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ExxonMobil
Production

May 15, 2014

Santa Ynez Unit
Offshore Power System Reliability-B Project
Application

Ms. Joan Barminski
Regional Supervisor
Office of Strategic Resources, Pacific OCS Region
Bureau of Ocean Energy Management
770 Paseo Camarillo, Mail Stop CM 215
Camarillo, CA 93010-6064

Dear Ms. Barminski:

ExxonMobil Production Company requests approval to replace two existing power cables (Cable A (or B) and C1) with two power cables (Cable A2 (or B2) and F2, located partially in State Lands within State of California Lease PRC 7163.1 with the remainder in the Outer Continental Shelf (OCS), from the Las Flores Canyon (LFC) facilities to Santa Ynez Unit (SYU) Platform Harmony. In addition, the project will install a power cable (Cable G2) from Platform Harmony to Platform Heritage as well as supporting electrical and communication equipment on both platforms. This project, known as the Offshore Power System Reliability-B Project (OPSRB), if approved, will be conducted in the area extending from the southern end of the onshore facilities in LFC to two of the three SYU platforms located in the Santa Barbara Channel on the OCS.

As referenced in the letter sent to ExxonMobil from your office on April 23, 2014, the BOEM determined that, per 30 CFR 550.283 (a)(8), the activities described in the OPSRB Phase 2 constitute a revision to the approved Development and Production Plan (DPP) for the Santa Ynez Unit. In addition, as requested by your office in an e-mail of May 8, 2014, ExxonMobil is submitting this request for approval of the project and issuance of a revision to the SYU DPP.

As discussed with Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement personnel at several meetings, the OPSRB Project will improve the reliability of the current offshore power distribution system due to continual aging of existing individual circuits, a history of power cable faults in the distribution system, and the obsolescence of offshore switchgear and electrical components. These improvements would be undertaken in several steps. ExxonMobil proposes replacing existing Cable A (or B) that goes from LFC to Platform Harmony with Cable A2 (or B2), which has an improved design. ExxonMobil also proposes replacing Cable C1 from LFC to Platform Heritage, which has experienced two failures since installation in 2003, with Cable F2 from LFC to Platform Harmony and Cable G2 from Platform Harmony to Platform Heritage. The out-of-service Cable A (or B) and Cable C1 would be retrieved in state waters and adjacent to the platforms and recycled to the extent feasible. In addition to the power cables, electrical and communication equipment would be installed at the SYU facilities to provide for the cable connections and improve communication reliability between the platforms and LFC.

ExxonMobil recently provided all of the August 2013 application documents to your office. These documents contain the latest information available on the design and installation aspects of the project. In addition, appropriate conditions and requirements have been incorporated into these documents from those developed for previous SYU power cable installations and repairs. The project description (Attachment A) provides an overview of the project. The execution plan (Attachment B) describes the planned installation approach for the project and also describes several contingency scenarios. The cable specification (Attachment C) describes the construction of the power cables and the fiber optic cores. The cable route map (Attachment D) shows the proposed location of the cables from LFC out to the platforms. The environmental impact analysis (Attachment E) describes the affected environment, potential impacts from installation of the cables and proposed mitigation measures to reduce impacts. The agency contact information (Attachment F) provides a listing of the various federal, state and local agencies and other entities that have been contacted about this project.

Under the current schedule, the retrieval of the out-of-service cable segments and installation of the replacement cables is expected to begin by late 2014 and continue through 2015 with the marine vessels activities occurring over about a 2 month period during 2Q15 to 3Q2015. In order to secure required contractor commitments for the cable installation vessel and other operations, ExxonMobil is requesting issuance of all discretionary permits before the end of 3Q14.

Overview meetings on this project have been conducted with the following agencies and entities: Bureau of Ocean Energy Management/Bureau of Safety and Environmental Enforcement, California State Lands Commission, California Coastal Commission, Santa Barbara County Planning and Development Department - Energy and Minerals Division, Santa Barbara County Air Pollution Control District and the Joint Oil/Fisheries Liaison Office. In addition, preliminary discussions have been held on this project with the following agencies: National Marine Fisheries Service, U.S. Army Corp of Engineers, U.S. Fish and Wildlife Service, U.S. Coast Guard, California Department of Fish and Wildlife, California State Parks and Regional Water Quality Control Board.

ExxonMobil appreciates the attention that you and your staff continue to devote to this important project. If you have any questions or require additional information, please contact Erik Case (erik.case@exxonmobil.com or by phone at 713-431-1251) or Bill Grady (bgrady@algcorp.com or by phone at 970-356-3856).

Sincerely,

Kevin Dillow

Kevin Dillow
Safety, Security, Health & Environment Manager
U.S. Production
ExxonMobil Production Company

BG/EC

c
Ken Foster – CA SLC
Chandra Basavaalinganadodi – CA SLC (Long Beach)
Kate Huckelbridge – CCC
Christine Louie – SBC P&D: Energy and Minerals
Theresa Bell -BSEE

ATTACHMENT A

ExxonMobil Santa Ynez Unit

Offshore Power System Reliability– B Project

PROJECT DESCRIPTION

August 2013
Rev 0

I. OVERVIEW

A. Background

As part of the Santa Ynez Unit (SYU) Expansion Project, the two new platforms (Harmony (HA) and Heritage (HE)) as well as the existing platform (Hondo (HO)) were required to utilize shore–based electric power. The electrical power distribution systems for the platforms were installed in the early 1990's. The systems consisted of an Offshore Substation (OSS) in Las Flores Canyon (LFC) and three power cables from the substation going offshore with two to Platform Harmony (Cables A and B) and one to Platform Heritage (Cable C). In addition, power cables were installed from Platform Harmony to Platform Hondo (Cable D) and to Platform Heritage (Cable E). The installation also included the associated electrical equipment at each facility. Once the electrical distribution system was energized, the SYU offshore operations became completely reliant on these systems for all normal operations. In 2003, Cable C experienced a failure in State Waters that could not be repaired. The SYU OPSR-A project replaced the C Cable (with the C1 Cable). In addition, at the same time the D1 submarine cable was installed between Platform Harmony and Platform Hondo for improved reliability. Since Cable C1 was installed, the cable has experienced two failures (2007 and 2009) which were able to be repaired. In May 2013, Cable B experienced a failure in the onshore splice between the land and submarine cables at the southern end of LFC. After receipt of approvals from the County of Santa Barbara in June 2013, the failed section was removed and a section of spare cable was spliced into the existing cable. The repaired cable was tested and returned to service in July 2013. The reliability of the current offshore power distribution system requires improvement due to continual aging of existing individual circuits, history of submarine cable faults in the distribution system and the obsolescence of offshore switchgear and electrical components. The proposed OPSRB project will further improve the reliability of electricity distribution from shore to and between the platforms.

B. Introduction

The OPSRB project is designed to enhance reliability of the power distribution systems to the offshore facilities by the replacement of two of the three existing onshore Las Flores Canyon (LFC) to platform based power cables (Cable A (or B) and C1). In addition to the power cables, some of the aging high voltage switchgear and electrical components on the platforms will be replaced as well as the installation of new electrical equipment for the replacement power cables. Replacement and new high voltage switchgear will utilize current technology Gas Insulated Switchgear (GIS) equipment.

The OPSRB project is divided into two installation phases:

- Phase 1 Platform Activities:

Install, as an initial phase, minor facility modifications on Platforms Harmony (HA) and Heritage (HE) required for the submarine cable installation activities that will occur in Phase 2. In addition, replace aging switchgear and electrical components and install new electrical equipment for the replacement power cables. Phase 1 modification/additions include the following:

  - HA Deck Extension: Install structural support for GIS Building;

- HA GIS Building: Install GIS Building with pre-installed GIS equipment and associated control systems; Commission new systems;
- HA Cable Risers: Install 2 Long I-Tubes and modify 2 Curved Conductors for use as cable risers;
- HA & HE Platform Cables and Fiber Optic Cables: Install platform cables and associated supports and trays from splice locations to GIS Building and other platform facilities; hook-up, commission, and start-up GIS equipment with existing submarine cables, supporting controls and systems;
- HA & HE Miscellaneous Structural Items: Install installation aids, catwalks and access platforms.

- Phase 2 Marine Activities:
  - Retrieve Out-of-Service Submarine Cable Segments: Retrieve C1 and A (or B) cable segments in State Waters and C1 and A (or B) cable segments adjacent to platforms using the cable installation vessel (CIV) to allow reuse of existing platform risers and routes;
  - Install Replacement Submarine Power Cables: Install cables (A2 (or B2) and F2) from Platform Harmony to onshore (LFC) and cable (G2) between Platform Harmony and Platform Heritage;
  - Complete splicing of replacement cables to existing cables on platforms and at LFC; Test circuits and energize systems.

C. Pre-Project Surveys

As a pre-project activity, several surveys and inspections were conducted in 2011 and 2012 that covered the submarine cable installation corridors from the conduit terminus nearshore area and continuing on to Platforms Harmony and Heritage. These surveys were conducted early to allow utilization of the information in design and to expedite the permitting process. The survey reports were transmitted to the agencies. The completed surveys and inspections include the following:

1) A Shallow Water and Deep Water Geophysical/Archeological Survey of proposed submarine cable installation corridor for all cables from the nearshore area to HA and HE platforms. Survey included: side-scan-sonar, sub bottom profiler, magnetometer and others. (Fugro 11/2012);
2) An ROV Anomaly Archeological Survey of all targets found inside submarine cable installation corridor during Geophysical/Archeological Survey (C&C 01/2012);
3) An ROV Data Gap Survey of areas inside submarine cable corridor not covered in Geophysical/Archeological Survey (C&C 01/2012);
4) A Marine Biological Survey around nearshore conduit terminus area, nearshore A and C1 submarine cable corridor, possible Phase 2 Dive Support Vessel anchor locations, POPCO Pipeline/Submarine Cable crossing area (Padre Associates 12/2011);
5) An expanded Marine Biological Survey around POPCO Pipeline/Submarine Cable crossing area (Padre Associates 05/2012);
6) An ROV Survey of Shelf Break Rock Area inside submarine cable corridor and rock area around HE platform. (C&C 1/2012 and 11/2012);

7) An archeological assessment of Target T-101 identified in 2011 Marine Biological Survey (C&C 11/2012); Target found to be a lost vessel anchor

8) A visual ROV inspection of existing platform Skirt Pile Guides (SPGs) Curved Conductors (CC), J-tubes and associated cables (Oceaneering 12/2011).

II. PHASE 2 MARINE ACTIVITIES

A. Summary

The existing Cable C1 will be replaced with two replacement cables. Cable F2 will be routed from Platform Harmony to LFC and Cable G2 will be routed from Platform Harmony to Platform Heritage. In State Waters, Cable F2 will be located within the existing State Lands Lease. In the OCS, both Cable F2 and G2 will be located within the surveyed and cleared routes. Existing Cable A (or B) will be replaced with the Cable A2 (or B2) from Platform Harmony to LFC. In State Waters, Cable A2 (or B2) will be located within the existing State Lands Lease. In the OCS, the cables will be located in the same general area and within the surveyed and cleared routes. Several contingency scenarios have been included in the OPSRB Execution Plan- Phase 2 (reference Attachment B) in case one of the existing out-of-service power cables cannot be removed from or a replacement cable cannot be installed in a conduit or platform riser. These contingency measures involve laying the cable that cannot be installed on the ocean floor parallel to the installed cable until an acceptable plan can be implemented to complete the cable replacement in the SYU power system. Also, the decision on which of the two cables, Cable A or B, that will be replaced will be made based on a detailed analysis of the condition of each cable prior to installation. Currently documents depict Cable A as being replaced.

The major activities associated with Phase 2 involve the installation of the replacement submarine power cables (each with three phase/three conductors and fiber core configuration) and the retrieval of the onshore and State Waters segments of the out-of-service cables using a dynamic positioning (DP) cable installation vessel (CIV) in six separate areas over a several month period:

- LFC Onshore: Excavation and trenching, retrieval and installation of submarine power cables, removal of existing splices, completion of new splices from existing land-based cables to replacement submarine cable in LFC, and routing of fiber optic cable to upper LFC facilities through new and existing conduits; Isolation of cables at the Offshore Sub Station (OSS) and protective circuitry calibration at the OSS control room. After installation, the excavated area will be backfilled and graded.
- Tunnel: Retrieval and installation of submarine power cables in tunnel with support operations at bike path in El Capitan State Beach; Removal of existing Cable A splice in tunnel;
- Nearshore Area: Retrieval and installation of submarine power cables in existing conduits and at POPCO crossing;
- State Lands Lease: Retrieval and installation of submarine power cable within State Lands Lease from conduit terminus to State/Federal Boundary;

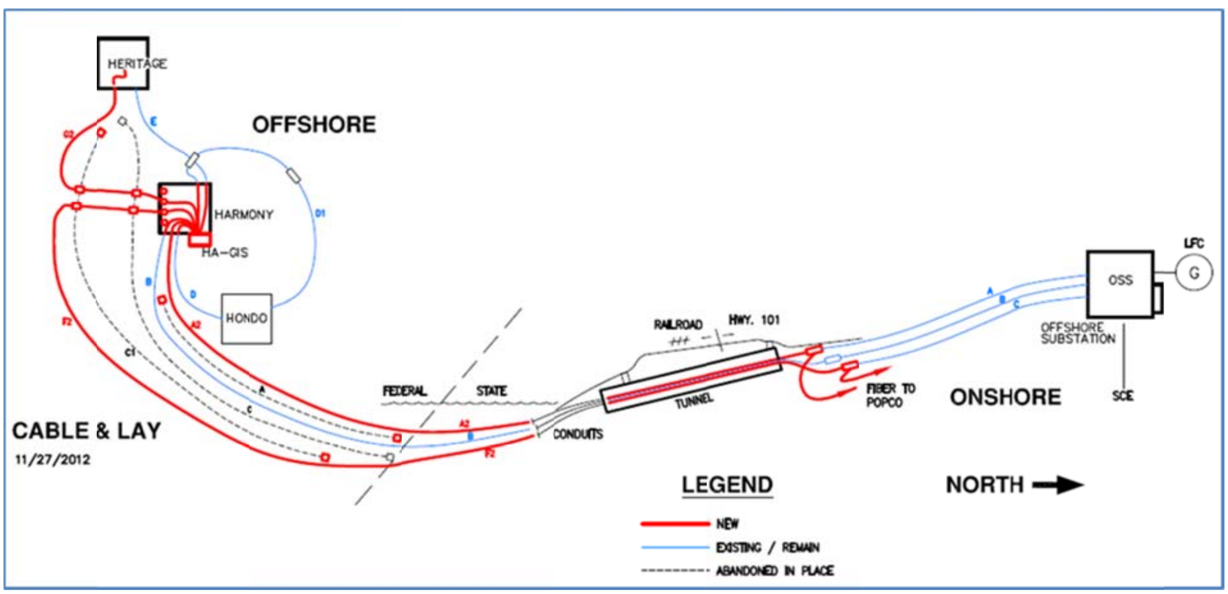
- OCS Corridor: Installation of replacement submarine power cable in previously surveyed and cleared routes from Platform Harmony to State/Federal Boundary and from Platform Harmony to Platform Heritage; Retrieval of out-of-service cables in platform risers and adjacent to platforms;
- Platforms Harmony and Heritage: Retrieval of out-of-service cables in risers and installation of replacement submarine power cables to platform topsides through existing J-Tube, Long I-Tube or curved conductor risers; Completion of splices to platform power cables; Interconnection of cables to GIS; Testing and energization of cables to and from GIS; Removal or preservation of existing HA switchgear.

The retrieval locations of the out-of-service cables will include the following:

- Onshore and State Waters segments of the out-of-service Cables A (or B) and C1;
- Cable A (or B) and C1 segments adjacent to the platforms and in the platform J-Tubes; Facilitates reuse of existing platform risers and routes;
- Possibility that the Cable A (or B) segment from the State Waters line to the Harmony Platform; Allow adequate room for installation of the replacement cable.

The retrieved cables will be cut on the ocean bottom or vessel as required, pulled onto the CIV, cleaned of excess marine growth and stored on the vessel. The remaining sections of the out-of-service cables will remain on the ocean bottom and concrete mats will be placed on the cut ends. When the CIV returns to port, the out-of-service cables will be removed from the vessel, cut into manageable sections, placed in trucks and transported to a local recycle facility for recycle to the extent feasible.

A simplified sketch of the concept is shown below.



In the above sketch, Cables A2 (or B2), F2, and G2 are the installed replacement cables. Note that Cables F2 and G2 have alternative routes; either outside of Cable C1 (as shown) or between Cable C and C1. Cables B (or A), D, D1 and E are existing cables, and will remain in operation. The dashed cables will be decommissioned in place. The Cable A (or B) and C1 State Waters segments, the segments adjacent to the platforms and possibly the Cable A (or B) segment from the State Waters line to the Harmony Platform will be retrieved and recycled to the extend possible.

Several Cable Execution Contingencies (CEC) and installation contingency scenarios have been included in the OPSRB Project (reference OPSRB Execution Plan) to account for situations that could arise during the work activities.

At this time there is no intention of replacing any of the three land based cables that connect the LFC Offshore Substation (OSS) with the splice connection point to submarine cables located in the lower portion of LFC.

Following installation of the replacement cables and connection to the platform and land-based cables, a number of different types of special tests will be executed to verify that the submarine power cables, splices and fiber optics members are ready to be placed in operation in the SYU power system. . Upon completion of the testing of the cables and all of the interconnecting equipment, energization will begin with some circuits being energized during the submarine cable installation process. Energization plans will be implemented to monitor and load balance the LFC and platform power distribution system components.

B. Schedule

ExxonMobil estimates that the proposed project would require approximately 15-21 months for Phase 1 and 8-12 months for Phase 2. The Phase 1 installation activities commenced in June 2013 after the Bureau of Safety and Environmental Enforcement (BSEE) approved the Phase 1 activities as minor platform modifications in May 2013. The Phase 1 activities are expected to be completed by about the 1st Quarter 2015. The Phase 2 cable retrieval and installation activities are expected to commence on or about the 4th Quarter of 2014 and be completed by about early 4rd Quarter 2015. Phase 1 and Phase 2 work will have some overlap. The offshore cable retrieval and installation portion of Phase 2 is expected to require 1-2 months and be conducted during mid to late 2015.

ATTACHMENT B

ExxonMobil Santa Ynez Unit (SYU)

Offshore Power System
Reliability- B (OPSRB) Project

EXECUTION PLAN- PHASE 2

August 2013

Rev 0

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- DWG-R-4002: Cable G2 – Cable Execution Contingency No. 2 (CEC #2)
- DWG-R-4003: Cable A2 – Cable Execution Contingency No. 3 (CEC #3)
- DWG-R-4004: Cable A2 – Cable Execution Contingency No. 4 (CEC #4)

1.0 INTRODUCTION

This document describes the activities associated with Phase 2 of the OPSRB Project and provides a general description of the approach to be used to retrieve the out-of-service power cable and install the replacement power cables at the Santa Ynez Unit facilities. The Phase 2 activities are to be conducted after the OPSRB Phase 1 minor modifications at Platform Harmony and Heritage have been essentially completed with some overlap at Platform Harmony and Heritage. Specific information on the OPSRB Phase 1 activities associated with the platform modifications was provided in a previously submittal dated December 7, 2012.

1.1 Offshore Power System Reliability- B (OPSRB) Project Overview

The overall objective of the OPSRB project is to enhance reliability of the power system distribution system to the offshore facilities at the ExxonMobil SYU facility near Santa Barbara, California. The project has been divided into the following two phases:

- Phase 1: Install, as an initial phase, minor facility modifications on Platforms Harmony (HA) and Heritage (HE) required for the submarine cable installation activities that will occur in Phase 2. In addition, replace aging high voltage switchgear and electrical components and install new electrical equipment and high voltage GIS switchgear for the replacement power cables. [See Phase 1 project description for additional details- Phase 1 is currently underway.]
- Phase 2:
    - Install installation aids on Platform Harmony, Platform Heritage, and onshore (LFC) needed for the Phase 2 activities;
    - Conduct nearshore soil sampling and pre and post Phase 2 marine surveys;
    - Mobilize dive support vessel in the near shore and mobilize cable installation vessel (CIV) and support vessels, as required;
    - Retrieve Out-of-Service Submarine Cable Segments: Retrieve C1 and A (or B) cable segments in State Waters and C1 and A (or B) cable segments adjacent to platforms using the cable installation vessel (CIV) to allow reuse of existing platform risers and routes; [The decision on which of the two cables, Cable A or B, to replace will be made based on a detailed analysis of the condition of each cable prior to installation. Currently documents depict Cable A as being replaced]
    - Install Replacement Submarine Power Cables: Install cables (A2 (or B2) and F2) from Platform Harmony to onshore (LFC) and cable (G2) between Platform Harmony and Platform Heritage; Utilize proposed or alternative routes;
    - Demobilize dive support vessel in the near shore and demobilize cable installation vessel (CIV) and support vessels, as required;
    - Complete splicing of replacement cables to existing cables on platforms and

at LFC;

- Conduct testing of circuits and energize systems.

In order to provide information to allow the reviewing regulatory agency to complete an analysis of the Phase 2 activities, ExxonMobil has included with this submittal a number of supporting documents that describe the entire project and the associated environmental impacts.

The proposed execution approach for the OPSRB Project is very similar to the OPSR-A project successfully completed in 2003. The main differences between the two projects is that the OPSRB project will replace two cables instead of one, reconfigure one circuit into two and also requires minor structural and facility modifications on Platform Harmony prior to cable installation.

1.2 Summary of Phase 2 Activities

The activities associated with the OPSRB Phase 2 work at SYU include both onshore activities and offshore activities. The onshore activities will occur at the ExxonMobil Las Flores Canyon (LFC) facilities, the tunnel under Highway 101 and the railroad, and the buried conduits connecting the tunnel to offshore. The offshore activities will occur from the nearshore area at the cable conduit terminus to Platforms Harmony (HA) and from Platform Harmony to Platform Heritage (HE).

The existing Cable C1 will be replaced with two replacement cables. Cable F2 will be routed from Platform Harmony to LFC and Cable G2 will be routed from Platform Harmony to Platform Heritage. In State Waters, Cable F2 will be located within the existing State Lands Lease. In the OCS, both Cable F2 and G2 will be located within the previously surveyed and cleared areas using either the proposed or alternative routes. Existing Cable A (or B) will be replaced with the Cable A2 (or B2) from Platform Harmony to LFC. In State Waters, Cable A2 (or B2) will be located within the existing State Lands Lease. In the OCS, the cables will be located in the same general area and within the previously surveyed and cleared routes. Several contingency scenarios have been included in the OPSRB Execution Plan- Phase 2 in case one of the existing out-of-service power cables cannot be removed from or a replacement cable cannot be installed in a conduit or platform riser. These contingency measures involve laying the cable that cannot be installed on the ocean floor parallel to the installed cable until an acceptable plan can be implemented. As indicated, the decision on which of the two cables, Cable A or B, to replace will be made based on a detailed analysis of the condition of each cable prior to installation. Currently documents depict Cable A as being replaced.

1.2.1 Phase 2 Operations Areas

The major activities associated with Phase 2 involve the retrieval of the onshore and State Waters segments of the out-of-service cables and the installation of the replacement submarine power cables (each with three phase/three conductors and fiber core configuration) within the power supply system using a dynamic positioning (DP) cable installation vessel (CIV) in the following six separate areas over a several month period:

- LFC Onshore: Surveying, staging of equipment, excavation and trenching, retrieval and installation of submarine power cables, removal of existing splices, completion of new splices from existing land-based cables to replacement submarine cable in LFC, and routing of fiber optic cable to upper LFC facilities through new and existing conduits; Isolation and de-isolation of cables at the Offshore Sub-Station (OSS) and protective circuitry calibration at the OSS control room. Backfilling and grading of excavated areas and equipment removal.
- Tunnel: Preparing tunnel for submarine power cable retrieval and installation. Retrieval and installation of submarine power cables in tunnel with minor support operations at bike path in El Capitan State Beach; Removal of existing Cable A splice in tunnel. Equipment removal.
- Nearshore Area: Nearshore soil sampling and pre- and post-installation marine biological surveys. Mobilization of diving support vessels. Retrieval and installation of submarine power cables in existing conduits and at POPCO crossing. Demobilization of survey and diving support vessels.
- State Lands Lease: Mobilizing CIV and support vessels. Retrieval and installation of submarine power cables within State Lands Lease from conduit terminus to State/Federal Boundary. Demobilizing CIV and support vessels.
- OCS Corridor: Installation of replacement submarine power cable in previously surveyed and cleared routes from State/Federal Boundary to Platform Harmony and from Platform Harmony to Platform Heritage; Retrieval of out-of-service cables in platform risers and adjacent to platforms.
- HA and HE Platforms: Installation of replacement submarine power cables to platform topsides through existing J-Tube, Long I-Tube or curved conductor risers; Completion of splices to platform power cables; Interconnection of cables to GIS equipment; Testing and energization of cables to and from GIS; Disconnection of existing HA switchgear from service and preservation.

1.2.2 Phase 2 Sequence of Execution and Shutdown Summary

As part of the installation and integration of the replacement power cables into the SYU facilities, there will be a sequences of planned platform electrical and production shutdowns as summarized below. (Proposed sequence of operation based on preliminary design and engineering; sequence and could change based on further study or forced to change by subsequent failure of existing cables.)

- De-energize Cable C1; Remove Cable C1 from tunnel; Transfer HO load from Cable D to Cable D1 (HO, HA & HE shutdown required). Transfer field load to Cable A and Cable B;
- Install Cable F2 from HA to nearshore and through tunnel to LFC; (HO, HA & HE shutdown required); Splice Cable F2 to Platform Cable;
- Splice Cable F2 to LFC Land Cable; Remove Cable C1 from HE; Install Cable G2 from HA to HE; Splice Cable G2 to Platform Cables on HA and HE;
- Test Cable F2; Align Cable F2 to provide power to Cable D1; (HO shutdown required); Accept and energize Cable F2;
- Following acceptance of F2, de-energize Cable A; Remove Cable A from tunnel; (HO, HA & HE shutdown required);
- Remove Cable A from HA; Install Cable A2 from HA to nearshore and through tunnel to LFC; Splice Cable A2 to Platform Cable; Connect Cable A2 to GIS (HO, HA & HE shutdown required);
- Splice Cable A2 to LFC Land Cable; Test Cable A2; Accept and energize Cable A2 (HO & HA shutdown required);
- Load balance distribution system from OSS to platforms and place in operational configuration.

All marine cable retrieval and installation activities will be conducted using a dynamic positioning (DP) cable installation vessel (CIV) that does not require the use of anchors. A CIV support tug could be required during certain field operations. The CIV support tug may utilize the boat buoy near HA when on standby in the field. One or more dive support vessels with temporary anchors will be required in the nearshore area to support cable retrieval and installation operations. In addition, several small motor craft will be used to support cable activities in the nearshore area. The sequence of retrieval of the out-of-service cables and installation of the replacement cables may be changed depending on the preferred sequence of operations determined during final construction planning.

In addition to the surveys conducted as part of the Pre-Project Surveys (reference Attachment A- OPSRB Project Description), three additional surveys will be executed pre- and post- cable retrieval and installation. The first survey will be a Pre-Installation Soil Sampling Survey of the soil at the nearshore conduit terminus and at the POPCO crossing utilizing the procedures contained in the Sampling and Analysis Plan. The second survey will be a Pre-Installation Marine Biological Survey, similar to the one executed in 2011, which will be conducted with divers a few months before the start of the Phase 2 submarine cable retrieval/installation operations to define initial environmental conditions. The third survey will be a Post-Installation Marine Biological Survey that will be conducted with divers soon after the completion of the Phase 2 submarine cable installation operations to define any project-related environmental impacts. Certain identified impacts to marine plant life determined by the marine biological survey could require restoration in the nearshore areas to comply with permit requirements.

2.0 ENVIRONMENTAL CONSIDERATIONS

This Phase 2 Execution Plan has been developed to minimize impact to the environment to the extent feasible throughout the various work activities. Items considered and addressed as part of this plan are included in the OPSRB Environmental Impact Analysis- Attachment E, which includes a review of the entire OPSRB Project and contains proposed mitigation measures to further reduce impacts.

3.0 PHASE 2 GENERAL EXECUTION OPERATIONS

Phase 2 execution activities include work required to be completed during the various stages of the project and include off-site fabrication, pre-mobilization, several mobilizations, onshore and offshore pre-installation work, onshore and offshore execution, and several demobilizations.

3.1 Off-Site Fabrication

All fabrication of submarine power cables and associated components will be performed in accordance with applicable ExxonMobil Construction Specifications and applicable Industry Standards. The power cables will be manufactured in Europe. To the extent possible, associated components will be fabricated at off-site locations.

3.2 Pre-Mobilization Activities

The pre-mobilization tasks will be comprised of the development of various engineering and operational plans and procedures, agency notifications, equipment and materials procurement and fabrication, and component testing. Engineering tasks will include structural, mechanical, instrumentation and electrical reviews. Procurement and fabrication reviews and inspections will be conducted as required.

As part of the pre-mobilization tasks, ExxonMobil will complete all required agency notifications and submittals as required by the project permits and approvals.

3.3 Mobilization of Marine Vessels

A number of mobilizations of marine vessel will occur throughout the OPSRB Phase 2 activities.

3.3.1 Mobilizations Using SYU DPV Crew and Supply Boats

Mobilizations of equipment and components to the Harmony and Heritage Platforms will occur from Port Hueneme using regularly scheduled SYU DPV supply boat and will occur throughout the OPSRB Phase 2 activities. Personnel required for the Phase 2 work will be transported to and from the platforms from Ellwood Pier using regularly scheduled SYU DPV crew boats. The existing Harmony and Heritage Platform cranes will be used to transfer all equipment and installation components to and from the SYU supply boats that service the platform.

3.3.2 Mobilizations for Soil Sampling and Marine Biological Diving Surveys

Mobilizations of a vessel and required equipment and components to conduct the OPSRB Phase 2 nearshore soil sample survey and marine biological surveys (one survey prior to cable installation and one survey after cable installation) is expected to occur from a local marina or port. Spot charter vessels allowed under the SYU PTOs are expected to be utilized for these activities. Personnel required for the Phase 2 work will travel to the local marina or port and return there.

One small dive survey vessel will be required to anchor in the nearshore area to conduct the marine biological surveys. The vessel anchors will be located in selected locations and will be installed and retrieved vertically. The vessel will de-mobilize to a local marina or port.

3.3.3 Mobilizations to Support Construction Diving and Anchor Handling Activities

Mobilizations of vessels and required equipment and components to support construction diving and anchor handling in the nearshore and POPCO crossing areas is expected to occur from a local marina or port during specific scheduled times throughout the OPSRB Phase 2 activities. Spot charter vessels, allowed under the SYU PTOs, are expected to be utilized for these activities. Personnel required for the Phase 2 work will travel to the local marina or port and return there.

One or more dive support vessel will be required to anchor in the nearshore area to support the retrieval and installation of the Phase 2 cables. The vessel anchors will be located in pre-surveyed locations and will be installed and retrieved vertically by an anchor handling vessels where required. The anchor lines will be connected to a floating buoy with a line to the vessel.

De-Mobilizations of vessel and required equipment and components supporting construction diving and anchor handling is expected to occur at a local marina or port. Personnel required for the Phase 2 work will debark at either the port or another designated location.

3.3.4 Mobilization of Cable Installation Vessel

The cable installation vessel (CIV) will be mobilized to Port Hueneme towed by a sea-going tug from Europe. The vessel will contain the fabricated cables from the manufacturing site. The CIV is expected to remain in port for several days to complete the following activities: mobilize ROVs, load equipment that has been staged at the ExxonMobil warehouse, off load spare cable reels, bunker CARB low sulfur diesel fuel, complete regulatory and safety inspections, complete regulatory and safety training, conduct any agency inspections, transfer required personnel and complete other activities. If required, a local support tug will be mobilized to Port Hueneme and utilized to transit the CIV to the work area.

After installation of Cable F2 and G2, the CIV is expected to return to Port Hueneme to offload the retrieved C1 cable over a several day period. The vessel may also take on supplies and transfer personnel.

After Cable F2 acceptance, the CIV is expected to return to the work area to complete the remaining scope. If required, a local support tug will be mobilized to Port Hueneme and utilized to transit the CIV to the work area.

The cable installation vessel (CIV) and support tug, if required, will be de-mobilized to Port Hueneme after completion of the work scope and will contain any extra replacement cables and remaining retrieved out-of-service cables. The vessel is expected to remain in port for several days to complete the following activities: de-mobilize ROVs, off-load equipment to be staged at the ExxonMobil warehouse, off-load spare cable, off-load equipment, off-load retrieved cable, and, transfer required personnel and other activities.

3.4 CIV Pre-Execution Sea Trials

The cable installation vessel (CIV) and support tug, if required, will conduct pre-execution sea trials to confirm DP operation, ROV operation, survey equipment, mechanical response and operational response prior to commencing work. These trials will be conducted outside of Port Hueneme prior to entering Santa Barbara County Waters.

3.5 Coordination with Platform Production and Drilling Operations

The ExxonMobil PIC on the cable installation vessel (CIV) will work with project management and operations management to coordinate execution timing with production and drilling activities. The required full field electrical power system shutdowns during phases of work in the tunnel will require drilling to reach safe stopping points in any well or work over where all of drilling power can be shutdown.

3.6 Onshore Pre-Execution

Pre-execution activities at LFC will include installation and staging of components required for the cable retrieval and installation activities and cable splicing. These items are expected to include the following: pulling winch, rigging, installation aids, miscellaneous structural members, excavation equipment, temporary offices and storage containers, temporary electrical service, tunnel dewatering equipment, conduit cleaning equipment, gauging components, video equipment, flushing equipment, safety equipment, temporary lighting, splicing equipment, excavation machinery, and other required components.

3.7 Offshore Pre-Execution

Pre-execution activities at Harmony and Heritage Platforms will include installation of winches, rigging, installation aids, miscellaneous structural members, scaffolding, storage containers, splicing equipment, test equipment, and other required components. The existing Harmony and Heritage Platform cranes will be used to transfer all equipment and installation components to and from the SYU supply boats that service the platform.

3.8 Onshore Execution

Onshore execution will be conducted in accordance with the applicable ExxonMobil Construction Specifications and applicable Industry Standards. Work will involve excavation and trenching to expose the out-of-service cables, placement of the winch and installation aids, retrieval and installation of cables, removal of existing splices and splicing of the installed replacement cables at LFC. Also, testing and energization of the installed replacement cables will take place. Following the completion of installation and testing of the replacement cables, a suitable fire-proofing material will be sprayed on the cables in the tunnel.

The work associated with the excavation and trenching will generally be conducted during daytime shifts (12-14 hours/day). Work associated with the retrieval and installation of the cables as well as the splicing is expected to be conducted on a 24-hour per day basis.

3.9 Offshore Execution

Offshore execution will be conducted in accordance with the applicable ExxonMobil Construction Specifications and applicable Industry Standards. Work will involve the retrieval of cable from the ocean bottom and platform risers, removal of existing platform splices, installation of cable on the ocean bottom and in platform risers, installation of cable to cable crossing components, installation of sand bags near Harmony for cable positioning and splicing of the installed cables on the platforms. Also, testing and energization of the installed cables will take place. The work associated with the retrieval and installation of the cables as well as the splicing will be conducted on a 24-hour per day basis.

3.10 Demobilization of Marine Vessels, Equipment and Personnel

Several demobilizations of equipment and personnel from LFC as well as the Harmony and Heritage Platforms could occur throughout the OPSRB Phase 2 activities.

3.10.1 Demobilizations of SYU Spot Charter Vessels Supporting Construction Diving and Anchor Handling Activities

De-mobilizations of vessel and required equipment and components supporting construction diving and anchor handling is expected to occur to Port Hueneme throughout the OPSRB Phase 2 activities. Personnel required for the Phase 2 work will debark either at the port or another designated location, transit to the work site, conduct work as associated with the construction sequence and return to Port Hueneme.

3.10.2 Demobilizations of Cable Installation Vessel

The cable installation vessel (CIV) and support tug, if required will be de-mobilized to Port Hueneme containing extra replacement cables and remaining retrieved out-of-service cables. The vessel is expected to remain in port for several days to complete the following activities: de-mobilize ROVs, off-load equipment to be staged at the ExxonMobil warehouse, off-load spare cable, off-load equipment, off-load retrieved cable, and, transfer required personnel and other activities. The vessel may also bunker low sulfur diesel, if required.

3.10.3 Demobilizations of Platform Installation Aids

The cable installation aids on the platforms including winches, rigging, installation aids, miscellaneous structural members, scaffolding, storage containers, splicing equipment, test equipment, and other required components. Any damage to platform coating systems will be repaired.

3.10.4 Demobilizations of Onshore Installation Aids

The cable installation aids onshore including pulling winch, rigging, installation aids, miscellaneous structural members, excavation equipment, temporary offices and storage containers, temporary electrical service, tunnel dewatering equipment, conduit cleaning, gauging, video and flushing equipment, safety equipment, temporary lighting, splicing equipment, excavation machinery, transportation, and other required components. The trench will be backfilled and returned to original grade. Cable markers will be installed.

4.0 PROJECT IMPLEMENTATION

The project consists of four distinct execution phases. The phases are cable dependent and are executed in required sequences until the entire scope of the project is complete. The first distinct execution phase involves the retrieval of the existing out-of-service cables (Cable A (or B) and C1) to clear the existing conduits, tunnels, J-Tubes and installation paths. The next distinct execution phase involves the installation of the replacement cables (Cables A2 (or B2), F2 and G2) in new I-Tubes or curved conductors and existing conduit, J-Tubes and installation paths. The third execution phase involves the potential implementation of cable execution contingencies (CEC) for the following situations:

- Inability to remove one of the existing out-of-service power cables from a conduit or platform riser
- Inability to install a replacement cable in a conduit or platform riser
- Alternative routes for installing Cables F2 and G2

The fourth execution phase involves the testing and startup and operation of the installed replacement cable systems.

The Phase 2 execution activities will begin after all permits and approvals have been received from the appropriate agencies. At this time, the selected installation contractor (Prysmian Group) will begin mobilizing the necessary personnel and equipment items required for the project including the cable installation vessel. The cable installation vessel (CS Enterprise) is in the process of being modified for the project's specific execution requirements.

The anticipated sequence of execution of the Phase 2 activities is summarized in Section 1.2.2. The actual sequence could change depending on the results of further analysis during detailed planning.

A number of figures are attached to this document (reference Figures 4.0-1 through 4.0-17) to help describe each of the project phases. These figures are organized by phase to correspond to the written information.

4.1 Retrieval of Out-of-Service Cables

The cable retrieval phase of the OPSRB project includes the retrieval of the out-of-service submarine power cables (A (or B) and C1) from LFC, the tunnel under the highway and railroad, the buried conduits connecting the tunnel to offshore, and State Waters using a DP cable installation vessel (CIV) offshore and a support winch on shore. In addition, the Cable A (or B) and C1 segments adjacent to the platforms and in the platform J-Tubes will also be retrieved to facilitate reuse of existing platform risers and routes using a DP cable installation vessel (CIV) offshore and a support winch on shore. There is a possibility that the Cable A (or B) segment from the State/Federal Boundary to the Harmony Platform will also be retrieved to allow adequate room for installation of the replacement cable.

At this time it is anticipated that 12-18 miles of out-of-service cable will be retrieved from LFC, tunnel and conduits, ocean bottom and platform risers. The retrieved cables will be cut on the ocean bottom, pulled onto the CIV, scrapped and washed to remove sediment and marine growth and stored on the vessel. The remaining sections of the out-of-service cables will either be already on the ocean bottom or cut on vessel deck and laid on the ocean bottom and then will have concrete mats placed on the cut ends to hold them in place. When the CIV returns to port, the out-of-service cables will be removed from the vessel, cut into manageable sections, placed in trucks and transported to a local recycle facility where the cable will be recycled to the extent feasible.

4.1.1 <u>LFC</u>

At LFC, the retrieval of each out-of-service submarine power cable (A (or B) and C1) will involve setting temporary aids, and excavating and trenching to uncover the cables from the north side of the tunnel to past the splice locations in the fill area at the southern end of LFC. A winch will be installed north of the excavated area to facilitate removal of the out-of-service cables and install the replacement cables. Excavation will be required for the winch hold down assembly. The assembly will be buried prior to cable handling activities and removed during demobilization. The submarine power cables within the tunnel will be de-energized. The cable will be cut as required to facilitate removal of several sections. Portions of the excavated cable and the splice section will be cut out and removed to allow for the splicing of the replacement offshore submarine cable to the existing land-based cable. A pull line will be attached to a pulling head on the cut end of the cable at LFC to help control the removal operations during recovery offshore to the CIV. The winch in LFC will pay out a pull line that will be left in the tunnel and conduit during the cable removal operations to facilitate the remaining installation operations. The exact sequence of operations will be determined in detailed design.

Submarine cable segments land-side of the tunnel bulkhead will either be cut into manageable sections, placed in trucks and transported to a local recycle facility or left intact and removed with the tunnel cable by the CIV.

4.1.2 Tunnel

Access to the man ways at both the LFC and El Capitan State Beach ends of the tunnel will be required. Equipment will be brought into the tunnel and will be installed to facilitate cable removal, conduit cleaning, conduit gauging, conduit flushing and video of operations. Safety, ventilation and other equipment will be required to facilitate the crews doing the work. Submarine cables in the tunnel will be placed on rollers and aids to facilitate removal. The concrete bulk head could require modification for cable removal or installation. For Cable A, the existing splice in the tunnel (from original installation) will be first cut out and removed. The location of the splice in the tunnel could require a larger segment of Cable A to be removed to the LFC side of the tunnel. The exact sequence of operations will be determined in detailed design.

4.1.3 Conduits

At the nearshore terminus of the cable conduits, divers will clear any sediment cover. The conduit opening and an area around the opening as well as the length of the cable to the point where it will be cut (~40-50 feet) will be exposed by divers using hand held water jets and eductors to sidecast the marine sediment into an existing sand channel adjacent to the POPCO gas pipeline. In addition, scraping pigs, gauging pigs, video cameras, fresh water flushing equipment and other inspection devices and equipment will be staged in or at the ends of the tunnel to be ready to help clear the conduit piping and verify suitability for installation. These activities are being planned due to the age of the existing conduits.

In order to retrieve the shore side of the out-of-service cable, divers will cut the submarine cable at the selected distance from the terminus and attach a pulling assembly connected to a pull line from the CIV. Equipment on the vessel will then remove the cable from LFC, the tunnel and conduit with support from the LFC winch. During cable removal, a pull line will remain at the end of cable removal and cleaning operations to facilitate installation. The recovered cable will be scrapped and washed to remove excess sediment and marine growth and stored onboard the vessel for future recycle.

After the cable is removed from the tunnel and each conduit, the cable path through the tunnel and conduit will be prepared for installation of the replacement cables. The conduits may have been gauged during cable removal by a proofing pig. Further cleaning of the conduit could require fresh water flushes and possibly pulling other types of pigs through the conduit to remove any sand or other debris that could inhibit the cable installation. Other types of pigs or cleaning devices could be pulled through the conduit to verify diameter and a video camera could be pulled through to inspect the conduit. These maintenance operations may need to be performed on the conduit to facilitate its reuse. This operation is required to verify that each conduit is ready for the new installation.

Once the path is cleared, the pull line will be secured through the tunnel, the conduit and to the conduit terminus offshore. The conduit end will be temporarily plugged to prevent any material from entering the opening. The plug will facilitate pull wire rope retrieval when installation operations commence.

4.1.4 POPCO Crossing Area

Prior to removing the out-of-service cable at the POPCO crossing, divers or an ROV will expose the concrete mats that were used to separate the pipeline from the cables using hand held water jets and eductors to sidecast the marine sediment downslope and away from sensitive habitat. The divers or an ROV will then cut and remove the concrete blocks above each of the out-of-service cables. After removal of the out-of-service cables, divers or an ROV will again inspect the area and prepare it for the installation of the replacement cables, as required.

4.1.5 State Lands Area

In order to retrieve the offshore side of the out-of-service cable, divers or an ROV will attach a pulling assembly to the cut end of the cable that is connected to a pull line from the CIV. Equipment on the vessel will then remove the cable from the nearshore location to just beyond the State/Federal boundary. The recovered cable will be scrapped and washed to remove excess sediment and marine growth and stored onboard the vessel for future recycle. At the boundary, the cable will be cut and capped and then placed on the ocean bottom. A concrete mat will be placed on top of the cut end to hold it in place.

4.1.6 Platform Risers

At the Harmony and Heritage Platforms, each of the out-of-service submarine power cables (A (or B) at HA and C1 at HE) will be removed from their J-Tube as well as some distance adjacent to the platform. On each platform a winch will be installed to help control the pull and allow for the cable to be reversed in case it gets stuck at some point. Winch, cable rollers, quadrant blocks and other cable removal equipment will be preinstalled on the platform. Installation of this equipment will require temporary welding to structural members for attachment points. The temporary removal of some decking may be required to allow equipment to be positioned.

