable routes. During the pre-lay grapnel run for each cable route, the grapnel blade will penetrate the seabed up to 40 centimeters (the maximum length of the blade). Cable burial, by seaplow and/or ROV, will also disturb the sediments. Although the seaplow is approximately 19 feet wide, the 12-inch-wide hollow share is the portion of the plow that will penetrate the seabed. For a relative comparison of the spatial extent of overall impacts to softbottom substrate from seaplow burial, the area to be traversed (~52 km) was compared to the over size of the Monterey Bay National Marine Sanctuary (13,784 km^2), through which the cable route will cross. The cable route will temporarily affect less than 0.301 km^2 of bottom. This constitutes an impact to less than 2.2E-05 percent of the bottom substrate found in the Sanctuary, and indicates the relative insignificance of the temporary impact to EFH resources.

Data from hydrographic and marine biological surveys indicate most of the cable route is in soft to medium substrate. Hard substrate identified by the survey data has been identified as primarily occurring between KP 31.7 and 40.6. In these areas burial cannot be achieved and thus, although cable installation impacts to benthos may be reduced, movement of the cable over the life of the project may be more substantial to these communities. Historically, assessment for other cable projects have shown increased colonization by epifaunal organisms on exposed acoustic cables (Kogan et al. 2003).

Biological surveys determined that the substrate is unconsolidated coarse sand and clays. The benthic biota was generally characterized as having low diversity and low abundance, and contained no sensitive species. Based on these data, activities associated with cable installation will disturb soft substrate and its resident biota.

Potential impacts to soft substrate organisms are related to sediment suspension during cable installation, which cause localized, increased turbidity levels, as well as physical burial and destruction of organisms.

Studies conducted to investigate the effects of burial of benthic infauna by offshore oil and gas exploration activities have found that recovery begins almost immediately following burial completion, and that recovery to near pre-disturbance conditions can occur within one year, depending upon the extent of burial and other environmental conditions (Dames and Moore 1981). Following the pre-lay grapnel run, cable burial, and diver jetting (as necessary), the post-installation condition of the seabed will not prevent benthic communities from re-establishing.

The benthic habitat will not be destroyed or altered to the extent that benthic communities cannot re-establish. The benthic communities affected have no special status under federal, state, or local policies, statutes, or regulations. Because resident benthic communities would not be prevented from re-establishing, and sediment disturbance does not affect special status species or habitat, the impact on benthic biota would be adverse but not significant.

The cable vessel engines use diesel for fuel, which is stored on board the vessel. The sea plow holds about 100 liters of hydraulic fluid to operate steering and adjusting burial depth. Other than fuel and hydraulic fluid, the vessels do not transport oil, nor do they perform operations that are common causes of oil releases, such as fuel transfers. However, if there were a collision severe enough to breach the fuel tank, oil could be released to marine waters.

Although a marine oil release from a cable lay vessel during installation is considered to be extremely unlikely, the potential effects on marine resources are evaluated below. The affected area would be highly dependent on the location, time and environmental conditions at the time of the release. For the purposes of this analysis, the effects of oil are described. These effects could apply to the resources identified in the project area.

The effects of oil pollution on biological resources range from temporary, sublethal pathological effects (e.g., corneal lesions and changes in blood parameters) to mortality.

Mitigations proposed by the applicant to prevent an oil release, and contain and remove a spill if one occurs include a shipboard oil spill prevention and response plan, navigational measures to prevent collision, and on-water spill control equipment on the support boats to respond to a release. A marine oil release could have significant effects on marine resources. However, the risk of the project activities resulting in an oil release is no greater than the background risk for marine oil spills. In addition, the mitigation measures proposed by the applicant to prevent, contain, and recover a spill, if one occurs, further reduce the potential for marine resources to be adversely affected by project activity, making the effect adverse but not significant.

Operation Impacts

If a repair is necessary, the disturbance to benthic organisms would be similar to those occurring during cable installation, except that the disturbance would be localized rather than along the entire route. Potential impacts to soft substrate benthic organisms are related to sediment suspension, causing reduced light penetration, as well as physical burial and destruction of organisms. If the repair location is near one of the rock outcrops, the retrieval point for the repair will be relocated - either along the affected cable or by approaching from the opposite side - to avoid contact with the rock outcrop. Therefore, there would be no potential for disturbance to hard-substrate biota. In addition, because resident benthic communities would not be prevented from re-establishing, the effect of cable repair on biological resources is less than significant.

Although considered extremely unlikely, there is a potential for the vessels involved in cable repair operations to have accidents that could result in a release of oil to marine waters. The potential effects of oil on marine biological resources range from temporary, sublethal pathological effects to mortality. The area affected would depend on the location, time, and environmental conditions at the time of the release.