The ROV from the CIV will locate the cable on the sea floor at a specified distance from the platform. The ROV will utilize a water jet or other similar device to uncover the cable at the cut point to allow access for the cutting tool. The ROV will confirm the correct cable by visual and tone identification. The ROV will activate the cutting tool to cut the cable. After the ROV cuts the cable on the sea floor, it will attach a recovery assembly to the J-tube side of the cable. The recovery assembly will be connected by a pull line to equipment on the CIV. In addition, the cable on the platform side will be cut and a pulling assembly will be attached to the platform cut end. The platform pulling assembly will be attached by a pull line to the platform winch. The CIV will pull the cable out of the J-tube and onto the deck where it will be scrapped and washed to remove excess marine growth and sediment and stored on the CIV turntable. The winch on the platform will pay out a line that will be left in the J-tube and external to the J-tube to facilitate the remaining installation operations. Before leaving the area, the CIV and ROV will install a concrete mat over the cut end of the out-of-service cable on the ocean bottom to hold it in place.

After the cable is completely removed from the J-tube or during removal, the path through the J-tube will be prepared for installation of the replacement cable. The pull line will be used to pull scraping pigs, gauging pigs, and possibly video cameras and other types of pigs through the J-tube to verify size and remove any sand or other debris that could inhibit the cable installation. Any repairs or modification will be made as required. These operations are required to verify that the J-tube is ready for the new installation. Once the path is cleared, a pull line will be installed through the J-tube and connected to the platform structure. The pull line will be positioned and secured, possibly with an underwater buoy, to facilitate retrieval when pulling operations commence.

4.2 Installation of Replacement Cables

Phase 2 of the OPSRB project includes the installation of the replacement submarine power Cables F2, G2 and A2 (or B2) (each with three phase/three conductors and fiber core configuration) using a DP cable installation vessel (CIV). At this time it is anticipated that approximately 29 miles of replacement cable will be installed from LFC to and between the platforms. Cable C1 will be replaced in two sections: Cable F2 will extend from Platform Harmony to LFC and Cable G2 will extend from Platform Harmony to Platform Heritage. In State Waters, Cable F2 will be located within the existing State Lands Lease. In the OCS, both Cable F2 and G2 will be located within the previously surveyed routes. Cable A (or B) will be replaced with Cable A2 (or B2) from Platform Harmony to LFC. In State Waters, Cable A2 (or B2) will be located within the existing State Lands Lease. In the OCS, the cable will be located in the same general area and within the previously surveyed routes. The decision on which of the two cables, Cable A or B, that will be replaced will be made based on a detailed analysis of the condition of each cable prior to start of Phase 2. Currently documents depict Cable A as being replaced.

Preparation for installation of the replacement cables will include adding temporary installation work areas and temporary installation equipment at Platforms Heritage and Harmony, the tunnel and the area north of the tunnel at the onshore transition splice. Prior to the arrival of the cable installation vessel, cable pulling and rigging equipment will be placed on all the two platforms as well as the fill pad area directly north of the tunnel. The platforms will be prepared to allow pulling of the cable from the vessel and up to the platform. A winch, cable rollers, quadrant blocks and other cable installation equipment will be preinstalled. Installation of this equipment will require temporary welding to structural members for attachment points. The temporary removal of some decking may be required to allow equipment to be positioned.

All of the cables will be installed with a dynamic positioning (DP) cable installation vessel. This vessel will not use anchors during normal installation activities. Anchoring may be required during emergency or safety situations with the anchors placed at locations away from pipelines, power cables and sensitive habitat. An ROV from the vessel will be used during selected phases of the subsea installation to monitor the operations. On board determination of the touchdown point and the as-laid position using survey fixes will be periodically monitored by the ROV during installation.

4.2.1 Cable F2, G2 and A2 Risers at Platform Harmony

At the Harmony Platform, five risers (2 new I-Tubes, 2 new curved conductors, and one existing J-Tube) will be available for installation of submarine Cables F2, G2 and A2 (or B2). The four new risers are being prepared as part of the Phase 1 work scope and are planned to be ready for Phase 2. During final construction planning the decision will be made as to which riser to use for each submarine cable. During installation, the selected riser may be changed to one of the spare risers if difficulties arise with the use of the selected riser. At the Heritage Platform, the existing C1 J-Tube will be reused for installation of submarine Cable G2.

4.2.2 Cable F2 and A2

At the Harmony Platform, the CIV will be positioned adjacent to the platform and replacement cable (F2 and A2 in separate operations) will have a pulling head attached. The CIV ROV will transfer the platform winch line in the platform riser to the CIV where it will be attached to the cable pull head. The platform winch will then pull the cable up the riser as it is being released by the CIV. The cable will be secured on the platform to a cable-hanging assembly. The submarine cable will then be spliced to the topsides power cables and fiber optic cables on the platform.

The CIV will then lay the replacement submarine cable on the ocean bottom from the platform to the nearshore area in the identified route. The F2 cable when installed in the Long I-Tube will include an unsupported catenary from the end of the tube to the touchdown. Additional cable protection system components such as bend stiffeners or VIV reducers, if required, could be installed at the bottom of the riser.. Maintenance of the catenary shape could require the installation of bags containing sand or other types of material at the F2 catenary touchdown. Cables installed in the curved conductor or existing J-tube will be laid directly to the sea floor after exiting the bell mouths. A special protective duct technology product will be applied to the cable in the area of the cable crossings to ensure the maintenance of an appropriate separation between the cable as well as provide impact and abrasion protection. The route will include the crossing of the POPCO Gas Pipeline in approximately 75 feet of water depth. At the pipeline crossing, concrete mats were used to separate the pipeline from the cables and to hold the cables in place. Prior to installation of the replacement cables, divers will have cleared the area and removed the concrete blocks from above the out-of-service cable. The replacement cables will be laid in the same general area as the retrieved out-of-service cable utilizing the existing separation to the pipeline. After installation of the cables, divers will either replace the concrete blocks above the replacement cables or remove the blocks and the CIV will install a concrete mat over the cables.

As the vessel approaches the conduit terminus area, the length of replacement cable to traverse the distance to the LFC splice point will be measured. The cable will be cut, the end prepared and floats attached to the cable. Divers will be utilized to remove the conduit plug, excavate any material that may have refilled the area around the conduit terminus using the same procedures as before. The divers will also help guide the cable into the conduit opening and monitor the pulling activity. The cable length will be floated on the ocean surface. Divers will attach the previously installed winch wire from the winch in LFC to the pull head at the cut end of the floating submarine cable. The winch will pull the replacement submarine cable from the CIV through the conduit and tunnel to the splice location where the splice between the land-based onshore and submarine cables will be performed. The cable is only expected to touch the sea bottom in the area immediately in front of the conduit (approximately 25-50 feet). Divers will remove the floats on the cable close to the conduit terminus and on the final straight section. Small motor craft will aid in the installation by maintaining the floating cable in the proper orientation and collecting the removed floats.

At LFC, the installation of the two replacement submarine cables will involve utilizing the temporary installation aids and winches installed for the cable retrieval. Previously installed rollers and aids placed in the tunnel will facilitate installation of the cables. The LFC winch will pull the cable into the conduit and through the conduit and tunnel to just beyond the splice location in LFC. The installed cable may be washed with water either in the tunnel or on the LFC pad to remove contaminants. The replacement submarine cable will then be spliced to the existing land-based cable. A small amount of trenching in fill and native soil will be required to install a new conduit for the fiber optic cable from the replacement cable splice location to an existing pull box in the area for routing to the upper LFC facilities.

4.2.3 <u>Cable G2</u>

Submarine Cable G2 will be installed from Platform HA to Platform HE. For the submarine cable installation, the submarine cable from the CIV will be pulled through one of the prepared risers onto the platform utilizing platform based temporary equipment. On the platform, the submarine cables will be secured and spliced to the platform-topsides power cables. The CIV will lay the replacement submarine cable on the ocean bottom from one platform to the next platform in the selected route. The G2 cable when installed in the Long I-Tube will include an unsupported catenary from the end of the tube to the touchdown. Additional cable protection system components such as bend stiffeners or VIV reducers, if required, could be installed at the bottom of the riser. Maintenance of the catenary shape could require the installation of bags containing sand or other types of material at the G2 catenary touchdown. Cables installed in the curved conductor or existing J-tube will be laid directly to the sea floor after exiting the bell mouths. A special protective duct technology product will be applied to the replacement cable in the area of the cable crossings to ensure the maintenance of an appropriate separation between the cable as well as provide impact and abrasion protection. At the next platform, the submarine cable from the CIV will be placed in a sector and lowered to the ocean bottom as it is being pulled through one of the prepared risers onto the platform utilizing platform based temporary equipment. The CIV ROV will help to remover the sector and the cable will lie down on the ocean bottom. The cable that is removed from the sector is anticipated to form a small omega shape on the sea floor due to the cable bight. On the platform, the submarine cables will be secured and spliced to the platform-topsides power cables.

The CIV support tug may be required to transport the CIV between ending points and starting points of each segment of the sequence within SYU, depending on current ABS regulations. When not required, the tug may standby at the boat buoy near Platform Harmony.

4.3 Execution Contingencies

Several Cable Execution Contingencies (CEC) and installation contingency scenarios summarized below have been included in the OPSRB Project to account for situations that could arise during the work activities.

- CEC#1: Inability to remove C1 from the nearshore conduit or install F2 in the existing near shore conduit;
- CEC#2: Inability to remove C1 from the Heritage Platform J-tube or install G2 into the Heritage Platform J-Tube;
- CEC#3: Inability to remove A from the nearshore conduit or install A2 in the existing near shore conduit;
- CEC#4: Inability to remove A from the Harmony Platform J-Tube or install A2 into the Harmony Platform J-Tube;
- Alternative routes for installing Cables F2 and G2 in Federal Water of the OCS;

4.3.1 Inability to Remove or Install Cable

The Project team has identified several scenarios where one of the existing out-of-service power cables cannot be removed from, or a replacement cable cannot be installed in, a conduit or platform riser. These are described below as CEC # 1, CEC # 2, CEC # 3 and CEC# 4. The proposed contingency measure involves laying the cable that cannot be installed in the conduit or riser on the ocean floor parallel to the installed cable that is approaching the conduit or J-tube. The cables will remain on the ocean bottom until an appropriate installation approach can be developed, reviewed and approved by the agencies and implemented. From an installation approach, utilizing one of these contingencies would not be expected to have a significant impact on the environmental analysis associated with the project. [The probability of one of these contingencies occurring is considered to be very low.]

In the nearshore area under CEC#1 and CEC # 3, if one or both of the out-of-service cables (C1 or A (or B)) cannot be removed from a conduit or a replacement cable cannot be installed in the conduit, the contingency measure would be implemented. For the situation where the out-of-service cable cannot be removed from the conduit, the out-of-service cable would be cut outside the conduit terminus and retrieved as planned in State Waters to a point just inside the Federal OCS Waters. The approach will involve installing the replacement cable from the platform to a location south of the POPCO crossing and then laying the cable in the required radius to execute a 180 degree turn. The cable would then be laid adjacent and parallel to the replacement cable along the installed route until the length required to reach the planned splice location is on the ocean bottom. For the situation where one or both of the replacement cables cannot be installed in the conduit, the CIV would retrieve the cable back onto the vessel to a point south of the POPCO crossing and execute a similar procedure to lay the cable adjacent and parallel to the replacement cable along the installed route until the required length is on the ocean bottom. Reference Drawing DWG-R-4001 and 4003.

In the OCS (near Platforms Heritage and Harmony) under CEC#2 and CEC# 4, a similar approach would be taken if one or more of the out-of-service cables (C1 or A) cannot be removed from a platform riser or a replacement cable cannot be installed in the riser, the contingency measure would be implemented. For the situation where the out-of-service cable cannot be removed from the platform riser, the out-of-service cable would be cut outside the riser terminus at some distance from the platform and retrieved as planned. The approach will involve installing the replacement cable from a point away from the platform toward the platform and then laying the cable in the required radius to execute a 180 degree turn away from the platform essentially adjacent and parallel to the replacement cable segment. The CIV would then proceed to lay the cable length required to reach the intended destination along the designated route. For the situation where one or both of the replacement cables cannot be installed in any of the platform risers, a similar approach would be followed. Reference Drawing DWG-R-4002 and 4004.

At Platform Harmony, since there are spare risers, if Cable A (or B) cannot be removed from the HA J-Tube, the replacement cable installation will continue using one of the spare risers. In a similar manner, if one of intended risers is not available, the replacement cable installation will continue using one of the spare risers.

4.3.2 Alternative Routes

The Project Team has identified several alternative routes for the installation of Cables F2 and G2 in the OCS. The determination of which route is selected will depend on final evaluation of survey data and operational considerations. The selected route could be adjusted during detailed installation evaluations. All of the routes will be within the previously surveyed and cleared areas.

1. Installation of approximately 11.2 miles (18.0 kilometers) of replacement power Cable F2 between Platform Harmony and the southern end of the onshore Las Flores Canyon (LFC): The route through the State Lands Right of Way will remain the same. The primary route in Federal Waters is the southern route where the cable would be laid outside and south of Cable C1. The alternative northern route would involve laying the cable between Cables C1 and C in Federal Waters.
2. Installation of approximately 7.3 miles (11.7 kilometers) of replacement power Cable G2 between Platform Harmony and Platform Heritage: The primary route in the Federal Waters is the southern route where the cable would be laid outside and south of Cable C1. The alternative northern route would involve laying the cable between Cables C1 and C in Federal Waters.

4.3.3 Bags Containing Sand or Other Materials

One installation measure being considered includes the placement of bags on top of the installed cables adjacent to Platform Harmony at the bottom of the catenary and at the location where the cable makes a sharp turn (F2 towards shore and G2 towards HE). The other area is at the installation of A2 at the Harmony platform. The bags could be required to maintain the touchdown point. The bags are estimated to be approximately 1-ton in weight and would be lowered by the cable installation vessel on top of the installed cable to help hold the cable in place and minimize any unintended movement as the cable is being laid. The bags will be located in close proximity to the platform jacket base (expected to be less than 1000 feet).

4.4 Testing and Energization

A series of electrical test will be performed on the replacement submarine cables after installation, after splicing and prior to continuous operation. These different types of special tests are required to verify that the power cables and fiber optics members have not been damaged during installation, are acceptable for splicing, have been spliced properly, and will perform properly. Upon completion of the testing of the cables and all of the interconnecting equipment, energization preparations will begin circuit by circuit – F2, G2 and A2. Acceptance and performance in the power system of the F2 circuit is critical to the operations and will be achieved prior to removal of cable A (or B) and installation of Cable A2 (or B2).

Existing cables will be de-energized, isolated and re-energized as part of the execution process. Existing cable will typically not be tested between de-energization and energization.

De-energization, isolation and energization plans will be reviewed and platform power distribution systems will be properly configured for load balance as required during the power system conversion. With close coordinating with production operations, circuit energization and power flow monitoring will begin as the platform load increases as production is returned.

5.0 REPORTING AND PERMITS

Final reporting activities include collecting all required information and preparing and submitting the final reports required by the agencies.

ExxonMobil will work with the various contractors to identify and collect the information required for the preparation of the final reports. Each final report will be prepared in the format requested by the specific agency. The reports will be submitted on the schedule provided in the agency permits and approvals.

6.0 SCHEDULE

All aspects associated with the retrieval of the out-of-service cables and the installation of the replacement cables will be completed in several overlapping phases during a several month period. Preliminary engineering design has been completed and is the basis for this project execution plan. Detailed engineering is progressing. A detailed schedule of project activities will be provided to the agencies prior to the start of any work onsite.

ExxonMobil estimates that the proposed project would require approximately 15-21 months for Phase 1 and 8-12 months for Phase 2. The Phase 1 installation activities commenced in June 2013 after the Bureau of Safety and Environmental Enforcement (BSEE) approved the Phase 1 activities as minor platform modifications in May 2013. The Phase 1 activities are expected to be completed by about the 1st Quarter 2015. The Phase 2 cable retrieval and installation activities are expected to commence on or about the 4th Quarter of 2014 and be completed by about early 4rd Quarter 2015. Phase 1 and Phase 2 work will have some overlap. The offshore cable retrieval and installation portion of Phase 2 is expected to require 1-2 months and be conducted during mid to late 2015.

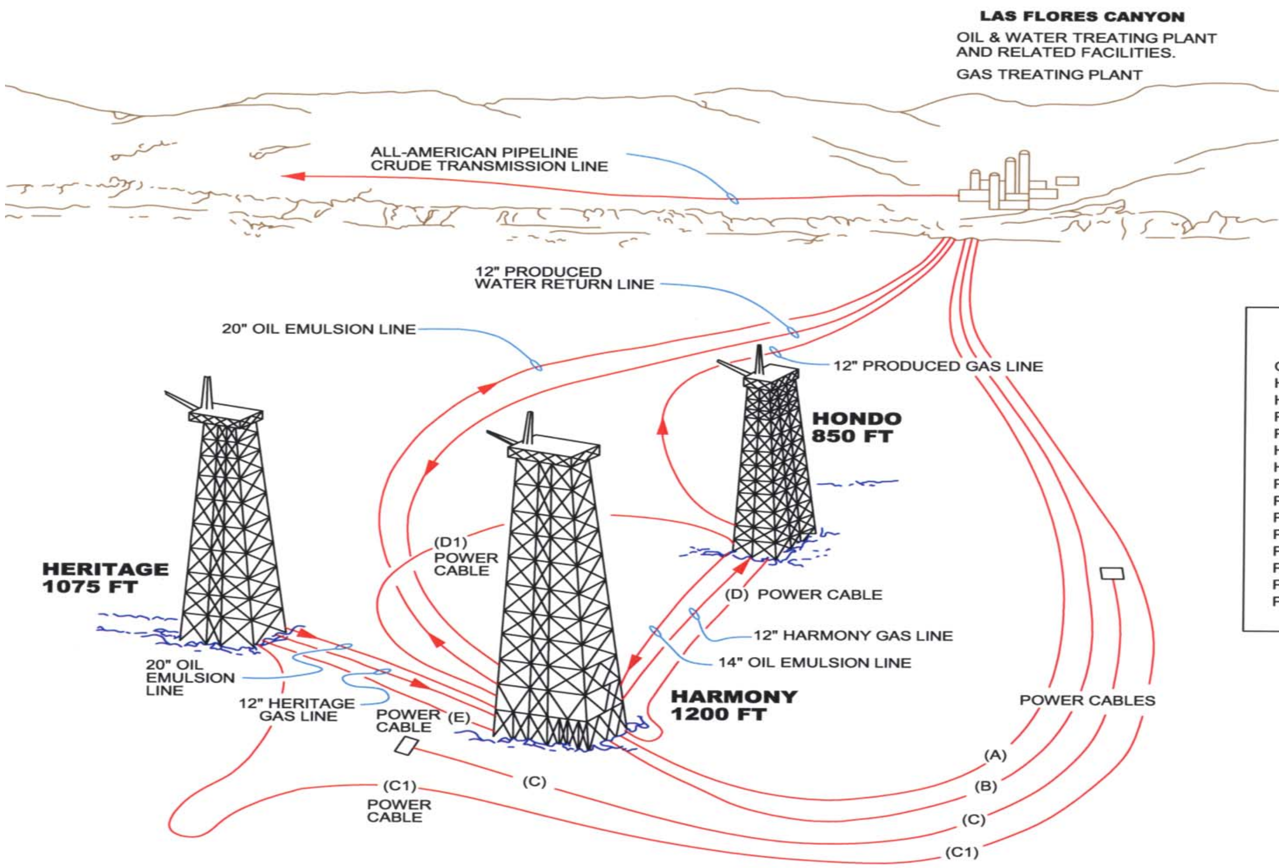

Santa Barbara County
Oil and Gas Facilities
Prepared for Santa Barbara County P&D Energy Division by MAGELLAN Geographix Santa Barbara CA June 2000
Pacific Ocean
San Luis Obispo County
Kern County
Ventura County
Santa Barbara Channel
Santa Maria
Orcutt
Guadalupe
Vandenberg AFB
Lompoc
Buellton
Solvang
Santa Ynez
Goleta
Santa Barbara
Carpinteria
Oxnard
Cuyama
Lake Cachuma
Gibraltar Reservoir
Twitchell Reservoir
Tosco/Santa Maria
SMRC/Santa Maria Asphalt Refinery
Tosco/Unocap Summit Pump Station
Tosco/Unocap Santa Maria Pump Station
Tosco/Unocap Orcutt Pump Station
All American Sisquoc Pump Station
All American Pipeline
Torch Sales Gasline
Unocal Pipeline (Gas)
Torch Pipelines
Lompoc Oil & Gas Plant (consolidated site)
Hallador/Cuyama
Molino Gas Project
AAPLP Gaviota Pump Station
AAPLP Las Flores
CalResources/AERA
POPCO/Las Flores Canyon
Exxon/Mobil Las Flores Canyon (consolidation site)
Arguello/Gaviota (consolidated site)
Equilon/Gaviota Terminal
ARCO/Dos Pueblos
Venoco/Ellwood
Ellwood Marine Terminal
Venoco/Carpinteria
Torch/Rincon
Unocal Cojo
Lion Rock Unit - AERA
Point Sal Unit - AERA
Purisima Point Unit - AERA
Santa Maria Unit - AERA
Point Pedernales Unit - Torch
Tranquillon Ridge Unit - Torch
Bonito Unit - Torch
Rocky Point Unit - Whiting
Point Arguello Unit - Arguello Inc
Sword Unit - Conoco
Santa Ynez Unit - Exxon/Mobil
Gato Canyon Unit - Samedan
Santa Clara Unit
Cavern Point Unit
Point Hueneme Unit
Pitas Point Unit
Irene
Hidalgo
Harvest
Hermosa
Heather
Harmony
Hondo
Heritage
Holly
Mr. Clean III
Mr. Clean I
Henry
Hogan
Houchin
Hillhouse
Habitat
Grace
Gilda
Gail
C B A
Oil-spill containment vessel
Helisupport
Platforms
Refinery
Gas processing plant
Oil separation and treatment plant
Oil & Gas separation, treatment and gas processing plant
Marine terminal
Storage tanks <500,000 bbl
Storage tanks 500,000 to 1,000,000 bbl
Crew and light support supply base
Soil remediation
Pump stations
Onshore drill site
Pipelines (w/direction of flow)
SCE 66kV Transmission line
Federal Lease boundary
Federal Unit boundary
0 5 10 mi
proposed existing under abandonment
3 NAUTICAL MILES

Figure 4.0-1

SYU Existing Offshore Facilities Overview

ExxonMobil Production

SANTA YNEZ UNIT FACILITIES



MAJOR PIPELINE AND POWER CABLE FACILITIES

OIL EMULSION LINE TO SHORE	16 MILES OF 20" LINE
HERITAGE TO HARMONY	7 MILES OF 20" LINE
HONDO TO HARMONY OIL LINE	4 MILES OF 14" LINE
PRODUCED WATER RETURN LINE TO SHORE	10 MILES OF 12" LINE
PRODUCED GAS LINE TO SHORE	7 MILES OF 12" LINE
HARMONY GAS LINE	4 MILES OF 12" LINE
HERITAGE GAS LINE	7 MILES OF 12" LINE
POWER CABLE (APPX. TOTAL)	47 MILES
POWER CABLE "A"	10 MILES
POWER CABLE "B"	10 MILES
POWER CABLE "C" (ABANDONNED IN PLACE)	11 MILES
POWER CABLE "C1"	17 MILES
POWER CABLE "D"	3 MILES
POWER CABLE "D1"	4 MILES
POWER CABLE "E"	7 MILES

Figure 4.0-2

SYU LFC Onshore Facilities Overview

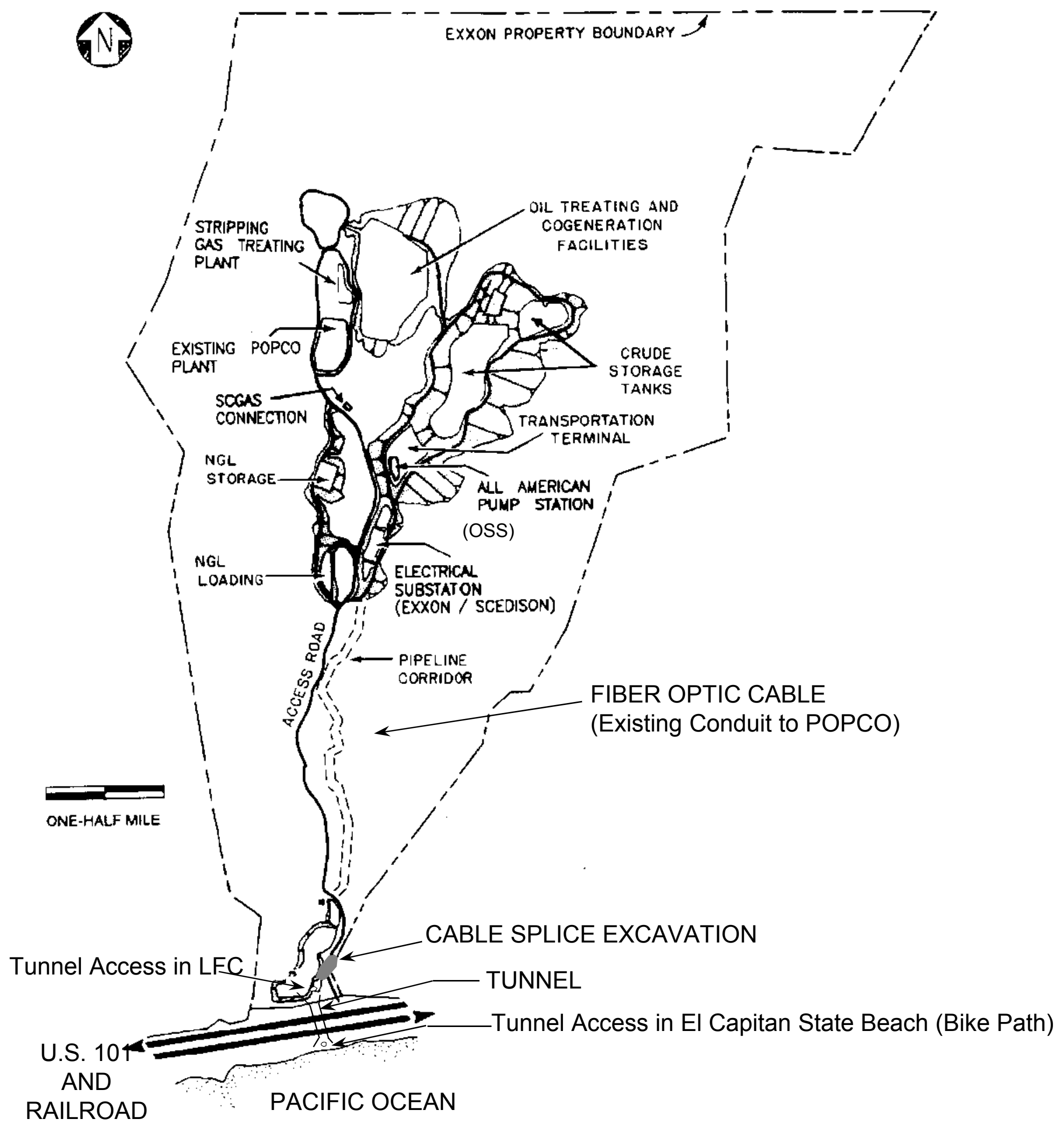


Figure 4.0-3

LFC Side of Tunnel

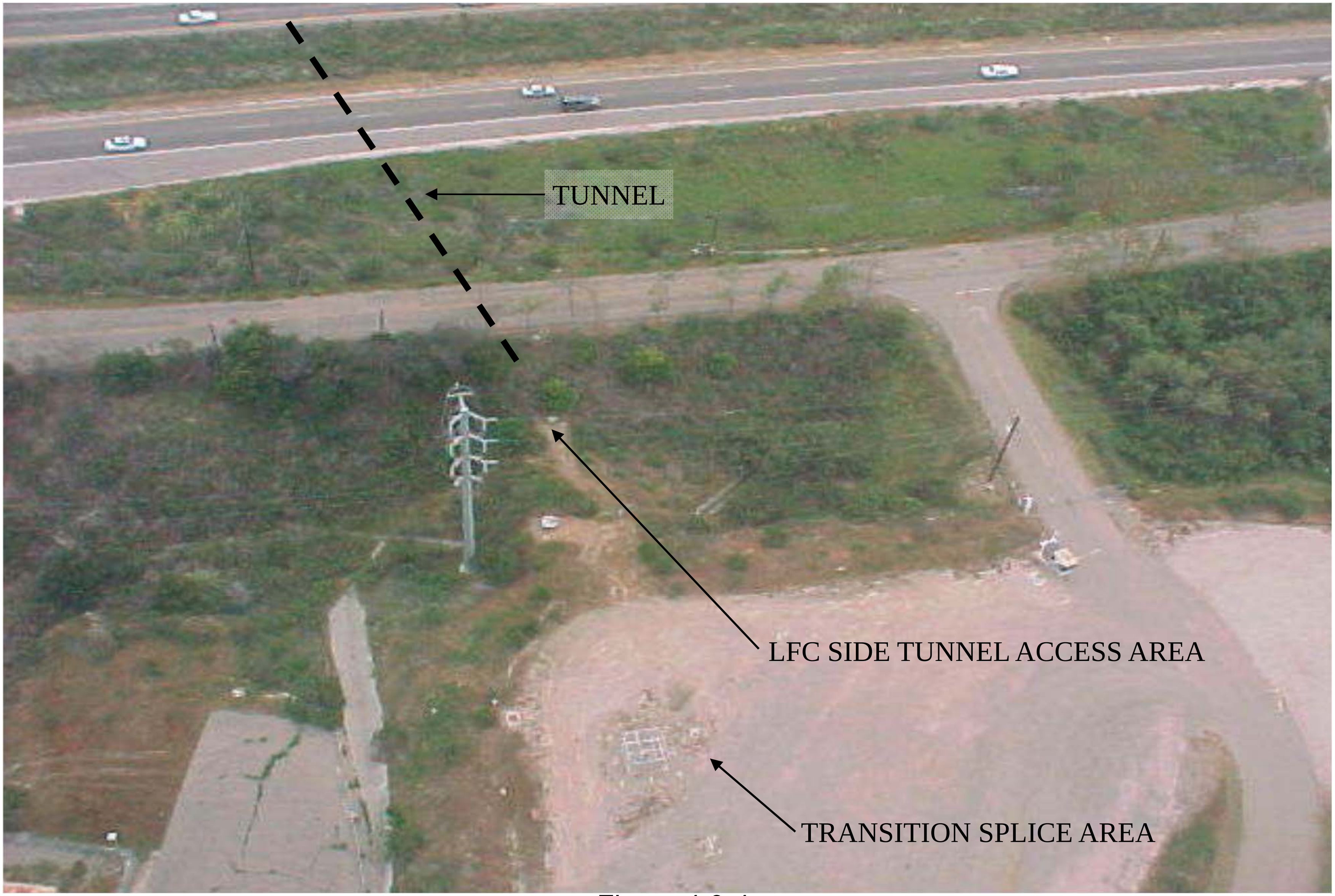


Figure 4.0-4

Cross-Section of Tunnel

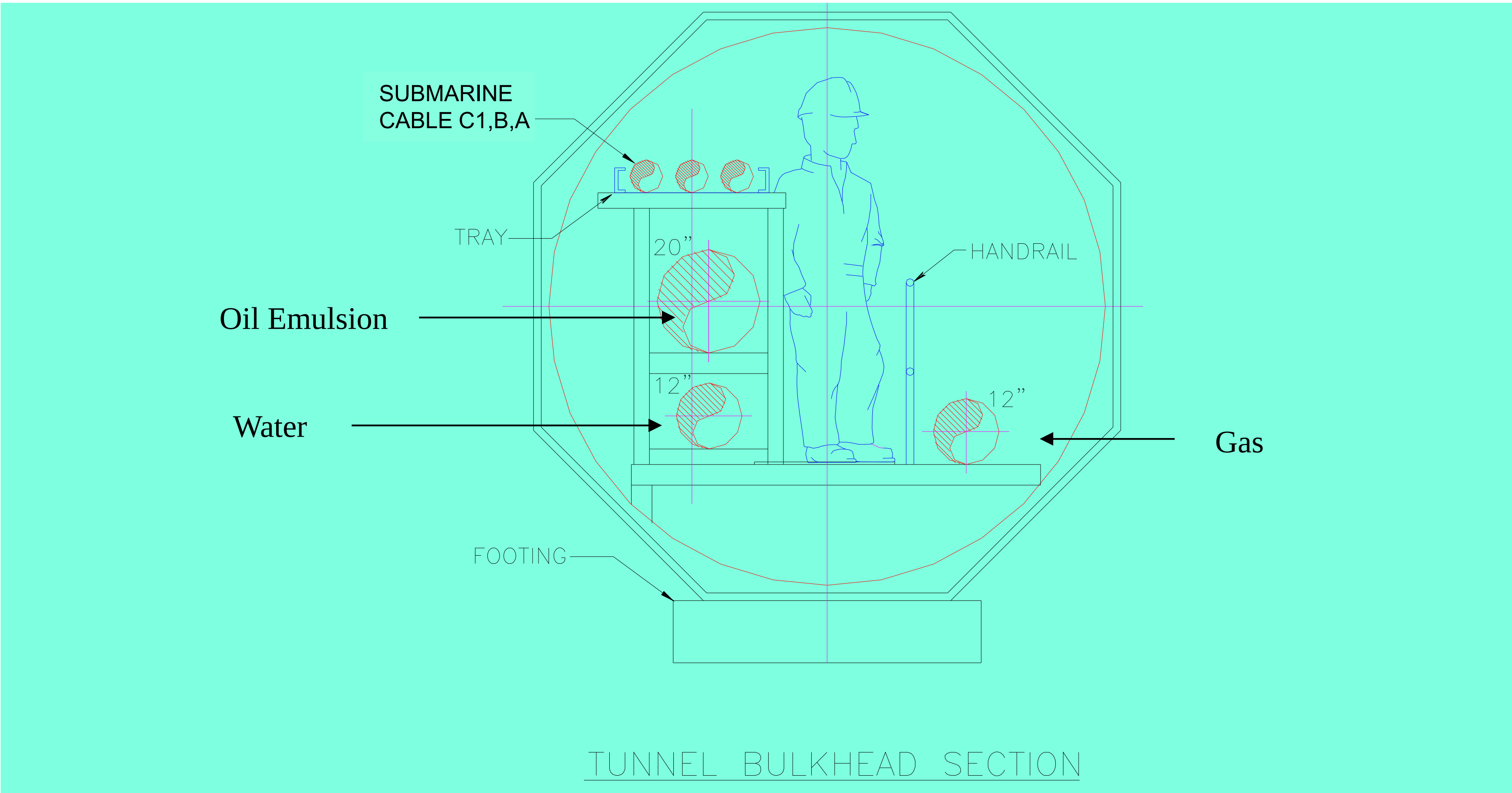


Figure 4.0-5

Diagram of Elevation of Tunnel and Conduit Area

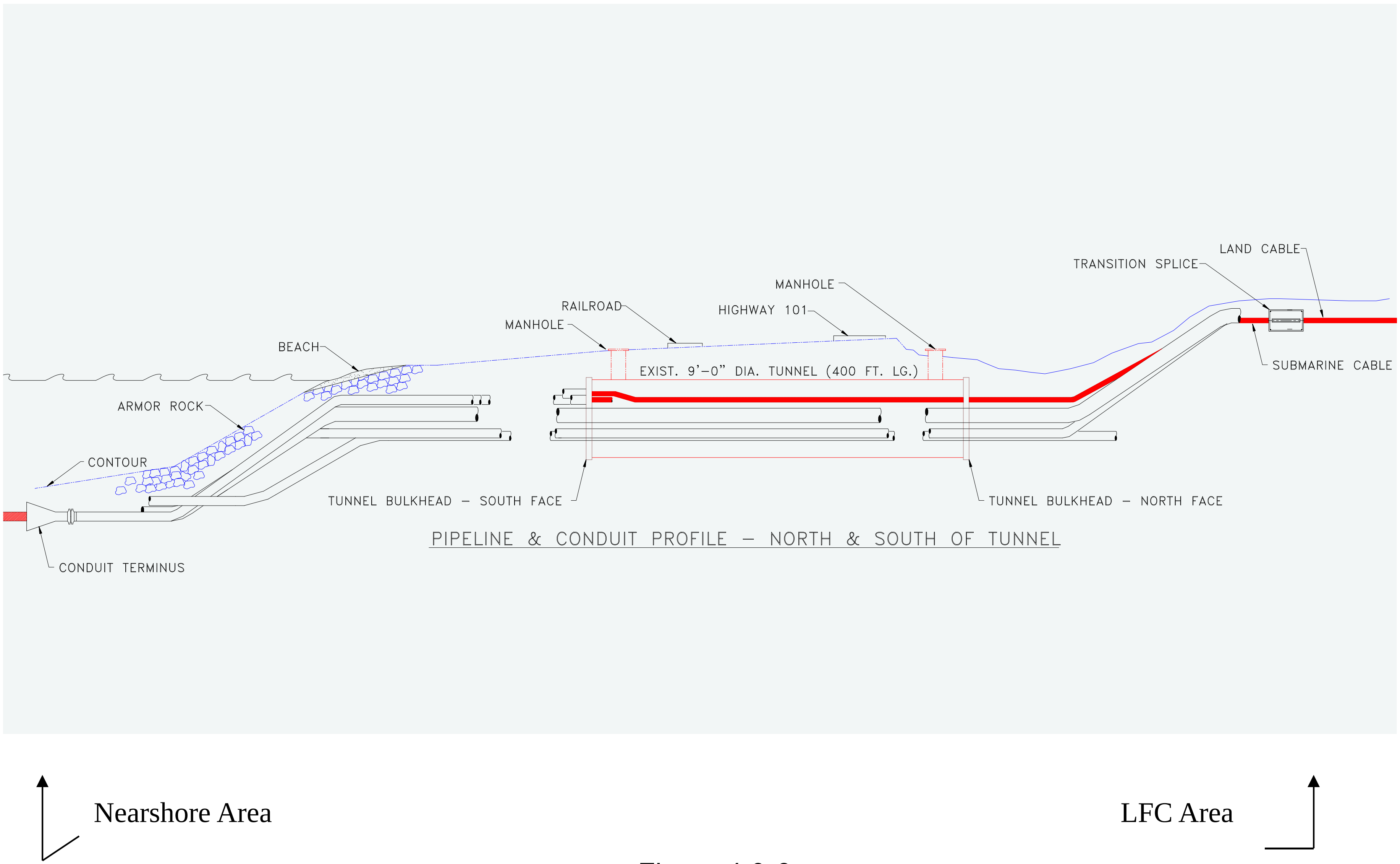


Figure 4.0-6

SYU Nearshore Power Cable Conduit Location

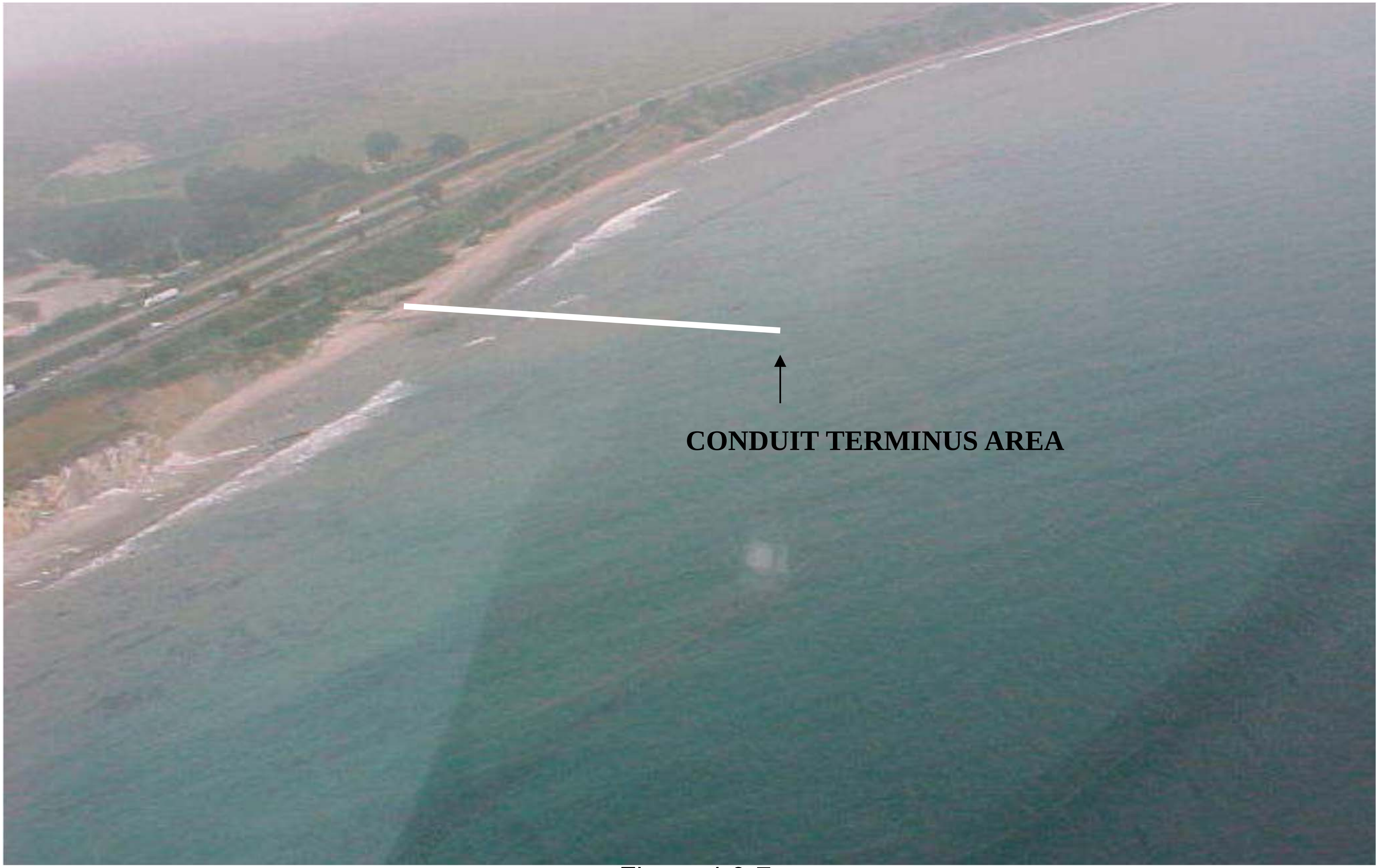
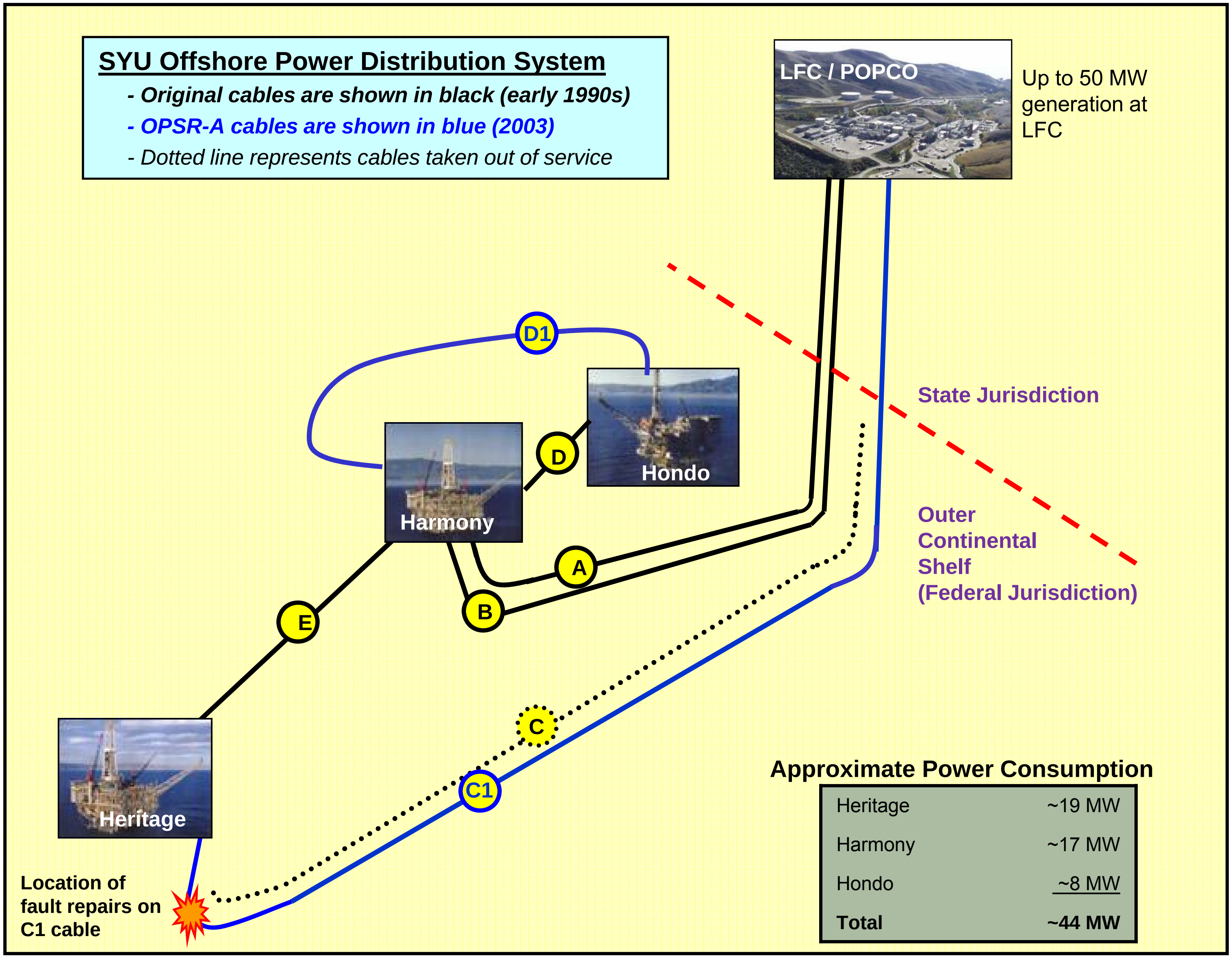


Figure 4.0-7

SYU Existing Power Distribution System

ExxonMobil Production



Approximate Power Consumption

Heritage	~19 MW
Harmony	~17 MW
Hondo	~8 MW
Total	**~44 MW**

Figure 4.0-8

OPSRB Proposed Scope

ExxonMobil Production

Description

- Replace 2 existing submarine power cables: Replace A (or B) with A2 (or B2) and replace C1 with F2 and G2 [Phase-2]
  - 29 miles of 3 phase cables; 35 kV ; 32 MW
  - Total cable weight approx. 2900 tons
- Retrieve and recycle 12-18 miles of Cables A (or B) and C1 (LFC to State/Federal Boundary, on and adjacent to HA and HE, and along route) [Phase-2]
- Install modifications on HA and HE for cable installation and electrical equipment [Phase-1]

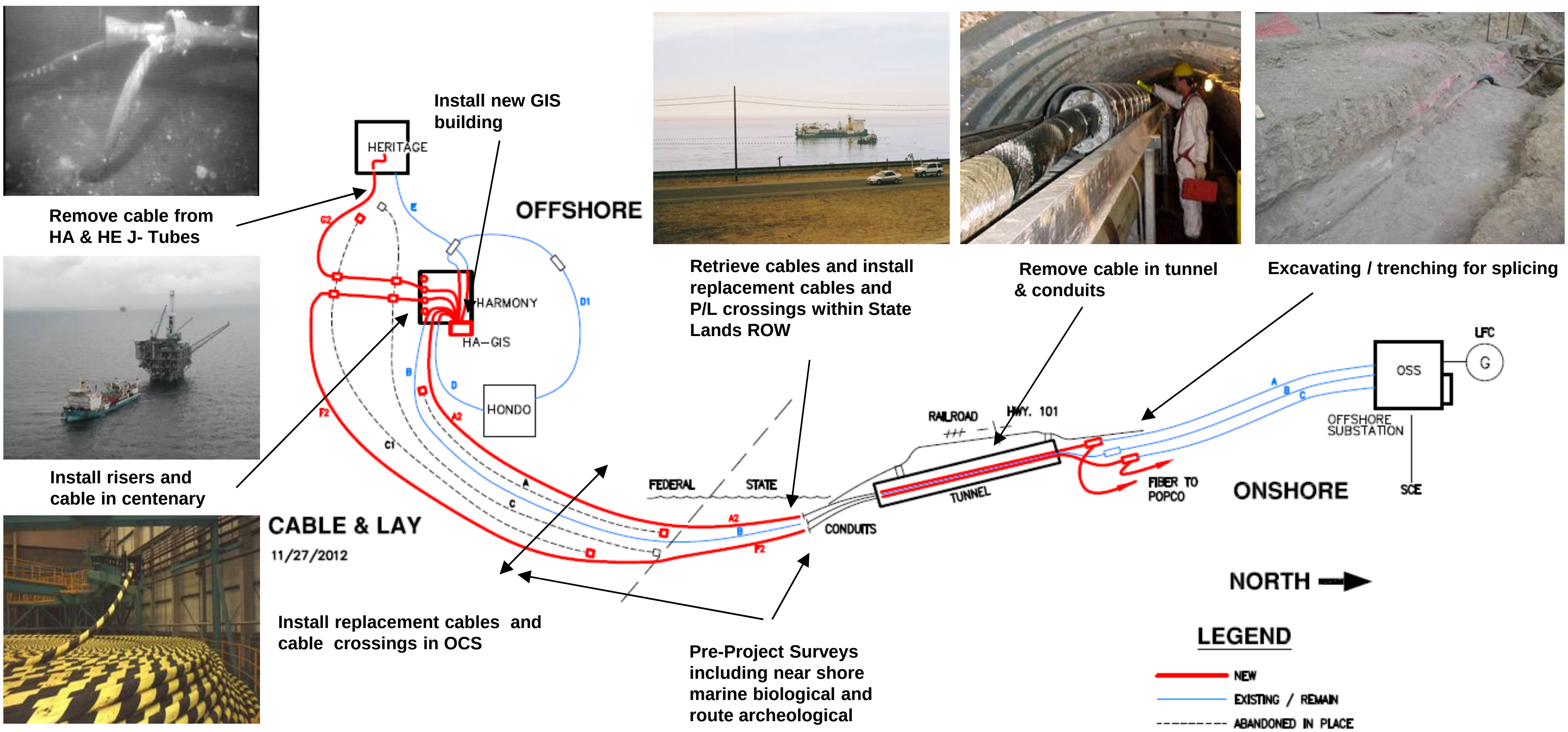
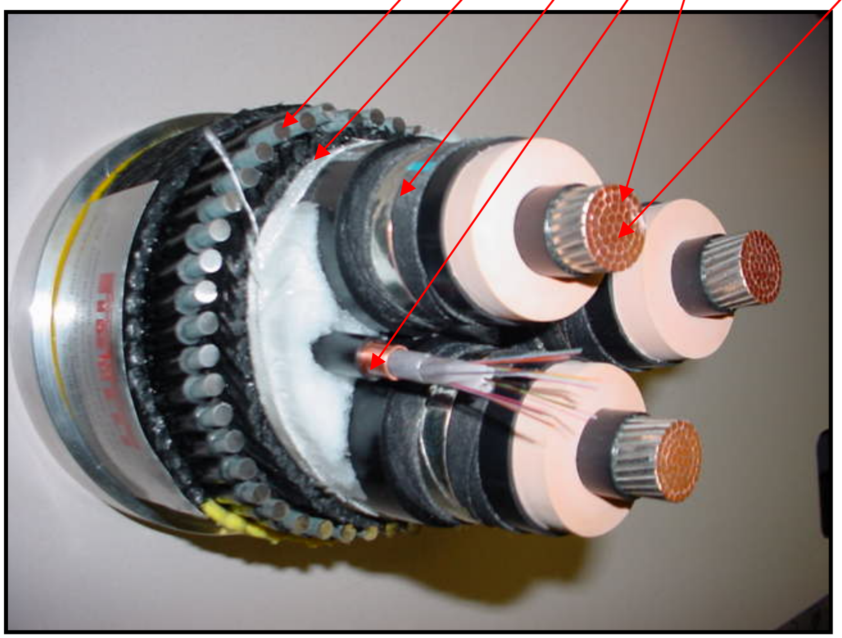


Figure 4.0-9

SYU OPSRB

SYU Cable Cross-Sections

- Kerite (1993)- Original submarine power cable installations
- Pirelli (2003)- Cable C1 and D1 (Similar design except water blocking and fiber optics)
- OPSRB (2015)- Similar to Pirelli with double armor wire, 46 kV insulation, and larger conductors



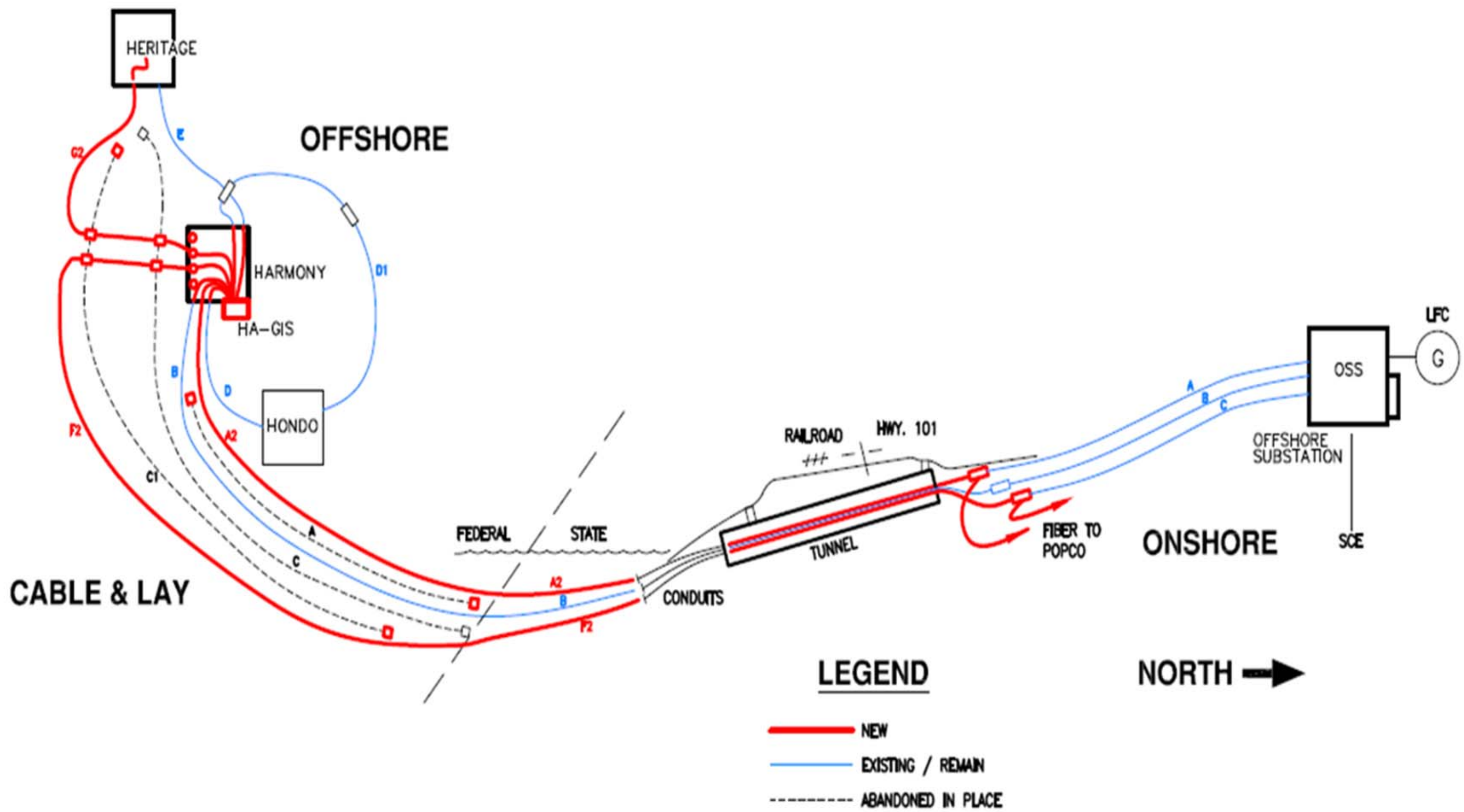
35 kV Pirelli Cable Installed in 2003

35 kV Kerite Cable Installed in 1993

Figure 4.0-10

OPSRB Cable Overview Diagram

ExxonMobil Production



Red Cables A2 (or B2), F2 & G2 will be installed replacement cables. Blue Cables B (or A), D, D1, & E are existing cables that will remain in operation. Black Dashed Cables A (or B), C1 & C will be abandoned in place. Cables A (or B) & C1 will be retrieved in Tunnel, Conduits, State Waters and adjacent to Platforms.

Figure 4.0-11

Typical DP Cable Installation Vessel

Typical DP Cable Installation Vessel - Preliminary Deck Layout

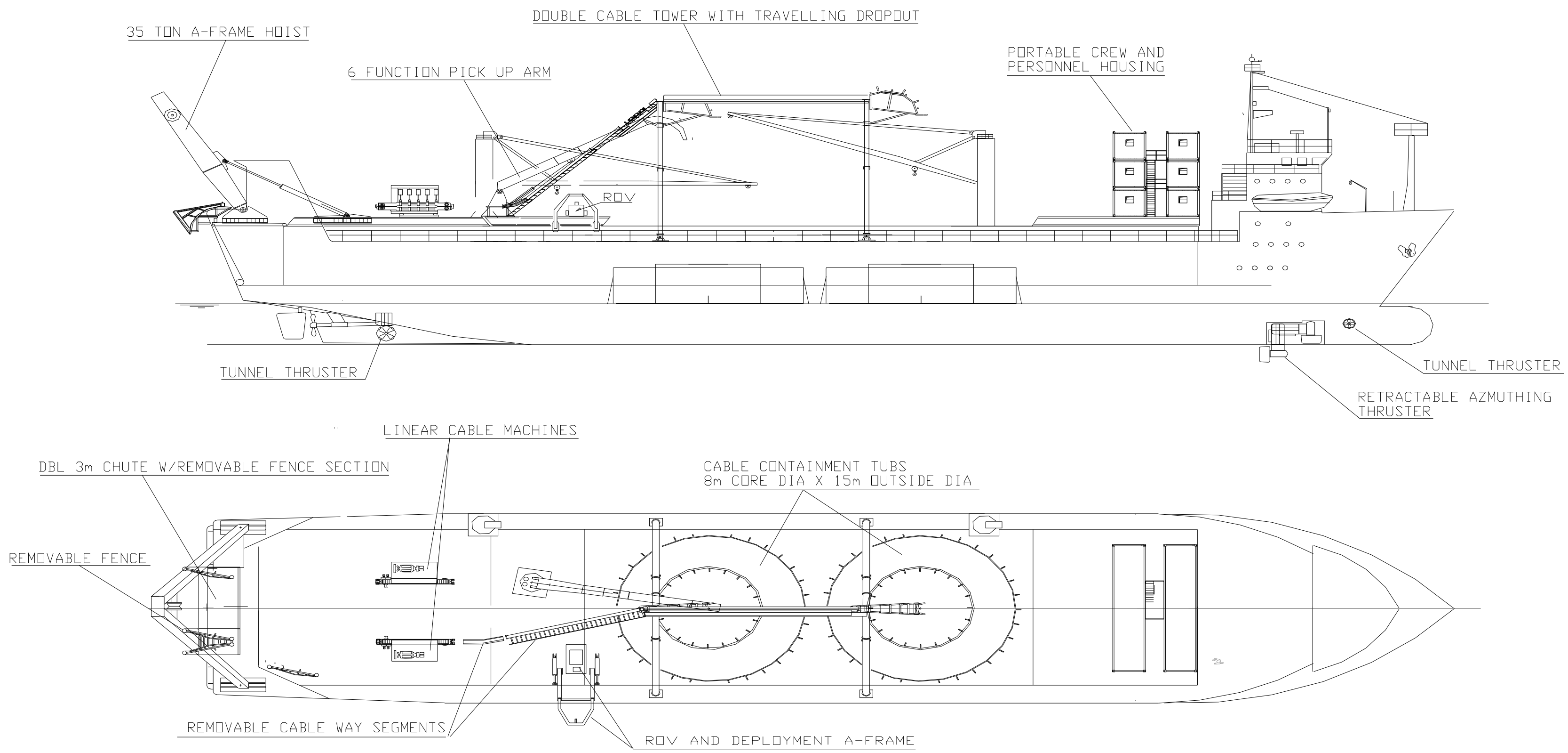


Figure 4.0-12

Cable Retrieval from Conduit and Tunnel

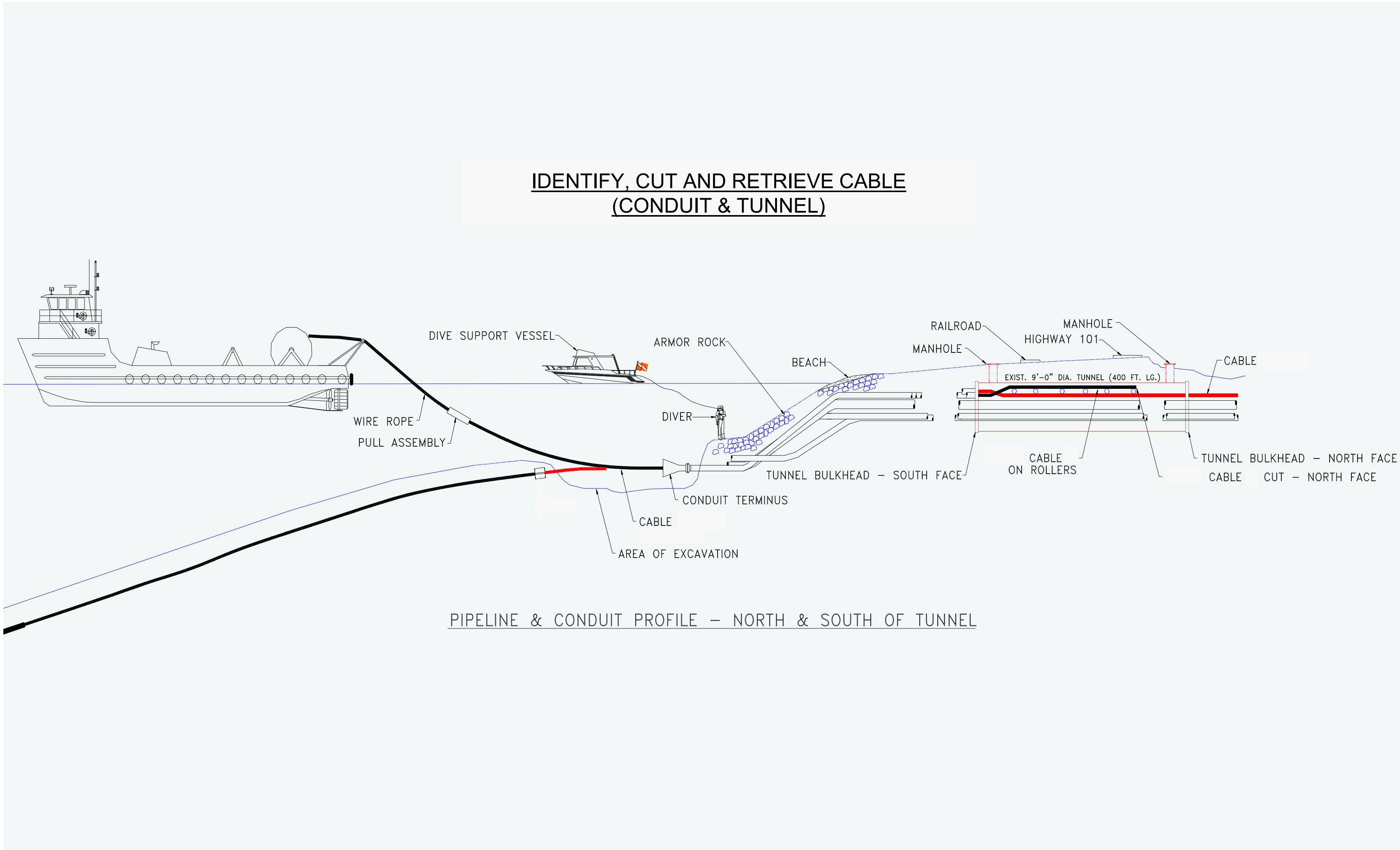


Figure 4.0-13

Cable Installation Start Pull-In at Platform

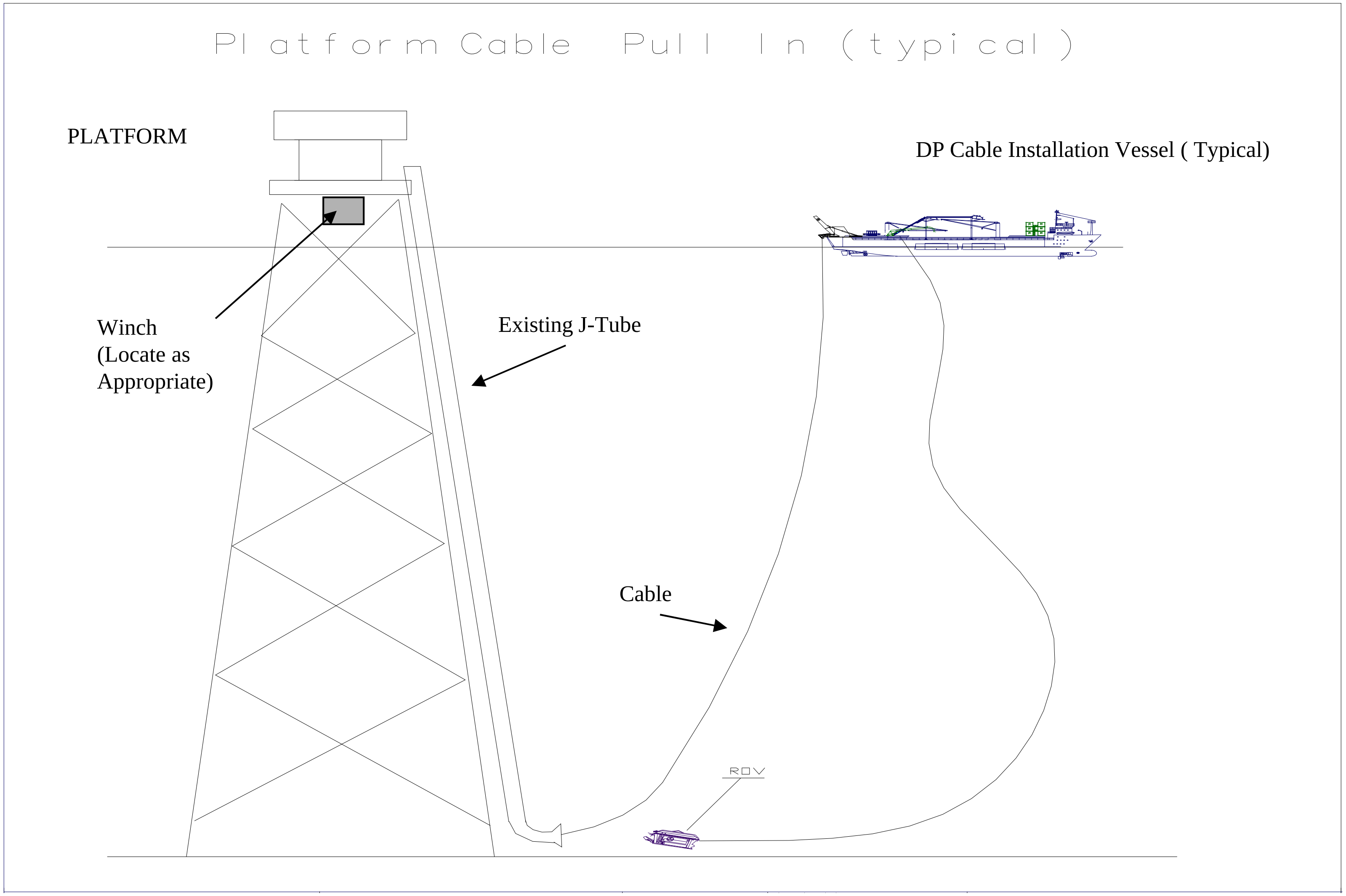


Figure 4.0-14

Cable Installation Platform to Platform or Platform to Shore

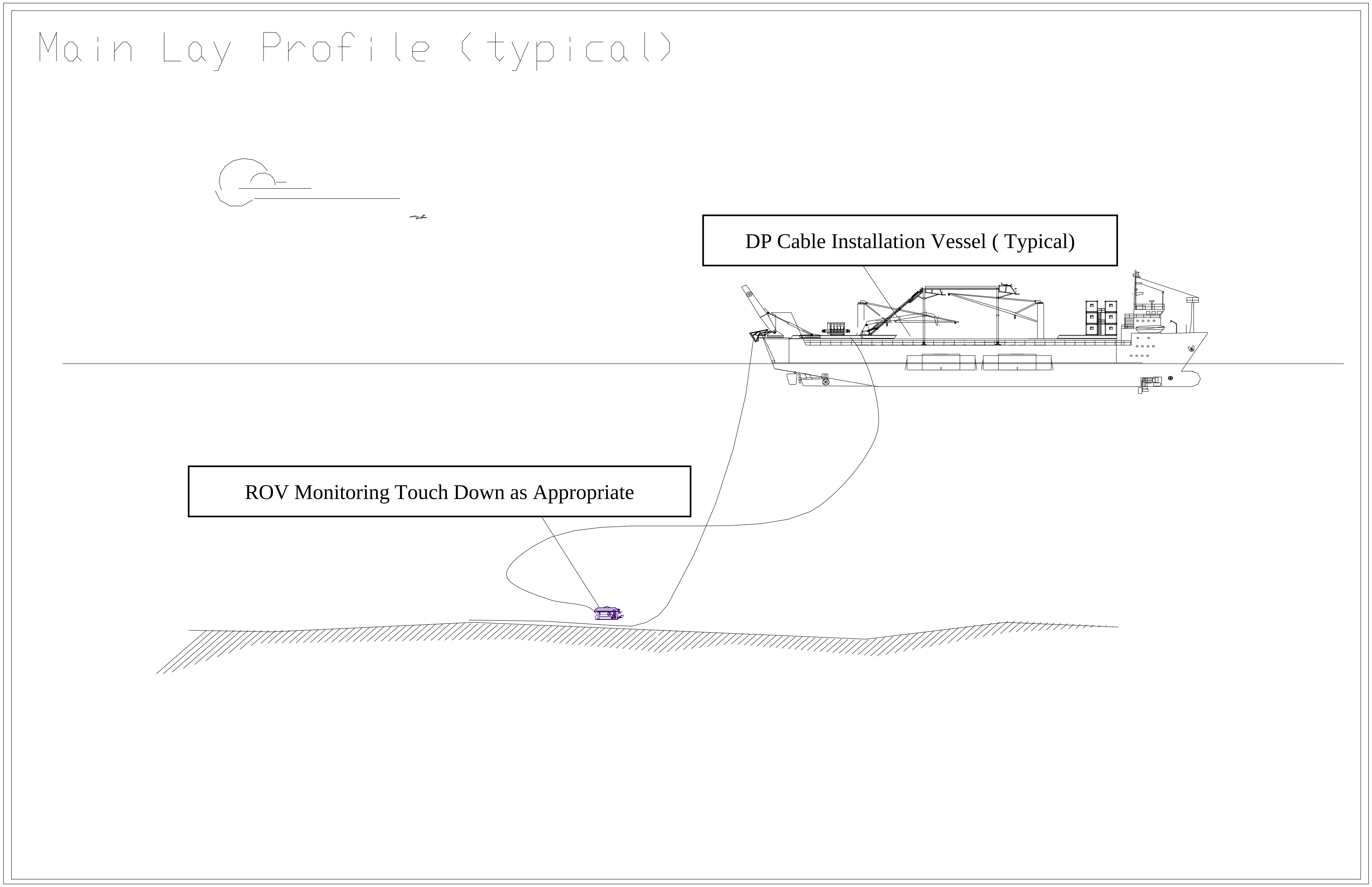


Figure 4.0-15

Cable Installation Final Pull-In (Platform to Platform)

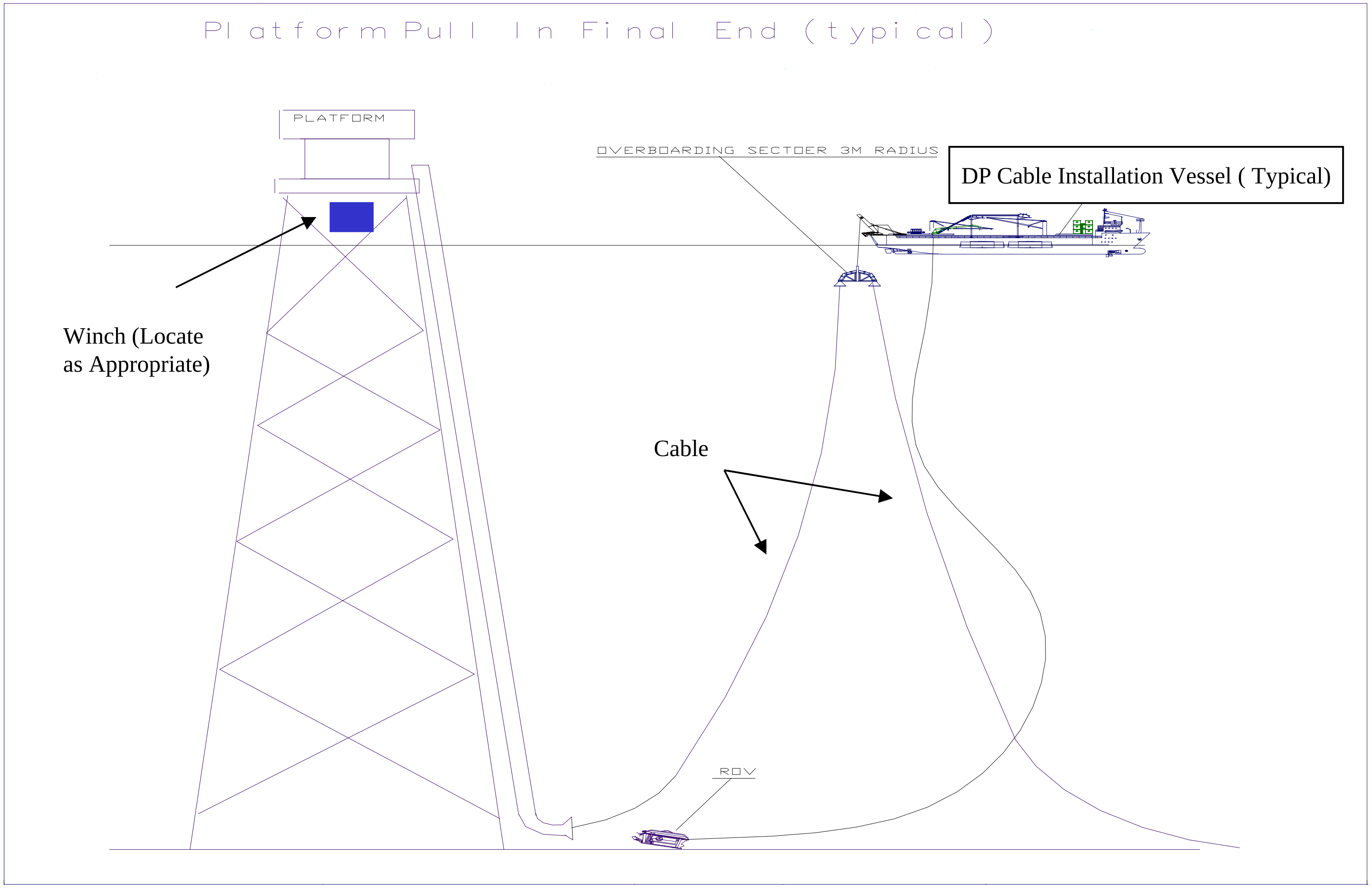


Figure 4.0-16

Cable Installation Final Shore Pull-In (Platform to Shore)

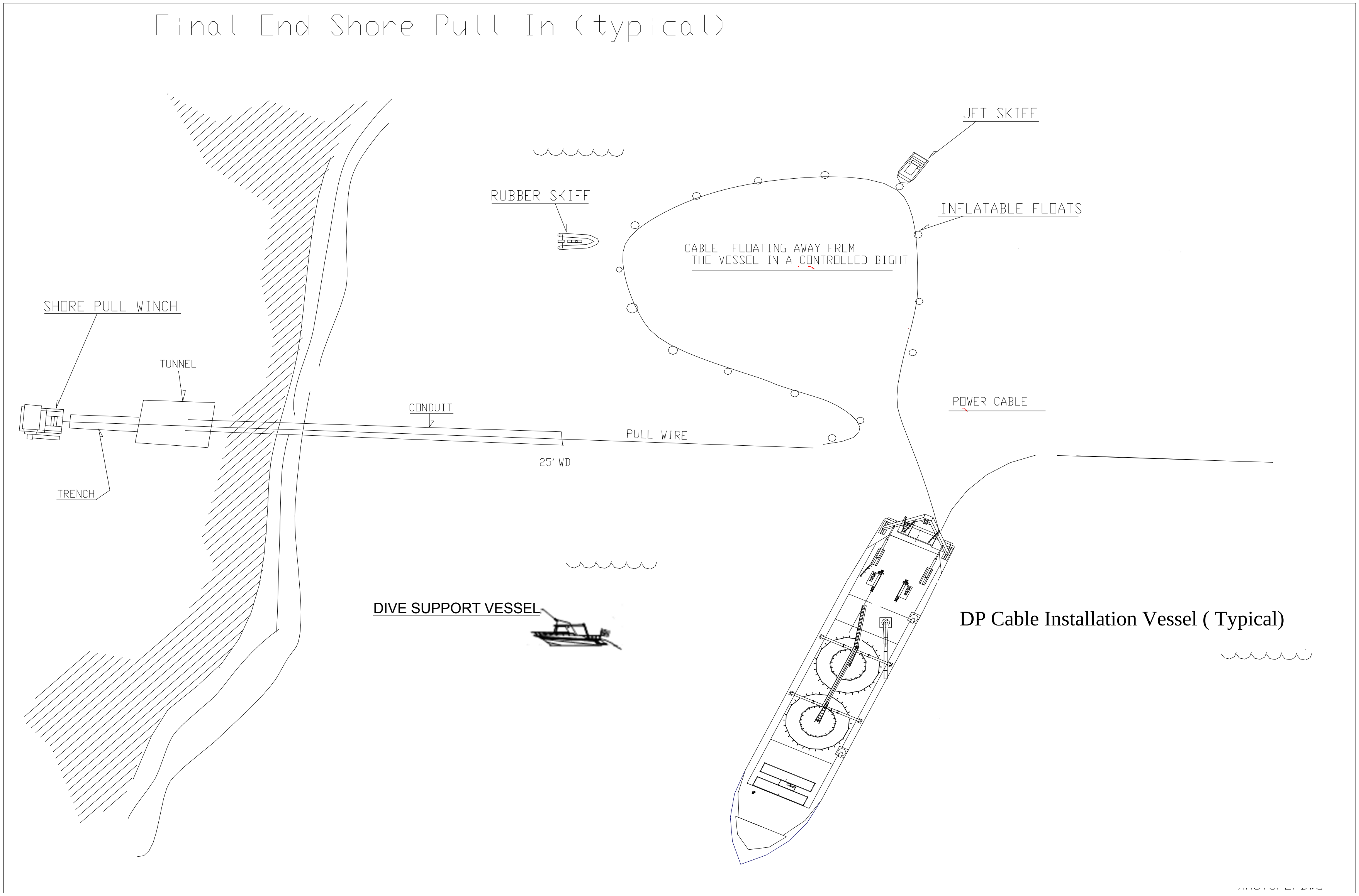


Figure 4.0-17

ATTACHMENT C

ExxonMobil Santa Ynez Unit

Offshore Power System
Reliability– B Project

CABLE SPECIFICATIONS

[Preliminary Concepts Based on Current Design]

- Static Submarine Cable Construction (3 x 1000 MCM SWA)
- Static Submarine Cable Construction (3 x 700 MCM DWA)
- Dynamic Submarine Cable Construction (3 x 700 MCM DWA)
- Cable A2, F2 and G2 Installation Design

August 2013
Rev 0

ATTACHMENT D

ExxonMobil Santa Ynez Unit

Offshore Power System
Reliability– B Project

CABLE ROUTE MAPS

August 2013
Rev 0

ATTACHMENT E

ExxonMobil Santa Ynez Unit

Offshore Power System
Reliability– B Project

ENVIRONMENTAL IMPACT ANALYSIS

August 2013
Rev 0

Environmental Impact Analysis

ExxonMobil Santa Ynez Unit
Offshore Power System Reliability- B Project
(OPSRB)

ExxonMobil has reviewed the proposed OPSRB Project Description and identified environmental impacts associated with the activities. As a result, ExxonMobil has developed a number of mitigation measures to reduce the impacts. This document describes the identified impacts and the associated mitigation measures. Since the OPSRB project is very similar to the previous OPSR-A project, the analysis for the OPSRB project is based on the Mitigated Negative Declaration/Environmental Assessment, ExxonMobil Offshore Power System Repair Project (02-ND-35) issued in January 2003 by the County of Santa Barbara Planning and Development Department, Energy Division and the United States Department of Interior, Minerals Management Service, Pacific Outer Continental Shelf Region.

The analysis focuses on the current environmental and regulatory setting, an assessment of project-specific and cumulative impacts, and includes recommended mitigation measures that will be implemented during the project to reduce impacts.

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APPENDICES

Summary

ExxonMobil Production Company is submitting applications for the Offshore Power System Reliability Project– B (OSPRB) for its Santa Ynez Unit (SYU) operations to Federal, State, and local regulatory agencies for review and approval. The proposed project is divided into two phases- Phase 1 and Phase 2. Phase 1involves the installation of modifications at Platforms Harmony and Heritage for the replacement power cables and electrical systems required for Phase 2 installation. Phase 2 involves the retrieval of existing Cable A (or B) and C1 from selected locations and installation of replacement Cables A2 (or B2), F2 and G2. Several contingency scenarios have been included in the OPSRB Execution Plan in case one of the existing out-of-service power cables cannot be removed from or a replacement cable cannot be installed in a conduit or platform riser (i.e., F2 at nearshore conduit, G2 at HE riser, A2 at nearshore conduit and A2 at HA riser). The decision on which of the two cables, Cable A or B, that will be replaced will be made based on a detailed analysis of the condition of each cable prior to installation. Currently documents depict Cable A as being replaced.

The OPSRB project phases are divided into the following principal elements:

1. Installing modifications on Platform Harmony and Heritage to allow installation of the replacement power cables and upgrade the electrical systems [Phase 1]
2. Retrieving approximately a 5 mile (8 kilometer) sections of power Cable A (or B) and C1 from an onshore point at the southern end of LFC to just beyond State-Federal boundary (approximately at the shelf break) [Phase 2]
3. Retrieving a 1-6 mile (1.6-9.6 km) section of power Cable A (or B) at and adjacent to Platform Harmony. Due to the restricted route available for installing the replacement cable, an additional section of Cable A (or B) may have to be retrieved from the State-Federal Boundary to the platform. Retrieving a 1-2 mile (1.6-3.2 km) section of power Cable C1 at and adjacent to Platform Heritage [Phase 2]
4. Installing approximately 10.3 miles (16.6 kilometers) of replacement power Cable A2 (or B2) between Platform Harmony and the southern end of the onshore Las Flores Canyon (LFC) Processing Facility [Phase 2]
5. Installing approximately 11.2 miles (18.0 kilometers) of replacement power Cable F2 between Platform Harmony and the southern end of the onshore Las Flores Canyon (LFC) Processing Facility. (Cable Route Map shows proposed and alternative routes within the surveyed area- the selected route will be chosen after detailed review of survey data and installation plans.) [Phase 2]
6. Installing approximately 7.3 miles (11.7 kilometers) of replacement power Cable G2 between Platform Harmony and Platform Heritage. (Cable Route Map shows proposed and alternative routes within the surveyed area- the selected route will be chosen after detailed review of survey data and installation plans.) [Phase 2]
7. At end of SYU life, removing all operating and remaining power cables in both State Waters and the Outer Continental Shelf (OCS)

As part of the Santa Ynez Unit (SYU) Expansion Project, the two new platforms (Harmony (HA) and Heritage (HE)) as well as the existing platform (Hondo (HO)) were required to utilize shore–based electric power. The electrical power distribution systems for the platforms were installed in the early 1990's. The systems consisted of an Offshore Substation (OSS) in Las Flores Canyon

(LFC) and three power cables from the substation going offshore with two to Platform Harmony (Cables A and B) and one to Platform Heritage (Cable C). In addition, power cables were installed from Platform Harmony to Platform Hondo (Cable D) and to Platform Heritage (Cable E). The installation also included the associated electrical equipment at each facility. Once the electrical distribution system was energized, the SYU offshore operations became completely reliant on these systems for all normal operations. In 2003, Cable C experienced a failure in State Waters that could not be repaired. The SYU OPSR-A project replaced the C cable with the C1 cable.. In addition, at the same time the D1 submarine cable was installed between Platform Harmony and Platform Hondo for improved reliability. Since the time that the C1 cable was installed, the cable has experienced two failures in the OCS which were repaired and the cable returned to service. In addition, in May 2013, Cable B experienced a failure in the onshore section of the cable near the southern end of LFC. After receipt of approvals from the County of Santa Barbara in June 2013, the failed section was removed and a section of spare cable was spliced into the existing cable. The repaired cable was tested and returned to service in July 2013.

The reliability of the current offshore power distribution system requires improvement due to continual aging of existing individual circuits, history of submarine cable faults in the distribution system and the obsolescence of offshore switchgear and electrical components. The proposed OPSRB project will further improve the reliability of electricity distribution from shore to and between the platforms.

ExxonMobil estimates that the proposed project would require approximately 15-21 months for Phase 1 and 8-12 months for Phase 2. The Phase 1 installation activities commenced in June 2013 after the Bureau of Safety and Environmental Enforcement (BSEE) approved the Phase 1 activities as minor platform modifications in May 2013. The Phase 1 activities are expected to be completed by about 1st Quarter 2015. The Phase 2 cable retrieval and installation activities are expected to commence on or about the 4th Quarter of 2014 and be completed by about early 4rd Quarter 2015. The offshore cable retrieval and installation portion of Phase 2 is expected to require 1-2 months and be conducted during mid to late 2015.

The Bureau of Safety and Environmental Enforcement (BSEE) is expected to be the lead agency for conducting environmental review of the Phase 2 activities pursuant to the requirements of the National Environmental Policy Act (NEPA). The California State Lands Commission is expected to be the lead agency for conducting environmental review of the Phase 2 activities pursuant to the California Environmental Quality Act (CEQA).

This analysis establishes the current environmental and regulatory setting, provides an assessment of project-specific and cumulative impacts, and includes recommended mitigation measures to reduce impacts in the following resource areas:

Aesthetics/Visual Resources	Fire Protection
Agricultural Resources	Geologic Processes
Air Quality	Greenhouse Gases
Onshore Biological Resources	Hazardous Materials/Risk Of Upset
Benthic Environment	Historic Resources
Commercial Fishing Operations	Land Use
Marine Mammals	Noise

Essential Fish Habitat (EFH) Endangered Abalone Species Cultural Resources Energy Environmental Justice	Public Facilities Recreation Transportation/Circulation Water Quality

A summary of the proposed project impacts and mitigation measures follows this opening section.

The analysis proposes that all potentially significant impacts associated with the OPSRB project can be reduced to less than significant levels with the implementation of applicant-proposed mitigation measures.