Mitigations proposed by the applicant to prevent an oil release, and contain and remove a spill if one occurs, include a shipboard oil spill prevention and response plan, navigational measures to prevent collision, and on-water spill control equipment to respond to a release. A marine oil release could have significant effects on marine resources. However, the risk of the project activities resulting in an oil release is no greater than the background risk for marine oil spills. In addition, the mitigation measures proposed by the applicant to prevent, contain, and recover a spill, if one occurs, further reduce the potential for marine resources to be adversely affected by project activity, making the effect adverse but not significant.

Cable Landing Site

Project activities at the cable landing site involve use of previously present pipelines or structures to be built away from intertidal areas. Based on this information, effects on nearshore biological resources will not occur.

Operation Impacts

Once installed, the cable landing will be subsurface and will require no maintenance. Repairs to cable will be conducted by accessing cable via the pipeline. Therefore, it will not impact biological resources in the area.

Project Abandonment

The project has a duration of 25 years. The alternatives for abandoning the cable system range from leaving the cable in place to partial or complete removal of the entire cable.

Pursuant to the standard lease terms of the CSLC, upon the expiration or sooner termination of a lease, the CSLC may take title to any or all improvements, or the CSLC can require that all or any portion of the cables be removed at the CSLC's discretion. In removing any or all improvements, all permits or other governmental approvals must be obtained prior to any removal or abandonment.

At the end of the lifetime of the project, the operator would have the cable inspected to determine its condition. Cable inspection offshore would consist of an ROV inspection. If it is authorized by agencies with jurisdiction over the cable, abandonment in place would be complete if the inspection confirms that the cable is still buried.

In addition to an inspection, if the cable is partially or completely removed, the equipment and procedures used would be similar to those used during project installation. A vessel would be used to remove the cable from the seafloor and store and transport the cable for disposal. A grapnel and/or ROV would be used to locate, cut, and remove the cable from the seafloor.

As discussed previously in this section, the cable installation and operation would not result in significant impacts to biological resources. The potential impacts to biological resources would be reduced to less than significant levels by the implementation of proposed mitigation measures. The same types of operations and accompanying mitigation measures would apply to the marine activities carried out during cable abandonment. Since the activities required for abandonment would be equivalent to those for installation and operation, it is anticipated that no significant impacts would result from the range of abandonment activities identified.

At the time that a specific plan for abandonment is proposed, agencies with jurisdiction would review the potential environmental consequences that could result from the proposed activities and make a conclusion about what level of additional environmental review, if any, would be necessary. The impacts would be assessed based on the current equipment and techniques for removal, project-specific information, historical data collected during the lifetime of the cable, and the current environmental conditions in the cable area.

10.2.1 Species of Concern

This section describes special-status species that may have suitable habitat within the project area, as well as those that may be directly or indirectly affected by project activities.

Steelhead (Oncorhynchus mykiss)

The steelhead is an anadromous species found in coastal streams and creeks in California and Oregon. It generally spends from one month to several years in the freshwater streams, migrates to the sea where it spends one to four years, then returns to streams to spawn. Most spawning occurs from December to May but may occur in the fall as well (Jones and Stokes Associates, Inc. 1981).

The Southern California steelhead ESU was federally listed as endangered under the ESA in October of 1997.

Coho Salmon (Oncorhyncus kisutch)

Central California ESU coho salmon are federally listed as threatened under the federal ESA and listed as endangered under the state ESA. They were listed as threatened by federal ESA on December 2, 1996 and listed as endangered by

California ESA on December 31, 1995. Coho salmon generally begin their migration in late summer or fall, and spawning is completed by mid-winter.

California Grunion (*Leuresthes tenuis*)

Grunion (*Leuresthes tenuis*) are members of the silversides family, Atherinidae, along with the jacksmelt and topsmelt. They normally occur from Point Conception, California, to Point Abreojos, Baja California. Occasionally, they are found farther north to Monterey Bay and south to San Juanico Bay, Baja California. They inhabit the nearshore waters from the surf to a depth of 60 feet. Tagging studies indicate that they are non-migratory.

It spawns at night high on sandy beaches, usually from February to August. Spawning occurs for only a few hours per season, on the third or fourth night following either a full or new moon, and then only 1 to 3 hours after a very high tide. The eggs remain buried in the sand for about 10 days until the next high tide washes them out to sea, where the young develop. Although it is not listed as threatened or endangered, this species is a popular sport fish, the taking of which is regulated (Jones and Stokes Associates, Inc. 1981).