Environmental Impact & Mitigation Summary Table

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
Aesthetics/Visual Res. Temporary impacts to visual character	Offshore construction vessels and night lighting	Offshore	Insignificant	Shielding or re-aiming of lights to minimize glare from night lighting shall be utilized onshore and on vessels offshore when within 1/2 mile from shore unless such shielding conflicts with USCG requirements. (VIS-1)	Insignificant	SLC, SBC
	Onshore night lighting (possible)	Onshore	Insignificant	Utilize shields onshore to minimize glare on Hwy 101 from night lighting. (VIS-1)	Insignificant	SBC
Air Quality Potential impacts associated with project emissions.	Diesel engines of the cable installation and support vessels.	Offshore	Insignificant	ExxonMobil shall implement the project in accordance with an Emissions Reporting Plan. Limit total actual project actual emissions from the retrieval and installation of the power cables to less than 25 tons of any affected pollutant in a 12-month period, as defined primarily by APCD Rules 202.F.7 and 202.D.16. (AQ-1)	Insignificant	BSEE, APCD
	Incidental emissions from stationary equipment on the vessel.	Offshore	Insignificant	Determine, on a daily basis, fuel use and emissions from the retrieval and installation of the power cable to verify compliance with APCD rules and regulations. (AQ-2)	Insignificant	BSEE, APCD

[1] Expected impact levels for proposed project; assume incorporation of all applicant-proposed mitigation measures.
[2] In some cases, impact levels may differ under CEQA vs. NEPA due to differences in agency significance criteria.
[3] See appropriate resource section for full mitigation language including timing
[4] Expected residual impacts; assume incorporation of all applicant-proposed mitigation measures.
[5] Expected enforcement agency(ies)

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				Require installation vessels and internal combustion engines to use ultra low sulfur fuel (15 ppm S). (AQ-3)		BSEE, APCD
				Prepare a contingency plan for the scenario where the total project emissions of any affected pollutant, except CO, are projected to exceed 80% of the above 25 ton/year limit. (AQ-5)		APCD, SBC
Increase in particulate matter due to grading operations.	Excavation in lower LFC.	Onshore	Insignificant	Implement dust control measures onshore. (AQ-4)	Insignificant	APCD, SBC
<u>Onshore Biological Resources</u> Impacts to sensitive species present in LFC construction area.	Lower canyon construction within range of sensitive species.	Onshore	Insignificant	ExxonMobil shall include awareness training for sensitive species located in Corral Creek. (BIO-1)	Insignificant	SBC
<u>Benthic Resources</u> Bottom sediment disturbance and cleaning of retrieved cable	Retrieval of cable & installation of replacement cable	Offshore	Insignificant	Contractors shall use a dynamically-positioned (DP) vessel to retrieve and install power cables. (BE-1)	Insignificant	BSEE, SLC
Bottom sediment disturbance or direct impact to benthic resources.	Vessel anchoring	Offshore	Insignificant	Where feasible, contractors shall use installation techniques that minimize or avoid environmental impacts such as turbidity and scarring. (BE-2) (See also RMM-7).	Insignificant	BSEE, SLC, SBC
Direct physical impacts to hard bottom habitat.	Placing a concrete mattress or replacement power cable on rocky	Offshore	Insignificant	A pre-installation marine biological survey of the nearshore area shall be performed prior to the work. Specific	Insignificant	SLC, SBC, BSEE, CDFG,

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
	outcrops			scope and methodology to be approved by agencies in advance. (BE-3)		NMFS
				A post-installation marine biological survey shall be conducted to identify any impacts from construction. Specific scope and methodology to be approved by agencies in advance. (BE-4)		SLC, SBC, BSEE, CDFG, NMFS
				Contractors shall use ROV to monitor and videotape portions of installation activities. Rocky outcrops shall be avoided wherever feasible. (BE-5)		BSEE, SLC
				ExxonMobil shall cast sand excavated at or near the conduit terminus and initial section of cable downslope into the adjacent sand channel. (BE-6)		SLC, SBC, CDFG, NMFS
				ExxonMobil shall provide, under safe conditions, the permitting agencies access to the site, during installation and installation-related activities. (BE-7)		BSEE, SLC, SBC
				ExxonMobil shall develop a restoration and restoration-monitoring plan after submission of the post-installation survey, if significant impacts to kelp, eelgrass, non-listed abalone and/or hard bottom habitats are detected. (BE-8)		SLC, SBC, CDFG
				ExxonMobil shall adhere to the Southern California Eelgrass Mitigation Policy and use native species for restoration. (BE-9)		SLC, SBC, CDFG, NMFS

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				If non-listed abalone(s) is detected near the conduit terminus during the time of the pre-installation marine biological survey, ExxonMobil shall either move anchor(s) at least 50' away to avoid any direct impacts to abalone or have a qualified biologist move abalone pursuant to procedures reviewed and approved by the agencies. (BE-10)		SLC, SBC, CDFG, NMFS
				ExxonMobil shall conduct a post-installation ROV or diver video survey along installed replacement cables in State Waters to verify as-built condition and confirm seafloor cleanup and restoration. (BE-11)		SLC
<u>Commercial Fishing</u> Potential interference with commercial fishing operations in the area.	Temporary preclusion of fishing areas from project vessels & anchoring	Offshore	Insignificant	ExxonMobil and all contractors shall comply with vessel traffic corridors. (CF-1)	Insignificant	BSEE, SLC
	Loss of trawling areas due to cable placement	Offshore	Insignificant	JOFLO shall be kept informed of construction activities. (CF-2)	Insignificant	BSEE, SBC
	Potential damage to fishing gear from debris on sea floor	Offshore	Insignificant	Offshore personnel shall view the Wildlife and Fisheries Training Program. (CF-3)	Insignificant	BSEE, SLC
				ExxonMobil shall file advisory with U.S. Coast Guard for publication in Local Notice to Mariners and shall notify JOFLO and fishers at least 15		BSEE, SLC, SBC

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				days prior to construction. (CF-4)		
				ExxonMobil shall continue to consult with JOFLO and fishers during planning and construction to identify and mitigate project-related impacts. If unanticipated conflicts with commercial fishing operations should arise, ExxonMobil shall resolve through appropriate measures such as physical modification of problem area, establishment of temporary preclusion zones, off-site mitigation. (CF-5)		BSEE, SLC, SBC
				ExxonMobil shall review installation procedures with JOFLO to minimize impacts to commercial fishing. (CF-6)		BSEE, SLC, SBC
				ExxonMobil shall require contractor to recover any escaped fan channel supports, if used. (CF-7)		BSEE
				ExxonMobil shall require contractors to recover all items lost overboard to the extent feasible. Logs shall be maintained on project vessels. (CF-8)		BSEE, SLC
				ExxonMobil shall require contractor to scout for traps in nearshore area that may interfere with the project. Temporary relocation of traps shall be coordinated through JOFLO. (CF-9)		BSEE, SLC
				Inside 30 fathoms, where corridors have not been established specifically for the project area, ExxonMobil shall		SLC, BSEE

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				establish temporary vessel traffic corridors reviewed and approved by JOFLO. (CF-10)		
				ExxonMobil shall include training on vessel traffic corridors in all pre-construction meetings with project contractors and their personnel. (CF-11)		BSEE, SLC, SBC
				See also BE-1, BE-2, and BE-4.		
Marine Mammals Disturbance of marine mammals due to noise associated with cable retrieval and installation activities.	DP vessel and other project-related vessels	Offshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	ExxonMobil shall prepare and implement a Marine Mammal Monitoring Plan. (MM-1)	Insignificant	BSEE, SLC, SBC
Increase in risk that a large marine mammal might become entangled in an anchor line or be hit by a vessel due to installation activities and associated vessel traffic.	DP vessel and other project-related vessels as well as anchoring	Offshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	ExxonMobil shall provide awareness training for offshore personnel re: marine mammals in area and potential project-related impacts. (MM-2)	Insignificant	BSEE, SLC, SBC
Essential Fish Habitat Disturbance to essential fish habitat.	Bottom sediment disturbance and cleaning of retrieved cable	Offshore	Insignificant	See BE-1 – BE-10.	Insignificant	
	Anchoring	Offshore	Insignificant		Insignificant	

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
	Placing a concrete mattress or the replacement power cable on rocky outcrops.	Offshore	Insignificant		Insignificant	
Endangered Abalone Species Potential direct or indirect impacts to endangered abalone species.	Bottom sediment disturbance and cleaning of retrieved cable, and anchoring	Offshore	Insignificant	If a white or black abalone(s) is detected during the pre-construction survey near the conduit terminus, the project shall not begin until the animal is relocated or an appropriate alternative is implemented. (AB-1) See also: BE-1 through BE-6, BE-8 and BE-10.	Insignificant	NMFS, CDFG, SLC, SBC
Cultural Resources Potential damage to marine cultural sites.	Vessel anchoring and retrieval and installation of power cables.	Offshore	Insignificant	Contractors shall avoid potential offshore cultural resources by a 300-foot radius to the extent possible. (ARCH-1) ExxonMobil shall provide contractors with coordinates of potential sites in order to comply with ARCH-1. (ARCH-2) Review of avoidance procedures shall be included in pre-installation compliance meeting. (ARCH-3)	Insignificant	BSEE BSEE BSEE

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				ExxonMobil shall utilize an ROV to monitor cable installation in areas of potential cultural resources. (ARCH-4)		BSEE
				ExxonMobil shall immediately halt installation if a previously unidentified cultural resource is detected that could be impacted by project activities. (ARCH-5, ARCH-10)		SBC, BSEE
				ExxonMobil shall use an ROV with color-imaging sonar to monitor cable placement in the area of potential cultural resource No. 3. (ARCH-6)		BSEE
				If the cable needs to be laid outside the previously surveyed area, ExxonMobil shall utilize the ROV to conduct a survey prior to installation. (ARCH-7)		BSEE
				ExxonMobil shall notify agencies of pre-installation meeting with contractor regarding cultural resource avoidance (ARCH-8)		BSEE, SLC
				ExxonMobil shall provide for inspectors to be present near archaeological sites, if requested by agencies. (ARCH-9)		BSEE, SLC
				If a previously undetected resource site(s) is discovered, ExxonMobil shall notify BSEE and SLC immediately and avoid the site. If site is unavoidable, ExxonMobil shall perform an		BSEE, SLC

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				investigation to assess significance. If site is significant, BSEE/SLC shall inform applicant how to protect resource. (ARCH-10)		
				Onshore excavation shall be limited to 8-9 feet below ground surface and 3-6 feet below cable entry point at north end of tunnel for approximately 400 ft. (ARCH-11)		SBC
Potential impacts to onshore archaeological site(s).	Excavation work in lower LFC area	Onshore	Insignificant	If potential cultural material is encountered during excavation, work shall be halted until an SBC-approved archaeologist and Native American representative are consulted. Protection of resource shall be per SBC guidelines. (ARCH-12)	Insignificant	SBC
				ExxonMobil shall organize a pre-construction meeting to discuss onshore cultural resources with onsite construction personnel. (ARCH-13)		SBC
<u>Fire Protection</u> Introduction of ignition source into high fire hazard area.	Construction equipment in lower canyon	Onshore	Insignificant	A project-specific onshore Fire Protection Plan shall be prepared for the project. (FIRE-1)	Insignificant	SBC
	Construction work in classified area (tunnel)	Onshore	Potentially significant but mitigable	Proposed project complies with applicable code requirements (API RP 500 and NFPA 70) through tunnel; construction operations (FIRE-2)	Insignificant	SBC

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
<u>Geologic Processes</u> Disturbance to sea floor.	Installation of cable and/or anchoring	Offshore	Insignificant	Contractors shall utilize current industry standards in engineering designs. (GEO-1) Utilize an ROV that shall monitor selected portions of the installation activities. (GEO-2)	Insignificant	BSEE, SLC, SBC BSEE, SLC
Potential for erosion-related impacts during excavation work in rainy season.	Grading work in lower LFC area.	Onshore	Insignificant	WQ-3 applies here also.	Insignificant	SBC
<u>Greenhouse Gases</u> Potential cumulative impacts on global climate change from project GHG emissions	Cable retrieval and installation, and other associated onshore and offshore construction activaties	Onshore and Offshore	Insignificant	Air Quality mitigation measures AQ-1, AQ-2, and AQ-5, summarized above	Insignificant	BSEE, APCD
<u>Hazardous Materials/ Risk of Upset</u> Risk of spills of lubricating oils, hydraulic fluids, waste oils.	Offshore vessel and cable laying operations	Offshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	Contractors shall maintain all petroleum products in contained areas and practice good housekeeping. (RMM-1) All project-related materials shall be loaded at port, to the extent possible. (RMM-2) ExxonMobil shall prepare a project-specific addendum to the SYU Oil Spill	Insignificant	BSEE, SLC BSEE, SLC, SBC BSEE, SLC, SBC

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				Response Plan. (RMM-3)		
				ExxonMobil shall provide oil spill response training for project and contract personnel. (RMM-4)		BSEE, SLC, SBC
Risk of fuel oil spills.	Refueling at sea	Offshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	All vessels shall be refueled at designated ports or per the prepared refueling plan. (RMM-5)	Insignificant	BSEE, SLC, SBC
Potential damage to existing pipelines or power cables.	Anchoring accidents	Offshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	Anchors shall be set at least 250' from active pipelines and power cables. (RMM-6)	Insignificant	SLC, BSEE
				ExxonMobil shall prepare an Anchoring Plan. (RMM-7)		BSEE, SLC, SBC
Potential damage to existing pipelines or power cables.	Accidental release of cable	Offshore	Insignificant	ExxonMobil shall prepare a Critical Operations and Curtailment Plan. (RMM-8)	Insignificant	BSEE, SLC, SBC
				Applicant shall prepare a Cable Release Prevention Plan. (RMM-9)		BSEE, SLC, SBC
Potential damage to existing pipelines or power cables in tunnel.	Accident during removal or installation of cable through onshore tunnel.	Onshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	ExxonMobil shall prepare a Safety Plan for tunnel work. (RMM-10)	Insignificant	SBC
				ExxonMobil shall prepare an Execution Plan for cable removal/installation procedures in tunnel. (RMM-11)	Insignificant	SBC, SLC
				ExxonMobil shall de-energize cables and shut-in oil and gas pipelines during		SBC, SLC

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
				cable pulling operations through onshore/nearshore conduit unless they demonstrate operations can be performed safely while in operation. (RMM-12) See also FIRE-2		
Land Use Potential inconsistency with existing CCC Coastal Development Permit for SYU project; cumulative impact.	Deferral of removal of out-of-service OCS cables.	Offshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	ExxonMobil shall remove replacement power cables as well as remaining out-of-service cables in their entirety at the end of the SYU project life. (LUS-1)	Insignificant	BSEE, SLC, SBC
Public Facilities Landfilling of waste.	Removal of approximately 1275 tons of out-of-service cables	Onshore	Insignificant	ExxonMobil shall require the contractor to recycle the out-of-service cables to the extent feasible. (PUB-1)	Insignificant	SBC
	Eventual removal of all installed cables.	Onshore	CEQA: Potentially significant but mitigable; NEPA: Insignificant	ExxonMobil shall submit a Recycling Feasibility Analysis for agency review and approval for replacement cable in state waters and onshore, along with other SYU facilities, as part of abandonment application at the end of project life. (PUB-2)	Insignificant	SLC, SBC
Recreation Impacts to recreationalists on public	Use of construction equipment and vehicles	Onshore	Insignificant	ExxonMobil shall obtain and comply with all conditions of approval set forth	Insignificant	SBC, State Parks

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) 5
bike path at El Capitan State Park.	on bike path			in its State Parks TUP. (REC-1) During any time that the south tunnel manhole is accessed, safety barriers shall be erected and speed limits for vehicle traffic along the bike path shall be adhered to pursuant to State Parks rules. (REC-2)		 SBC, State Parks
Potential damage to bike path.	Use of construction equipment and vehicles on bike path	Onshore	Insignificant	In order to ensure public safety, signs shall be posted alerting cyclists and pedestrians to project-related work being conducted along the bike path. (REC-3) ExxonMobil shall submit photo-documentation of the physical condition of the bike path at the work area before and after access to the south manhole tunnel and be responsible for any maintenance or repair work necessary if there is evidence of damage during construction. (REC-4)	Insignificant	SBC, State Parks SBC, State Parks
<u>Water Quality</u> Degradation of water quality due to increased turbidity.	Anchoring	Offshore	Insignificant	BE-2 also applies to this impact.	Insignificant	
Degradation of water quality due to discharges to marine water.	Water jetting, flushing and pigging, where necessary at the conduits and J-tubes	Offshore	Insignificant	If required, ExxonMobil shall provide results of samples taken of the seawater in the existing J-tubes and other information to EPA in order to receive permission to conduct flushing. (WQ-1)	Insignificant	EPA, BSEE
	Removal and cleaning	Offshore	Insignificant	ExxonMobil shall work with the	Insignificant	CCRWQCB,

Description of Potential Impacts	Impacting Agents	Onshore/ Offshore	Impact Levels [1, 2]	Mitigation Measures [3]	Residual Impacts [4]	Enforcement Agency(ies) [5]
	of short segments of cable in preparation for installation of the replacement cable			CCRWQCB in order to receive permission to conduct conduit flushing operations. (WQ-2) See also BE-1 and BE-2.		BSEE, SLC, SBC
Potential erosion-related impacts during excavation work in LFC.	Excavation work in lower LFC	Onshore	Insignificant	Utilize a site-specific Storm Water Pollution Prevention Plan for the onshore work activities. (WQ-3)	Insignificant	SBC

1.0 POTENTIALLY SIGNIFICANT EFFECTS CHECKLIST

The 1984 Santa Ynez Unit/Las Flores Canyon Development and Production Plan Final Environmental Impact Statement/Report and Supplemental EIS/EIR (83-EIR-22) provide a comprehensive analysis of the environmental impacts associated with the development of oil and gas resources in the project area. The EIS/EIR included a detailed analysis of impacts associated with the construction of up to four platforms (Platform Heather was never constructed), pipelines and the onshore Las Flores Canyon facilities.

The resources analyzed in the EIS/EIR included: air quality, climatology and meteorology, geology, surface water, groundwater, cultural resources, terrestrial biology, marine biology, socioeconomics (which included regional growth, tourism, recreation, aesthetics, land use, energy, noise, traffic and commercial and recreational fishing), system safety and reliability, physical oceanography and marine water quality.

As was done for the Mitigated Negative Declaration/Environmental Assessment (02-ND-35) for the OPSR-A project, the same areas were analyzed for the OPSRB project with the addition of a section discussing Greenhouse Gases. These issue areas include aesthetics/visual resources, agricultural resources, air quality, onshore biological resources, benthic environment, commercial fishing operations, marine animals, essential fish habitat, endangered abalone species, cultural resources, energy, environmental justice, fore protection, geologic processes, greenhouse gases, hazardous materials/risk of upset, historic resources, land use, noise, public facilities, recreation, transportation/circulation, and water quality. Significance criteria for assessing impacts are outlined in each section.

The following issue areas are expected to have the most potential of being affected by the offshore portion of the proposed project:

- Air Quality
- Marine Biological Resources (including Essential Fish Habitat and Benthic Resources)
- Risk of Upset/Hazardous Materials

The following issue areas are expected to have the most potential of being affected by the onshore portion of the proposed project:

- Fire Protection
- Risk of Upset/Hazardous Materials

The discussion on marine biological resources is divided into several focused sections. These include Essential Fish Habitat, Endangered Abalone Species, Benthic Resources, and Marine Mammals. The purpose is to facilitate the future federal consultation process with the U.S. Fish & Wildlife Service and National Marine Fisheries Service.

1.1 Aesthetics/Visual Resources

1.1.1 Environmental & Regulatory Setting

Onshore: The existing onshore oil and gas processing facilities are located in Las Flores Canyon along the Gaviota Coast, approximately 20 miles (32 km) west of the City of Santa Barbara. The processing facilities are screened from public view by the topography of the canyon. In addition, the nearest public roads, Calle Real and US Highway 101, are located approximately 2 miles (3.2 km) south of the facilities. The LFC lower parking lot, guard shack and principal areas of onshore excavation for the proposed project, however, are visible from US Highway 101 and Calle Real. South of US Highway 101 and the UPRR railroad tracks, a manhole exists providing access to the tunnel. The manhole and signs indicating the presence of the pipelines and power cables are visible to recreationalists walking or riding along the bike path (currently bike path in area of tunnel manhole is closed due to damage to path) and beach goers in the area. The onshore facilities were considered a Class II and III visual impact in the original project EIR (84-EIR-22).

Offshore: The existing offshore facilities consist of three platforms located in federal waters, between 5 and 8 miles (8 to 13 km) offshore. In addition to the platforms, there are numerous subsea cables and pipelines. The pipelines and power cables are buried beneath the surf zone and are therefore not visible from the beach area. The platforms were considered a Class I visual impact in the original project EIR (84-EIR-22). Pursuant to their County-issued Final Development Plan permit, ExxonMobil contributes to the Santa Barbara County Coastal Resources Enhancement Fund annually to help mitigate visual impacts from two of their three platforms (Harmony and Heritage).

1.1.2 Project Impact Assessment

The classification of a project's visual or aesthetic impacts as beneficial or adverse, and insignificant or significant, is subject to personal and cultural interpretation. Assessing the visual impacts of a project involves two major steps. First, the visual resources of the project site must be evaluated. Important factors in this evaluation include the physical attributes of the site, its relative visibility to the public and its relative uniqueness. In terms of visibility, four types of areas are especially important: coastal and mountainous areas, the urban fringe and travel corridors. Second, the potential impact of the project on visual resources located onsite and on views in the project vicinity that may be partially or fully obstructed by the project must be determined. Determining compliance with local and state policies regarding visual resources is also an important part of visual impact assessment. Based on these criteria, the proposed project would not create significant impacts on visual resources.

The project would not generate any long term adverse impacts to aesthetic or visual resources nor would impacts to the visual character of the area (scenic Gaviota coast) be exacerbated. Potential impacts caused by the proposed project would be temporary and would be primarily limited to offshore construction vessels and night lighting. Work is proposed to occur up to 24 hours per day on the platforms and vessels. Phase 1 construction activities on Platform Harmony would be expected to last approximately 12-14 months. Phase 2 cable retrieval and installation activities would be expected to last approximately 7-10 months for onshore activities and 1-2 months for offshore activities. Onshore work activities would normally occur during daylight hours except for operational and electric utility shut down periods when work would be continuous. Night glare from vessel lighting and construction equipment would be visible to the public. All new structures would be located on the seafloor, within an existing underground tunnel or within previously developed areas of the canyon.

Onshore work would be limited to previously disturbed areas of the canyon. The only portion of construction activity that would be visible to the public (along Calle Real and US Highway 101 northbound) would be excavation in the lower canyon. The proposed project would be visually compatible with the height, scale and design of the existing facility. All impacts would be temporary.

1.1.3 Mitigation Measures

To minimize impacts to the maximum extent feasible, the following mitigation measure is recommended:

VIS-1: Shielding or re-aiming lights to minimize glare from night lighting shall be utilized onshore and on vessels offshore when within 0.5 mile from shore unless such shielding would conflict with U.S. Coast Guard requirements.
Expected enforcement Agency: SLC, SBC

Residual impacts would be temporary and insignificant.

1.1.4 Cumulative Impacts

The proposed project would not extend the expected life of the SYU operations and therefore would not prolong the Class I impacts caused by the existing platforms. There are no cumulative impacts associated with the project.

1.2 Agricultural Resources

1.2.1 Environmental and Regulatory Setting

The portion of the project site that is not developed with oil and gas-related facilities is zoned for agricultural use (AG-II-320). Leased property in the lower canyon is currently utilized as an avocado orchard.

1.2.2 Project Impact Assessment

The project involves the replacement of offshore power cables with onshore work limited to the already developed lower canyon area. No agricultural land would be taken out of use if the proposed project is implemented. There would be no effect upon any state or local farmlands. Onshore work would be limited to the footprint of existing development.

1.2.3 Mitigation Measures

No mitigation measures are required.

1.2.4 Cumulative Impacts

The project would not contribute to cumulative impacts to Agricultural Resources.

1.3 Air Quality

1.3.1 Environmental and Regulatory Setting

The proposed project is located in the OCS, offshore and onshore of Santa Barbara County within the South Central Coast Air Basin. The climate, meteorology, air quality, and air quality trends of the Santa Barbara County area have been described in detail in several planning and environmental documents and are best summarized in the Santa Barbara County 2010 Clean Air Plan (CAP) (SBCAPCD, 2010). Santa Barbara County can be described as having a Mediterranean climate, characterized by warm, dry summers and cooler mildly damp winters. The unique combination of prevailing wind conditions generated by a persistent offshore high pressure system and the topography of coastal mountains results in variations of airflow are conducive to the formation and retention of air pollutants.

The Federal Government has established ambient air quality standards to protect public health (primary standards) and, in addition, has established secondary standards to protect public welfare. The State of California has established separate, more stringent ambient air quality standards to protect human health and welfare. California and National standards have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter 10 microns (PM_{10}), suspended particulate matter 2.5 microns ($PM_{2.5}$) and lead. In addition, California has standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles.

The federal attainment status of Santa Barbara County is found in 40 CFR 81.305. Currently, Santa Barbara County is in attainment of all the National Ambient Air Quality Standards. Santa Barbara County is presently classified as an attainment area for the federal ozone standard and a nonattainment area for the state 8-hour ozone standard and the state PM_{10} ambient air quality standard. The SBCAPCD Board of Directors adopted the 2010 CAP in January 2011 which provides a three-year update to the 2007 CAP. The 2010 CAP describes how Santa Barbara County will attain the 8-hour state ozone ambient air quality standard at the earliest practicable date as well as progress toward attaining the California PM_{10} air quality standard.

Section 328 of the 1990 Clean Air Act Amendments (CAAA) transfers authority for air quality on the OCS to the U.S. Environmental Protection Agency (EPA). On September 4, 1992, the EPA Administrator promulgated requirements (40 CFR Part 55) to control air pollution from OCS sources to attain and maintain Federal air quality standards and to comply with CAAA provisions for the Prevention of Significant Deterioration. The promulgated regulations require OCS sources to comply with applicable onshore air quality rules in the corresponding onshore area (COA). The EPA delegated authority to the SBCAPCD on November 5, 1993 to implement and enforce the requirements of 40 CFR Part 55. The full transfer of authority to SBCAPCD to regulate OCS air emissions pursuant to 40 CFR Part 55 transpired on September 4, 1994. The SYU Platforms Harmony, Heritage, and Hondo are currently permitted and within the jurisdiction of the SBCAPCD.

SBCAPCD Rules and Regulations

Under Rule 202.F.7, marine vessels used in cable laying projects are subject to a 25 ton emission limitation in a 12-month period. Projects meeting these criteria may be required to obtain a permit from the SBCAPCD in accordance with Rule 202. F.7, however eligible projects are exempt from the requirement to comply with Best Available Control Technology (BACT) or provide emission offsets pursuant to SBCAPCD Rule 804. ExxonMobil will submit a permit application to the SBCAPCD to demonstrate that the anticipated actual annual emission for the OPSRB project will be below the 25 TPY threshold.

Construction Emissions
Significance criteria have not been presently established by either Santa Barbara County or the SBCAPCD for short-term construction emissions. The cable retrieval and cable installation project qualify as short term construction emissions for the purposes of CEQA. Under the terms of SBCAPCD Rule 202.F.7, the project will be limited to 25 TPY in a single 12-month period.

Operations Emissions
Santa Barbara County, as an agency under CEQA, considers the subject project as a temporary construction project and not an ongoing operational project. Therefore, the County-adopted significance criteria for operational emissions do not apply to this project (See the Environmental Review Guidelines for Santa Barbara County Air Pollution Control District, SBCAPCD, 2000)).

SBCAPCD has determined that both the cable retrieval portion of the project and the cable installation portion of the project qualify under the terms of Rule 202.F.7. In accordance with Rule 202.F.7, ExxonMobil must apply for and received a permit which limits the project duration to a maximum of 12 consecutive months and an emission limit of 25 tons.

Based on meetings and discussions between ExxonMobil and the SBC APCD between August and November 2012, the following table was developed to better define the requirements for use of the 202.F exemptions and existing Permits to Operate.

Table AQ-1: Requirements of SBCAPCD Construction Exemptions

	Demolition (TPY emissions)	Construction (TPY emissions)	Permit Exemption Evaluation
Platform Activities - Outside vessels used to support a specified short-term project that does not meet existing PTO criteria for dedicated project vessels (DPV) and Spot Charter vessels. [1,2]	A1	A2	A1 + A2 < 10 TPY (**202.F.8**) [In a 12-month period]
Cable Removal and Cable Installation - Outside vessels used to support a specified short-term project that does not meet existing PTO criteria for DPV and Spot Charter vessels. [1,2]	B1	B2	B1 + B2 < 25 TPY (**202.F.7**) [In a 12-month period]
PERP Equipment - Certified equipment used to support a specified short-term project	C1	C2	No limit
Other Exempt Equipment - Vehicles, <50hp Engines, etc. used to a support specified short-term project.	D1	D2	No limit
DPV and Spot Charters - Vessels meeting PTO criteria for DPV and Spot Charter which are used exclusively to support a specified short-term project	E1	E2	Subject to PTO Limits[3]
Applicable Terms in Offset Exemption Evaluation (202.D.16)[4]	NA	A2 + B2 + C2 + D2 + E2 <25 TPY [In a 12-month period]	
Additional Notes	Demolition activities are not subject to offsets under Rule 804.D.8 and H&SC 42301.13	If the construction activity exceeds 25 TPY, then offsets will be required, regardless of any permit exemption it qualifies for. (**202.D.16**)	

Notes:

1. Current SYU Platform Part 70/APCD PTOs identify a number of acceptable crew and supply boat uses to support various platform operations (reference Section 2.2.3). Emissions resulting from the use of approved DPV, and qualifying spot charter vessels are reported to the APCD under the terms of the Part 70/APCD PTO and are also federally enforceable. These emissions are not covered under the 202.F.7 or 202.F.8 exemptions.

2. Vessels used for specified short-term projects which are not eligible for DPV or spot charter status per the criteria defined in the facility Part 70/PTO may qualify under the 202.F.7 and/or F.8 exemptions. Emissions would be included in the equation to determine compliance with the 202.F.7 or F.8 exemption threshold.

3. Depending on the specific activity for which a DPV or spot charter is used, the associated emissions may be limited under the existing facility PTO for allowable uses or under the ATC/PTO issued for the specified short-term project in accordance with Rule 202.F.7 or F.8 for exclusive uses. A specific District-approved mechanism will be utilized for logging and reporting each type of operation with a description of how the emissions will be differentiated, recorded and calculated.

4. Compliance with the 202.D.16 exemption threshold should include all equipment used to construct a stationary source. As such, emissions associated with the following activities should be included in the determination: outside vessels under 202.F.7 and/or F.8, PERP equipment, other exempt equipment and existing DPV and spot charters used exclusively to support a specified short-term project. Note that clearly delineated demolition activities are deleted when determining compliance with this rule.

1.3.2 Project Impact Assessment

Emissions resulting from the proposed power cable retrieval and installation may have a potential to increase concentrations of pollutants onshore. The primary regulated pollutants of concern in Santa Barbara County are oxides of nitrogen (NO_x) and reactive organic compounds (ROC). Both NO_x and ROC are considered precursors to ozone formation, for which Santa Barbara County is in nonattainment for the state ozone standard. The major pollutant of concern associated with projects of this type and duration are NOx emissions due to the extensive use of propulsion and stationary combustion equipment.

Cable Retrieval and Installation Impacts

As described in the OPSRB Project Description, the proposed project would involve the retrieval of approximately 12-18 miles (19.3-29 km) of power cable and installation of 29 miles (47 km) of replacement cable in the vicinity of the SYU project facilities. This section analyzes impacts to air quality that would be expected to occur as a result of cable retrieval and installation activities. In addition, impacts that could occur from removal of the replacement cables (A2 (or B2) and F2) and the remaining out-of-service cables (Cable C1 and A (or B)) at the end of SYU life are also analyzed.

The applicant will provide an Emission Basis Report (EBR) as part of the submittal of Phase 2 applications containing equipment specifications and emission estimate information specific to the proposed project, including both offshore and onshore equipment.

Preliminary emission estimates have been prepared for the Phase 1 and Phase 2 portions of the project. For Phase 1, all emissions are expected to be associated with platform-based internal combustion engines that are covered under the Rule 202.F.1 and 202.F.2 under the Statewide Portable Equipment Registration Program (PERP) and spot charter vessels that are covered under the platform APCD PTOs. These activities are expected to occur over several months and generate approximately 6-7 tons NO_x emissions which are not included in the 202.F.7 exemption totals, but are included with the 202.D.16 cumulative emissions. As such, no permits are expected to be required from the SBCAPCD for these activities. Equipment and personnel required for the Phase 1 installation activities will be transported to the Harmony Platform using regularly scheduled SYU crew and supply boats.

For Phase 2, emissions will be divided into cable retrieval and cable installation activities. The cable retrieval activities will involve the use of the cable installation vessel, a support tug and one or more diver support vessels. These activities are expected to take several weeks and generate about 3-5 tons of NO_x emissions that would be included in the 202.F.7 exemption, but are not included in the Rule 202.D.16 cumulative emissions. The cable installation activities will involve the use of the cable installation vessel, a support tug and one or more diver support vessels, as well as platform and onshore based internal combustion engines. The platform and onshore based internal combustion engines will be covered under the Statewide Portable Equipment Registration Program (PERP) and are not included in the 202.F.7 exemption totals, but are included in the 202.D.16 cumulative emissions. The installation activities are expected to occur over several months. The cable installation activities are expected to generate about 15-20 tons of NOx emissions that would be included in the 202.F.7 exemption. Total emissions for Phase 2 (both retrieval and installation activities) will be limited to less than or equal to 25 tons as required by SBCAPCD 202.F.7 exemption. Table AQ-2 provides the calculational methodology for estimating the marine vessel emissions for the cable installation vessel, support tug and dive vessels.

The project phases would be scheduled to occur in mostly sequential progression with Phase 1 requiring approximately 15-21 months and Phase 2 requiring 8-12 months. The projected emissions from the proposed project would result primarily from the main diesel engines on the cable installation, support tug and diver support vessels.

The proposed cable installation vessel for the project will be dynamically positioned (DP) and not require anchoring. Several small SYU spot charter type vessel will also be required to support the diving operations. The dive vessel will require anchoring in the nearshore area near the conduit terminus. As such, the vessel main engines will only be used for transit to and from the location with the small generator engines used while onsite.

Cable Removal Impacts at End of SYU Life

No additional impacts are estimated at this time from the removal of the out-of-service OCS cables simultaneous with the removal of the SYU facilities at the end of the project life. All impacts associated with complete removal of the remaining out-of-service OCS cables would occur in the future with removal of all associated SYU power cables, pipelines and platforms and total decommissioning emissions cannot be estimated at this time.

However, impacts from the removal of the out-of-service Cables A (or B) and C1 may be assumed to be less significant in the future as the emissions resulting from the removal of the power cable will not occur simultaneously with the operational emissions of the SYU platforms. Therefore, removal of the out-of-service cable would not add to the increased emission loading potential with operational emissions in the SYU Unit area. Additional factors that are unpredictable at the present time are the technological advances that may be expected for both cable removal operations and emission control technology which may further reduce any air quality impacts associated with removal at the end of the facility life.

Onshore Construction Impacts

Onshore impacts to air quality from the proposed project would result primarily from equipment used for the excavation of earth and materials adjacent to the power cable conduit tunnel at the lower end of Las Flores Canyon. Onshore equipment includes various pieces of construction equipment including winches, backhoes, front end loaders, air compressors, generators and other necessary equipment. It is expected that these pieces of equipment would be exempted from permit by SBCAPCD Rule 202.F.1 or 202.F.2.

Dust mitigation measures have been proposed to reduce and further minimize particulate matter impacts resulting from the grading required of this activity. Given the project location and minimal volume of earth to be moved, ambient particulate matter standards would not be expected to be exceeded.

Worker commute trips and supply/equipment delivery trips would additionally be expected to contribute approximately 30-40 additional workforce trips. In addition, there would be an estimated 3-5 truck trips per day involved with the transport of supplies and an estimated 20-30 total truck trips associated with transporting the retrieved cable from Port Hueneme in Ventura County to a recycle facility. Trips to recycle cable would not be expected to all occur on the same day. Worker commute trips and supply/equipment delivery trip impacts to Santa Barbara County would be considered to be minimal due to the short duration of the project.

Project Impact
Significance determination for the proposed project is based on whether activities anticipated under the proposed project will be conducted consistent with plans, programs, and regulations enacted to achieve and maintain compliance with California and National ambient air quality standards. As discussed above, the proposed project will comply with requirements of SBCAPCD Rules, therefore, air quality impacts are expected to be less than significant.

1.3.3 Mitigation Measures

ExxonMobil is proposing the following mitigation measures to be implemented to further reduce and minimize impacts to air quality.

AQ-1: ExxonMobil shall implement the OPSRB Project in accordance with the provisions of the submitted Emissions Reporting Plan and any subsequent approved modification to the plan. This plan shall provide detailed information regarding the internal combustion engines used, the duration of their use, the fuel consumed, and the calculated emissions. The plan shall be submitted to the BSEE and SBCAPCD, for review and approval prior to commencement of cable retrieval or installation activities.

The plan and issued permit shall limit the combined actual emissions from the DP vessel and associated equipment used in the retrieval and installation of the power cables at the SYU stationary source to less than 25 tons of any pollutant, except carbon monoxide, in a 12 month period. The plan shall include detailed information on the engines used and methods to measure fuel consumption to demonstrate that the actual emissions for the project will be below 25 tons per year in accordance with Rules 202.F.7 and 202.D.16.
Expected Enforcement Agency: BSEE, APCD.

AQ-2: Determine, on a daily basis, fuel use and emissions from the retrieval and installation of the power cables when within 25 miles of SYU. At the conclusion of the project, the applicant shall prepare and submit a summary of the daily and total fuel use and emissions associated with the project to verify compliance with SBCAPCD rules and regulations and SYU and project specific permit conditions.
Expected Enforcement Agency: BSEE, APCD.

AQ-3: Require all cable retrieval and installation vessels and other associated IC engines to comply with the SYU ATC/PTO condition by using fuel with less than 0.0015% sulfur by weight (15 ppm) when operating within Santa Barbara County.
Expected Enforcement Agency: BSEE, APCD.

AQ-4: Dust generated by onshore construction activities shall be kept to a minimum with a goal of retaining dust on site. The dust control measures shown below shall be followed. *Enforcement Agency: APCD, SBC.*

a. During clearing, grading, earth moving, excavation, or transportation of cut or fill materials, water trucks or sprinkler systems are to be used to prevent dust from leaving the site and create a crust after each day's activities cease.

b. During construction of the onshore portion of the project, water trucks will be used as necessary to keep all areas of vehicle movement damp enough to reduce dust from leaving the site. At a minimum, this should include wetting down such areas in the late morning and after work is completed for the day.

AQ-5: Prepare a contingency plan prior to cable retrieval and installation for the scenario where the total project emissions of any affected pollutant (specifically NO_x), except CO, are projected to exceed 80% of the above 25 ton/year limit. This plan shall identify potential measures that could be implemented by the contractors to reduce, defer or eliminate emissions without adversely impacting safety or completion of the project. In addition, daily fuel use with pollutants emitted to date and projected toward project completion shall be provided to BSEE and the SBCAPCD.
Expected Enforcement Agency: BSEE, APCD.

Residual impacts would be short term and insignificant.

Conclusions-Proposed Project
The potential impacts to onshore air quality resulting from emissions from vessels and equipment used in the SYU Offshore Power System Reliability- B Project (cable retrieval and installation phases) would be considered to be insignificant based on the significance criteria utilized in this analysis. The cable retrieval and installation phases of the project are subject to permit, however they are exempt from the New Source Review Provisions as specified under SBCAPCD Rule 201.F.7 provided the actual emissions of the DP cable installation vessels and associated engines stays below 25 tons in a consecutive 12-month period. The 25-ton emission limitation contained in the aforementioned rules is the level below which the SBCAPCD considers that projects of this type and duration would result in insignificant air quality impacts.

The Emission Reporting Plan would be used to limit equipment usage and project duration to ensure compliance with Rule 201.F.7 limiting the actual emissions of the project to less than 25 tons of any affected pollutant during any consecutive 12 month period. Emission limitations placed upon the project would be additionally assured by daily monitoring of emissions to ensure compliance with SBCAPCD threshold levels. Threshold levels would be preserved through identified contingency measures to be implemented for the project if the project reaches 80% of the emission limitation as identified in the daily monitoring reports. The contingency measures would be implemented when actual emissions generated to date plus the projected emissions required to complete the project exceed 20 tons. The potential for violations of the ambient air standards would be further minimized through implementation of the aforementioned project conditions to mitigate emissions associated with the OPSRB project.

1.3.4 Cumulative Impacts

Cumulative air quality impacts and consistency with the policies and measures in the Air Quality Supplement of the Comprehensive Plan, other general plans, and the CAP should be determined for all projects (i.e., whether the project exceeds the CAP emission projections or growth assumptions). As discussed above, the proposed project will comply with requirements of SBCAPCD Rules, therefore, the proposed project would be consistent with the adopted 2010 Clean Air Plan.

ExxonMobil is not aware of other projects with significant levels of emissions that are presently anticipated for the affected OCS area during the proposed project period. SBCAPCD rules have deemed that power cable retrieval and installation projects that result in emissions below the 25 ton level per Rule 202.F.7 are considered to be insignificant. Previously identified potential impacts have been addressed through the applicant's commitment of the aforementioned mitigation measures. To date, the SYU Expansion Project emissions of NO_x and ROC have been typically been below permitted levels, and no exceedances of the either the federal or the state 1-hour NO_2 standard have occurred at applicable monitoring sites during the highest emission intensive phases of the OCS construction. Thus, the emissions associated with the short-term power cable installation and retrieval operations would not be expected to result in any cumulative exceedances of applicable air quality standards.

Table AQ-2: Estimated Marine Vessel Emissions

Equipment Description [Reasonable Worst Case]

		Device Specifications				Usage Data			Maximum Operating Schedule				Exemption/	OPERATING		Operating
Equipment	Description	Fuel	%S	Size	Units	BSFC	Units	Load	Hr	Day	Qtr	Yr	Appl. Reg.	DAYS	ENGINE INFO	Time
												Days				
Marine Vessel Emission Estimates							Load Main	0.30	Gen		Work	15		Days in SYU		Days in SYU
Cable Retrieval and Installation							Load Main	0.30	Direct		Boats		Bio/Soil Survey	6.0	CIV	63.75
OPSRB Activities (Within SBC)							Load Aux	0.40	Gen				Mooring	6.0	Dive (80% of CIV)	51
CIV Vessel	Main Engine-Gen Set (# 1)	Diesel	0.0015	3,922	bhp	0.055	gal/bhp-hr	0.30	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Wartsila 9L26 (900 RPM)	Operate DP 100%
[Prysmian	Main Engine-Gen Set (# 2)	Diesel	0.0015	3,922	bhp	0.055	gal/bhp-hr	0.30	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Wartsila 9L26 (900 RPM)	Operate DP 100%
Enterprise DP2]	Main Engine-Direct Drive (# 3)	Diesel	0.0015	3,621	bhp	0.055	gal/bhp-hr	0.30	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Wartsila 8L26 (1000 RPM)	Operate DP 100%
	Main Engine-Direct Drive (# 4)	Diesel	0.0015	3,621	bhp	0.055	gal/bhp-hr	0.30	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Wartsila 8L26 (1000 RPM)	Operate DP 100%
	Emerg Generator (Engine 1)	Diesel	0.0015	158	bhp	0.055	gal/bhp-hr	0.25	0.5	0.5	4.6	4.6	APCD Rule 202.F.7	63.8	Cat C4.4 DITA	Operate 0.5 hr/wk
	Work Boats (3) [Assume]	Diesel	0.0015	100	bhp	0.055	gal/bhp-hr	0.30	1	15	675.0	675.0	APCD Rule 202.F.7	63.8	TBD	Operate in Nearshore
	Life Boat (1)	Diesel	0.0015	28	bhp	0.055	gal/bhp-hr	0.25	0.5	0.5	4.6	4.6	APCD Rule 202.F.7	63.8	BUKH A/S DV29RME	Operate 0.5 hr/wk
	Life/Rescue Craft	Diesel	0.0015	28	bhp	0.055	gal/bhp-hr	0.25	0.5	0.5	4.6	4.6	APCD Rule 202.F.7	63.8	BUKH A/S DV29RME	Operate 0.5 hr/wk
	Existing Aux (Engine 1)	Diesel	0.0015	1,333	bhp	0.055	gal/bhp-hr	0.40	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Cat C32	Operate 100%
	Existing Aux (Engine 2)	Diesel	0.0015	1,333	bhp	0.055	gal/bhp-hr	0.40	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Cat C32	Operate 100%
	Existing Aux (Engine 3)	Diesel	0.0015	1,333	bhp	0.055	gal/bhp-hr	0.40	0	0	0.0	0.0	APCD Rule 202.F.7	63.8	Cat C32	Spare
	Existing Aux (Engine 4)	Diesel	0.0015	1,333	bhp	0.055	gal/bhp-hr	0.40	0	0	0.0	0.0	APCD Rule 202.F.7	63.8	Cat C32	Spare
										Days	4.0	Tow				
Support Vessels										Days	5.0	Transit				
CIV Support Tug	Main Generator (Engine 1)	Diesel	0.0015	3,040	bhp	0.055	gal/bhp-hr	0.60	1	24	96.0	96.0	APCD Rule 202.F.7	4.0	Mitsubishi S12 U MPTK	Operate for Tow
[Example-	Main Generator (Engine 2)	Diesel	0.0015	3,040	bhp	0.055	gal/bhp-hr	0.60	1	24	96.0	96.0	APCD Rule 202.F.7	4.0	Mitsubishi S12 U MPTK	Operate for Tow
AHTS Norne]	Main Generator (Engine 1)	Diesel	0.0015	3,040	bhp	0.055	gal/bhp-hr	0.40	1	24	120.0	120.0	APCD Rule 202.F.7	5.0	Mitsubishi S12 U MPTK	Operate for Transit
	Main Generator (Engine 2)	Diesel	0.0015	3,040	bhp	0.055	gal/bhp-hr	0.40	1	24	120.0	120.0	APCD Rule 202.F.7	5.0	Mitsubishi S12 U MPTK	Operate for Transit
	Auxiliary Gen (Engine 1 of 2)	Diesel	0.0015	138	bhp	0.055	gal/bhp-hr	0.65	1	24	1530.0	1530.0	APCD Rule 202.F.7	63.8	Mitsubishi 6D 16T	Operate 100%
Dive Vessel	Main Propulsion (Engine 1)	Diesel	0.0015	600	bhp	0.055	gal/bhp-hr	0.40	1	24	122.4	122.4	SYU- Spot Charter	51.0	Detriot Diesel 16V-71	Operate 10%
[Example-	Main Propulsion (Engine 2)	Diesel	0.0015	600	bhp	0.055	gal/bhp-hr	0.40	1	24	122.4	122.4	SYU- Spot Charter	51.0	Detriot Diesel 16V-71	Operate 10%
Surveyor	Auxiliary Gen (Engine 1)	Diesel	0.0015	107	bhp	0.055	gal/bhp-hr	0.50	1	24	612.0	612.0	SYU- Spot Charter	51.0	John Deere	Operate 50%
(Anchored)]	Auxiliary Gen (Engine 2)	Diesel	0.0015	107	bhp	0.055	gal/bhp-hr	0.50	1	24	612.0	612.0	SYU- Spot Charter	51.0	John Deere	Operate 50%
Mooring/Survey	Main Propulsion (Engine 1)	Diesel	0.0015	360	bhp	0.055	gal/bhp-hr	0.40	1	24	144.0	144.0	SYU- Spot Charter	12.0	Caterpillar 3406C	Operate 100%
Vessel [Example-	Main Propulsion (Engine 2)	Diesel	0.0015	360	bhp	0.055	gal/bhp-hr	0.40	1	24	144.0	144.0	SYU- Spot Charter	12.0	Caterpillar 3406C	Operate 100%
Danny C	Auxiliary Gen (Engine 1)	Diesel	0.0015	66	bhp	0.055	gal/bhp-hr	0.50	1	24	72.0	72.0	SYU- Spot Charter	12.0	Isuzu UM4JB1	Operate 50%
(Install anchors)]	Auxiliary Gen (Engine 2)	Diesel	0.0015	32	bhp	0.055	gal/bhp-hr	0.50	1	24	72.0	72.0	SYU- Spot Charter	12.0	Northern Lights M20CRW2	Operate 50%

Note 1: CIV Main Engines- IMO Tier 2 w/SCR (normally operate all 4 engines)
Note 2: CIV Auxiliary Engines- EPA Tier 2 (normally operate 2 of 4 engines)
Note 3: CIV Main Engine Load and CIV Auxiliary Engine Load based on Prysmian desktop calculations based on operating experience
Note 4: CIV 9.6 MW total thruster power; Operate as required to maintain position
Note 5: ABS requires Support Tug to tow CIV to and from site or remain on site; Assume remain on site
Note 6: CIV and Support Tug emissions combined to determine compliance with APCD exemption (202.F.7); Dive and Mooring vessels under spot charter allowance and included in 202.D.16 totals
Note 7: Spot Charter Limitations- Mains < 4,000 BHP; Generator < 400 BHP; Bow Thruster < 500 BHP [Engine have no emission factor limitations]
Note 8: Dive and Mooring Vessel engine load factors based on expected operations from experience on previous projects.

Equipment Emission Factors [Reasonable Worst Case]

Equipment	Description	Emission Factors (Note 1)							Notes
		NOx	ROC	CO	SOx	PM	PM10	Units	
Marine Vessel Emission Estimates **Cable Retrieval and Installation** **OPSRB Activities (Within SBC)**									SCR Eff. 85% NOx Red.
CIV Vessel	Main Engine-Gen Set (# 1)	41.25	78.61	66.66	0.21	14.83	14.23	lb/1000gal	IMO Tier 2 w/ SCR / Wartsila
[Prysmian	Main Engine-Gen Set (# 2)	41.25	78.61	66.66	0.21	14.83	14.23	lb/1000gal	IMO Tier 2 w/ SCR / Wartsila
Enterprise DP2]	Main Engine-Direct Drive (# 3)	40.26	113.58	78.61	0.21	14.83	14.23	lb/1000gal	IMO Tier 2 w/ SCR / Wartsila
	Main Engine-Direct Drive (# 4)	40.26	113.58	78.61	0.21	14.83	14.23	lb/1000gal	IMO Tier 2 w/ SCR / Wartsila
	Emerg Generator (Engine 1)	563.64	44.91	121.45	0.21	41.67	40.00	lb/1000gal	EPA Table 3.3.1 (<600HP)
	Work Boats (3) [Assume]	563.64	44.91	121.45	0.21	41.67	40.00	lb/1000gal	EPA Table 3.3.1 (<600HP)
	Life Boat (1)	563.64	44.91	121.45	0.21	41.67	40.00	lb/1000gal	EPA Table 3.3.1 (<600HP)
	Life/Rescue Craft	563.64	44.91	121.45	0.21	41.67	40.00	lb/1000gal	EPA Table 3.3.1 (<600HP)
	Existing Aux (Engine 1)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
	Existing Aux (Engine 2)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
	Existing Aux (Engine 3)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
	Existing Aux (Engine 4)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
Support Vessels									
CIV Support Tug	Main Generator (Engine 1)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
[Example-	Main Generator (Engine 2)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
AHTS Norne]	Main Generator (Engine 1)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
	Main Generator (Engine 2)	234.13	26.01	149.51	0.21	14.83	14.24	lb/1000gal	EPA Marine Tier 2
	Auxiliary Gen (Engine 1 of 2)	600.00	49.00	129.30	0.21	42.20	40.50	lb/1000gal	SYU Supply- Spot Charter (UC)
Dive Vessel	Main Propulsion (Engine 1)	561.00	16.80	78.30	0.21	33.00	31.70	lb/1000gal	SYU Supply- Spot Charter (UC)
[Example-	Main Propulsion (Engine 2)	561.00	16.80	78.30	0.21	33.00	31.70	lb/1000gal	SYU Supply- Spot Charter (UC)
Surveyor	Auxiliary Gen (Engine 1)	600.00	49.00	129.30	0.21	42.20	40.50	lb/1000gal	SYU Supply- Spot Charter (UC)
(Anchored)]	Auxiliary Gen (Engine 2)	600.00	49.00	129.30	0.21	42.20	40.50	lb/1000gal	SYU Supply- Spot Charter (UC)
Mooring/Survey	Main Propulsion (Engine 1)	337.00	16.80	78.30	0.21	33.00	31.70	lb/1000gal	SYU Supply- Spot Charter (C)
Vessel [Example-	Main Propulsion (Engine 2)	337.00	16.80	78.30	0.21	33.00	31.70	lb/1000gal	SYU Supply- Spot Charter (C)
Danny C	Auxiliary Gen (Engine 1)	600.00	49.00	129.30	0.21	42.20	40.50	lb/1000gal	SYU Supply- Spot Charter (C)
(Install anchors)]	Auxiliary Gen (Engine 2)	600.00	49.00	129.30	0.21	42.20	40.50	lb/1000gal	SYU Supply- Spot Charter (C)

Notes:

Note 1: Reference EPA documents for Non-Road and Marine Emission Standards for Tier engines; Reference IMO documents for marine engine emissions

Note 2: CIV Main Engines; Emissions based on MARPOL 73/78 Annex VI Tier II NOx emission standard; SCR efficiency based on manufacturer's information at anticipated engine load

Note 3: CIV Auxiliary Engine emission factors based on EPA Marine Tier 2 factors

Hourly and Daily Construction Emissions Estimate [Reasonable Worst Case]

		NOx		ROC		CO		SOx		PM		PM10	
Equipment	Description	lb/hr	lb/day	lb/hr	lb/day	lb/hr	lb/day	lb/hr	lb/day	lb/hr	lb/day	lb/hr	lb/day
Marine Vessel Emission Estimates **Cable Retrieval and Installation** **OPSRB Activities (Within SBC)**													
CIV Vessel	Main Engine-Gen Set (# 1)	2.67	64.06	5.09	122.09	4.31	103.52	0.01	0.33	0.96	23.03	0.92	22.11
[Prysmian	Main Engine-Gen Set (# 2)	2.67	64.06	5.09	122.09	4.31	103.52	0.01	0.33	0.96	23.03	0.92	22.11
Enterprise DP2]	Main Engine-Direct Drive (# 3)	2.41	57.73	6.79	162.87	4.70	112.72	0.01	0.30	0.89	21.26	0.85	20.41
	Main Engine-Direct Drive (# 4)	2.41	57.73	6.79	162.87	4.70	112.72	0.01	0.30	0.89	21.26	0.85	20.41
	Emerg Generator (Engine 1)	0.61	0.61	0.05	0.05	0.13	0.13	0.00	0.00	0.05	0.05	0.04	0.04
	Work Boats (3) [Assume]	0.93	13.95	0.07	1.11	0.20	3.01	0.00	0.01	0.07	1.03	0.07	0.99
	Life Boat (1)	0.11	0.11	0.01	0.01	0.02	0.02	0.00	0.00	0.01	0.01	0.01	0.01
	Life/Rescue Craft	0.11	0.11	0.01	0.01	0.02	0.02	0.00	0.00	0.01	0.01	0.01	0.01
	Existing Aux (Engine 1)	6.87	164.78	0.76	18.31	4.38	105.23	0.01	0.15	0.43	10.44	0.42	10.02
	Existing Aux (Engine 2)	6.87	164.78	0.76	18.31	4.38	105.23	0.01	0.15	0.43	10.44	0.42	10.02
	Existing Aux (Engine 3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Existing Aux (Engine 4)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Support Vessels													
CIV Support Tug	Main Generator (Engine 1)	23.49	563.70	2.61	62.63	15.00	359.97	0.02	0.51	1.49	35.71	1.43	34.28
[Example-	Main Generator (Engine 2)	23.49	563.70	2.61	62.63	15.00	359.97	0.02	0.51	1.49	35.71	1.43	34.28
AHTS Norne]	Main Generator (Engine 1)	15.66	375.80	1.74	41.76	10.00	239.98	0.01	0.34	0.99	23.81	0.95	22.85
	Main Generator (Engine 2)	15.66	375.80	1.74	41.76	10.00	239.98	0.01	0.34	0.99	23.81	0.95	22.85
	Auxiliary Gen (Engine 1 of 2)	2.96	71.04	0.24	5.80	0.64	15.31	0.00	0.02	0.21	5.00	0.20	4.80
Dive Vessel	Main Propulsion (Engine 1)	7.41	177.72	0.22	5.32	1.03	24.81	0.00	0.07	0.44	10.45	0.42	10.04
[Example-	Main Propulsion (Engine 2)	7.41	177.72	0.22	5.32	1.03	24.81	0.00	0.07	0.44	10.45	0.42	10.04
Surveyor	Auxiliary Gen (Engine 1)	1.77	42.37	0.14	3.46	0.38	9.13	0.00	0.01	0.12	2.98	0.12	2.86
(Anchored)]	Auxiliary Gen (Engine 2)	1.77	42.37	0.14	3.46	0.38	9.13	0.00	0.01	0.12	2.98	0.12	2.86
Mooring/Survey	Main Propulsion (Engine 1)	2.67	64.06	0.13	3.19	0.62	14.88	0.00	0.04	0.26	6.27	0.25	6.03
Vessel [Example-	Main Propulsion (Engine 2)	2.67	64.06	0.13	3.19	0.62	14.88	0.00	0.04	0.26	6.27	0.25	6.03
Danny C	Auxiliary Gen (Engine 1)	1.09	26.14	0.09	2.13	0.23	5.63	0.00	0.01	0.08	1.84	0.07	1.76
(Install anchors)]	Auxiliary Gen (Engine 2)	0.53	12.67	0.04	1.03	0.11	2.73	0.00	0.00	0.04	0.89	0.04	0.86
Total CIV (202.F.7 exemption)		**25.64**	**587.94**	**25.41**	**607.73**	**27.17**	**646.14**	**0.07**	**1.56**	**4.69**	**110.54**	**4.50**	**106.12**
Total Tug (202.F.7 exemption)		**81.25**	**1,950.05**	**8.94**	**214.58**	**50.63**	**1,215.22**	**0.07**	**1.71**	**5.17**	**124.02**	**4.96**	**119.06**
Total CIV + Tug (202.F.7 exemption)		**106.89**	**2,538.00**	**34.35**	**822.31**	**77.80**	**1,861.37**	**0.14**	**3.27**	**9.86**	**234.56**	**9.46**	**225.18**
Total Support (Dive/Moor Spot Charter Vessels)		**25.30**	**607.12**	**1.13**	**27.12**	**4.42**	**106.00**	**0.01**	**0.26**	**1.76**	**42.14**	**1.69**	**40.48**
Total		**132.19**	**3,145.11**	**35.48**	**849.43**	**82.22**	**1,967.37**	**0.15**	**3.53**	**11.61**	**276.71**	**11.15**	**265.65**

Quarterly and Annual Construction Emissions Estimate [Reasonable Worst Case]

Equipment	Description	NOx		ROC		CO		SOx		PM		PM10	
		TPQ	TPY	TPQ	TPY	TPQ	TPY	TPQ	TPY	TPQ	TPY	TPQ	TPY
Marine Vessel Emission Estimates **Cable Retrieval and Installation** **OPSRB Activities (Within SBC)**													
CIV Vessel	Main Engine-Gen Set (# 1)	2.04	2.04	3.89	3.89	3.30	3.30	0.01	0.01	0.73	0.73	0.70	0.70
[Prysmian	Main Engine-Gen Set (# 2)	2.04	2.04	3.89	3.89	3.30	3.30	0.01	0.01	0.73	0.73	0.70	0.70
Enterprise DP2]	Main Engine-Direct Drive (# 3)	1.84	1.84	5.19	5.19	3.59	3.59	0.01	0.01	0.68	0.68	0.65	0.65
	Main Engine-Direct Drive (# 4)	1.84	1.84	5.19	5.19	3.59	3.59	0.01	0.01	0.68	0.68	0.65	0.65
	Emerg Generator (Engine 1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Work Boats (3) [Assume]	0.31	0.31	0.03	0.03	0.07	0.07	0.00	0.00	0.02	0.02	0.02	0.02
	Life Boat (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Life/Rescue Craft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Existing Aux (Engine 1)	5.25	5.25	0.58	0.58	3.35	3.35	0.00	0.00	0.33	0.33	0.32	0.32
	Existing Aux (Engine 2)	5.25	5.25	0.58	0.58	3.35	3.35	0.00	0.00	0.33	0.33	0.32	0.32
	Existing Aux (Engine 3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Existing Aux (Engine 4)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Support Vessels													
CIV Support Tug	Main Generator (Engine 1)	1.13	1.13	0.13	0.13	0.72	0.72	0.00	0.00	0.07	0.07	0.07	0.07
[Example-	Main Generator (Engine 2)	1.13	1.13	0.13	0.13	0.72	0.72	0.00	0.00	0.07	0.07	0.07	0.07
AHTS Norne]	Main Generator (Engine 1)	0.94	0.94	0.10	0.10	0.60	0.60	0.00	0.00	0.06	0.06	0.06	0.06
	Main Generator (Engine 2)	0.94	0.94	0.10	0.10	0.60	0.60	0.00	0.00	0.06	0.06	0.06	0.06
	Auxiliary Gen (Engine 1 of 2)	2.26	2.26	0.18	0.18	0.49	0.49	0.00	0.00	0.16	0.16	0.15	0.15
Dive Vessel	Main Propulsion (Engine 1)	0.45	0.45	0.01	0.01	0.06	0.06	0.00	0.00	0.03	0.03	0.03	0.03
[Example-	Main Propulsion (Engine 2)	0.45	0.45	0.01	0.01	0.06	0.06	0.00	0.00	0.03	0.03	0.03	0.03
Surveyor	Auxiliary Gen (Engine 1)	0.54	0.54	0.04	0.04	0.12	0.12	0.00	0.00	0.04	0.04	0.04	0.04
(Anchored)]	Auxiliary Gen (Engine 2)	0.54	0.54	0.04	0.04	0.12	0.12	0.00	0.00	0.04	0.04	0.04	0.04
Mooring/Survey	Main Propulsion (Engine 1)	0.19	0.19	0.01	0.01	0.04	0.04	0.00	0.00	0.02	0.02	0.02	0.02
Vessel [Example-	Main Propulsion (Engine 2)	0.19	0.19	0.01	0.01	0.04	0.04	0.00	0.00	0.02	0.02	0.02	0.02
Danny C	Auxiliary Gen (Engine 1)	0.04	0.04	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
(Install anchors)]	Auxiliary Gen (Engine 2)	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total CIV (202.F.7 exemption)		**18.59**	**18.59**	**19.36**	**19.36**	**20.56**	**20.56**	**0.05**	**0.05**	**3.51**	**3.51**	**3.37**	**3.37**
Total Tug (202.F.7 exemption)		**6.40**	**6.40**	**0.64**	**0.64**	**3.13**	**3.13**	**0.00**	**0.00**	**0.42**	**0.42**	**0.40**	**0.40**
Total CIV + Tug (202.F.7 exemption)		**24.99**	**24.99**	**20.00**	**20.00**	**23.69**	**23.69**	**0.05**	**0.05**	**3.93**	**3.93**	**3.78**	**3.78**
Total Support (Dive/Moor/Survey Spot Charters)		**2.43**	**2.43**	**0.14**	**0.14**	**0.46**	**0.46**	**0.00**	**0.00**	**0.17**	**0.17**	**0.16**	**0.16**
Total Offshore Marine		**27.41**	**27.41**	**20.14**	**20.14**	**24.15**	**24.15**	**0.06**	**0.06**	**4.10**	**4.10**	**3.94**	**3.94**

Peak Construction Emissions [Reasonable Worst Case]

Marine Vessel Emission Estimates

Cable Retrieval and Installation

OPSRB Activities (Within SBC)

Peak Hourly (lb/hr)

Equipment Category	NOx	ROC	CO	SOx	PM	PM10
OPSRB Activities (Within SBC)						
- Cable Installation Vessel	25.64	25.41	27.17	0.07	4.69	4.50
- CIV Support Tug	49.94	5.46	30.64	0.04	3.18	3.06
- Total 202.F.7 Exemption (CIV+Tug)	75.58	30.87	57.81	0.11	7.87	7.56
- Support Vessels (Dive+Moor+Survey)	25.30	1.13	4.42	0.01	1.76	1.69
Total	**100.87**	**32.00**	**62.22**	**0.12**	**9.63**	**9.25**

Note: Not all activities occur at the same time

Peak Daily (lb/day)

Equipment Category	NOx	ROC	CO	SOx	PM	PM10
OPSRB Activities (Within SBC)						
- Cable Installation Vessel	587.94	607.73	646.14	1.56	110.54	106.12
- CIV Support Tug	1,198.45	131.07	735.26	1.04	76.41	73.35
- Total 202.F.7 Exemption (CIV+Tug)	1,786.39	738.79	1,381.40	2.60	186.95	179.47
- Support Vessels (Dive+Moor+Survey)	607.12	27.12	106.00	0.26	42.14	40.48
Total	**2,393.51**	**765.92**	**1,487.40**	**2.86**	**229.10**	**219.95**

Note: Not all activities occur at the same time

Peak Quarterly (tpq)

Equipment Category	NOx	ROC	CO	SOx	PM	PM10
OPSRB Activities (Within SBC)						
- Cable Installation Vessel	18.59	19.36	20.56	0.05	3.51	3.37
- CIV Support Tug	6.40	0.64	3.13	0.00	0.42	0.40
- Total 202.F.7 Exemption (CIV+Tug)	24.99	20.00	23.69	0.05	3.93	3.78
- Support Vessels (Dive+Moor+Survey)	2.43	0.14	0.46	0.00	0.17	0.16
Total	**27.41**	**20.14**	**24.15**	**0.06**	**4.10**	**3.94**

Note: Not all activities occur at the same time

Peak Annual (tpy)

Equipment Category	NOx	ROC	CO	SOx	PM	PM10
OPSRB Activities (Within SBC)						
- Cable Installation Vessel	18.59	19.36	20.56	0.05	3.51	3.37
- CIV Support Tug	6.40	0.64	3.13	0.00	0.42	0.40
Total 202.F.7 Exemption (CIV+Tug)	**24.99**	**20.00**	**23.69**	**0.05**	**3.93**	**3.78**
- Support Vessels (Dive+Moor+Survey)	2.43	0.14	0.46	0.00	0.17	0.16
Marine Total	**27.41**	**20.14**	**24.15**	**0.06**	**4.10**	**3.94**

Note: Not all activities occur at the same time

Avg. NOx Ton/day	CIV	0.292	Tug	0.100
CIV Demolition Days		15.0 Days	[Estimated days to retrieve out-of-service cables]	
CIV Demolition (202.F.7) [15 days]		4.4 Tons NOx	[Deduct from 202.D.16 cumulative project emissions]	

Estimated Fuel Consumption [Reasonable Worst Case]

				Usage Data			Maximum Operating Schedule				OPERATING	Estimated Fuel Consumption			
Equipment	Description	Size	Units	BSFC	Units	Load	Hr	Day	Qtr	Yr	DAYS	Gal/Day	CuM/Day	Gal Total	CuM Total
Marine Vessel Emission Estimates															
Cable Retrieval and Installation															
OPSRB Activities (Within SBC)															
CIV Vessel	Main Engine-Gen Set (# 1)	3,922	bhp	0.055	gal/bhp-hr	0.30	1	24	1,530.0	1,530.0	63.8	1,553.1	5.9	99,010.9	374.8
[Prysmian	Main Engine-Gen Set (# 2)	3,922	bhp	0.055	gal/bhp-hr	0.30	1	24	1,530.0	1,530.0	63.8	1,553.1	5.9	99,010.9	374.8
Enterprise DP2]	Main Engine-Direct Drive (# 3)	3,621	bhp	0.055	gal/bhp-hr	0.30	1	24	1,530.0	1,530.0	63.8	1,433.9	5.4	91,412.1	346.0
	Main Engine-Direct Drive (# 4)	3,621	bhp	0.055	gal/bhp-hr	0.30	1	24	1,530.0	1,530.0	63.8	1,433.9	5.4	91,412.1	346.0
	Emerg Generator (Engine 1)	158	bhp	0.055	gal/bhp-hr	0.25	0.5	0.5	4.6	4.6	63.8	1.1	0.0	9.9	0.0
	Work Boats (3) [Assume]	100	bhp	0.055	gal/bhp-hr	0.30	1	15	675.0	675.0	63.8	24.8	0.1	1,113.8	4.2
	Life Boat (1)	28	bhp	0.055	gal/bhp-hr	0.25	0.5	0.5	4.6	4.6	63.8	0.2	0.0	1.8	0.0
	Life/Rescue Craft	28	bhp	0.055	gal/bhp-hr	0.25	0.5	0.5	4.6	4.6	63.8	0.2	0.0	1.8	0.0
	Existing Aux (Engine 1)	1,333	bhp	0.055	gal/bhp-hr	0.40	1	24	1,530.0	1,530.0	63.8	703.8	2.7	44,868.8	169.8
	Existing Aux (Engine 2)	1,333	bhp	0.055	gal/bhp-hr	0.40	1	24	1,530.0	1,530.0	63.8	703.8	2.7	44,868.8	169.8
	Existing Aux (Engine 3)	1,333	bhp	0.055	gal/bhp-hr	0.40	0	0	0.0	0.0	63.8	0.0	0.0	0.0	0.0
	Existing Aux (Engine 4)	1,333	bhp	0.055	gal/bhp-hr	0.40	0	0	0.0	0.0	63.8	0.0	0.0	0.0	0.0
Support Vessels															
CIV Support Tug	Main Generator (Engine 1)	3,040	bhp	0.055	gal/bhp-hr	0.60	1	24	96.0	96.0	4.0	2,407.7	9.1	9,630.7	36.5
[Example-	Main Generator (Engine 2)	3,040	bhp	0.055	gal/bhp-hr	0.60	1	24	96.0	96.0	4.0	2,407.7	9.1	9,630.7	36.5
AHTS Norne]	Main Generator (Engine 1)	3,040	bhp	0.055	gal/bhp-hr	0.40	1	24	120.0	120.0	5.0	1,605.1	6.1	8,025.6	30.4
	Main Generator (Engine 2)	3,040	bhp	0.055	gal/bhp-hr	0.40	1	24	120.0	120.0	5.0	1,605.1	6.1	8,025.6	30.4
	Auxiliary Gen (Engine 1 of 2)	138	bhp	0.055	gal/bhp-hr	0.65	1	24	1,530.0	1,530.0	63.8	118.4	0.4	7,548.3	28.6
						0.00									
Dive Vessel	Main Propulsion (Engine 1)	600	bhp	0.055	gal/bhp-hr	0.40	1	24	122.4	122.4	51.0	316.8	1.2	1,615.7	6.1
[Example-	Main Propulsion (Engine 2)	600	bhp	0.055	gal/bhp-hr	0.40	1	24	122.4	122.4	51.0	316.8	1.2	1,615.7	6.1
Surveyor	Auxiliary Gen (Engine 1)	107	bhp	0.055	gal/bhp-hr	0.50	1	24	612.0	612.0	51.0	70.6	0.3	1,800.8	6.8
(Anchored)]	Auxiliary Gen (Engine 2)	107	bhp	0.055	gal/bhp-hr	0.50	1	24	612.0	612.0	51.0	70.6	0.3	1,800.8	6.8
						0.00									
Mooring/Survey	Main Propulsion (Engine 1)	360	bhp	0.055	gal/bhp-hr	0.40	1	24	144.0	144.0	12.0	190.1	0.7	1,140.5	4.3
Vessel [Example-	Main Propulsion (Engine 2)	360	bhp	0.055	gal/bhp-hr	0.40	1	24	144.0	144.0	12.0	190.1	0.7	1,140.5	4.3
Danny C	Auxiliary Gen (Engine 1)	66	bhp	0.055	gal/bhp-hr	0.50	1	24	72.0	72.0	12.0	43.6	0.2	130.7	0.5
(Install anchors)]	Auxiliary Gen (Engine 2)	32	bhp	0.055	gal/bhp-hr	0.50	1	24	72.0	72.0	12.0	21.1	0.1	63.4	0.2
											CIV Total	**7,407.9**	**28.0**	**471,710.8**	**1,785.4**
											Tug Total	**4,933.8**	**18.7**	**26,809.7**	**101.5**
											Sup Vessel Total	**1,219.7**	**4.6**	**9,308.0**	**35.2**
											TOTAL	**13,561.4**	**51.3**	**507,828.5**	**1,922.1**

1.4 Onshore Biological Resources

1.4.1 Environmental and Regulatory Setting

The ExxonMobil onshore facilities are located in Las Flores Canyon. Vegetation and habitat in the canyon include Las Flores Creek and Corral Creek to the east (and south of the confluence of Las Flores and upper Corral Creeks), chaparral to the north, grassland and coastal sage scrub to the west and coastal sage scrub and grassland to the south. Most of the areas disturbed in the upper canyon area during initial project construction were non-native grasslands with scattered stands of coastal sage scrub. Ruderal and cultivated plant communities were also present due to past land use. In addition, vegetation along both creeks was impacted. Streamside vegetation consisted of well-developed riparian woodland dominated by large sycamores and occasional coast live oaks. The understory was comprised of small trees including willow and elderberry with other shrubs, vines and herbs. Oak woodland and chaparral habitats occurred toward the northern end of the project site on slopes of the Vaqueros formation (Exxon SYU Las Flores Canyon Revegetation 1994 Monitoring Report, SAIC, 1994).

To mitigate project impacts, ExxonMobil has participated in extensive revegetation efforts and an annual revegetation survey is performed. Onshore work in the canyon would be limited to the lower canyon parking area, used mostly as a secondary entrance to the canyon and an area for equipment and vehicle parking during construction efforts.

Biological surveys are now conducted in Las Flores Canyon every five years as mitigation for impacts related to the initial project construction and continued operation. No endangered species are known to occur within the existing POPCO and ExxonMobil plant areas. However, several sensitive species are known to occur in Las Flores and Corral Creeks as documented in the annual biological surveys. Such species include the California red-legged frog (a federally-listed threatened species), the Southwestern Pond Turtle (state species of special concern), the California Newt (state species of special concern) and the Two-Striped Garter snake (state species of special concern). The Southern steelhead (endangered) and California red-legged frog (threatened) are protected under the Federal Endangered Species Act. Southern Steelhead and its habitat are listed as endangered. The United States Fish and Wildlife Service (USFWS) has jurisdiction over the California red-legged frog and the National Marine Fisheries Service (NMFS) has jurisdiction over the steelhead. The NMFS designated all Santa Barbara County streams and rivers below Bradbury and Twitchell dams as critical habitat for the steelhead trout (March 17, 2000). Corral and Las Flores creeks, located within Las Flores Canyon, are included within this critical habitat designation.

In addition, since the initial survey during LFC site construction, other sensitive species have been observed in and near Las Flores and Corral creeks during the course of subsequent surveys, including the Coast Range newt, Golden eagle, Prairie falcon, Yellow warbler, Coastal black-tailed jackrabbit, Mountain lion and American badger.

The most recent biological survey was conducted in June 2010 (Garcia & Associates, *2010 Survey Final Report: Ninth Annual Survey, 2010*). Twelve stations are surveyed along Las Flores and Corral Creeks every year, the closest station to the onshore construction area (ABS-1) is located approximately 400 feet northwest of the proposed excavation area. No sensitive herptiles have been observed at this station during the years the survey has been conducted. The station is considered to be suitable habitat for Southwestern Pond Turtle but only marginal habitat for California red-legged frog and Two-Striped Garter snake.

While Las Flores and Corral Creeks are designated critical habitat for steelhead trout, a four-foot culvert located on the south side of US Highway 101 has been considered too high to be negotiated by migrating steelhead. As a result, no steelhead would be expected to be located in either creek and surveys have not been conducted since 1993.

An autumnal monarch butterfly aggregation site was found in 1998 in Sycamore trees along the Corral Creek, behind the three adobe structures in the lower canyon (*Monarch Butterfly Overwintering Sites in Santa Barbara County*, Althouse and Meade, August 1999). Approximately 2000 butterflies were documented, although significantly fewer have been documented during subsequent site visits. This site is notable as one of few aggregation sites that occur on native trees. Santa Barbara County Policy requires the protection of butterfly habitat and limits work that could potentially disturb aggregation and roost sites between October and February. The onshore excavation work would be located approximately 200 feet from the site.

1.4.2 Project Impact Assessment

The term "biological resources" refers to plant and animal species and habitats that support plant and animal species. Based on a preliminary site assessment and review of existing historical resource information (designated environmentally sensitive habitat areas, biological resources maps, reports, surveys and Natural Diversity Database Maps), the lead agency determines whether resources on a site are biologically valuable and whether a project may result in a significant impact to biological resources.

Assessment of impacts must account for both short term and long term impacts. Disturbance to habitats or species may be significant, based on substantial evidence if they 1) substantially limit reproductive capacity through losses of individuals or habitat or 2) substantially limit or fragment range and movement (geographic distribution or animals and/or seed dispersal routes). Based on these criteria, the proposed project would not create any significant impacts on biological resources.

Flora: There would be no loss or disturbance to any unique, rare or threatened plant community as a result of the proposed project. Neither would there be a reduction in the numbers or restriction in the range of any unique, rare or threatened plant species or a reduction in extent, diversity or quality of native vegetation. No significant amount of vegetation with any habitat value or existing habitat would be impacted by the proposed project. Lastly, no specimen trees would be removed during the proposed project. The onshore portion of the project would be limited to previously disturbed areas in the lower canyon. Excavation necessary to expose the two out-of-service submarine power cable and install the replacement cables is estimated to be approximately 800 to1000 cubic yards of material. Some previously disturbed vegetation would be removed or disturbed with reseeding after completion of the work. The excavation location is approximately 500 feet east of Corral Creek; therefore no impacts to riparian habitat would result.

Fauna: The onshore project area would be limited to the already developed lower canyon parking lot approximately 500 feet from riparian habitat. An autumnal monarch butterfly roost site is located in the lower canyon, approximately 200 feet from the proposed project area. Santa Barbara County policy requires that development be set back 50 feet from any potential butterfly aggregation or roosting sites. It is not anticipated that the proposed project would have the potential to impact the known butterfly roost site.

While the project area would be approximately 500 feet from the creek, Southwestern Pond Turtle and California red-legged frog are mobile and could be found in the construction area. In order to make workers aware of the sensitivity of these species, since 1994 ExxonMobil has prepared a pamphlet describing the protection status and potential occurrence of these species in Corral and Las Flores creeks. The pamphlets have been distributed during safety briefings, held at least once a month. The pamphlet is distributed to ExxonMobil personnel as well as contractors and subcontractors. The pamphlet cautions workers to avoid handling either species and to be aware of their potential occurrence on roads near creeks. With the dissemination of this information during a pre-construction meeting, there would be no expected impacts to any listed or sensitive species as a result of the proposed project.

1.4.3 Mitigation Measures

BIO-1: ExxonMobil shall include awareness training for its contractors of the sensitive species located in Corral Creek. The training shall include a description of the species, protection status under the law, the potential range of movement, and what to do in the event one is found within the construction area. This training should be incorporated into the pre-construction meeting(s) with construction personnel to perform the work. Agency representatives shall be invited to attend the meeting(s).
Expected Enforcement Agency: SBC.

Residual impacts would be expected to be temporary and insignificant.

1.4.4 Cumulative Impacts

No additional excavation projects are currently underway in the lower canyon area.

1.5 Benthic Environment

1.5.1 Environmental and Regulatory Setting

Extensive regional descriptions of the benthic environments in the proposed project region were prepared by Dames and Moore (1982b); SAI (1984); SAI (1986), and Chambers Group (1987a,b,c). Numerous biological surveys have been conducted to further characterize the marine biological communities of the area (e.g., Dames and Moore, 1982a,b; Chambers Group, 1982 and 1987a; State Lands Commission, 1995). Previous site-specific surveys of the nearshore benthic environment include Dames and Moore (1991 and 1992). De Wit (2001, 2002, and 2003) reports the results of additional biological surveys specifically for the OPSR-A project at the nearshore site. The results of OSPR-B related marine biological surveys are provided in Padre Associates, 2011 and 2012a. Much of pre-year 2000 information has been previously presented in MMS, 1988, 1991, and 1997, and that and the more recent descriptions are summarized below.

Because of their relative rarity and special value as habitat for species of scientific, recreational, commercial, and education interest, nearshore rocky reefs are given special protection by the SBC Local Coastal Plan. Offshore rocky reefs and hardbottom sites share the ecological values of shallow reefs, and are additionally sensitive to impacts because of the relative stability and slow recovery rates of deep ocean locations and biota. Offshore hardbottom sites in the proposed project area are protected through numerous conditions placed by BSEE and SBC on their respective approvals of activities within the SYU areas of operation.

The environmental setting for the proposed project includes both nearshore and offshore locations. The nearshore site is located on the Gaviota coast, near the mouth of Corral Creek, west of Capitan, Santa Barbara County, California (Figure 4). The nearshore marine habitats and biota are typical of that found in similar water depths along the Santa Barbara Channel coastline. The seafloor habitat inshore of the 35-foot (11 meter) isobath includes armor rock covering existing pipelines and conduits, boulder fields, broken rock, and bedrock ridges interspersed with sand.

A 20 to 50 foot-wide (6 to 15 meter) sand channel runs parallel to and on the eastern side of the conduits and west of the POPCO pipeline into about 30 feet (9 meters) of water. The sand channel was created during the 1983 installation of the POPCO pipeline (de Wit, 2002). The seafloor deeper than 35 feet is predominantly sedimentary.

The nearshore rock and boulder fields are typical of areas influenced by coastal streams and the shale ridges are characteristic of the nearshore solid substrate found throughout the area (de Wit, 2002). Within the nearshore pipeline corridor and adjacent areas, these habitats extend approximately to the 35 foot (11 meter) isobath and generally support a mixed flora of brown algae (*Macrocystis* spp., *Desmarestia* spp, *Pterygophora* californica, and *Egregia menziesii*), patchy turf red algal complex comprising, among others, species of *Gracillaria* sp., *Rhodymenia* sp., *Gracilariopsis* sp., and various coralline algae. Red and purple urchins *(Strongylocentrotus franscicanus* and *S. purpuratus*) are common to locally abundant (Padre Associates, 2011a). Other common macroinvertebrates include sea cucumbers (*Parastichopus* spp.), bat stars (*Asterina Patria miniata*), giant and sun stars (*Pisaster giganteus* and *Pycnopodia helianthoides*, respectively), Kellet's whelk (*Kelletia kelletii*), the sea hare (*Aplysia californica*), and the giant keyhole limpet (*Megathura crenulata*). Spiny lobsters (*Panulirus interruptus*) are present in the crevices between the individual rocks. Recruit and juvenile-size giant kelp plants are also present on the rock substrates and on the exposed portions of the existing pipelines. In the most recent survey (Padre Associates, 2011a) juvenile *Macrocystis pyrifera*, were common to abundant in water depths deeper than 12 feet (4 meters) and where urchins were not present; adult *Macrocystis* were only common at and around the conduits. Fish species include kelp bass (*Paralabrax clathratus*), barred sandbass (*P. nebulifer*), senorita (*Oxyjulius californica*), and surfperch, including the white, black, and pile perch (*Phanerodon furcatus, Emibotoca jacksoni,* and *Rachochilus toxotes*, respectively).

Two species of abalone, the white abalone (*Haliotis soensoni*) and the black abalone (*H. cracherodii*), are listed as endangered under the Federal Endangered Species Act. All other California abalone species are non-listed but considered regionally rare along the California coast. No abalone were observed on rock substrate that was surveyed and reported in Padre Associates, 2011a. The results of a diver survey of the concrete mats at the three existing cable crossings that focused on locating and identifying abalone are reported in Padre Associates, 2012a. No abalone were observed on any of the manmade mats at those locations.

It is likely that black abalone were historically present on the rocky habitat within the intertidal and shallow subtidal zones west of Santa Barbara. However, black abalone have not been detected during recent years of intertidal monitoring at long-term study sites near the proposed project location (Steve Lee, pers. comm., 2002). None were reported in any of the previously-completed marine biological surveys within and around the SYU pipeline and power cables corridor.

The nearshore sedimentary habitat supports abundant polychaete worms (*Diopatra ornata*), sand stars (*Astropecten* sp.), and sand dollar (*Dendraster excentricus*) communities. Surf grass (*Phyllospadix torreyi*), which is attached to the underlying rock but is partially covered with sand, is common from 10 feet (3 meters) to a depth of approximately 15 feet (5 meters). Further offshore within the project area, sedimentary habitat dominates, and relatively large and scattered patches of eelgrass (*Zostera* sp.) are found in water depths from 30 to approximately 45 feet (9 to 14 m). Historically, eelgrass has not been found inshore of the 30 feet (9 meters) isobath at the nearshore SYU site (de Wit 2002); it was however found in 25 feet (<8 meters) during the 2011 survey (Padre Associates, 2011a).

The seafloor habitat in water depths of 50 feet (15 meters) to the platforms in 800 to 1200 feet (244 to 366 meters) of water is sedimentary, consisting of silts and clays. Silty sediments surround the offshore platforms and lay between platforms Harmony and Hondo. Isolated rocky features have been recorded along the shelf break (300 to 400 feet [91 to 122 meters]) and approximately 1 mile (<2 kilometers) northeast of Platform Hondo (SAI, 1984a). High resolution geophysical data (side-scan sonar) reported in ExxonMobil, 2002a indicates that the shelf break hardbottom habitat within the pipeline/power cables corridor consists of a few low- to medium-relief (1to 5 feet [< 1 to < 2 meters]) features in water depths between 265 and 445 feet (80 and 135 meters). Chambers Group (1987a,b) noted a number of species in this shelf-break rocky habitat including the solitary coral *Paracyathus stearnsi*; the anemones *Metridium senile* and *Corynactis californica*; the crinoid *Florimetra serritissima*, the sea star *Mediaster aequalis*; and various species of hydroids, tube worms, bryozoans, and sponges. In addition, the rocky areas provide shelter/habitat for several species of rockfishes (*Sebastes* spp.), as well as shelter for several crab species (e.g., *Cancer anthonyi*). The de Wit (2003) report discusses the results of a review of video recorded during the installation of power cable C-1 in water depths between 280 and 410 feet (85 and 137 meters). That report supports observations reported in Chambers Group (1987a, b) and indicates that scattered rock along the C-1 power cable route is most comment in water depths of 295 and 410 feet (90 and 125 meters) and supports many of the same epibiota referenced in the earlier reports.

The deeper water sedimentary habitat-associated macroepibiota is characterized by the two seapen species, *Acanthoptilum gracile* and *Stylatula elongata*; the sea cucumber *Parastichopus californicus*; and the pink sea urchin *Allocentrotus fragile*. Evidence of superficially buried rocks was noted due to the presence of *Paracyathus* sp. and *Metridium* sp. protruding from an otherwise muddy bottom. Seapens, seastars, sea urchins, shrimp, and sea cucumbers dominate the soft bottom macrobiota in the area (Chambers Group, 1987a), whereas polychaete worms, clams, and amphipods characterize the infauna (Dames and Moore, 1982b).

High resolution geophysical data (side-scan sonar), of the seafloor from 800 to 1,000 feet (245 to 365 meters) south of Platform Heritage indicates there is an area of scattered higher-relief substrate (ExxonMobil 2002a). Video from an ROV survey (ExxonMobil, 2002b) of the proposed power cable route reveals that this area is all low-relief (< 1 foot [< 1 meter]) consolidated sediment or clay lumps with no observable epibiota. There are no hardbottom areas around the offshore platforms in or near the path of the proposed project.

1.5.2 Project Impact Assessment

The impact analysis for the benthic environment in this document adopts significance criteria developed for all biological resources. An impact from the proposed project is significant if it is likely to result in any of the following:

- A measurable change in population abundance and/or species composition beyond natural variability
- Substantially limit reproductive capacity through losses of individuals or habitat.
- Substantially limit or fragment range and movement (geographical distribution and normal route of movement)
- A substantial loss or irreversible modification of habitat in several localized areas or 10 percent of the habitat within the affected area

For an impact to be locally significant, the size of the localized area would be relatively small compared with that of an ecologically equivalent area within the region. The threshold for significance is determined by scientific judgment, and considers the relative importance and sensitivity of the habitat and/or species affected. The affected area, relative to that available in the region, is determined in the same way as that for locally significant impacts. This determination considers the sensitivity and relative importance of the species and/or habitat affected.

Cable Installation and Retrieval Impacts

As described in the OPSRB Project Description, the proposed project would involve removal of approximately 12-18 miles (19.3-29 km) of out-of-service power cable and the installation of 29 miles (47 km) of replacement cable within the existing SYU pipeline and power cables corridor and within general vicinity of the existing SYU facilities.

Several contingency scenarios have been included in the OPSRB Execution Plan in case one of the existing out-of-service power cables cannot be removed from, or a replacement cable cannot be installed in, a conduit or platform riser (i.e., F2 at nearshore conduit, G2 at HE riser, A2 at nearshore conduit and A2 at HA riser). These contingency measures involve laying the cable that cannot be installed on the ocean floor parallel to the installed cable. In the nearshore area, a cable that cannot be installed in a conduit would be laid in a normal manner from the platform to a location south of the POPCO crossing and then turned parallel to the installed route for several thousand feet. In the OCS, a similar approach would be taken at an appropriate distance from the platform. Any cable installed under one of the contingencies would be left in place until an acceptable approach could be identified, approved by the agencies with jurisdiction, and implemented. From an installation approach, utilizing one of these contingencies would not be expect to have a significant impact on the benthic environment. [The probability of one of these contingencies occurring is considered to be very low.]

This section discusses the potential impacts to the seafloor habitats and associated biota that would be expected to occur as a result of cable retrieval and installation, and associated activities.

Seafloor disturbance, and the resulting impacts to the biota, from the retrieval of existing power cables and concrete mats, the installation of replacement power cables and concrete mats (to insulate the power cables from underlying pipelines), and from the anchoring of support vessels are expected. Disturbance of existing solid substrate is expected to be limited to that associated with the removal of existing concrete mats and from the potential for replacement cables being laid across deeper-water rocky habitat. Local sediment-bottom disturbance could also be expected during excavation and pre-installation diver activities around the conduit termini.

Removal and cleaning of the retrieved cable at the surface, placement of anchors, installation of the replacement cables and mats, and excavation around the conduits are expected to resuspend seafloor sediments resulting in an increase in water column turbidity. In addition, one installation measure being considered includes the placement of large bags containing sand or other materials on top of the installed cables adjacent to Platform Harmony at the bottom of the catenary and at the location where the cable makes a sharp turn (F2 towards shore and G2 towards HE). The bags are estimated to be approximately 1-ton in weight and would be lowered by the cable installation vessel on top of the installed cable to help hold the cable in place and minimize any unintended movement as the cable is being laid. That turbidity increase would reduce water clarity and available light for photosynthesis, temporarily clog the gills of biota, and potentially subject attached immobile biota to an increase in sediment deposition. Anchor and concrete mat placement, and cable installation would also cover immobile epibiota and infauna and could alter the existing seafloor habitat. Although retrieval of the out-of-service cables will require the disassembly of the in-place concrete mats which will effectively remove the higher-relief solid substrate (and the associated biota) that it provides, the removed habitat will be replaced by new concrete mats which will provide similar substrate and habitat as that removed. No impacts to the marine resources are expected from the on-platform pre-installation activities.

Detailed discussions on the potential impacts, and mitigations to reduce or eliminate those effects to the existing seafloor habitats and associated biota, are provided below.

Seafloor Disturbance and Sediment Resuspension

As described in the OPSRB Project Description (Attachment A), a number of activities would disturb seafloor sediments and increase turbidity within the nearshore and offshore water columns. Table WQ-3 in the Water Quality section, lists sources, locations, and estimated quantities of sediment that would be resuspended during the proposed project.

Overall, the proposed project is expected to result in minimal seafloor disturbance and short-term, temporary, and localized increases in water column turbidity. In the shallow nearshore, divers working at and seaward of the conduit terminus will excavate sand in order to uncover the out-of-service cables, clear the conduits and expose the cables for approximately 50 feet offshore. The excavated material will be sidecast and could result in burial of sediment infauna and nearby rocky substrate and the associated epibiota, including kelp and immobile fauna.

Turbidity effects are expected to be short-term due to the sandy sediment that is present within this area (de Wit, 2001 and 2002; and Padre Associates, 2011a) and its rapid settlement. The effects are expected to be similar to, but less than, those generated by storm waves.

Because most of the existing power cables are self-buried into the sediment, exposing the cables, cutting and removal of those cables is expected to result in sediment disturbance and resuspension. Additional turbidity in the near-surface waters could result from the cleaning (washing with seawater) of the removed power cables prior to securing them onboard the cable installation vessel. Sediment disturbance, albeit substantially less than during cable retrieval, is also expected to occur immediately around the replacement cables as they "touch-down" onto the seafloor. The sedimentary habitat that characterizes the majority of the project area is not unique within the region and does not support any sensitive species. The effects of sediment disturbance and increases in turbidity are expected to be less than significant, local, and short-term.

The existing concrete mats were placed onto sedimentary habitat and the underlying sediments are expected to be resuspended during the removal of those mats to facilitate the removal of the cables. Similar to the effects of cable retrieval, the resuspended sediment and resulting turbidity is expected to result in less than significant, local, and short-term effects on the surround habitat and biota. The concrete mats are located in water too deep to support eelgrass and no sensitive biota or habitats are expected to be affected by those activities.

To reduce the potential effects of the deposition on the rocky habitat inshore of the conduits, ExxonMobil's contractor will be required to cast excavated sand, via a hose, approximately 20-50 feet (5-15 meters) south, downslope, onto existing natural sedimentary habitat and away from armor rock, boulder fields, broken rock, or bedrock ridges. In addition, actual impacts to the seafloor habitat and biota around the conduits will be assessed during the post-installation surveys. Mitigations including, but not limited to, habitat restoration, transplanting of flora, etc. will be identified and instituted if significant impacts are found and following consultation with regulatory and resource agencies.