Pismo Clam (Tivela stultorum)

The Pismo clam was once abundant on the sandy beaches of Central and Southern California. Pismo clams burrow no more than 6 inches deep and are usually found in 1 to 3 feet of water at low tide. Some sources have stated that Pismo clams have a depth range of approximately 90 feet. The Pismo Clam is harvested by recreational clammers and preyed upon by sea otters. Although it is not listed as threatened or endangered, CDFG regulates harvest levels within reserves and has established clam reserves on beaches in Central California.

11 Analysis of Effects Conclusion

The preceding *Analysis of Effects* presents an assessment of the potential short and long-term effects to EFH that will occur based on construction, operational, and abandonment activities associated with the installation of the MARS cable. Based on the definition for adverse effect, as provided in the NMFS Guidance, it is predicted that no reduction in quality and/or quantity of EFH is likely. Minimal short-term impacts to benthic biota will occur based on cable laying methods, but these communities will reestablish to near pre-construction levels within the first year following construction. Direct impacts to fish communities managed under the three Pacific FMPs will not occur. Fish will most likely compensate for short-term impacts to feeding grounds during construction, and resume normal activities in time. No toxicological impacts which could result in acute or chronic effects will occur based on the methods and materials to be used during construction. No sensitive nursery areas are to be crossed by the cable route and thus no reduction in population yields are expected.

12 Mitigations Incorporated into the Project

Table 12-1 provides a list of some of the mitigation measures included as part of this project. Each mitigation measure noted is accompanied by a brief statement of the mitigation's benefit. A more complete discussion of how mitigation measures will avoid or reduce project effects is presented in Section 9, Analysis of Effects.

Table 12-1 Mitigations Included in Project to Reduce Impacts to Essential Fish Habitat

Mitigation Measure	Intended Purpose
Installation	
Site-specific spill prevention plan	Reduces potential for fuel release from work area
Secondary containment for fuel stored on site	Reduces potential for fuel release from work area
Seafloor and biological surveys conducted during project design; cable re-routing	Confirmation that sensitive habitats avoided; re-routed to areas allowing full burial and avoiding heavily fished areas
Cable buried along most of the route	Reduces potential contact with anchors, fishing lines/nets, and marine life
Shipboard spill prevention plan	Reduces potential for a fuel release to affect marine waters
Sorbents (pad, boom) on work boat for immediate spill containment	Increases oil spill response capabilities
Fast-response vessel available during installation with sorbent boom for spill control	Increases oil spill preparedness and response capability in case of vessel fuel release
Operation and Repair	
Avoid grapnel retrieval near outcrops by consulting charts and relocating repair to soft substrate	Avoids rocky outcrop and damage to biota if repair required near selected portions of the route
In the event that a repair in a heavily-fished area is necessary, the cable operator will notify fishermen and a local fishing vessel will be chartered to act as liaison and patrol the area to minimize the possibility of interference with fishing operations.	Notifies fishermen of location of potentially exposed cables and reduces risk of gear loss.

13 References

Adams, P.B. and J.L. Butler, C.H. Baxter, T.E. Laidig, K.A. Dahlin, W.W. Wakefield, 1995. Population estimates of Pacific coast groundfishes from video transects and swept-area trawls. Fishery Bulletin 93(3): 446-455.

Advanced Research Projects Agency (ARPA), 1995, *FEIS/FEIR for the California Acoustic Thermometry of Ocean Climate Project*, Arlington, VA; cited in Morro Group, Inc., 1999.

Battelle Ocean Sciences (Battelle) 1990, California OCS Phase II Monitoring Program. Year-Three Annual Report, Volume 1, prepared for the Minerals Management Service. Contract No. 14-12-0001-30262.

Bence, J.R., D. Roberts, and W.H. Lenarz, 1992, "An Evaluation of Spatial Distribution of Fishes and Invertebrates off Central California in Relation to EPA Study Areas with Emphasis on Midwater Ichthyofauna." Report to U.S. Environmental Protection Agency, Region IX. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Tiburon Laboratory, Southwest Fisheries Science Center, Tiburon, California, 234 pp; cited in Morro Group, Inc., 1999.

California Coastal Commission (CCC), 1991, *California Coastal Access Guid*e, University of California Press.

CNDDB, 2004, California Natural Diversity Data Base, search of Monterey Quadrangle, data from July 2004.

Cross, J.N. and L.G. Allen, 1993, Fishes. *Ecology of the Southern California Bight: A Synthesis and Interpretation.* M.D. Dailey, D.J. Reish and D.W. Anderson (eds.), University of California Press, Berkeley, CA; cited in Morro Group, Inc., 1999.

Ferguson, A. and G. Cailliet, 1990, *Sharks and Rays of the Pacific Coast*. Monterey California: Monterey Bay Aquarium Press, 64 pp; cited in Morro Group, Inc., 1999.