Given the projected levels of activity and implementation of proposed mitigation measures, the effects of turbidity would be expected to be highly-localized and temporary causing insignificant impacts.

Physical Alteration of Seafloor Habitats and Biota

Burial of or alteration of seafloor habitats and associated biota from the placement of nearshore anchors, the concrete mats at the POPCO pipeline crossing and over the exposed ends of the cut cables in deeper water, the placement of excavated sediments, and from the installation of the replacement power cables is possible. Potentially significant impacts could occur if anchors or other components are placed onto or across solid substrate habitats; deeper water rock habitats are not common and support long-lived, slow-growing organisms that are particularly sensitive to physical disturbance. Further, placing anchors onto rocky substrate could crush attached organisms (including abalone) and anchor lines across rock features could abrade across rock features and remove or damage algae (including kelp). Although relatively small in area (each power cable is approximately 0.5 feet (<0.2 meter) in diameter, cable placement onto or across hard bottom habitats could result in potentially significant impacts. Other potential impacts to marine resources include damage or burial of eelgrass under the power cables and anchors within sedimentary habitat in water depths that support that species.

Padre Associates (2011a) reported the results of a pre-project marine biology survey that included diver-biologist's observations within proposed nearshore anchoring sites. That report states that the macroepibiota within the proposed anchor sites was typical of that found in similar water depths and substrate throughout southern California; eelgrass was present along the cable route seaward of the 25 foot (<8 meter) isobath; and that one of the anchor sites was within 12 feet (<4 meters) of rocky substrate. Impacts to the habitats and biota along the cable route and at the anchoring sites are expected to be similar to those described in de Wit (2003) and to be limited in areal extent (i.e. anchoring will only occur within the nearshore areas in water depths of approximately 150 feet (46 meters) or less, but could be significant if sensitive species are affected.

Potentially significant impacts to the endangered white abalone (*Haliotis sorenseni*) could occur if individuals are present on the existing concrete mats. The white abalone has been reported in water depths up to 197 feet (60 meters) (National Marine Fisheries Service, 2008) and could occur on the concrete mats at the existing cable crossings. The results of a focused diver survey at the three existing power cable/POPCO pipeline crossing are reported in Padre Associates (2012a). No abalone were observed on the two concrete mat habitat sites that were found (the mats at crossing site C-1 were covered with sediment and no exposed solid substrate was found). Based on that survey, no significant impacts to the endangered white abalone are expected from the dismantling of the existing concrete mats. Placing of concrete mats over of the cut ends of the remaining power cables in water depths of approximately 400 feet and 1200 feet of water depth is expected to be result in less than significant impacts as the seafloor habitat within the water depths of those activities is sedimentary and does not support any special status species.

There is a rocky habitat feature within the cable route that is expected to be crossed by the replacement cables. This feature is located at the shelf break, approximately 5 miles (8 kilometers) from shore, in water depths of 265 to 275 feet (70 to 85 meters). The rocky feature is generally oriented east-west and is approximately 1,600 feet (490 meters) long and between 25 and 50 feet (<8 to <16 meters) wide; maximum vertical relief is 3 feet (1 meter). Uncontrolled placement of the power cables across this feature could damage the habitat and bury or injure attached organisms.

Impacts from placing the replacement cables at the shelf-break are expected to be limited to approximately 25 square feet (2.0 square meters) of the hardbottom feature and are expected to be insignificant. The use of a dynamically-positioned (DP) vessel that would facilitate the slow, controlled lay of the cable and the expectation that the cable would not move once it is laid, results in the minimal area of the feature being affected.

A beneficial effect of the proposed project is that the new concrete mats will provide additional hard bottom substrate onto a relatively featureless, sedimentary seafloor. Epibiota and fish, similar to the community currently present around the existing concrete mats, are expected to inhabit the new area within a relatively short period after installation.

To reduce potential impacts from physical burial, the following mitigations have been incorporated into the proposed project: A DP cable installation vessel would be used to install the cable in deeper-water areas thus eliminating the potential impacts to hardbottom habitats at the shelf-break from anchoring. There are no hardbottom areas around the offshore platforms in or near the path of the proposed project.

A pre-construction marine biological survey will be completed within the proposed nearshore anchoring sites, cable corridors, and excavation site at the conduit. The results of that survey will be used to relocate anchor sites away from rock substrate and to estimate the area of eelgrass potentially affected by the proposed activities. Mitigation requirements will be based on those results and following consultation with the regulatory and resource agencies.

Anchors would be lowered and retrieved vertically to and from pre-selected positions, using a differential geographic positioning system (DGPS) with accuracy usually within 3 feet (1 meter). Anchors would have chain and wire rope extending from the anchor shank to a floating buoy that becomes the mooring buoy and precludes the chain and wire rope from dragging on the seafloor. Controlled mooring using pre-plotted and pre-set anchors and vertical anchor placement and retrieval would reduce seafloor disturbance and prevent placement of anchors onto rocky habitat. The results of a post-installation marine biological survey would be used to determine actual impacts from anchoring and would be the basis for determining the need for additional mitigation (i.e. habitat restoration or habitat/biota enhancement).

Using the DP vessel or a separate work boat with DGPS, would allow placement of the concrete mats in the proper location and avoid hardbottom habitat by at least 50 feet (15 meters).

Using the DP vessel, the applicant would be able to lay the replacement cable along a route that would avoid most hardbottom habitats by 50 feet (15 meters) or greater. In addition, the applicant has stated that they will utilize an ROV to monitor power cable installation operations in the shelf-break hardbottom area. To avoid impacts, the applicant will monitor the area along the proposed route in water depths from 250 to 500 feet (75 to 150 meters) with an ROV during cable installation. If the ROV observes a rocky outcrop, the ROV would assist the DP vessel in adjusting its route or moving the cable to avoid a feature. There are no hardbottom areas around the offshore platforms in or near the path of the proposed project.

Cable Removal Impacts at End of SYU Life

This section discusses the potential impacts of the removal of all power cables and associated material on the benthic environment within the OCS at the end of SYU life.

The decommissioning of its SYU facilities will occur at some point in the future. Deferral of removing all cables within the OCS until that time would mean that this activity would occur during the larger-scale SYU decommissioning project, which would involve the dismantlement and removal of three offshore platforms and their associated pipelines and power cables. It is estimated that it would take up to three years to remove all SYU facilities. Removal of the OCS segments of out-of-service cables is estimated to take up to three weeks during that period. The SYU decommission project would be subjected to a detailed NEPA and CEQA review and permitting prior to initiation. Expected impacts would be the same as those described in the previous section.

1.5.3 Mitigation Measures

As described above, the applicant has proposed to implement the following mitigation measures to further reduce the potential for impacts on the benthic environment.

BE-1: ExxonMobil shall select contractors who shall use a DP vessel to retrieve and install the replacement power cables from nearshore to Platform Harmony and between Platforms Harmony and Heritage.
Expected Enforcement Agency: BSEE, SLC.

BE-2: ExxonMobil shall require contractors, whenever feasible, to utilize appropriate installation techniques that minimize or avoid environmental impacts such as turbidity and anchor scarring. This shall be accomplished by following procedures included in the Anchoring Plan.
Expected Enforcement Agency: BSEE, SLC, SBC.

BE-3: ExxonMobil shall perform a pre-installation marine biological survey of the nearshore project area prior to any installation work adjacent to the conduit, within the proposed anchoring locations, and within the nearshore power cable corridors. Preliminary survey results shall be submitted to agencies as soon as they are available after completion of the pre-installation survey. Final report shall be submitted within approximately 60 days of completion of the pre-installation survey.
Expected Enforcement Agency: SLC, SBC.

BE-4: ExxonMobil shall, after completion of the project, conduct a post-installation marine biological survey to identify any impacts to the nearshore area that could have resulted from construction activity. Mitigation requirements will be based on the results of that survey and will be developed following consultation with the appropriate regulatory and resource agencies (see BE-8 below). Preliminary survey results shall be submitted to agencies as soon as they are available after completion of the post-installation survey. Final report shall be submitted within 60 days of completion of the post-installation survey.
Expected Enforcement Agency: SLC, SBC.

BE-5: ExxonMobil shall require contractors to utilize an ROV to monitor and videotape selected portions of the installation activities during the cable lay operations. If the ROV observes a rocky outcrop, the ROV shall assist the DP vessel in adjusting its route to avoid a feature, whenever it is feasible to do so. Activities that shall be videotaped with a copy provided to agencies include cable laying along the route in water depths were rocky habitat is suspected.
Expected Enforcement Agency: BSEE, SLC.

BE-6: ExxonMobil shall cast sand excavated at or near the conduit, via a hose, 20-50 feet (5-15 meters) south, downslope, into the sand channel between the out-of-service cables and the POPCO pipeline away from armor rock, boulder fields, broken rock, or bedrock ridges.
Expected Enforcement Agency: SLC, SBC.

BE-7: ExxonMobil shall provide, under safe conditions, the permitting agencies access to the site, during installation and installation-related activities, including but not limited to, the cable laying vessel and support vessels. Agency biologists may observe the extent, distribution, and

type of habitat that could be present near anchors or in the path of the proposed power cable. In the event that rocky habitat is observed during cable installation, the applicant shall adjust its anchors or operations, if at all possible, to avoid the habitat or notify the appropriate regulatory agencies for further direction if rocky habitat is unavoidable. All agency personnel on ExxonMobil contracted vessels shall be advised of and adhere to ExxonMobil safety requirements.
Expected Enforcement Agency: BSEE, SLC, SBC.

BE-8: ExxonMobil shall develop a restoration and restoration-monitoring plan after submission of the post-installation survey, if significant impacts to kelp, abalone, and/or hard bottom habitats are detected. The final restoration and restoration-monitoring plan shall be submitted for review and approval to the appropriate regulatory and resource agencies prior to implementation. The final restoration plan shall be implemented after approval and the restoration-monitoring plan shall extend for a 3-year period.
Expected Enforcement Agency: SLC, SBC, and CDFG.

BE-9: If eelgrass restoration is required, ExxonMobil shall adhere to the Southern California Eelgrass Mitigation Policy and include a requirement to use only native species, e.g., *Zostera marina*, for restoration purposes, where appropriate.
Expected Enforcement Agency: SLC, SBC, CDFG and NMFS.

BE-10: If non-listed abalone are detected near the conduit terminus during the time of the pre-installation marine biological survey, ExxonMobil shall complete one of two actions. Either ExxonMobil shall move anchor(s) at least 50 feet (15 meter) away to avoid any direct impacts on abalone, or ExxonMobil shall have a qualified biologist move the abalone pursuant to procedures reviewed and approved by the appropriate regulatory agencies.
Expected Enforcement Agency: SLC, SBC.

BE-11: ExxonMobil shall conduct a post construction ROV or diver video survey, with voice overlay, along the length of the completed cable installation in State waters to verify the as-built condition of the cable. Such survey shall also include the entirety of the area affected by the proposed project, including all anchor locations, to confirm seafloor cleanup and site restoration.
Expected Enforcement Agency: SLC.

With incorporation of the proposed mitigation measures, residual impacts would be expected to be insignificant.

Conclusions-Proposed Project
According to the significance criteria established for this document, an impact on the benthic environment would be considered to be locally significant if it results in a measurable change in population abundance and/or species composition beyond natural variability, substantially limits reproductive capacity through losses of individuals or habitat, substantially limit or fragment range and movement, or results in a substantial loss or irreversible modification of habitat in several localized areas or 10 percent of the habitat in the affected area. Increases in turbidity would be expected to be highly-localized and temporary, causing insignificant impacts. The temporary loss of eelgrass plants would be mitigated by measures ExxonMobil is proposing to adopt and by the additional measures the agencies would require; therefore, any adverse impacts

on eelgrass from anchoring or removing cable would be expected to be relatively short-term, local, and insignificant. Based on the distance of the nearshore abalone habitat from planned activities and implementation of the proposed mitigation measures, the effects of the project on abalone would be expected to be insignificant. Impacts on the benthic environment from concrete mats being placed on the bottom would be expected to be limited to short-term turbidity increases and therefore local and insignificant. Those mats will provide additional higher-relief solid substrate and are, therefore, considered a beneficial effect of the project. Impacts from each replacement cable contacting up to a 12.5 ft^2 (1.2 m^2) area within the hardbottom feature at the shelf-break would be expected to be insignificant. The small area affected, coupled with the use of a DP vessel to allow a controlled lay of the cable and the presence of the ROV to monitor the laydown and move the cable(s) if necessary, further reduces potential effects. The weight of the cable would preclude lateral movement once it is in-place, thus minimizing the potential effects of scraping. Overall, as proposed, the impacts on the benthic environment from the proposed project would be expected to be insignificant and have been mitigated to the maximum extent feasible.

4.5.4 Cumulative Impacts

The draft EIS for Delineation Drilling Activities in Federal waters Offshore Santa Barbara County, California (MMS, 2001) provides a detailed discussion of cumulative impacts on the benthic environment and seafloor resources. The EIS identifies several activities that may impact the benthic environment including: commercial fishing operations, fiber optic cable installation operations, ongoing and reasonably foreseeable oil and gas activities in Federal and State waters, and non-anthropogenic and anthropogenic sources of sediment and contaminants.

Cumulative impacts on nearshore benthic habitats and communities could take the form of degradation or elimination of rocky, shallow-water subtidal habitat in the region west of Santa Barbara. The shallow subtidal habitat is a dynamic environment that is exposed to regular increases in water column turbidity from resuspened sediments, strong water surges and wave action. Although the orientation of the Santa Barbara Channel mainland south and these habitats are therefore somewhat protected, they still experience periodic strong winter storm conditions (especially during El Niño events) that subject the shallow habitats to freshwater runoff, increases in turbidity, physically alter the habitat, remove attached biota, and scour sand. Freshwater runoff and increased turbidity are usually short-term (days to weeks), temporary conditions, however longer-term effects can result from habitat alteration or burial.

Cumulative impacts on offshore benthic habitats and communities could also take the form of degradation of hardbottom communities and the associated biota. Hardbottom substrate along the Santa Barbara Channel mainland is considered rare due to the preponderance of sedimentary habitat. The limited extent of hard bottom habitat and the importance of the biota which it supports results in both entities being considered sensitive to potential environmental effects.

Leet et al. (2001) identifies several fishing and non-fishing activities that may have adverse impacts to benthic communities along the Pacific Coast. In addition to the effects of natural events on animal and plant species, over-harvesting of commercial species such as abalone and nearshore rockfish, fishing-related impacts to marine mammals and birds, the introduction of anthropogenic pollution, and competition among user groups, both consumptive and non-consumptive all affect the marine environment.

The NMFS (1998a,b) has identified several fishing and non-fishing activities that may cause adverse impacts to Essential Fish Habitat (EFH) along the Pacific Coast and within the SYU. These include dredging and discharge of dredged material, water intake structures, aquaculture, wastewater discharge, oil and hazardous waste spills, coastal development, agricultural runoff, commercial marine resource harvesting, and commercial fishing. Most of these activities occur throughout the California coastal habitat and all of these activities produce impacting agents within the southern California coastal zone, including the Santa Barbara Channel. As a result, marine water quality has been impacted by municipal, industrial, and agricultural waste discharges and runoff in much of the Southern California Bight (MMS, 1992).

The proposed project activities would be expected to result in locally insignificant impacts (e.g., highly-localized, temporary turbid conditions, temporary impact on eelgrass, and contact up to two 12.5 $feet^2$ (1.2 $meters^2$) areas within a rocky feature at the shelf-break. Mitigations that reduce or eliminate potential effects have been incorporated into the proposed activities and result in the impacts being less than significant. The Phase 1 activities will not be within the marine waters of the project area thus no marine-related impacts are expected. The project is also not expected to add significantly to cumulative impacts on the benthic environment within the Santa Barbara Channel.

1.6 Commercial Fishing Operations

1.6.1 Environmental and Regulatory Setting

Commercial fishing activities in the SYU and within the Santa Barbara Channel have been described in previous studies and environmental documents (Fusaro et al., 1986; Kronman 1995; MMS 1995, 1997, and 2001; SAI, 1984).

The SYU project area supports a diverse assemblage of valuable fishery resources. These resources, in turn, support important commercial and recreational fisheries (Fusaro et al., 1986; MBC, 1986; Leet et al., 1992 and 2001). Major fisheries within or near the proposed project area include trapping for crab and lobster; purse seining that generally target anchovy, bonito, mackerel, squid, and other pelagic fish; trawling for spot prawn, ridgeback shrimp, sea cucumbers, and halibut; diving for urchins; and drift and set gillnetting for thresher shark, bonito shark, swordfish, white seabass, and barracuda.

The project area traverses two California Department of Fish and Game (CDFG) Fish Blocks (FB), 655 and 656. Table CF-1 summarizes the commercial catch as provided by CDFG over the most recent five years available (2007 through 2011). Table CF-2 provides catch (pounds) and value information for each of the two project region FBs by year, for the most abundant species, and highest value taxa during that same period.

Table CF-1: Summary Commercial Catch Data for Fish Blocks 655 and 656 (2007 through 2011)

Year	FB 655		FB 656	
	Pounds	Value	Pounds	Value
2007	48,041	$134,057	154,277	$135,282
2008	103,584	$195,221	377,600	$248,786
2009	172,346	$245,346	206,344	$240,021
2010	1,247,534	$400,846	1,117,450	$455,339
2011	881,867	$268,179	3,984,477	$1,195,098
Total	2,453,372	$1,243,649	5,840,148	$2,274,526
Year Avg.	490,674	$248,730	1,168,030	$454,905

Table CF-2: Commercial Catch and Value for Most Abundant and/or Valuable Taxa (2007 through 2011)

Year	Fish Block	Species	Pounds	Value	Gear Types
2007	**655**	Crab (all species) Kellet's whelk Sea cucumbers Lobster Spot prawn	22,036 7,707 6,730 3,538 3,511	$24,153 $5,634 $8,076 $40,505 $42,017	Trap, trawl Trap Trawl, diving Trap Trap, trawl
	656	Pacific bonito[1] Crab (all species) Urchins Lobster	86,339 61,135 3,000 2,917	$25,902 $73,024 $1,068 $32,100	Purse seine Trap, trawl Diving Trap
2008	**655**	Hagfish Sea cucumbers Lobster White seabass	72,551 16,512 5,300 3,492	$73,258 $33,592 $58,630 $12,745	Trap Trawl, diving Trap Drift/set gill net
	656	Pacific bonito[2] Crab (all species) Ridgeback prawn Urchins	266,991 84,723 18,774 5,096	$94,141 $104,839 $34,722 $1,544	Purse seine Trap Trawl Diving
2009	**655**	Pacific bonito Sea cucumbers Hagfish White seabass Lobster	89,452 36,211 13,382 7,593 3,808	$32,604 $80,683 $13,382 $17,508 $41,248	Purse seine, H&L[3] Trawl Trap Drift/set gill net, H&L Trap
	656	Crab (all species) Pacific bonito Ridgeback prawn Hagfish Halibut	106,865 67,570[4] 20,485 5,419 2,852	$136,920 $23,650 $39,009 $5,419 $12,300	Trap Purse seine Trawl Trap Trawl, H&L
2010	**655**	Market squid Sea cucumbers Pacific sardine Lobster	1,217,345 14,241 10,326 3,379	$304,336 $26,974 $0[5] $56,750	Drum/purse seine Trawl Drum/purse seine Trap

	656	Market squid Crab (all species) Lobster Hagfish	978,517 130,075 21,471 4,928	$244,629 $168,371 $27,331 $4,928	Drum/purse seine Trap Trap Trap
2011	**655**	Market squid Sea cucumber Lobster	850,760 23,023 4,036	$166,745 $88,634 $68,932	Drum/purse seine Trawl, diving Trap
	656	Market squid Crab (all species) Red urchins	3,820,988 156,626 2,736	$948,030 $206,762 $2,510	Drum/purse seine, lampara net Trap Diving

About 10 nautical miles (19 kilometers) of FB 655 and approximately 5 nautical miles (10 kilometers) of FB 656 would be traversed by project-related activities. The portion of FB 656 that could be impacted is the area along the cable route between platforms Harmony and Heritage, an area that receives minimal fishing pressure due to the extreme depths over 1,100 feet (335 meters) and the limited access to the area immediately around each platform. Each CDFG FB encompasses approximately 100 square nautical miles (1,900 square kilometers) except when one of the FB boundaries is the shoreline. Commercial fishing operations occur within the proposed project area throughout the year. Conflicts between fisheries and fishing and oil and gas activities on the California OCS can generally be separated into two categories: (1) potential effects on managed fish species and Essential Fish Habitat (see Section 4.8), and (2) space-use, or operational conflicts (areal preclusion) discussed below.

The following summarizes the commercial fishing activities that, based on CDFG FB data, have occurred during the last five years within the project region.

Purse Seining. As is shown in Table CF-2, the species targeted are primarily pelagic, such as anchovy, mackerel, squid and bonito. Because purse seiners follow schools of these pelagics , it is difficult, if not impossible, to predict how large or where the fleet will be at a given time. When working an area, the purse seine fleet is made up of a group of vessels. While searching, the vessels often move on erratic or zigzag courses, trying to spot schools visually, with the help of aircraft, or with onboard sonar. Although there are no "seasons" for most pelagic species (white seabass is an exception), the CDFG sets catch quotas. When quotas are filled, the fishery is closed for that year unless an extended quota is subsequently issued. Purse seining for pelagic species, particularly mackerel, bonito, squid, sardine and anchovy, could be expected throughout the area. The purse seine fishery contributed a substantial percentage of the total catch in both FBs during the most recent five years with market squid and Pacific bonito being the primary taxa (see Table CF-2).

Trawling. Trawlers in the Santa Barbara Channel target Pacific Ocean shrimp, spot and ridgeback prawn, sea cucumbers, rockfish, and various species of sole. They also fish seasonally in specified sections of State waters for halibut. This is a mobile fishery in which a single or double rig is towed behind the fishing vessel at slow speed, either in midwater or, more commonly in the Santa Barbara Channel, along the bottom. The trawler deploys the net(s) in areas where fish or shellfish are noted on the fathometer, or where trawling has been successful previously. Trawling occurs year-round in the Santa Barbara Channel at depths of 180 to 1,080 feet (55 to 330 meters) (Fusaro, 1986). Trawl catches from FB 655 predominantly consisted of sea cucumbers; trawling targeted ridgeback prawns in FB 656 for the reporting period (see Table CF-2). Ridgeback prawns are fished within the proposed project area from October 1 through May 30 in water depths of 90 fathoms (fm) (165 meters) and shallower (Mike McCorkle, pers. com., 2002). The peak season is in the spring from late February to June. Sea cucumbers are trawled in the proposed project area between 60 and 90 fm (110 to 165 meters) in winter, and from 1 mile (<2 kilometers) offshore out to 40 fm (73 meters) in summer (Mike McCorkle, pers. com., 2002). The peak season is from June through September.

Drift Gillnetting. Due to restrictions within State waters, all drift gillnetting occurs in Federal waters. The target species are thresher and bonito shark, and swordfish. In the Santa Barbara Channel, drift gillnetting occurs for swordfish and thresher shark from August 15 through January 31 and for bonito shark year-round. The peak season is from October through December. During the summer months, some drift netting for white seabass and barracuda may occur in the offshore portion of the project area. One end of the net is attached to the fishing vessel, while the other is secured to a free-floating buoy marked with a flag, light, and radar reflector. The net also has floats on top and weights on the bottom that can be arranged to allow the net to be at or below the surface. The vessel and net drift together. When not deployed, the net is either stacked on the deck or rolled on a reel. During net deployment, the vessel is under way, and the buoy is set over the stern or side, pulling the net into the water. Rollers on the stern or side keep the net from snagging as it is payed out. The net and buoy are hauled in from the leeward side of the vessel. As the net comes aboard, the fish are removed from the net, which is then restacked or reeled up for the next set. For the most recent five years' commercial catch, drift nets targeted white seabass and were more commonly used in FB 655 (see Table CF-2).

Trap Fishing. Trap fishing for lobster, crab, and hagfish is a fixed gear operation. The crab and hagfish seasons are year-round, and the lobster season is from October to mid-March. Crab and lobster traps (pots) are baited and deployed in fishing grounds; hagfish are usually caught with a large PVC tube-like trap or with fish traps. The crab and lobster pots are commonly left to fish or soak for about three days (hagfish somewhat shorter periods), and then are retrieved. The fishing vessel pulls alongside the pot buoy(s) that are attached to lines and the traps, grapples the buoy on deck, feeds the line through a pinch-puller, and raises the pot from the sea floor. The catch is taken from the pot; it is rebaited and redeployed. Normal fishing practice dictates the movements of trap location: if the traps are fishing well, they are left where they are. If the traps are not catching much, they will usually be moved to a new location. In practice this means that groups, or strings, of gear will be moving from one location to another on an unpredictable time schedule dictated by crab and lobster population movements. It is therefore difficult to predict the location of any particular string of gear at a given time. Most full-time fishermen have at least 50 to70 pots, and many fishermen have several hundred pots arranged in strings of from 5 to 25 individual traps set along particular depth contours. From a practical standpoint in locating and avoiding a string(s) of pots, it is important to consider the effects of tide and current strength on the line and buoy, and the effects of wind and current on the buoy. During conditions of high tide, strong currents, or high winds, buoys may be below sea surface and invisible. Crab and lobster traps are required to have a release door so that any lost or unretrievable pots will not continue to fish indefinitely. Trap-caught crab and/or lobster contributed a substantial percentage of the total commercial catch from both project area FBs and the relatively per-pound price for lobster, makes it one of the major contributors to the total value of the commercial catch for the area (see Table CF-2).

1.6.2 Project Impact Assessment

The impact analysis for the commercial fisheries in this document adopts the following significance criteria. An impact from the proposed project is significant if it is likely to cause any of the following:

- Fishermen are precluded from 10 percent or more of the fishing grounds during the proposed project;
- 10 percent or more of a specific gear type is precluded from a fishing area for all or most of a fishing season; or
- A decrease in catchability of target species exceeds 10 percent of the average annual landing.

Cable Removal and Installation Impacts

As described in the OPSRB Project Description, the proposed project would involve the removal of approximately 12-18 miles (19-29 km) of out-of-service power cable and installation of 29 miles (47 km) of replacement cable in the general vicinity of the existing SYU facilities. The implementation of one of the contingency measures where additional cable in laid on the ocean bottom would not be expected to significantly impact commercial fishing operations. This section analyzes impacts to commercial fishing operations that would be expected to occur as a result of cable retrieval and installation. Impacts that would occur from the removal of the replacement cables (A2 or B2, F2 and G2) and the remaining cables A or B and C1 at the end of the SYU life are analyzed in the following section.

The potential operational conflicts associated with the proposed project include vessel traffic, project-associated obstructions due to anchoring, the power cables themselves, and any project-associated items lost overboard, and space-use conflicts. Due to access limitations around the platform and the proposed actions, no impacts to commercial fishing are expected from the on-platform modifications.

<u>Vessel Traffic:</u> As described in the OPSRB Project Description, ExxonMobil expects that 3-4 vessels would be involved in the cable retrieval and installation: a DP cable installation vessel, a support tug, an anchor handling vessel, and 1-2 dive vessels. Two to four support skiffs would also be deployed to support cable activities in the nearshore area during the project. The Phase 1 on-platform activities are expected to take 15 to 21 months to complete and were initiated in June 2013. Phase 2 activities are expected to take 8-12 months to complete and would be initiated in 2015.

Overall, the proposed project would be expected to result in a temporary, minimal increase in area vessel activity. Following the proposed activities, vessel traffic would be expected to return to current SYU baseline levels. Currently, three crew boats typically are in the SYU area at any time, and crew boats normally make 2-3 round trips per day between the SYU platforms and Ellwood Pier. No additional crew boat trips are anticipated for the OPSRB project. In addition, one supply boat typically is in the field at any time and supply boats normally make 1 trip every other day between Port Hueneme and the SYU platforms. No significant increase in additional supply boat trips are anticipated for the OPSRB project. With this minimal increase in vessel traffic, the chances of project vessel/fishing vessel interaction are expected to increase at a less than significant level.

The Santa Barbara Channel Oil Service Vessel Traffic Corridor Program is intended to minimize interactions between oil industry operations and commercial fishing operations. It was developed cooperatively between the two industries through the Joint Oil/Fisheries Liaison Office (JOFLO). All vessels associated with the proposed project would use the vessel traffic corridors in transit to and from onshore loading sites. In addition to providing transit corridors in and out of area ports, the program routes support traffic within the Channel seaward of an outer boundary line. East of Gaviota, the 30-fathom (55 meter) line defines the outer boundary. Inside 30 fathoms (55 meters), where corridors have not been established specifically for the project area, the permitting agencies are expected to specify that the applicant establish temporary vessel traffic corridors reviewed and approved by JOFLO for the duration of the project. In addition, the permitting agencies are expected to specify that the applicant include training on vessel traffic corridors in all pre-construction meetings with project contractors and their personnel. This method of reducing vessel conflicts has been shown to be effective during past OCS activities. Although minimal effects are expected, with incorporation of the vessel traffic corridors, the impact to commercial fishing operations attributed to increased vessel traffic associated with the proposed project would be expected to be negligible.

Project-Associated Obstructions: The construction activities associated with the proposed project have the potential to generate seafloor obstructions that could impact commercial fishing, particularly trawling, in the project area. These obstructions could result from vessel anchoring, the power cables themselves, and project-associated items lost overboard.

Anchoring: While the majority of the work would be performed using a DP vessel, thereby avoiding use of anchors, anchoring of a diver support vessel would be required in the nearshore conduit terminus area.. Anchor scars caused by dragging the anchors as they are being set, may cause short to long-term obstacles to commercial trawling depending upon the type of seafloor sediment where the anchors are placed (Centaur Associates, Inc., 1984). Anchor scars would not impact trawl fishermen in the nearshore conduit terminus area since trawling is prohibited within one mile (1.6 kilometers) of shore in this area and except for specified areas for halibut and sea cucumbers, for all commercial trawling. Thus, only the anchoring operations in the nearshore area could be of concern.

Power Cables and Lost Debris. The applicant proposes to lay approximately 29 miles (47 km) of replacement power cable from the Las Flores Canyon Plant to Platform Harmony and from Platform Harmony to Platform Heritage. The project also proposes to retrieve 12-18 miles (19-29 km) of out-of-service cables from the nearshore conduit to the shelf break and adjacent to the platforms.

Commercial fishing gear damage and loss problems attributed to obstructions and lost debris related to offshore California oil and gas activities have been identified since at least 1966 (Richards, 1990). Since 1983, JOFLO has served as an information clearinghouse with primary responsibility for inter-industry communications. A search of the JOFLO inter-industry interactions records on the proposed project area has found no incident in the vicinity of either the existing or proposed power cable route that could be attributed to the existing cables. The power cables are approximately 7 inches (18 cm) in diameter, and weigh approximately 30-40 lbs/feet (50-60 kg/m). Due to the weight and small diameter of the power cables, they are partially to completely self-buried and thus pose a low risk of snagging or entangling a trawl net. No adverse impact to commercial fishing operations due to the replacement or the existing power cables in the proposed area would be expected. In the unlikely event that commercial fishing conflicts attributable to the replacement power cables in the SYU area develop in the future, the permitting agencies could require additional mitigations that may include physical modification of identified problem areas, removal of the abandoned cable, or offsite, out-of-kind measures.

The applicant proposes to require its contractors on the cable installation and support vessels for the project to maintain logs that identify the date, time, location, depth, and description of all items lost overboard. To the extent reasonable and feasible, the applicant proposes to require its contractors to recover all items lost overboard during activities associated with the project. No adverse impact to commercial fishing operations due to project-related lost debris in the proposed project area would be expected.

Space-Use Conflicts. As previously discussed, 3-4 vessels (a DP cable installation vessel, a support tug and dive vessels) and several support skiffs would be involved in the Phase 2 offshore activities over a 1-2 month period.

The DP cable installation vessel, support tug, dive vessels and support skiffs would be onsite an estimated 1-2 months to retrieve the out-of-service cables and install the replacement cables. During deployment and retrieval operations, the cable installation vessel would move slowly and will create a minor obstruction to commercial fishing activities within an estimated 0.25 mile (0.4 kilometer) radius centered on the vessel. The following sections describe the potential impacts to those commercial gear types primarily related to maneuverability while nets are deployed, and analyzes the impacts associated with the proposed project.

Trawl: The trawl fishery is a mobile fishery. But with nets deployed, a trawl vessel is not readily maneuverable. The net is on the bottom and in fairly deep water can be up to or even exceed one mile (1.6 kilometers) behind the vessel. Trawlers often work along the edges of steep drop-off slopes; to turn into deeper water would force the net to drop off these slopes. This causes loss of fishing time since the net has to be picked up and reset. Similarly, seafloor obstructions (i.e. rocky outcrops, wrecks, or other debris) are usually pre-located by the trawl fishers so they can be avoided. Knowledge of the location of these snags also limits the maneuverability of the trawler when towing a net(s). Turning into such a snag may mean loss or damage to the net(s), and potential hazard to the vessel itself if the hang is significant and/or weather/sea conditions are unfavorable. Since turning into such obstructions would be hazardous, most trawlers would have to stop towing and pull their gear rather than turn.

The ridgeback prawn and sea cucumber trawl fisheries are both active in the proposed project area. During cable retrieval and installation operations, the cable installation vessel would move very slowly, and experienced trawlers would likely be able to avoid conflicts. Considering the limited area of effect (i.e. no anchors will be deployed), the impact to commercial trawlers would be expected to be insignificant. Proposed mitigation measures would further minimize potential impacts.

Drift Gillnet: Drift gillnets may be a mile (1.6 km) or more in length and the vessels to which the net is attached has restricted ability to maneuver. The "free" end of the gillnet usually has a radar reflector/lighted buoy attached to it, but may not be immediately obvious because it is so far from the fishing vessel. Since drift gillnetting is usually done at night, and often during the darker phases of the moon, it is difficult for other vessels to be aware of the configuration of drift gillnet operations. A drift gillnet up to 6,000 feet (2000 meters) long and 60 to 100 feet (20 to 30 meters) deep can be fished anywhere from right at the surface to 30 to 40 feet (10 to 15 meters) below the surface. Since drift gillnetters drift with the current and wind, this fishery would be precluded from an increasing large area up-current of the cable installation vessel. The preclusion zone would be a triangular-shaped area up-current, with the apex at the cable installation vessel. Since gillnets are restricted from state waters and most drift net fishing occurs in mid- to south Channel, only a relatively small area compared to the available area between the 3-mile state seaward boundary and the platforms would potentially be affected. Drift net fishers would be expected to routinely avoid fixed objects such as platforms, thus the project area would be expected to be within the area normally avoided. Given this very small area of affect to the drift gillnet fishery, no impact to this fishery would be expected from the proposed project.

Purse Seine: By necessity, the purse seine fleet is very mobile, and usually consists of a group of vessels. While searching, the vessels often move on erratic or zig-zag courses, trying to spot schools of fish visually or with onboard sonar; aerial observations are also used to locate near-surface schools of target fish. When a school of fish is spotted, the vessel maneuvers into position and launches the stern-mounted skiff, which drags the seine around the school of fish and back to the mother vessel. The purse line of the seine is rapidly winched-in to close the bottom of the net, and the entire net is brought in with a power block and winch. A successful set and haul usually takes from 30 to 90 minutes, depending on the size of the fish school, weather, and other factors. With nets deployed, purse seiners are essentially dead in the water and drift with the current. Purse seining would thus be precluded from a triangle-shaped area up-current of the cable installation vessel. Due to the highly mobile nature of this fishery and the limited area of the proposed project, only minor inconveniences would be expected to occur during the cable installation phase of the project.

Trap: Both crab and lobster traps can be expected in the nearshore (up to approximately 200 feet [61 meters), however hagfish traps could be located in substantially deeper water within the project area. A dive vessel with a two to four anchor spread would be onsite at the conduit terminus area for approximately 30-45 days. Assuming a 6 to 1 anchor scope in 25 feet (8 meters) water depth at the conduit terminus, all traps would be precluded from within the anchor spread radius of approximately 165 feet (50 meters) around the vessels for the time period. Trap fishing for crab and lobster would also be precluded from an area approximately 0.25 mile (0.44 kilometer) down current of the work vessel for several days while the replacement cables are floated in a controlled bight to be pulled through the conduit to shore. Due to the short duration (estimated to be 30-45 days) and the limited area of the proposed project, only minor inconveniences to the trap fishery would occur. Hagfish trap fishing, if the fishery, which is based on international buyers' needs, is ongoing, would be affected by a smaller area than the crab/lobster fishery as it is located in deeper water where vessel anchoring is not proposed. The impact to the hagfish fishery is, therefore, also expected to be minor. The proposed mitigation measures would further minimize any impact.

Cable Removal Impacts at End of SYU Life
This section analyses the impacts to commercial fishing operations that would be expected to occur to as a result of removing all remaining cables on the OCS at the end of SYU life.

The applicant currently estimates that decommissioning of its SYU facilities will occur sometime in the future. Deferral of removal of the cable segments on the OCS until that time would mean that this activity would occur as a small part of a large-scale project, which would involve the dismantlement and removal of three offshore platforms and their associated pipelines and power cables. It is estimated that 2-3 years would be required to remove all SYU facilities. Removal of the cable segments on the OCS would take an estimated 2-3 weeks. This project would be subjected to a detailed NEPA and CEQA review in the future. Expected impacts would be the same as those described in the previous section.

1.6.3 Mitigation Measures

The applicant has proposed to implement the following mitigation measures to further reduce the potential for impacts to commercial fishing operations.

CF-1: ExxonMobil shall require all project-related vessels utilize the vessel traffic corridors established by the Joint Oil/Fisheries Committee.
Expected Enforcement Agency: BSEE, SLC

CF-2: ExxonMobil shall keep the JOFLO in Santa Barbara informed of construction activities as they progress.
Expected Enforcement Agency: BSEE, SLC

CF-3: ExxonMobil shall require all offshore personnel to view the Wildlife and Fisheries Training video and receive wildlife and fisheries training.
Expected Enforcement Agency: BSEE, SLC

CF-4: ExxonMobil shall file a timely advisory with the local U.S. Coast Guard District office, with a copy to the Long Beach Office of the SLC, for publication in the Local Notice to Mariners and shall place a similar notification in all Santa Barbara Channel ports that support commercial fishing vessels at least 15 days prior to the commencement of construction activities.
Expected Enforcement Agency: BSEE, SLC

CF-5: ExxonMobil shall continue to consult with JOFLO and commercial fishermen, as appropriate, during the planning stages and construction to identify and mitigate any unanticipated impacts regarding the OPSRB project. If the JOFLO determines that conflicts with commercial fishing operations in the SYU area develop during this project, ExxonMobil shall make all reasonable efforts to satisfactorily resolve any issues with affected fishermen. Possible resolutions may include physical modification of identified problem areas on the replacement cables, the establishment of temporary preclusion zones, or off-site, out-of-kind, measures. Evidence of consultations shall be provided to the BSEE, SLC, and SBC.
Expected Enforcement Agency: BSEE, SLC, SBC.

CF-6: ExxonMobil shall review design concepts and installation procedures with JOFLO to minimize impacts to commercial fishing to the maximum extent possible.
Expected Enforcement Agency: BSEE, SLC, SBC.

CF-7: ExxonMobil shall require the contractor to recover any fan channel support, if used, prior to demobilization in the event they escape.
Expected Enforcement Agency: BSEE.

CF-8: ExxonMobil shall require contractors, to the extent reasonable and feasible, to recover all items lost overboard during activities associated with the proposed project. Logs shall be maintained on the cable installation and support vessels that identify the date, time, location, depth, and description of all items lost overboard.
Expected Enforcement Agency: BSEE, SLC.

CF-9: Prior to initiating work there, ExxonMobil shall require the contractor to scout the nearshore conduit terminus area to determine the presence of any traps that could interfere with the cable operations. If any traps are found, the affected fishermen shall be contacted through JOFLO and requested to relocate the traps for the project duration. If the traps have not been moved by the time project activities are scheduled to begin, any traps that could interfere with the activities shall be relocated and then returned to the original site at the end of the work.
Expected Enforcement Agency: BSEE, SLC.

CF-10: Inside 30 fathoms (55 meters), where vessel corridors have not been established specifically for the proposed project area, ExxonMobil shall establish temporary vessel traffic corridors reviewed and approved by JOFLO for the duration of the project.
Expected Enforcement Agency: SLC, BSEE.

CF-11: ExxonMobil shall include training on vessel traffic corridors in all pre-construction meetings with project contractors and their personnel.
Expected Enforcement Agency: BSEE, SLC, SBC.

In addition to these mitigation measures, please refer to the following mitigation measures from other resource sections: BE-1, BE-2 and BE-4.

With institution of the proposed mitigation measures, the residual impacts would be insignificant.

Conclusions – Proposed Project
According to the significance criteria established for this document, an impact from the proposed project is significant if it is likely that fishermen would be precluded from 10 percent or more of the fishing grounds during the proposed project, that 10 percent or more of a type of fishermen are precluded from a fishing area for all or most of a fishing season, or that a decrease in catchability of target species exceeds 10 percent of the average annual landing. Inside 30 fathoms (55 meters), where corridors have not been established specifically for the proposed project area, the permitting agencies would specify that ExxonMobil establish temporary vessel traffic corridors that would be reviewed and approved by JOFLO. In addition, the permitting agencies would specify that ExxonMobil include training on vessel traffic corridors in all pre-construction meetings with project contractors and their personnel. Thus, the impact to

commercial fishing operations attributable to increased vessel traffic associated with the proposed project would be expected to be insignificant. No adverse impacts on commercial fishing operations would be expected from the power cables themselves. No adverse impacts on commercial fishing operations would be expected from project-related debris. Considering the limited area of potential effect (a pre-specified zone around the DP vessel), the impact to commercial trawlers would be expected to be insignificant. Given this very small area of potential effects to the drift gillnet fishery, no impact to this fishery would be expected from the proposed project. Due to the highly mobile nature of the driftnet fishery and the limited area of the proposed project, only insignificant inconveniences would be expected to occur during the cable installation phase of the proposed project. Due to the limited area of the proposed project, only insignificant preclusion of the anchoring area around the conduit mouth for the crab/lobster trap fishery would be expected to occur. Similar, less than significant effects from the vessel anchoring and cable installation to the deeper water hagfish trap fishing are also expected. Phase 1 activities are not expected to have any negative impacts to the commercial fishing activities. Implementation of the proposed mitigation measures would further minimize conflicts with commercial fishing. Overall, the impacts on commercial fishing operations from the proposed project would be expected to be insignificant and mitigated to the maximum extent feasible.

1.6.4 Cumulative Impacts

The draft EIS for Delineation Drilling Activities in Federal waters Offshore Santa Barbara County, California (MMS, 2001) provides a detailed discussion of cumulative impacts on the commercial fishing industry of southern California. The EIS identifies several activities that contribute to space-use and preclusion conflicts with commercial fishing operations including: on-going and proposed oil and gas activities in Federal and State waters; tankering and shipping; and commercial and recreational fishing. The EIS also identifies several activities that damage the fish resource including: dredging and discharge of dredged materials; oil and gas development; aquaculture; coastal development and non-point source pollution; agricultural run-off, and; commercial and recreational overfishing.

The NMFS (1998a,b) has identified several fishing and non-fishing activities that may cause adverse impacts to Essential Fish Habitat (EFH) along the Pacific Coast and within the SYU. These include dredging and discharge of dredged material, water intake structures, aquaculture, wastewater discharge, oil and hazardous waste spills, coastal development, agricultural runoff, commercial marine resource harvesting, and commercial fishing. Most of these activities occur throughout the California coastal habitat and all of these activities and impacting agents exist in the southern California coastal zone within the Santa Barbara Channel. As a result, marine water quality has been impacted by municipal, industrial, and agricultural waste discharges and runoff in much of the Southern California Bight (MMS, 1992).

Several fish stocks in the marine waters off California, and within the Santa Barbara Channel, are depressed resulting in management decisions to restrict some gear types, place fish size and bag limits, and close fisheries. It is difficult to apportion the reasons for a fishery's demise among overfishing, habitat degradation, pollution, and natural variability of the population. Several rockfish species that occur in the Santa Barbara Channel were declared overfished for the entire west coast of the U.S. (Leet et al., 2001). Recent predictions of population trends indicate that rockfish populations may take many decades to recover to sustainable levels. The establishment of state Marine Protected Areas is one recent method that is being used in an attempt to rejuvenate the rockfish populations.

Given the relatively small area of potential effects and with the proposed mitigation measures, no significant impacts to commercial fishing operations from the proposed operations would be expected. In conclusion, the project is not expected to add significantly to cumulative impacts on commercial fishing operations in the Santa Barbara Channel.

1.7 Marine Mammals

1.7.1 Environmental and Regulatory Setting

Marine mammals in the Santa Barbara Channel have been described in detail in previous studies and environmental documents (e.g., Bonnell et al., 1981, 1983; Bonnell and Dailey, 1993; Dohl et al., 1981, 1983; ADL, 1984a, 1986; SAI, 1984a; Barlow, 1995; Barlow et al., 1995, 1997, 2001; Barlow and Gerrodette, 1996; Koski et al., 1998; FWS, 2000; DeLong and Melin, 2000; Forney et al., 2000; MMS, 1988, 1991, 1994, 1995, 2000, 2001; Stewart and Yochem, 2000). At least 29 species of marine mammals inhabit or visit California waters. These include five species of pinnipeds (seals and sea lions), 23 species of cetaceans (whales, porpoises, and dolphins), and the southern sea otter (Allen, et al., 2011). Pinnipeds breed on the Channel Islands and on offshore rocks and isolated beaches along the mainland coast; thousands also move through the area during their annual migrations. Cetaceans, including a number of endangered species, use area waters as year-round habitat and calving grounds, important seasonal foraging grounds, or annual migration pathways. The sea otter, a year-round resident of the mainland coast north of Point Conception, is appearing in increasing numbers in the western Channel and around the northern Channel Islands (FWS, 2000).

In the U.S., two laws currently regulate human activities where marine mammals might be adversely affected. These include the Marine Mammal Protection Act of 1972, which prohibits the intentional taking, import, or export of any marine mammal without a permit, and the Endangered Species Act of 1973, which extends similar protection to species listed as threatened or endangered. The threatened or endangered marine mammal species found in southern California waters include six whales (blue, humpback, fin, sei, right, and sperm whales), one pinniped (Guadalupe fur seal), and the southern sea otter.

Two of the endangered whale species, the blue whale (*Balaenoptera musculus*) and humpback whale (*Megaptera novaeangliae*), usually feed on krill in the western Santa Barbara Channel and southern Santa Maria Basin during summer and fall (Calambokidis et al., 1990; Calambokidis, 1995; Reeves et al., 1998; Mate et al., 1999; Forney et al., 2000; Barlow et al., 2001). Although also present in the Channel during summer, fin whales generally are distributed somewhat farther offshore and south of the northern Channel Island chain (Leatherwood et al., 1987; Bonnell and Dailey, 1993). The other two endangered baleen whales, sei and northern right whales, are rare in California waters (Barlow et al., 1997).

Marine mammal observers onboard the Cable Vessel (CV) *Giulio Verne* during the 15 day October-November 2003 installation of the C-1 power cable recorded a total of 3,069 individuals representing five species: California sea lion, long-beaked common dolphin, Pacific whitesided dolphin, Dall's porpoise, and Minke whale. Two sightings of unidentified whales were also recorded during that period (Marine Mammal Consulting Group [MMCG], 2003).

Similar marine mammal observations were recorded during geophysical surveys along the SYU pipeline/power cable corridors (Padre Associates, Inc. 2011b, 2012b). During the April and September observation periods, 1,712 individuals representing seven taxa were recorded: common dolphin, California sea lion, California gray whale, bottlenose dolphin, killer whale, Pacific harbor seal, and southern sea otter. Twenty-five unidentified dolphins were also recorded (Padre Associates, Inc. 2011b, 2012b).

Sperm whales (*Physeter macrocephalus*), also an endangered species, are present offshore California year-round, with peak abundance from April to mid-June and again from late August through November (Dohl et al., 1981, 1983; Gosho et al., 1984; Barlow et al., 1997, 2001). They are primarily a pelagic species and are generally found offshore in waters with depths of greater than 3,200 feet (1,000 meters) (Bonnell and Dailey, 1993).

The two threatened pinniped species, Steller sea lions *(Eumetopias jubatus)* and Guadalupe fur seals *(Arctocephalus townsendi*), do not breed in the area and presently are uncommon in southern California waters (Stewart et al., 1987b; Bonnell and Dailey, 1993; DeLong and Melin, 2000).

Southern sea otters (*Enhydra lutris nereis*) now range in nearshore waters from San Mateo County in the north to Santa Barbara County in the south (FWS, 2012). Since 1998, 100-150 sea otters have moved south and east of Point Conception along the Channel in the early spring, with most returning to waters north of the Point by mid-summer (FWS, 2000). One individual was recorded in the nearshore segment of the SYU during the 2011 geophysical survey (Padre Associates, Inc. 2011b).

Two species of pinnipeds, California sea lions (*Zalophus californianus*) and harbor seals (*Phoca vitulina*), commonly occur in the Santa Barbara Channel and nearshore waters of the Santa Maria Basin. San Miguel Island is the major southern California rookery for California sea lions, the most frequently encountered marine mammals in southern California waters (Bonnell and Dailey, 1993; Koski et al., 1998; Forney et al., 2000; Environmental Consulting, Inc., 2001). Sea lions haul out on the lower decks and structures of OCS platforms and on associated mooring buoys. MMCG (2003) reported 424 sea lions but no harbor seals during the C-1 cable project observation period. Padre Associates, Inc. (2011b, 2012b) recorded 458 sea lions and harbor seals during the September 2011 and April 2012 observations.

Harbor seals haul out on nearshore rocks and beaches along the mainland coast and on the northern Channel Islands; major mainland haul-out sites near the project area are located near the Carpinteria Pier, Dos Pueblos, Ellwood Pier, Point Conception, and Rocky Point (Hanan et al., 1992). Individual harbor seals are frequently sighted in waters near the SY U facilities (MMS, unpubl. data).

Northern elephant seals (*Mirounga angustirostris*) and northern fur seals (*Callorhinus ursinus*) also breed on San Miguel Island, but are uncommon in project area waters (Bonnell and Dailey, 1993; Environmental Consulting, Inc., 2001). Elephant seals range widely at sea and spend much of their time underwater (Le Boeuf et al., 1989, 2000; DeLong et al., 1992). Fur seals forage in deeper waters beyond the continental shelf, generally 20 nautical miles (40 kilometers) or more from shore (Bonnell et al., 1983; Bonnell and Dailey, 1993).

The small odontocetes, or toothed whales, most often seen in the project area are common dolphins (*Delphinus capensis* and *D. delphis*), Dall's porpoise (*Phocoenoides dalli*), Risso's dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and bottlenose dolphin (*Tursiops truncatus*) (Bonnell and Daily, 1993; Barlow et al., 1997; MMS, unpubl. data). Common dolphins, the most abundant cetaceans off California, move through area waters in groups of up to several thousand animals. Bottlenose dolphins are most commonly encountered along the shoreline. Common dolphins (all identified as the long-beaked species *C. capensis*) were most abundant species reported in MMCG (2003). Likewise, Padre Associates, Inc. (2011b, 2012b) reported common dolphin as the most abundant (1,211 individuals) but did not separate the two species. Dall’s porpoise (22 individuals) and Pacific white-sided dolphins (310 individuals) were also recorded by MMCG (2003). Six bottlenose dolphin and five killer whales were reported by Padre Associates, Inc. 2011b.

The gray whale (*Eschrichtius robustus*) migrates through southern California waters twice a year on its way between Mexican breeding lagoons and feeding grounds in the Bering Sea. The southbound migration of gray whales through the Southern California Bight begins in December and lasts through February; the northbound migration is more prolonged, lasting from February through May with a peak in March (Leatherwood, 1974; Bonnell and Dailey, 1993; Rugh et al., 1999). The northward migration occurs in two “waves” (Dohl et al., 1981; Herzing and Mate, 1984; Poole, 1984). The first, composed mainly of whales other than cows with calves, begins moving northward in February (Braham, 1984). The second, cow/calf phase of the spring migration generally peaks 7 to 9 weeks after the peak of the first (Herzing and Mate, 1984; Poole, 1984). Although individual animals may be sighted throughout the year, gray whales are generally absent from southern California waters from August through November. Padre Associates Inc. (2012b) reported observing two gray whales during the month of April while surveying the SYU cable corridor.

Minke whales (*Balaenoptera acutorostrata*), the smallest of the baleen whales, occur year-round in southern California waters (Dohl et al., 1983; Barlow et al., 1997; Forney et al., 2000), where they are often sighted near the northern Channel Islands (Leatherwood et al., 1987; Bonnell and Dailey, 1993; Koski et al., 1998; Environmental Consulting, Inc., 2001). One Minke whale was reported in MMCG (2003).

1.7.2 Project Impact Assessment

The impact analysis for the marine biological resources in this document adopts significance criteria developed for all biological resources, including threatened and endangered species. An impact from the proposed project is significant if it is likely to cause any of the following:

- A measurable change in population abundance and/or species composition beyond natural variability. For threatened and endangered species, this includes any change in population that is likely to hinder the recovery of a species.
- Displacement of a major part of the population from either feeding or breeding areas or from migration routes for a biologically important length of time.

- A substantial loss or irreversible modification of habitat in several localized areas or in 10 percent of the habitat in the affected area.
- Disturbance resulting in biologically important effects on behavior patterns.

For marine mammals (including threatened and endangered species), the phrase "biologically important length of time" is assumed to mean one season or more. Depending on the species and the circumstances, a season could be a breeding season (e.g., California sea lion breeding season), feeding or foraging season (e.g., blue whale feeding period off southern California), or a migratory period (e.g., gray whale migration).

In addition to the aforementioned significance criteria, SBC uses the following additional criterion for determining significance under CEQA:

- Adverse change to or the reduction in a population or habitat used by a State or Federally listed endangered, threatened, regulated or sensitive species. Any "take" of a listed species shall be considered significant.

Cable Installation and Retrieval Impacts

As described in the OPSRB Project Description, the proposed project would involve platform modifications, and the retrieval and installation of various power cables between the shoreline and existing platforms and between platforms within the SYU. This section discusses the potential impacts to marine mammals that could result from the proposed actions and from activities associated with the "end of SYU life".

The two sources of marine mammal impacts are underwater noise generated by vessels and other cable installation and retrieval activities and the presence of project-related vessels which could increase the risk of entanglement in an anchor line or in the deployed cable, or of a collision between a marine mammal and a vessel.

Noise Disturbance: As described in Section 1.19, three to four vessels would be involved in the cable installation: a DP cable installation vessel, a support tug, and one or two dive support vessels. Several support skiffs would also be deployed in the nearshore area during the project. The offshore activities associated with the Phase 2 cable installation and retrieval activities of the proposed project would be expected to occur over a 1-2 month period. Phase 2 is scheduled to take place sometime in 2015.

Overall, the proposed project would be expected to result in a minor increase in area vessel activity. Three crew boats typically are in the SYU area at any time, and crew boats normally make 2-3 round trips per day between the SYU platforms and Ellwood Pier. ExxonMobil estimates that there will be no need for additional crew boat trips during the OPSRB project period.

In addition, one supply boat typically is in the field at any time and supply boats normally make a trip every other day between the SYU platforms and Port Hueneme. ExxonMobil estimates that there will be no need for additional supply boat trips during the OPSRB project period.

Available information on the potential impact of noise and other OCS-related disturbances on marine mammals was reviewed by Hill (1978); Geraci and St. Aubin (1980, 1985); Terhune

(1981); Gales (1982); Malme et al. (1983, 1984, 1989); Richardson and Malme (1993); and Richardson et al. (1991, 1995). Vessels are the major contributors to overall background noise in the sea (Richardson et al., 1995). Sound levels and frequency characteristics are roughly related to ship size and speed. The dominant sound source is propeller cavitation, although propeller "singing," propulsion machinery, and other sources (auxiliary machinery, flow noise, wake bubbles) also contribute. Vessel noise is a combination of narrowband tones at specific frequencies and broadband noise. For vessels the approximate size of crew and supply boats, tones dominate up to about 50 Hz. Broadband components may extend up to 100 kHz, but they peak much lower, at between 50 and 150 Hz. These sounds are within the frequency range of sounds produced and known or assumed to be heard by marine mammals, with highest levels concentrated at the low frequencies that are assumed to be most audible to large baleen whales, such as the gray whale.

The source levels and frequency ranges of sounds produced by cable- and pipe-laying vessels have apparently not been measured directly. However, diesel-powered vessels of the approximate size of the lay vessel can be expected to generate sounds at broadband source levels above 180 dB, with most of the energy below 200 Hz (Richardson et al., 1995) at the source. The use of thrusters to dynamically position the cable installation vessel would not be expected to change the overall noise level, because the thrusters are operated from the central engines, which operate continuously throughout the laying process.

Richardson et al. (1995) also gives estimated source levels of 156 dB for a 53-foot (16-meter) long crew boat (with a 90-Hz dominant tone) and 159 dB for a 112-foot (34-meter) long twin diesel (630 Hz, 1/3 octave). Broadband source levels for small, supply boat-sized ships 180 to 179 feet (55 to 85 meters) in length are between 170 and 180 dB. Most of the sound energy produced by vessels of this size is at frequencies below 500 Hz. Many of the larger commercial fishing vessels that operate off southern California fall into this class. Currently, NMFS uses 160 dB re 1 μPa at received level for impulse noises as the onset of behavioral harassment for marine mammals that are under its jurisdiction.

In general, seals often show considerable tolerance of vessels. Sea lions, in particular, are known to tolerate close and frequent approaches by boats (Richardson et al., 1995).

Although sea otters often allow close approaches by boats, they sometimes avoid heavily disturbed areas (Richardson et al., 1995). Garshelis and Garshelis (1984) reported that sea otters in southern Alaska tend to avoid areas with frequent boat traffic, but will reoccupy those areas in seasons with less traffic.

Odontocetes, or toothed whales, also often tolerate vessel traffic, but may react at long distances if confined (e.g., in shallow water) or previously harassed (Richardson et al., 1995). Depending on the circumstances, reactions may vary greatly, even within species. Although the avoidance of vessels by odontocetes has been demonstrated to result in temporary displacement, there is no evidence that long-term or permanent abandonment of areas has occurred. Sperm whales may react to the approach of vessels with course changes and shallow dives (Reeves, 1992), and startle reactions have been observed (Whitehead et al., 1990; Richardson et al., 1995).

As summarized in Richardson et al. (1995), there have been specific studies of reactions to vessels by several species of baleen whales, including gray (e.g., Wyrick, 1954; Dahlheim et al., 1984; Jones and Swartz, 1984), humpback (e.g., Bauer and Herman, 1986; Watkins, 1986; Baker and Herman, 1989), bowhead (e.g., Richardson and Malme, 1993), and right whales (e.g., Robinson, 1979; Payne et al., 1983). There is limited information on other species.

Low-level sounds from distant or stationary vessels often seem to be ignored by baleen whales (Richardson et al., 1995). The level of avoidance exhibited appears related to the speed and direction of the approaching vessel. Observed reactions range from slow and inconspicuous avoidance maneuvers to instantaneous and rapid evasive movements. Baleen whales have been observed to travel several kilometers from their original position in response to a straight-line pass by a vessel (Richardson et al., 1995).

Few quantitative data are available on the effects of dredging or trenching, and marine construction noise on marine mammals (Richardson et al., 1995). In two instances, migrating gray whales passing within less than 3 to 4 nautical miles (< 5 to < 8 kilometers) of a platform construction site in the Santa Barbara Channel were not observed to react to pile-driving activities (Dames and Moore, 1990). Observations from studies in the Arctic indicate that white whales (belugas) and bowheads may tolerate considerable dredge noise, but are more sensitive to moving tug-dredge combinations than to stationary dredges (Malme et al., 1989).

During the Exxon offshore pipelines and power cables project in 1991/1992, a Marine Mammal Monitoring Program was conducted by biologists from and under contract to the Santa Barbara Museum of Natural History (SBMNH, 1992). The monitoring program was conducted between December 1991 and March 1992, during the gray whale migration. Although no entanglement, physical contact, or overt startle reactions were observed during the monitoring study, gray whales were observed to alter course in apparent reaction to construction activities (SBMNH, 1992). Animals moved through the project area throughout the project period, and there was no evidence that the construction activities interfered with the gray whale migration.

Installation of power Cable C-1 was completed over a 15-day period in late October to early November 2003. Onboard marine mammal observers recorded all marine mammals that were visible throughout the cable removal and installation. As reported in MMCG (2003) no large whales approached the DP cable lay vessel closer than 1 nautical mile (<2 kilometers) and no noise-related effects were recorded. Padre Associates, Inc. (2011b, 2012b) reported that with institution of mitigations prescribed in the project-specific Marine Wildlife Contingency Plan, no negative effects from noise generated by the geophysical equipment and survey vessels were observed.

Although it is possible that cetaceans, including gray whales, could respond to noise produced by the cable installation vessel and associated support vessels with short-term changes in swimming speed, increased intervals between blows, and small deflections in course, and that they would resume normal course and speed after passing the source of the sound, recent observations suggest it unlikely. The temporary effects are possible during cable-laying operations but would not be expected to have a significant impact on marine mammals in the project area.

Entanglement/Collision: Proposed equipment and vessel activity in the project area also increases the probability that a marine mammal might become entangled in an anchor line and drown or that a boat might hit an animal. Mooring lines and ROV support lines may also present some risk of entanglement. However, there have been no documented cases of marine mammal entanglement in anchor or mooring lines during operations on the Pacific OCS. The MMCG (2003) reports that no whales approached the cable lay vessel closer than 1 nautical mile (<2 kilometers) and no entanglement of non-cetacean taxa were recorded.

The DP installation vessel would not anchor within the project area except for an emergency, although dive support vessels would anchor during operations in the nearshore area adjacent to the conduit terminus, and would utilize pre-positioned anchor buoys. Given the limited scope of this anchoring activity in time and space and the small associated risk, no impacts would be expected from anchor-line entanglement.

Based on experiences in southern California, accidental collisions between cetaceans and support vessel traffic are unlikely events. Although large cetaceans have been struck by freighters or tankers, and sometimes by small recreational boats (Barlow et al., 1995), no such incidents have been reported with crew or supply boats off California (MMS, unpubl. data).

Cable installation vessels move very slowly during cable deployment operations and are even less likely to present a collision risk to large cetaceans. Only one possible incident of this type has been reported- in January 2001, an injured gray whale calf was sighted in the vicinity of a fiber-optic cable-laying operation off Morro Bay (Burton and Harvey, 2001). While the cause of its injuries could not be ascertained, the animal was observed swimming within a few meters of the DP cable-lay vessel.

Pinnipeds are very nimble and considered very unlikely to be struck by vessels. The same is true for southern sea otters. However, the single documented instance of a collision between a marine mammal and a support vessel involved a pinniped- an adult male elephant seal struck and presumably killed by a supply vessel in OCS waters in the Santa Barbara Channel in June 1999.

In their 1984 Biological Opinion on the plan for proposed oil and gas development and production activities in the SYU, the National Marine Fisheries Service (NMFS) concluded that the probability of a collision between vessels and marine mammals was so low that no significant impacts on mammal populations were expected (SAI, 1984a). Since the only large vessel involved with this project will be the cable installation vessel itself, the risk of vessel collision with large cetaceans is expected to be very small. The risk of vessel collision is further reduced by the fact that, with the exception of mobilization/demobilization activities, the cable installation vessel would be moving extremely slowly as the cable is being retrieved or deployed.

Actions specified in the project-specific Marine Wildlife Contingency Plans for the 2003 C-1 cable installation and the plans for the 2011 and 2012 marine geophysical surveys included slowing vessel speed, altering direction of travel, and not crossing the path of whales. No vessel/mammal interactions were recorded by onboard observers during either of those projects (MMCG, 2003, Padre Associates, Inc. 2011b, 2012b).

If the cable retrieval and installation activities occur outside of the gray whale migration period (approximately December to June), such interactions would be considered unlikely. Other large whale species, such as humpback and blue whales, do occur in the Santa Barbara Channel, but are considered uncommon in the project area (MMS, 1997, 2000; Koski et al., 1998; Environmental Consulting, Inc., 2001). No observations of those species were reported in MMCG (2003) or in Padre Associates, Inc. (2011b, 2012b). As stated above in the Environmental and Regulatory Setting section, fin and sperm whales are uncommon in the Channel. Thus, no harassment of threatened or endangered marine mammals would be expected.

If the cable retrieval and installation activities do overlap with the gray whale migration season, it would be expected that whales will continue to move through the project area, exhibiting the minor reactions observed during the 1991/92 pipelines and power cables project. In addition, the applicant would work with NMFS, BSEE, SBC and other agencies to implement appropriate mitigation in order to further reduce potential impacts, so no significant impacts would be expected. Therefore, under NEPA, the potential project impacts are considered insignificant.

Under CEQA, the project could potentially have a significant impact utilizing the additional criterion supported by SBC. ExxonMobil will implement a marine mammal monitoring program during the cable retrieval and installation operations. Based on the OPSR-A project, SBC believed that marine mammal monitoring would be appropriate for all period of cable laying operations because of the fact that other sensitive species are resident or migrate through the channel at different times of year and could potentially be in the project area. Therefore, under CEQA, the project is considered to have a potentially significant, but mitigable impact (see MM-1).

Cable Removal Impacts at End of SYU Life: This section analyzes the impacts to marine mammals that would be expected to occur to as a result of removing all remaining cable segment on the OCS at the end of SYU life.

ExxonMobil currently estimates that decommissioning of its SYU facilities will occur sometime in the future. Deferring the removal of all remaining cables and cable segments until that time would mean that this activity would occur during the larger-scale project, which would involve the dismantlement and removal of three offshore platforms and their associated pipelines and power cables. It is estimated that 2 to 3 years would be required to remove all SYU facilities. Removal of the OCS segments of the existing cables would take an estimated 3 weeks to complete. This project will be subjected to detailed NEPA and CEQA review in the future. Expected impacts would be the same as those described in the previous section.

1.7.3 Mitigation Measures

Applicant Proposed Mitigation

The applicant has proposed to implement the following mitigation measures to further reduce the potential for impacts to marine mammals.

MM-1: Applicant shall prepare and implement a marine mammal monitoring plan (MMMP) during cable retrieval and installation operations. The plan shall include the following elements:

a) A minimum of two NMFS-qualified marine mammal observers shall be located on the cable installation vessel to conduct observations, with at least one observer on duty during all cable installation activities.
b) Shipboard observers shall submit a daily sighting report to NMFS and BSEE. This report shall be used to determine whether observable effects to marine mammals are occurring.
c) The observers shall have the appropriate safety and monitoring equipment to conduct their activities (including night-vision equipment).
d) The observers shall set a 1,640-ft (500-m) radius hazard zone around the cable installation vessel for the protection of large marine mammals (i.e., whales) and shall have the authority to stop any activity if it appears likely that a whale could enter the hazard zone.
e) Applicant shall immediately contact the Santa Barbara Marine Mammal Center for assistance should a marine mammal be observed to be in distress. In the event that a whale becomes entangled in any cables or lines, the observer shall notify the Santa Barbara Marine Mammal Center and required agencies, so appropriate response measures can be implemented. Similarly, if any take involving harassment or harm to a marine mammal occurs, the observer shall immediately notify the required regulatory agencies.
f) The vessel captain shall have the final authority on vessel operations to ensure the safety of the vessel, its equipment, and the people on board and shall cooperate with the observers to minimize the potential for damage to marine mammals or the environment. The vessel captain and ExxonMobil project management shall be responsible for ensuring that the OPSRB MMMP is implemented.
g) A report summarizing the results of the monitoring activities shall be completed following completion of these activities and submitted to the required agencies.

The plan shall be submitted for review to BSEE and SLC prior to commencement of installation activities and to CCC and/or SBC prior to approval of the Coastal Development Permit.
Expected Enforcement Agency: BSEE, SLC, SBC, CCC.

MM-2: Applicant shall provide awareness training on the most common types of marine mammals likely to be encountered in the project area and the types of activities that have the most potential for affecting the animals to all project-related personnel and vessel crew prior to the start of installation activities. In addition, the applicant shall require all offshore personnel to view the Wildlife and Fisheries Training video.
Expected Enforcement Agency: BSEE, SLC.

Residual impacts would be expected to be insignificant.

Conclusions – Proposed Project
According to the significance criteria established for this project, an impact to marine biological resources would be considered to be locally significant if it is likely to directly or indirectly cause measurable change in species composition or abundance beyond that of natural variability, or a measurable change in ecological function within a localized area. Observable effects of noise and disturbance on marine mammals from the proposed project, including on-platform improvements, cable retrieval and installation operations would be expected to be restricted to possible temporary changes in direction of movement during cable retrieval and installation operations. Given the projected levels of equipment and activity and the timing of activities, the effects of noise and disturbance on marine mammals from this project would be expected to be

insignificant. Implementation of the mitigation measures proposed for in-water activities by ExxonMobil would decrease the probability that adverse impacts would occur due to collision or entanglement. ExxonMobil, in consultation with the appropriate regulatory and resource agencies, would implement an MMMP to further reduce potential impacts. No significant impacts to marine mammals in the project area would be expected under NEPA.

According to the additional significance CEQA criterion used by SBC, an impact to marine biological resources would be considered to be significant if it is likely to cause an adverse change to or the reduction in a population of or habitat used by a State or Federally listed endangered, threatened, regulated or sensitive species. In addition, any "take" of a listed species would be considered significant. As discussed above, ExxonMobil will conduct the marine monitoring effort during the entire cable retrieval and installation operations. As a result, and with incorporation of the proposed mitigations, potential impacts to marine mammals under CEQA would be considered potentially significant but mitigable.

1.7.4 Cumulative Impacts

The DEIS for Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California (MMS, 2001) provides a detailed discussion of cumulative impacts on marine mammals in southern California waters. The EIS identifies ongoing and proposed oil and gas activities in Federal and State waters, Alaskan and foreign-import tankering, military operations, commercial fishing activities, shipping activities, subsistence hunting, whale watching, and marine pollution as potential anthropogenic sources of cumulative impacts to marine mammals in the area. Potential non-anthropogenic sources of potential cumulative impact identified include disease, marine toxins and El Niño events. The EIS concludes that incidental take in commercial fishing operations is currently the primary source of anthropogenic impacts to marine mammals in the area, although these impacts are expected to decrease as additional restrictions and mitigation measures are imposed on coastal fisheries.

Multiple sources of noise and disturbance, including stationary oil and gas activities (construction, drilling, and production), ship and boat noise, aircraft, and seismic survey noise, occur in the Santa Barbara Channel and nearby waters. Although some oil and gas activities off southern California, such as construction and seismic surveys, have declined over the last decade, overall vessel traffic, including commercial, military, and private vessels, is increasing. These increasing levels of noise and disturbance could result in more frequent masking of marine mammal communications, behavioral disruption, and short-term displacement. And, in other areas, there is some evidence for long-term displacement of marine mammals due to disturbance, particularly in relatively confined bodies of water (summarized in Richardson et al., 1995).

However, marine mammal populations in California waters have generally been growing in recent decades (Bonnell and Dailey, 1993; Barlow et al., 1997, 2001; Forney et al., 2000) despite a gradual increase in a wide variety of human activities in the area. There is no evidence that these activities have resulted in adverse impacts on marine mammal populations. Given the low levels of noise and disturbance associated with the proposed cable installation activities, and based on real-time observations during cable-laying operations within the SYU in 2003 (MMCG, 2003), this project would not be expected to add significantly to cumulative impacts on marine mammals in the Santa Barbara Channel. This is expected to be true even if the project activities overlap with the gray whale migration through the area. In their analysis of the impacts of OCS activities on gray whales prepared in support of the determination to remove the species from the List of Threatened and Endangered Species, NMFS (1992) concluded that the cumulative impacts from oil and gas activities may have the potential to adversely affect the eastern North Pacific gray whale stock, but that these impacts are not likely to jeopardize its continued existence either through direct exposure or through the loss of food resources.

In conclusion, as mitigated, no significant impacts to marine mammals would be expected to occur from the proposed project. Further, given the low levels of noise and disturbance associated with the platform modifications and cable installation activities, this project would not be expected to add significantly to cumulative impacts on marine mammals in the Santa Barbara Channel.

1.8 Essential Fish Habitat (EFH)

1.8.1 Environmental and Regulatory Setting

Under Section 305 (b) (2) of the Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801 et seq) as amended by the Sustainable Fisheries Act on October 11, 1996, Federal agencies are required to consult with the Secretary of Commerce on any actions that may adversely affect Essential Fish Habitat (EFH). The Department of Commerce published a final rule (50 CFR Part 600) in the Federal Register (January 17, 2002, Volume 67, Number 12) that detailed the procedures under which Federal agencies would fulfill their consultation requirements.

Congress defined EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. 1802(10)). The EFH regulations further interpret the EFH definition as follows. “Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate. “Substrate” includes sediment, hardbottom, structures underlying the waters, and associated biological communities. “Necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem. “Spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.

Section 600.920 (e)(1) of the final rule states that Federal agencies may incorporate an EFH Assessment into documents prepared for other purposes such as NEPA documents. Section 600.920 (h) describes the abbreviated consultation process that the BSEE and SBC is following for the proposed project proposed by the applicant. The purpose of the abbreviated consultation process is to address specific Federal actions that may adversely affect EFH, but do not have the potential to cause substantial adverse impacts.

Sections of this document are intended to serve as an assessment for EFH consultation. As set forth in the regulations, EFH Assessments must include: 1) a description of the action; 2) an analysis of the potential adverse effects of the action on the managed species and EFH; 3) the Federal agency’s conclusions regarding the effects of the action on managed species and EFH; and 4) proposed mitigations if applicable.

NOAA identifies four habitats of particular concern (HAPC) within the southern California area: estuaries, rocky reefs, seagrass beds, and kelp beds (NOAA, 2012). HAPCs are defined as discrete subsets of EFH that provide important ecological functions and/or are especially vulnerable to degradation. The HAPC designation does not necessarily confer additional protection or restrictions upon an area, but they help prioritize and focus conservation efforts. Although these habitats are particularly important for healthy fish populations, other EFH areas that provide suitable habitat functions are also necessary to support and maintain sustainable fisheries and a healthy ecosystem (NOAA, 2012).

The OPSRB Project Description contains a description of the proposed project. Below is a discussion of the managed species that may be present within the area where project activities would take place, and an impact analysis of the proposed project on managed species and EFH. A discussion of the potential cumulative impacts, a listing of proposed mitigations and summary conclusions are also included below.

<u>Species Managed under Fishery Management Plans (FMP):</u> The environmental setting for the OPSRB Project includes both nearshore and offshore locations. The Pacific Fishery Management Council (PFMC) manages 90 species of fish under three Fishery Management Plans: 1) Coastal Pelagics Fishery Management Plan; 2) Pacific Salmon Fishery Management Plan; and 3) Pacific Groundfish Fishery Management Plan. Many but not all of the managed species could be found during all or part their life cycle within the areas where the proposed project would take place.

The nearshore site is located on the Gaviota coastline in the northwestern Santa Barbara Channel. At least fifteen species listed under the Pacific Groundfish Management Plan and two species listed under the Coastal Pelagics Fishery Management Plan frequent kelp beds and reefs in less than 120 feet (40 meters) of water off the coast of Santa Barbara, California, and could be present during some life stages in the nearshore area of the OPSRB Project (Table EFH-1) (Leet et al., 2001; Love et al., 1999; Schroeder, 1999a,b). The pelagic species could be present for short-time periods as schooling adults whereas many of the groundfish species could be present for longer time periods as both adults and juveniles. The juveniles of many rockfish species use the shallow-water algae and kelp canopies during early development before settling over deeper water or to the bottom. Benthic rockfish juveniles could be found in *Sargassum* and eelgrass beds. Cabezon, lingcod and greenlings could be present as adults, in egg masses (nests) on substrate, and as settled juveniles in *Sargassum*, kelp or eelgrass beds (Leet et al., 2001; Love 1996).

The seafloor habitat within the power cable corridor is predominantly sedimentary and extends for about 16 miles (25 kilometers) in a southwesterly direction to Platform Heritage. Some rocky habitat exists along the shelf break and eelgrass and kelp have been documented within the nearshore (to water depths of approximately 45 feet [14 meters]) portion of the corridor (Padre Associates 2011a). At least 31 species listed under the Pacific Groundfish Management Plan and all species listed under the Coastal Pelagics Fishery Management Plan could be found in this region between the SYU nearshore area and around the offshore platforms and could be present during some life stages in the area of the proposed project (Table EFH-2) (Leet, et al., 2001; NMFS, 1998a,b; Orr et al., 1998).

The three platforms are located from about 15 to 18 miles (24 to 29 kilometers) to the southwest of the nearshore site. At least 39 species listed under the Pacific Groundfish Management Plan and three species listed under the Coastal Pelagics Fishery Management Plan frequent platforms within the Santa Barbara Channel and could be present during some life stages in the offshore area of the proposed project (Table EFH-3) (Love et al., 1999; Schroeder, 1999b). The pelagic species could be present for short-time periods as schooling adults whereas many of the groundfish species could be present for much longer time periods as both adults and juveniles. Adult rockfish, cabezon, lingcod and greenlings may become semi- to permanent residents and young-of-the-year rockfish may use mid-water depths under platforms as a nursery area before settling at the platforms or elsewhere (Leet et al., 2001; Love et. al.,1999). The planktonic eggs and larvae of many managed species could be present within the water column and therefore pass through the platform structure (Love, 1996).

1.8.2 Project Impact Assessment

The impact analysis for the EFH in this document adopts significance criteria developed for all biological resources. An impact from the proposed project is significant if it is likely to cause any of the following:

- A measurable change in population abundance and/or species composition beyond natural variability
- Substantially limit reproductive capacity through losses of individuals or habitat
- Substantially limit or fragment range and movement (geographical distribution and normal route of movement)
- A substantial loss or irreversible modification of habitat in several localized areas or 10 percent of the habitat in the affected area
- An HAPC is substantially affected by the proposed actions

Impacts of regional significance are judged by the same criteria as those for local significance, except that the impacts cause a change in the ecological function within several localized areas or a single large area. The affected area, relative to that available in the region, is determined in the same way as that for locally significant impacts. This determination considers the importance of the species and/or habitat affected and its relative sensitivity to environmental perturbations.

Because Phase 1 activities will not include any in-water actions, no impacts to EFH or HAPCs are anticipated from those activities. Below is a discussion of the potential effects of Phase 2 activities on EFH.

Cable Retrieval and Installation Impacts

As described in the OPSRB Project Description, the proposed project would involve retrieval of approximately 12-18 miles (19-29 km) of out-of-service power cable and the installation of 29 miles (47 km) of replacement cable in the general vicinity of the existing SYU facilities. This section analyzes impacts to managed species and EFH that would be expected to occur as a result of cable retrieval and installation activities. Impacts that would occur from removal of all cables at the end of the SYU life, are analyzed in the following section.

Three major types of activities associated with the proposed project that could impact EFH are: bottom sediment disturbance and cleaning of retrieved cables as they are brought onboard the cable installation vessel, anchoring and placing a concrete mats or the replacement power cables on rocky outcrops. Bottom sediment disturbance and cleaning of the retrieved cables at the surface would increase turbidity that could cause gill irritation or clogging, decrease the ability of fish to sight-feed, reduce available light, and subject eelgrass, kelp and benthic biota to an increase in sediment deposition. Anchoring could crush infauna and attached epibiota or damage habitat and could also cause an increase in turbidity from resuspended sediments. Laying the power cables physically across rocky outcrops could crush epibiota and alter the seafloor habitat. There would be no impacts anticipated on hardbottom features from retrieving the out-of-service power cables to the shelf-break and around the platforms. Minimal impacts to the eelgrass HAPC from retrieval of the out-of-service cables, from excavation around the conduits, and to plants that are directly under the replacement cables are also anticipated.

Bottom Sediment Disturbance and Cleaning of Retrieved Cable. As described in the OPSRB Project Description, a number of activities would disturb seafloor sediments and increase turbidity in the upper water column both in the nearshore and offshore environments. Table WQ-3 in Water Resources Section lists sources, locations and estimated quantities of sediment that will be resuspended during the proposed project.

Overall, the proposed project would be expected to result in minimal, temporary increases in turbidity from resuspended surficial sediments. Around the cable conduits, divers would excavate sandy sediment in order to uncover the out-of-service cables and clear the conduits. However, for the OPSR-A project, CDFG (Tom Napoli, pers. comm., 2002) expressed concern for the potential effects on shallow nearshore species from localized suspended sediment.

To accommodate concerns and further minimize the impacts from turbidity within the shallow nearshore rocky habitat, the permitting agencies are expected to require that the applicant cast excavated sand, via a hose, 50 feet (15 meters) south, downslope, into natural sedimentary seafloor habitat between the out-of-service cables and the POPCO pipeline away from armor rock, boulder fields, broken rock, or bedrock ridges. In addition, actual impacts to the seafloor habitat and biota around the conduits will be assessed during the post-installation surveys. Mitigations including, but not limited to, habitat restoration, transplanting of flora, etc. will be identified and instituted if significant impacts are found and following consultation with regulatory and resource agencies.

The sites where the out-of-service cables crosses the POPCO pipeline is in 80 to 85 feet (24 to 26 meters) of water are sedimentary and are too deep to support eelgrass or kelp. Excavation work around a concrete mattresses resting on top of these cables at the crossings would result in temporary and highly-localized increases in turbidity on the bottom. Offshore around the platforms, any excavation work would result in temporary and highly-localized increases in turbidity on the bottom; the water depth there also exceeds that which supports eelgrass or kelp.

Retrieval of the out-of-service cable would disturb a small amount of sediment that overlays the cables. In addition, surface cleaning of these cables would result in a temporary and highly-localized turbid cloud beneath and around the cable installation vessel beginning at least 75 feet (22 meters) south of the conduit terminus, continuing out to the shelf break, and near the offshore platforms. As reported by de Wit (2001 and 2002) and more recently by Padre Associates, 2011a, sediment found in the shallow nearshore area appears to have a sandy texture that would rapidly resettle when disturbed either on the bottom or when washed from the out-of-service cables at the surface. In addition, the natural exposure of the nearshore Gaviota coast contributes to periods of high-energy surf with periodic strong surge and the associated increase in water column turbidity. Given the projected levels of activity and implementation of proposed mitigation measures, the effects of turbidity would be expected to be highly-localized and temporary, resulting in insignificant impacts.

<u>Anchoring:</u> As described in the OPSRB Project Description, anchoring would take place at the nearshore site. Use of a DP vessel would eliminate potential anchoring impacts to hardbottom habitats at the shelf-break. There are no hardbottom areas around the offshore platforms that could be affected by the proposed project.

Padre Associates (2011a) reported the results of a pre-project marine biology survey that included diver-biologist's observations within proposed nearshore anchoring sites. That report states that the macroepibiota within the proposed anchor sites was typical of that found in similar water depths and substrate throughout southern California; eelgrass was present along the cable route seaward of the 25 foot (<8 meter) isobath; and that one of the anchor sites was within 12 feet (<4 meters) of rocky substrate. Impacts to the habitats and biota along the cable route and at the anchoring sites are expected to be similar to those described in de Wit (2003) and to be limited in areal extent (i.e. anchoring will only occur within the nearshore areas in water depths of approximately 150 feet (46 meters) or less, but could be significant if sensitive species are affected.

Anchors (nearshore or at the platforms) would be lowered and retrieved vertically to and from pre-selected positions, using a differential geographic positioning system (DGPS) to assure the location of each anchor. Moorings would consist of a chain and wire rope extending from the anchor shank to a floating steel buoy that becomes the mooring buoy and also keeps the chain and wire rope off the seafloor. Nearshore moorings would have a line from the buoy to the vessel to eliminate seafloor disturbance. Controlled placement of each mooring using DGPS and the use of pre-set anchors and vertical anchor placement and retrieval would impacts to rocky habitat, or kelp plants. However, touchdown of the anchors would likely impact some eelgrass.

To mitigate the impacts from the potential destruction of eelgrass , ExxonMobil would complete a pre-installation survey within the proposed anchoring locations and the final placement of anchors would be based on the results of that survey. Relocation of proposed anchors to avoid rock and minimize eelgrass effects will be completed and the agencies would require that the applicant adhere to the Southern California Eelgrass Mitigation Policy should eelgrass mitigation be required. The temporary loss of eelgrass plants would be mitigated by measures the applicant proposes to adopt and by the additional measures the permitting agencies will require; therefore, any adverse impacts on eelgrass would be expected to be insignificant.

<u>Placing a Concrete Mat or Power Cable on Rocky Outcrops</u>: As described in the OPSRB Project Description, anchoring would take place at the nearshore site. Use of a DP vessel would eliminate potential anchoring impacts to hardbottom habitats at the shelf-break. There are no hardbottom areas around the offshore platforms that could be affected by the proposed project.

Padre Associates (2011a) reported the results of a pre-project marine biology survey that included diver-biologist's observations within proposed nearshore anchoring sites. That report states that the macroepibiota within the proposed anchor sites was typical of that found in similar water depths and substrate throughout southern California; eelgrass was present along the cable route seaward of the 25 foot (<8 meter) isobath; and that one of the anchor sites was within 12 feet (<4 meters) of rocky substrate. Impacts to the habitats and biota along the cable route and at the anchoring sites are expected to be similar to those described in de Wit (2003) and to be limited in areal extent (i.e. anchoring will only occur within the nearshore areas in water depths of approximately 150 feet (46 meters) or less, but could be significant if sensitive species are affected.

Anchors would be lowered and retrieved vertically to and from pre-selected positions, using a differential geographic positioning system (DGPS) to assure the location of each anchor. Moorings would consist of a chain and wire rope extending from the anchor shank to a floating steel buoy that becomes the mooring buoy and also keeps the chain and wire rope off the seafloor. Nearshore moorings would have a line from the buoy to the vessel to eliminate seafloor disturbance. Controlled placement of each mooring using DGPS and the use of pre-set anchors and vertical anchor placement and retrieval would impacts to rocky habitat, or kelp plants. However, touchdown of the anchors would likely impact some eelgrass.

Cable Removal Impacts at End of SYU Life

This section analyses the impacts to managed species and EFH that would be expected to occur to as a result of removing of all power cables within the OCS at the end of SYU life.

The applicant currently estimates that decommissioning of the SYU facilities would occur sometime in the future. Deferring the removal of existing cables within the OCS until that time would mean that this activity would occur as a small part of a large-scale project, which would involve the dismantlement and removal of three offshore platforms and associated pipelines and power cables. It is estimated that 2 to 3 years would be required to remove all SYU facilities. Removal of the OCS segments of all power cables would take an estimated 2 to 3 weeks. The project would be subjected to a detailed NEPA and CEQA review in the future. Expected impacts would be the same as those described in the previous section.

1.8.3 Mitigation Measures

In addition to the mitigations discussed above, instituting mitigations BE-1 through BE-10 (Benthic Environment section) will further minimize impacts on managed species and EFH. No additional mitigations are recommended for Phase 1 since no effects to managed species, EFH, or HAPCs are expected during those activities.

Residual impacts would be expected to be insignificant.

Conclusions – Proposed Project

According to the significance criteria established for this document, an impact on managed species, EFH, and HAPCS would be considered to be locally significant if: 1) it results in a measurable change in population abundance and/or species composition beyond natural variability, 2) substantially limits reproductive capacity through losses of individuals or habitat, substantially limits or fragments range and movement, 3) results in a substantial loss or irreversible modification of habitat in several localized areas or 10 percent of the habitat in the affected area, or 4) an HAPC is substantially affected by the proposed actions.

To minimize the impacts from turbidity within the shallow nearshore rocky habitat, the permitting agencies would require that ExxonMobil cast excavated sand, via a hose, 50 feet (15 meters) south, downslope, into the existing sedimentary habitat between the existing cables and the POPCO pipeline away from armor rock, boulder fields, broken rock, or bedrock ridges. Increases in turbidity would be expected to be highly-localized and temporary causing insignificant impacts. The temporary loss of some eelgrass plants (number would be determined during pre-construction marine biological surveys) would, if required, be mitigated by measures ExxonMobil proposes to adopt and by the additional measures the permitting agencies would require. Therefore, any adverse impacts on eelgrass from anchoring would be expected to be insignificant. Impacts on EFH from concrete mats being placed onto the sedimentary bottom would be expected to be insignificant. Impacts from the replacement cable contacting an estimated 24 square feet (2 square meter) on the hardbottom feature at the shelf-break would be expected to be insignificant based on the amount of available rock reef within the area compared to the affected area. The cable itself will provide solid substrate that is expected to support epibiota similar to that on the surrounding rocky feature. Overall, impacts on managed species and EFH from the proposed project would be expected to be insignificant and mitigated to the maximum extent feasible.

1.8.4 Cumulative Impacts

Cumulative impacts on managed species, EFH, and HAPCs are expected to be limited to the short-term degradation or alteration of a limited amount of shallow-water rocky substrate from turbidity and sedimentation. The shallow subtidal habitat is a dynamic environment that is exposed to resuspended sediments and strong water surges and wave action. Although these areas face southward and are therefore somewhat protected, they still experience periodic storm conditions that result in freshwater runoff, increase turbidity, habitat alteration, removal of eelgrass and kelp plants, and scour the sedimentary habitat. Freshwater runoff and increased turbidity are usually short-term (days to weeks), temporary conditions, but rock movement and sand scouring may be long-term.

Cumulative impacts on offshore EFH and managed species could also include degradation of sensitive and unusual offshore hardbottom habitat and the associated epibiotic communities. These impacts are expected to be minimal in area affected, but potentially long-term.

Leet et al. (2001) discusses several fishing and non-fishing activities that may cause adverse impacts on EFH and managed species along the Pacific Coast and within the SYU. Major issues include the impact of natural events like El Niño, as well as man-induced overharvesting of fish and invertebrates, interactions between fisheries and marine mammals, pollution from human activities and competition among user groups, both consumptive and non-consumptive.

In addition, NMFS (1998a,b) has identified several fishing and non-fishing activities that may cause adverse impacts to EFH and managed species along the Pacific Coast and within the SYU. These include dredging and discharge of dredged material, water intake structures, aquaculture, wastewater discharge, oil and hazardous waste spills, coastal development, agricultural runoff, commercial marine resource harvesting and commercial fishing. Most of these activities occur throughout the western U.S. nearshore areas, including within the southern California coastal zone. As a result, marine water quality has been impacted by municipal, industrial and agricultural waste discharges and runoff in much of the Southern California Bight (MMS, 1992).

The proposed project is not expected to add substantially to the historical and ongoing natural and anthropogenic impacts. The proposed project activities are expected to result in highly-localized, temporary turbid water conditions, potentially impact some eelgrass plants, and cover an estimated 24 square feet (2 square meter) of a rocky feature at the shelf-break. As mitigated, this project is not expected to add significantly to cumulative impacts on managed species, EFH, or HAPCs within the Santa Barbara Channel.