Froese, R. and D. Pauly. Editors. 2004. FishBase. World Wide Web electronic publication. www.fishbase.org, version (07/2004).

Fugro Seafloor Surveys, Inc., 2004, Monterey Accelerated Research System (MARS) Geophysical and Burial Assessment Surveys, Final Report, Survey Results Volume 1 & 2. Prepared for MBARI, February 2004.

Jones and Stokes Associates, Inc., 1981, *Ecological Characterization of the Central and Northern California Coastal Region,* U.S. Fish and Wildlife Service, Office of Biological Services, and Bureau of Land Management, Pacific Outer Continental Shelf Office, Washington, D.C. FWS/OBS-80/46.2.

Kogan, I., C.K. Paull, L. Kuhnz, E.J. Burton, S.Von Thun, H.G. Greene and J.P. Barry, 2003, Environmental Impact of the ATOC/Pioneer Seamount Submarine Cable, MBARI, Moss Landing, CA.

Morro Group, Inc., 1999, *Draft Environmental Impact Report for Consideration of MFS Globenet Corp./WorldCom Network Services Fiber Optic Cable Project*, prepared for County of San Luis Obispo Department of Planning and Building. October.

Moyle, P.B. and J.J. Cech, Jr., 1988, *Fishes: Introduction to Ichthyology*. Englewood Cliffs, NY: Prentice-Hall. 559 pp.

National Marine Fisheries Service (NMFS), 1999. Essential Fish Habitat Consultation Guidance. Office of Habitat Conservation.

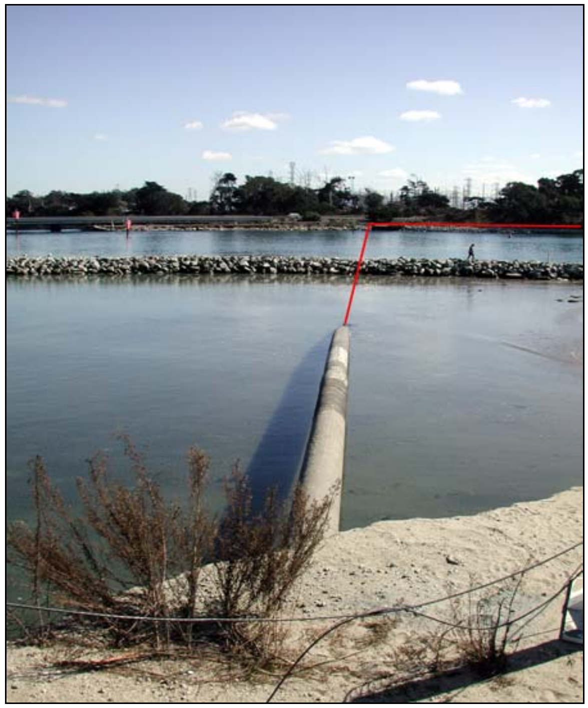
Pacific Fishery Management Council (PFMC), 1993. Pacific Coast Groundfish Plan, Fishery Management Plan for the California, Oregon and Washington Groundfish Fishery as amended through Amendment 7, July 1993.

Straughan, D., 1983, "Sandy Beach Communities Exposed to Natural Oil Seepage." *Proceedings, 1983 Oil Spill Conference (Prevention, Behavior, Control Clean-up).* Sponsored by the American Petroleum Institute, Environmental Protection Agency, and U.S. Coast Guard, San Antonio, Texas; cited by Arthur D. Little Corp., 1997.

Towers, S. 2003. Principal Senior Biologist, North State Resources Environmental Consulting, 5000 Bechelli Suite 203 Redding, CA 96002.

C

Duke Energy Pipeline Photos



Photograph E-2 View to the east across the channel showing the existing Duke Energy oil pipeline emerging from the channel into the dune.

Photograph E-3 View to the east across the channel showing the existing Duke Energy pipeline running along the shore and entering the water.

Photograph E-4 View of the Duke pipeline coming ashore on the eastern side of the channel.

Photograph E-5 View of a portion of the pipeline as it runs along side the power breaker panel.

Photograph E-6 Example of a typical iso van utilized by MBARI scientists. A structure similar to this will be used as the Shore Facility at the Duke Energy landing site.

Photograph E-7 Interior view of an iso van. In this image, it is being used to perform laboratory experiments.

Photograph E-8 Proposed staging area to be used during cable installation operations.

Photograph E-9 View seaward from the land side of the planned Moss Landing pier.

Photograph E-10 View northward at low tide across the proposed landing site (pier to be built) for the MARS cable.