Table EFH-1: Fish species managed under Pacific Fishery Management Plans that could be present in the nearshore project area.

Common Name	**Scientific Name**
Managed under Groundfish:	
Cabezon	*Scorpaenichthys marmoratus*
Lingcod	*Ophiodon elongatus*
California scorpionfish	*Scorpaena guttata*
Kelp greenling	*Hexagrammos decagrammus*
Leopard shark	*Triakis semifasciata*
Black-and-yellow rockfish	*Sebastes chrysomelas*
Blue rockfish	*Sebastes mystinus*
Calico rockfish	*Sebastes dalli*
China rockfish	*Sebastes nebulosus*
Copper rockfish	*Sebastes caurinus*
Gopher rockfish	*Sebastes carnatus*
Grass rockfish	*Sebastes rastrelliger*
Kelp rockfish	*Sebastes atrovirens*
Olive rockfish	*Sebastes serranoides*
Treefish rockfish	*Sebastes serriceps*
Managed under Coastal Pelagics:	
Northern Anchovy	*Engraulis mordax*
Jack Mackerel	*Trachurus symmetricus*

Table EFH-2: Fish species managed under Pacific Fishery Management Plans that could be present between nearshore and the offshore platforms.

Common Name	Scientific Name
Managed under Groundfish:	
Curlfin sole	*Citharichthys sordidus*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Pacific sanddab	*Citharichthys sordidus*
Petrale sole	*Eopsetta jordani*
Ratfish	*Hydrolagus colliei*
Leopard shark	*Triakis semifasciata*
Soupfin shark	*Galeorhinus galeus*
Spiny dogfish	*Squalus acanthias*
California skate	*Raja inornata*
Aurora rockfish	*Sebastes aurora*
Widow rockfish	*Sebastes entomelas*
Bank rockfish	*Sebastes rufus*
Blackgill rockfish	*Sebastes melanostomus*
Bocaccio	*Sebastes paucispinis*
Calico rockfish	*Sebastes dalli*
California scorpionfish	*Scorpaena guttata*
Chilipepper	*Sebastes goodei*
Copper rockfish	*Sebastes caurinus*
Cowcod rockfish	*Sebastes levis*
Flag rockfish	*Sebastes rubrivinctus*
Gopher rockfish	*Sebastes carnatus*
Greenspotted rockfish	*Sebastes chlorostictus*
Greenstriped rockfish	*Sebastes elongatus*
Honeycomb rockfish	*Sebastes umbrosus*
Speckled rockfish	*Sebastes ovalis*
Starry rockfish	*Sebastes constellatus*
Stripetail rockfish	*Sebastes saxicola*
Thornyhead	*Sebastolobus sp.*
Lingcod	*Ophiodon elongatus*
Sablefish	*Anoplopoma fimbria*
Managed under Coastal Pelagics:	
Northern anchovy	*Engraulis mordax*
Pacific sardine	*Sardinops sagax*
Pacific mackerel	*Scomber japonicus*
Jack mackerel	*Trachurus symmetricus*
Market squid	*Loligo opalescens*

Table EFH-3: Fish species managed under the Pacific Groundfish Fishery Management Plan recorded at oil and gas platforms in southern California.

Common Name	Scientific Name
Managed under Groundfish:	
Pacific sanddab	*Citharichthys sordidus*
Widow rockfish	*Sebastes entomelas*
Bank rockfish	*Sebastes rufus*
Black rockfish	*Sebastes melanops*
Black-and-yellow rockfish	*Sebastes chrysomelas*
Blue rockfish	*Sebastes mystinus*
Bocaccio	*Sebastes paucispinis*
Brown rockfish	*Sebastes auriculatus*
Calico rockfish	*Sebastes dallii*
California scorpionfish	*Scorpaena guttata*
Canary rockfish	*Sebastes pinniger*
Chilipepper	*Sebastes goodei*
Copper rockfish	*Sebastes caurinus*
Cowcod rockfish	*Sebastes levis*
Darkblotched rockfish	*Sebastes crameri*
Flag rockfish	*Sebastes rubrivinctus*
Gopher rockfish	*Sebastes carnatus*
Grass rockfish	*Sebastes rastrelliger*
Greenblotched rockfish	*Sebastes rosenblatti*
Greenspotted rockfish	*Sebastes chlorostictus*
Greenstriped rockfish	*Sebastes elongatus*
Honeycomb rockfish	*Sebastes umbrosus*
Kelp rockfish	*Sebastes atrovirens*
Olive rockfish	*Sebastes serronides*
Rosy rockfish	*Sebastes rosaceus*
Sharpchin rockfish	*Sebastes zacentrus*
Squarespot rockfish	*Sebastes hopkinsi*
Starry rockfish	*Sebastes constellatus*
Stripetail rockfish	*Sebastes saxicola*
Treefish	*Sebastes serriceps*
Vermilion rockfish	*Sebastes miniatus*
Yelloweye rockfish	*Sebastes ruberrimus*
Yellowtail rockfish	*Sebastes flavidus*
Thornyhead	*Sebastolobus sp.*
Cabezon	*Scorpaenichthys marmoratus*
Kelp greenling	*Hexagrammos decagrammus*
Lingcod	*Ophiodon elongatus*
Pacific whiting	*Merluccius productus*
Spiny dogfish	*Squalus acanthias*
Managed under Coastal Pelagics:	
Northern anchovy	*Engraulis mordax*
Pacific sardine	*Sardinops sagax*
Jack mackerel	*Trachurus symmetricus*

1.9 Endangered Abalone Species (*Haliotis sorenseni* and *H. cracherodii*)

1.9.1 Environmental and Regulatory Setting

Although all abalone along the California coastline are considered depleted and no commercial or recreational harvesting of abalone is allowed south of San Francisco, two species, the white and black, are listed as endangered. Below is a discussion of those two taxa, an assessment of potential impacts of the proposed project, and mitigations that will be implemented by the applicant.

In the 1990s, less than one white abalone, *Haliotis sorenseni*, per acre could be found in surveys conducted by Federal and State biologists. The rarity of this species within its historical center of abundance prompted the NMFS to list it as a candidate species under the Endangered Species Act (ESA) in 1997. In May 2001, the white abalone became the first marine invertebrate to receive Federal protection as an endangered species. The ESA regulates human activities where listed species might be adversely affected by prohibiting intentional take.

In January 2009, the black abalone (*H. cracherodii*) was listed as endangered under the Federal ESA. In October 2011, NMFS published the critical habitat for that species (NMFS, 2011). Below is a summary of each species, both of which could occur within the project area.

The white abalone is a marine, rocky benthic, herbivorous, broadcast spawning gastropod. The shell is oval-shaped, very thin and deep. They can be up to 10 inches (25 centimeters), but are usually 5 to 8 inches (13 to 20 centimeters). This species usually dwells in deep waters from 80 to over 200 feet (24 to 60 meters) from Point Conception (southern California) southward to Baja California. White abalone were reported to be more common along the mainland coast at the northern end of the range, while in the mid-portion of the California range it was more common on the islands (especially San Clemente and Santa Catalina Islands) (Cox, 1960; Leighton, 1972; NMFS, 2002).

This species has occurred in shallower depths near its northernmost limit (Hobday and Tegner, 2000). Specifically, localized mainland areas in the Coal Oil Point region, west of Santa Barbara, have supported white abalone in water depths less than 60 feet (20 meters) (Greg Sanders, pers. comm., 2002; Pete Haaker, pers. comm. 2002). Speculation concerning reasons for its presence in shallow water includes competition with red abalone (*H. rufescens*) and/or a localized decrease in predation from sea otters without a concomitant increase in harvest (as reported in Hobday and Tegner, 2000). The vertical distribution limits may also be controlled by water temperature.

White abalone are found in open low relief rock or boulder habitat surrounded by sand (with a variety of algal/invertebrate cover), usually near the rock-sand interface, (Davis et al., 1996; Hobday and Tegner, 2000; Lafferty, 2001). Sand may be important in forming channels for the movement and concentration of algal drift, although white abalone are reported to feed less on drift material than congeneric species (Hobday and Tegner, 2000). Common algae in the white abalone habitat include the kelps (*Laminaria farlowii, Agarum fimbriatum*, *Macrocystis pyrifera*), and a variety of red algae. White abalone may live dozens of years and attain a length of about 10 inches (25 centimeters). The designation of critical habitat for the white abalone was determined to not be prudent as it could increase the likelihood of poaching (NMFS, 2001).

The following is a summary of the information provided in NMFS (2011). As a result of the disease, most black abalone populations in Southern California have declined by 90 to 99 percent since the late 1980s and have fallen below estimated population densities necessary for recruitment success. The black abalone is a shallow-living marine gastropod with a smooth, circular, and black to slate blue colored univalve shell and a muscular foot that allows the animal to clamp tightly to rocky surfaces without being dislodged by wave action. Black abalone generally inhabit coastal and offshore island intertidal habitats on exposed rocky shores from Crescent City, California to southern Baja California, Mexico. Today the species' constricted range occurs from Point Arena, California, to Bahia Tortugas, Mexico, and it is rare north of San Francisco, California. Black abalone range vertically from the high intertidal zone to a depth of 20 feet (6 meters) and are typically found in middle intertidal zones. Twelve critical habitat zones were designated by NMFS; the proposed project is not within any of those zones (NMFS, 2011).

Unlike more mobile animals, abalone are slow-moving and are confined to a small area for their entire life. They reproduce by broadcasting their eggs and sperm into the seawater. For fertilization to occur, the spawners need to be within 3 feet (1 meter) of a member of the opposite sex.

In August 2001, a pre-construction marine biological survey was completed in the nearshore area for the then-proposed OPSR-A project (de Wit, 2001). The underwater survey was centered on a corridor that has armor rock over pipelines and conduits housing existing power cables including the failed Cable C1. During the initial survey, a single abalone, assumed to be a white, was observed on the armor rock in 22 feet (7 meters) of water approximately 50 feet (15 meters) shoreward (north) of the power cable conduit terminus. The specimen was not removed but the white peripodium and highly convex shell with three elevated respiratory pores were characteristic of *H. sorenseni*.

An Expanded Marine Biological Survey was completed in April 2002 (de Wit, 2002). The expanded survey was performed specifically to 1) characterize the habitats and dominant macroepibiota of the nearshore project area and to 2) locate and identify any abalone within two areas. The areas were east and west of the conduit corridor, approximately 825 feet long by 800 feet wide (200 meters x 240 meters), respectively, and centered on the terminus. The second survey did not find the initial white abalone; however, an empty shell that matched the characteristics of the shell of the single individual was found near its original location. Matching external characteristics of the shell with video taken during the August 2001 survey strongly suggested it was the same animal. The shell was retrieved and it has been confirmed that the individual was a white (hybrid) abalone (Tom Napoli, pers. comm., 2002; Ian Tanaguchi, pers. comm., 2002). A single mature sea otter was also observed at the site and it is possible that the sea otter had eaten the abalone individual during the period between the two surveys.

The second survey located 21 additional abalone one of which was thought to be a *H. sorenseni*. This white abalone was located in about 25 feet (8 meters) of water about 600 feet (180 meters) east and slightly north of the conduit terminus near the base of an isolated boulder (de Wit, 2002). In 2011, two pre-project marine biological surveys were completed. The first was a nearshore (to water depths of approximately 100 feet [33 meters]) diver and towed camera survey of the existing power cable corridors, proposed anchoring locations, power cable/POPCO pipeline crossing locations, and unidentified targets recorded during an earlier geophysical survey (Padre Associates, Inc. 2011). The second was a deeper-water diver survey at the three power cable/POPCO pipeline crossing locations that focused on identifying mollusks that were observed during the earlier survey (Padre Associates, Inc. 2012). An objective of both surveys was to observe, note, and locate abalone that were within the project area. No abalone were observed during either of the aforementioned surveys.

The proposed Phase 1 platform modifications are in water depths that exceed those known to support abalone and the platform habitat is not conducive to abalone attachment and survival.

Prior to the retrieval of the existing and installation of the replacement power cables in Phase 2, the applicant would perform a pre-installation biological survey of the nearshore project area just prior to any installation work adjacent to the conduit. At that time, if an abalone is detected within an area of potential impact, project activities would not begin until the animal(s) has/have been relocated or the agencies with jurisdiction agree to another appropriate alternative. The applicant would include the permitting agencies and NMFS and the CDFG in any discussions and/or approval for the design of a pre-installation survey. In addition, project conditions would specify that the applicant include the permitting agencies and NMFS and CDFG in any discussions and/or approval for the design of a restoration and restoration-monitoring plan that may be necessary if impacts to abalone or critical habitat are incurred.

1.9.2 Project Impact Assessment

The impact analysis for abalone resources in this document adopts significance criteria developed for all biological resources. An impact from the proposed project is significant if it is likely to cause any of the following:

- A measurable change in population abundance and/or species composition beyond natural variability. For threatened and endangered species, this includes any change in population that is likely to hinder the recovery of a species.
- Substantially limit reproductive capacity through losses of individuals or habitat.
- Substantially limit or fragment range and movement (geographical distribution and normal route of movement). A measurable loss or irreversible modification of habitat in several localized areas or 10 percent of the habitat in the affected area.
    - If the project results in any impact to an individual of a listed species (white or black abalone) or its habitat.

For an impact to be locally significant, the size of the affected area would be relatively small compared with that of an equivalent area in the region. The threshold for significance is determined by scientific judgment, and considers the relative importance of the habitat and/or species affected.

Impacts of regional significance are judged by the same criteria as those for local significance, except that the impacts cause a change in the ecological function within several localized areas or a single large area. The amount of affected area, relative to that available in the region, is determined in the same way as that for locally significant impacts. This determination considers the importance of the species and/or habitat affected and its relative sensitivity to environmental perturbations. Although no impacts to abalone are expected from the Phase 1 activities, potential effects of Phase 2 activities are discussed below.

Cable Retrieval and Installation Impacts
As described in the OPSRB Project Description, the proposed project would involve removal of approximately 12-18 miles (19-29 km) of out-of-service power cable and the installation of 29 miles (47 km) of replacement cable in the general vicinity of the existing SYU facilities. This section analyzes impacts to the two species of endangered abalone that would be expected to occur as a result of cable retrieval and installation activities. Impacts that would occur from removal of all existing cables at the end of the SYU life, are analyzed in the following section.

No impacts to abalone or the required habitat are expected from the Phase 1 activities. Two activities associated with Phase 2 activities of the proposed project that could impact the abalone are turbidity from the resuspension of seafloor sediments and from the cleaning of retrieved cables, and from anchoring. Bottom sediment disturbance and cleaning of the retrieved cable at the surface would increase turbidity that could deposit sediment onto nearby abalone, cause physical irritation, reduce available light, and subject algal species upon which abalone feed to an increase in sediment disposition. Substantial increases in sediment deposition on rocky substrate could also reduce that habitat's value to support abalone. Anchoring could directly crush individuals or damage the rocky substrate, in addition to causing an increase in water column turbidity.

Bottom Sediment Disturbance and Cleaning of Retrieved Cable. As described in OPSRB Project Description, a number of activities would disturb seafloor sediments and increase turbidity in the upper water column in the nearshore environment. Table WQ-3 on water quality lists sources, locations, and estimated quantities of sediment that would be resuspended during the proposed project.

Overall, the proposed project would be expected to result in minimal, temporary, and localized increases in water column turbidity. In the shallow nearshore, divers working at and seaward of the conduit terminus would excavate sand in order to uncover the out-of-service cables and clear the conduits. To minimize the impacts from turbidity within the shallow nearshore rocky habitat, the applicant will cast excavated sand, via a hose, 50 feet (15 meters) south, downslope, onto the existing sedimentary habitat between the cables and the POPCO pipeline away from armor rock, boulder fields, broken rock, or bedrock ridges. The surface cable cleaning will result in a turbid cloud beneath and around the cable installation vessel. The cable installation vessel would begin to retrieve and clean cable about 75 feet (20 meters) south of the conduit terminus. As reported by de Wit (2001 and 2002), and more recently by Padre Associates (2011a), sediment found in the shallow nearshore area is sandy and would be expected to rapidly resettle onto the seafloor when disturbed or when washed from the retrieved cable at the surface. In addition, the natural exposure of the nearshore Gaviota coast contributes to periods of high-energy surf with periodic strong surge and increased turbidity. Consequently, the marine organisms found in the nearshore habitat are routinely exposed to natural turbid conditions.

Padre Associates (2011a) reported no abalone were observed during the pre-project nearshore marine biological survey and Padre Associates (2012a) found that the mollusks attached to the existing concrete mats at the power cable/POPCO pipeline crossings were rock jingles (*Pododesmus cepio*) or rock scallops (*Hinnites multirugosus*) and not abalone.

To minimize the impacts from turbidity within the shallow nearshore habitat, the applicant will cast excavated sand, via a hose, 50 feet (15 meters) south, downslope, onto the sedimentary habitat between the failed cables and the POPCO pipeline away from armor rock, boulder fields, broken rock, or bedrock ridges. In addition, if abalone(s) is/are detected near the conduit terminus during the pre-installation marine biological survey, project activities would not begin until any individual(s) have been relocated or the agencies with jurisdiction agree to another appropriate alternative. As proposed and with the recommended mitigations, no impacts to abalone would be expected from the proposed project.

Anchoring: As described in OPSRB Project Description, anchoring would take place at the nearshore site. Padre Associates (2011a) reported the results of a pre-project diver-biologist and towed camera survey of the nearshore power cable corridor and proposed anchoring locations. No rocky substrate or abalone were observed within a 50-foot (15-meter) diameter area of the 12 proposed anchor locations or within the existing cable corridor. A pre-installation survey will be completed and the results of that survey will be used to locate the anchors away from rocky substrate.

All anchors would be lowered and retrieved vertically to and from pre-selected positions, using a differential geographic positioning system (DGPS) to assure accurate location. All nearshore moorings would consist of a chain and wire rope extending from the anchor shank to a floating steel buoy that becomes the mooring buoy and also keeps the chain and wire rope off the seafloor. A soft-line would extend from the buoy to the vessel, thus eliminating potential seafloor impacts. All anchor locations would be beyond the agency-specified distance from rocky substrate. The use of pre-set anchors and vertical anchor placement and retrieval would prevent crushing of any rocky habitat or attached biota and would limit any increase in turbidity to the initial touchdown of the anchors to the immediate vicinity and away from rocky substrate and any abalone. If a white or black abalone is detected near the conduit terminus during the pre-installation marine biological survey, project activities would not begin until any individual(s) have been relocated or the agencies with jurisdiction agree to another appropriate alternative.

Cable Removal Impacts at End of SYU Life

This section analyses the potential impacts to abalone that would be expected to occur to as a result of removing all remaining cables within the OCS at the end of SYU life.

The applicant currently estimates that decommissioning of its SYU facilities will occur sometime in the future. Deferral of the OCS portion of the cable removal until that time would mean that this activity would occur as a small part of a large-scale project, which would involve the dismantlement and removal of three offshore platforms and their associated pipelines and power cables and would require an estimated 2 to 3 years to complete. Removal of the OCS segments of all cables would take 2 to 3 weeks to complete. This project would be subjected to a detailed NEPA and CEQA review in the future, however because the water depths within the OCS exceed that within which abalone have been reported, no impacts are anticipated. Nearshore impacts would be the same as those described in the previous section.

1.9.3 Mitigation Measures

The applicant has proposed to implement the following mitigation measures to further reduce the potential for impacts to abalone.

AB-1: If a white or black abalone is detected near the conduit terminus during the pre-installation marine biological survey, ExxonMobil would not begin project activities until any individual(s) have been relocated or the agencies with jurisdiction agree to another appropriate alternative.
Expected Enforcement Agency: NFMS, SLC, SBC, CDFG

In addition to these mitigation measures, please refer to the following mitigation measures from other resource sections: BE-1 through BE-6, BE-8 and BE-10.

Residual impacts would be expected to be insignificant.

Conclusions – Proposed Project
According to the significance criteria established for this document, an impact to non-listed abalone would be considered to be locally significant if it results in a measurable change in population abundance and/or species composition beyond natural variability, or results in a substantial loss or irreversible modification of habitat in several localized areas or 10 percent of the habitat in the affected area. For listed species, any impact to an individual or its habitat is considered significant. As proposed and mitigated, no impacts to abalone are expected from the proposed project.

1.9.4 Cumulative Impacts

Currently, the white abalone is frequently found alone, and has little chance for successful fertilization (NMFS, 2002); black abalone are uncommon within the project area and no critical habitat for that species is within the project region. Because populations of both species are only small fractions of former numbers, recovery would be complicated by loss of genetic diversity from genetic bottlenecks, genetic drift, and founder effects. Abalone are also vulnerable to various bacterial and parasitic infections. The fishery was historically managed using size limits and seasons, but such methods failed because they did not account for density dependent reproduction and assumed regular successful settlement of the larvae (Lafferty, 2001). The other two more common abalone species, red (*H. rufescens*) and pink (*H. corrugata*) are no longer as abundant as they once were and recreational and commercial harvesting of all abalone is illegal within the project region.

Cumulative impacts on abalone could result from degradation or elimination of rocky shallow subtidal habitat in the coastal region west of Santa Barbara. This shallow subtidal habitat is a dynamic environment that experiences regular resuspension of sediments and water surges and pounding through wave action. Although the Gaviota coast faces southward and is therefore somewhat protected, periodic strong winter storm conditions (especially during El Niño events) that result in substantial freshwater runoff, increase turbidity, altered habitat the removal of eelgrass and kelp plants, and scour sedimentary habitat. Freshwater runoff and increased turbidity are usually short-term (days to weeks), temporary conditions, but habitat alteration and sediment scouring can be long-term. In addition, sea otter predation may have a substantial impact on all abalone taxa, particularly those that are within the normal otter diving depths of 80 feet (24 meters).

There are several activities that may cause adverse impacts to abalone along the Pacific Coast, particularly in southern California (NMFS 1998a,b). These include dredging and discharge of dredged material, water intake structures, aquaculture, wastewater discharge, hazardous waste spills, coastal development, agricultural runoff, commercial marine resource harvesting, and commercial fishing. Most of these activities occur throughout the western U.S. coastal area and all of these activities and impacting agents exist in the southern California coastal area, including the Santa Barbara Channel. As a result, marine water quality has been impacted by municipal, industrial, and agricultural waste discharges and runoff in much of the Southern California Bight (MMS, 1992). The proposed project, as mitigated, is not expected to add to the cumulative effects to abalone or their habitat.

1.10 Cultural Resources

1.10.1 Environmental and Regulatory Setting

Cultural resources include any prehistoric or historic sites, buildings, districts, structures, traditional use areas or objects considered to be important to a culture, subculture or community for scientific, traditional, religious or other reasons. Cultural resources encompass three categories: archaeological resources (both historic and prehistoric), architectural resources and traditional cultural resources.

Onshore: The onshore portion of the project has been subject to numerous archaeological investigations by professional archaeologists. Floodplain areas at the mouth of Corral Canyon (in the vicinity of onshore work) have been subject to extensive subsurface monitoring and testing programs that (a) assessed the location, integrity and the scientific, historic and ethnic significance of cultural resources in the floodplain; and (b) resulted in the recommendation of professionally adequate mitigation measures for future construction in the floodplain areas. Five sites were identified within a ¼ mile area near the mouth of Corral Canyon at the southern end of the ExxonMobil property. These sites are identified as SBA-85, SBA-1675, SBA-1731, SBA-1733, and SBA-1732.

The earliest archaeological work was conducted by Rodgers (1929) who identified SBA-85, a large prehistoric site on a marine terrace overlooking the mouth of Corral Creek. Surveys in 1973 (Spanne and Fagan) documented the boundaries of SBA-85, documented its disturbance and recorded SBA-1344, a prehistoric and historic site since determined to be insignificant (Perez, 1975). SBA-1733 was identified by Spanne in 1982. The site is a prehistoric archaeological site in the floodplain of Corral Canyon Creek. Subsequent investigations by the Office of Public Archaeology (OPA) (Neff, 1983) indicated that SBA-1733 may be a scientific and ethnically significant cultural resource because it has vertical and horizontal integrity, is ethnically significant to local Native Americans and because the site can yield information important to the study of prehistory.

In 1982, OPA conducted investigations at a prehistoric village site (SBA-1731) near the beach at the mouth of Corral Canyon. These investigations were conducted to mitigate impacts resulting from the installation of the POPCO pipeline. Results of the investigation (Moore and Luce, 1983), indicates that SBA-1731 may also be scientifically and ethnically significant.

Prior to initiation of construction, ExxonMobil was required to prepare a Cultural Resources Management Plan (CRMP), approved by the County and the State Office of Historic Preservation. All construction activities were required to be performed in accordance with the approved plan. Four of the sites identified in the EIR (SBA-1801, SBA-1344, SBA-1731 and SBA-1733) were determined to be subject to the CRMP. Impacts included capping sites with fill, cutting into site deposits, removal of structures, surface disturbance and off road vehicle use. The CRMP provided procedures to minimize impacts to these and newly discovered cultural resources including, but not limited to, test excavations, additional historical research and data recovery excavations prior to construction and monitoring during construction activities.

Offshore: The BSEE (previously MMS), under various Federal laws and regulations, ensures that regulated OCS activities do not adversely affect significant cultural resources. The National Historic Preservation Act of 1966, Section 106, requires Federal agencies to identify historic properties that their actions could affect, determine whether or not there could be a harmful or adverse affect, and if so, to try to avoid or reduce the effect. The section also requires consultation with State historic preservation officers and tribal historic preservation officers. The Archaeological and Historic Preservation Act of 1974 requires Federal agencies to notify the Secretary of the Interior when they find that any federally permitted activity or program may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data.

The applicant received approval of the Historic Properties Treatment Plan (HPTP) for the original SYU project in January 1988 from the U.S. Army Corps of Engineers and the California State Office of Historic Preservation (Dames and Moore, 1988). Many of the potential archaeological resources described herein are included in the approved HPTP.

Four potential cultural resource nautical sites were located during geophysical surveys of the SYU offshore facilities in the 1980s. Of the four nautical sites with possible cultural potential, three are in Federal waters and one is in State waters in the general vicinity of the proposed project area. Two of the sites described below, number three (in OCS waters) and four (in State waters), could be within the zone of potential disturbance from operations described for the proposed project.

According to Macfarlane (1982) and Dames and Moore (1988), the archeological resources listed below occur within the *general* area of the proposed project. *Only items 3 and 4*, below, are near the current power cable project. The actual locations are not listed in this public document in order to preserve the potential archaeological resources.

1. A large rectangular feature measuring 100 feet (30 m) long by 40 feet (12 m) wide by 6.3 feet (2 m) high, with an associated scatter of smaller objects; a possible scour or drag mark was also noted. Although this feature may be a mound of sediment deposited by anchoring activity, its height above the sea floor and the possible debris surrounding it suggest that it may be a cultural resource.

2. A "T" shaped configuration of four objects, measuring 25 feet (8 m) across and 100 feet (30.5 m) long. The linear configuration suggests a cultural origin; it may be associated with oil exploration activities or may be an archeological resource.

3. A complex feature measuring approximately 50 - 100 feet (15 to 30 m) wide, 160 feet (49 m) long, and as much as 16 feet (5 m) high. The lack of bedrock or hard sediments in the area that might indicate a geologic origin for the feature means that this site must be considered a potential cultural resource. Although the feature may have resulted from anchoring, lack of specific identification, regarding the site means that the feature must be considered to be potentially significant.

4. A linear feature of variable height that may either be a construction-related feature or a cultural resource.

ExxonMobil contracted with Fugro for the OPSR-A power cable project to conduct a side scan sonar survey of the proposed Cable C1 and D1 routes from the nearshore area to the three SYU platforms (Fugro, 2001). In addition, ExxonMobil contracted with Fugro for the OPSRB power cable project to conduct a side scan sonar survey of the proposed Cable A2 or B2, F2 and G2 routes from the nearshore area to the three SYU platforms (Fugro, 2011).

The reported locations of site #3 and #4 are 500 to 600 feet (150 to 185 meters) from the centerline of the proposed power cable location.

In 2008, video of the seafloor southeast of Platform Heritage revealed two potential archeological features in approximately 1,300 feet (396 meters) of water. A review of that video footage by a marine archaeologist indicated that both were rock features and were not significant archaeological or cultural resources (C&C Technologies, 2010).

In September 2011, a marine geophysical survey, which included side scan sonar and magnetometer to detect potential archaeological resources on the seafloor, was completed within the power cable corridors (Fugro Consultants, 2011). That survey resulted in the listing of 116 potential seafloor "targets", two of which were listed a possibly significant cultural resource features. Other items that were listed as of possible significance were surveyed by divers during the 2011 pre-project marine biological surveys (Padre Associates, Inc. 2011a and 2012) and were found not to of significant archaeological or cultural value. One "target" (T-035 in the final listing) corresponded to a previously-identified potential shipwreck and the other (T-033) was identified as a small rock reef from video footage.

1.10.2 Project Impact Assessment

Significant impacts to cultural resources occur when the integrity of a significant or potentially significant site or isolated artifact is eliminated or reduced. In Section 5.6.2 of the SYU FEIS/R (SAI, 1984a), local cultural resources were described as significant in terms of criteria established in the Code of Federal Regulations (36 CFR 60.6), in that the sites may be likely to yield information important in history or prehistory. These criteria are complemented, and sometimes nearly duplicated by criteria set forth in Section 21083.2 of the California Public Resources Code (PRC) which modifies the CEQA provisions pertaining to cultural resources. Section 21083.2 states that mitigation measures may only be applied to "unique" resources, defined as those that have a high probability of meeting any of the following criteria: (1) contain information needed to answer important, research questions that are of demonstrable public interest; (*2*) have special or particular qualities, such as being the oldest of its type or best available example; and (3) are directly associated with a scientifically recognized important prehistoric or historic event or person. In addition, PRC Section 6313(c) states that any submerged cultural site or submerged historic resource remaining in state waters for more than 50 years shall be presumed to be culturally or historically significant.

Cable Retrieval and Installation Impacts: As described in the OPSRB Project Description, the proposed project would involve retrieval of approximately 12-18 miles (19-29 km) of out-of-service power cable and installation of 29 miles (47 km) of replacement cable in the general vicinity of the existing SYU facilities. This section analyzes impacts to cultural resources that would be expected to occur as a result of cable retrieval and installation activities. Impacts that would occur from removal of all power cables at the end of SYU life are analyzed in the following section.

Onshore: No cultural or ethnic resources or human remains would be adversely impacted by the proposed project. One site, SBA-1733, appears to be potentially located in the immediate project area, however, the site was capped by approximately 10-15 feet of fill material during original project construction. Excavation required as part of the project would be limited to 8-9 feet below ground surface. A small trench may need to be dug in native soil from the fill pad to an existing pull-box (approximately 50-100 ft.) to connect the fiber optic cable. Existing LFC protocol will be followed. All documented sites are on private property (owned by ExxonMobil) with strict security; therefore the likelihood for vandalism or other disturbance to resources is low.

Offshore: The two sources of potential offshore cultural resource impact under the proposed project are from the anchoring of vessels and from the installation and retrieval of power cables.

Anchoring: The applicant proposes to use a DP cable installation vessel for this project. The applicant estimates that the Phase 1 activities on the platforms could take 12-14 months while the Phase 2 offshore cable installation and retrieval phase of the operations would take approximately one to two months. The DP cable installation vessel would not anchor during the project activities except for an emergency situation. However, dive support vessels could anchor adjacent to the conduit terminus in the nearshore area and are expected to use an anchor up to 10,000 lbs. (4500 kg). The anchors would be positioned a minimum distance of 250 feet (75 m) from any active pipeline or power cable. The anchor handling procedures are proposed by the applicant to include the following: use of an anchor handling plan, anchor placement in pre-selected areas, utilizing work vessel anchor installations and removals techniques such as straight up and down placement of the anchors and use of anchor-tenders, where necessary, to help place the anchors. During an emergency/safety situation there may be the unplanned need for deployment of anchors by the support vessel.

All emergency/safety anchor deployments would be beyond the 300 feet (90 m) protective buffer zone surrounding any identified cultural resource, and any anchor lines that may cross over the buffer zone would be suspended in the water column, (i.e., no anchor would contact the bottom near the cultural resource). With implementation of those operational features, no impacts to any identified cultural resources would be expected to result from anchoring activities.

Cable Installation and Retrieval. The zone of disturbance from power cable installation is expected to be generally limited to a corridor defined by the length and width of the power cables. Retrieval of the cables will necessarily disturb the overlying sediments and thus the width of the disturbance would be slightly wider (estimated to be up to 2 feet [<1 meter]). The power cable routes for this project would be within the area previously surveyed and evaluated for cultural resources (see above) and the one potential resource will be avoided by all cables.
The retrieval of the out-of-service cables and installation of replacement power cables by the DP cable installation vessel would not be expected to impact the identified cultural resource sites as they are located away from the power cable corridor.

Cable Removal Impacts at End of SYU Life: This section discusses the potential impacts of the removal of all power cables to cultural resources within the OCS at the end of SYU life.

ExxonMobil estimates that decommissioning of its SYU facilities would occur sometime in the future. Deferring removal of all cables within the OCS until that time would mean that this activity would occur as a small part of a large-scale decommissioning and removal project. It is estimated that 2 to 3 years would be required to remove all SYU facilities. Removal of the OCS segments of the power cables is estimated to require up to 3 weeks to complete. The decommissioning and final removal of the project will be subjected to detailed NEPA and CEQA review in the future. Expected impacts would be the same as those described in the previous section.

1.10.3 Mitigation Measures

As stated above, only one potentially-significant cultural resource site is within the zone of potential disturbance from the proposed cable installations. The potential threat to this site is minimal as it is located several hundred feet from the nearest power cable and will not be within any proposed vessel anchoring location.

The applicant has committed to the protection of cultural resources during cable placement and retrieval and has proposed the following procedures as agreed to in previous consultation with the California State Office of Historic Preservation and included in the SYU Expansion Project Cultural Resource Plan. In addition, FDP conditions of approval already in-place (Conditions XIII – XIII-6) will be implemented for the onshore portion of the proposed project.

Offshore

ARCH-1: Require contractors to avoid potential offshore cultural resources by a 300 feet (90 m) radius to the extent possible during all offshore installation activities. This protective zone is to account for routine uncertainties in using remote sensors to precisely locate potential cultural resources in deep waters.
Expected Enforcement Agency: BSEE.

ARCH-2: Provide all vessel operators working in these areas with the coordinates of the probable location of the previously-identified site and instruct them to remain outside of the 300 foot-diameter (90 meter-) protective zone.
Expected Enforcement Agency: BSEE.

If complete avoidance of the zone is not possible, further investigations of the affected zone may be conducted through more intensive geophysical field surveys or ROV inspection. If further study indicates that the affected location is the remains of a shipwreck, the significance of the resource would be evaluated, and a mitigation plan would be developed, if appropriate.

ARCH-3: Include a review of avoidance procedures for the cultural resource areas during the pre-installation environmental compliance meeting.
Expected Enforcement Agency: BSEE.

ARCH-4: Utilize an ROV to monitor power cable retrieval and installation activities in the areas of potential cultural resources. The ROV would allow real time monitoring and detection of potential cultural resources. If a potential cultural resource site is encountered during cable placement or removal operations, the operator would immediately notify the BSEE.
Expected Enforcement Agency: BSEE.

ARCH-5: The applicant shall immediately halt cable laying operations if a previously undetected cultural resource site that could be impacted by ongoing operations is discovered. After the applicant has notified BSEE of the discovery, if investigations determine that the resource is significant, BSEE shall inform the operator how to protect the resource.
Expected Enforcement Agency: BSEE.

ARCH-6: ExxonMobil shall use an ROV equipped with a color-imaging sonar with a range of at least 300 feet (90 meters) in polar-scanning mode to monitor cable placement and retrieval activities in the area of the previously-identified possible cultural resource. . If a previously undetected resource site is discovered, then mitigation ARCH-10 will be instituted
Expected Enforcement Agency: BSEE.

ARCH-7: In the event that a power cable needs to be laid outside of the previously-surveyed area, ExxonMobil shall use the ROV described in ARCH-6, above, to identify potential cultural resources within the revised corridor prior to installation. If a previously undetected resource site is discovered, then mitigation ARCH-10 will be instituted.
Expected Enforcement Agency: BSEE.

ARCH- 8: The applicant shall arrange for responsible agencies to attend a meeting with the cable installation contractor ship's captain to review cultural site avoidance procedures prior to commencing cable installation activities.
Expected Enforcement Agency: BSEE, SLC.

ARCH-9: The BSEE and/or SLC retain the option for inspectors to be present on a vessel at the sites to ensure that proper cable installation and retrieval procedures are conducted.
Expected Enforcement Agency: BSEE, SLC.

ARCH-10: If a previously undetected resource site is discovered, the applicant shall immediately notify BSEE and SLC and avoid the site. If the resource site is unavoidable, the applicant shall immediately halt cable installation or retrieval operations and perform an investigation, according to BSEE/SLC instructions, to assess whether the site is significant. If the site is significant, the BSEE/CSLC shall inform the applicant how to protect the resource.

Expected Enforcement Agency: BSEE, SLC.

<u>Onshore</u>

While impacts to onshore archaeological resources from the proposed project are not expected to be significant, the following mitigation measures would minimize potential impacts to the maximum extent feasible. In addition, FDP conditions of approval already in-place (Conditions XIII – XIII-6) will be implemented for the onshore portion of the proposed project.

ARCH-11: All onshore construction plans shall clearly state that excavation shall be limited to approximately 8-9 feet below ground surface and to 3-6 feet below the cable from the entry point at the tunnel north wall for a distance of approximately 400 feet north of the wall. Evidence of compliance with this mitigation measure shall be documented prior to land use clearance and monitored by the County's EQAP Monitor or County Staff in the field.
Expected Enforcement Agency: SBC.

ARCH-12: If potential cultural material is encountered during excavation, work shall be halted until a Planning and Development-qualified archaeologist and Native American representative are consulted. Protection of archaeologically significant material shall be in accordance with County Guidelines.
Expected Enforcement Agency: SBC.

ARCH-13: A pre-construction meeting shall be organized to educate onsite construction personnel as to the sensitivity of archaeological resources in the area. ExxonMobil personnel shall instruct all construction and project personnel to avoid removing cultural materials from the property. Evidence of compliance with this mitigation measure shall be documented prior to land use clearance. Agency personnel shall be invited to attend the meeting.
Expected Enforcement Agency: SBC.

As proposed and mitigated, residual impacts to onshore and offshore cultural resources are expected to be less than significant.

Conclusions – Proposed Project
The one offshore site within the general area of the proposed project is potentially significant under the criteria described above. Significant impacts to cultural resources occur when the integrity of a significant or potentially significant site or isolated artifact is eliminated or reduced. All anchor deployments would be located outside of the 300 foot (90 meter) wide protective buffer zone, centered on the resource location. This avoidance measure, coupled with the suspending of anchor lines that might cross previously-identified resource sites, ensures that disturbances to known potential cultural resources would be minimized. Therefore, anchoring operations would not impact known cultural resources. The one identified site is located away from the cable installation and retrieval locations, therefore, these activities would not result in impacts. As proposed and mitigated, the proposed actions are expected to result in less than significant impacts to known offshore cultural resources.

Excavation work in the lower canyon would not be expected to result in any adverse impacts to onshore cultural resources due to the depth of excavation and amount of fill material over known sites. As such, impacts to known onshore cultural resources would be insignificant, assuming the implementation of mitigation measures.

1.10.4 Cumulative Analysis

The source of cumulative impacts to submerged cultural resources is physical disturbance from non-project related activities. The sources include commercial trawl fishing, non-project vessel anchoring, other cable/pipe laying activities, and unauthorized removal of artifacts by recreational scuba divers. Because of stringent monitoring and mitigation of actions that could affect cultural resources by local, State, and Federal agencies, project actions are likely to cause little cumulative impact.

Since no other offshore operations are expected to take place during the Phase 1 platform modifications and the Phase 2 cable retrieval and installation operations in this area, and given the insignificant impacts of the ExxonMobil's OPSRB project on cultural resources, the incremental addition of the proposed action to cumulative impacts on cultural resources would be insignificant.

1.11 Energy

1.11.1 Environmental and Regulatory Setting

Energy needs for both onshore and offshore SYU facilities are typically supplied by a 49 MW cogeneration plant, comprised of a gas and steam turbine. Natural gas produced offshore and processed at LFC provides fuel for the 39-MW gas turbine and steam from process boilers runs the 10 MW steam turbine. Any excess power may be sold to the local utility. If additional electrical power is needed, it may be purchased from the Southern California Edison grid.

1.11.2 Project Impact Assessment

A project may be expected to have the potential for significant impacts to energy if it creates a substantial increase in demand upon existing energy sources or requires the development or extension of new sources of energy. The proposed project would not significantly increase demand for energy. The replacement of the existing power cables would re-establish the initial level of power system distribution redundancy to the platforms and enhance overall SYU reliability. Energy needs for the project would be supplied by existing sources or from onsite generation (via ExxonMobil's cogeneration plant). There would be a slight decrease in energy production and consumption during the time SYU is down for cable connections at platforms, onshore and during tunnel work. The proposed project would not require the development of new sources of energy.

1.11.3 Mitigation Measures

No mitigation would be required as there would be no impacts from the proposed project.

1.11.4 Cumulative Impacts

Given the fact that the proposed project would re-establish the original level of power system redundancy to the platforms and the project adds no substantial electrical load, there are no cumulative impacts on energy usage foreseen.

1.12 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 13084 to address questions of equity in the environmental and health conditions of impoverished communities. In response to this Executive Order an Environmental Justice analysis of the community affected by a Federal action is required. The U.S. Census Tract (Tract 2910) directly affected by the proposed project had a year 2000 minority population of 33.7 percent which is lower than the State of California minority population of 40.5 percent, and higher than the 24.9 percent for the entire U.S. The 1999 median annual income of the directly affected community was $70,550 compared to $47,493 for the State of California and $41,994 for the United States. The percentage of the population living at or below the poverty level in 1999 was 5.5 percent or approximately one-half of the 10.6 percent experienced in California, and 58 percent of the United States poverty level of 9.6 percent. Based on the demographic and economic characteristics of the directly affected community there does not appear to be an Environmental Justice concern from the project.

1.13 Fire Protection

1.13.1 Environmental and Regulatory Setting

Onshore: Las Flores Canyon is a designated high fire hazard zone. Fire risk was identified as a Class I impact (significant and avoidable with mitigation) in the Exxon FEIR (83-EIR-22). Design safety features were incorporated into the overall facility design to minimize fire and explosion probability, including automatic shutdown valves, emergency relief devices and control of ignition sources. In addition, a comprehensive training program and operations procedures have been implemented as part of the Safety Inspection and Maintenance Plan (SIMP). Lastly, the integrated canyon-wide Fire Protection Plan (FPP) was implemented to evaluate the potential fire hazards associated with the ExxonMobil onshore facilities and explain the measures taken to mitigate fire-related hazards. Design features, including the selection of equipment and process systems, were incorporated to minimize fire and explosion probability.

As part of the development of the FPP, qualified fire protection engineers performed a fire hazard analysis of the facility using national standards and industry practices as guidelines. In addition to the fire hazard analysis, the following five additional analyses were conducted or used as part of ExxonMobil's Risk Management Program: 1) LFC Facilities Hazards Identification Analysis (Arthur D. Little, Inc., 1988); 2) SYU Expansion Project, Hazards and Operability Study HAZOPS), (NUS Corp., 1989); 3) SYU Expansion Project, Preliminary HAZOPS Review (Technica, 1991); 4) SYU Expansion Project Risk Assessment of LFC Facilities (Technica, 1993); and 5) Final Risk Assessment for Ammonia Transportation to the Chevron Gaviota Facility (Arthur D. Little, Inc., 1991).

Offshore/Platforms: Design safety features were incorporated into the overall platform design to minimize fire and explosion probability, including automatic shutdown valves, emergency relief devices and control of ignition sources. The platforms must comply with Code of Federal Regulations 30 CFR 250.803(b)(8), fire fighting systems, and 30 CFR 250.803(b)(9), fire and gas detection system. In addition, the platforms must comply with American Petroleum Institute (API) Recommended Practice (RP) 14G Fire Prevention and Control on Open Type Offshore Production Platform and API RP 14 F, Recommended Practice for Design and Installation of

Electrical Systems for Offshore Production Platforms, as incorporated by reference in 30 CFR 250.

1.13.2 Project Impact Assessment

A project would be expected to have the potential for significant impacts to fire protection if it introduced development in an existing high fire hazard area without appropriate fire prevention measures or involved high fire risk operations.

Onshore: Las Flores Canyon is a designated high fire hazard zone and is located in a high fire area. The proposed project would not increase the risk of fire beyond that analyzed in previous environmental documents and would not introduce new development into the area. There would be no additional operational risk associated with this project upon completion of the cable installation. However, construction activities in the lower canyon and tunnel areas do present a fire risk.

Existing fire fighting equipment onshore includes adequate firewater pressure, storage, hydrants and other ancillaries. The proposed project would not hamper fire prevention techniques as the project would be located within the existing area of development and Santa Barbara County Fire Station #18 is located approximately 5 miles (8 km) west of Las Flores Canyon. According to County Fire Department officials, response time is 3 to 10 minutes. (See Hazardous Materials/Risk of Upset section for further discussion.)

The tunnel is currently classified Class I, Division 1. The tunnel contains three electrical power cables, a gas pipeline, an oil emulsion pipeline and a produced water line. When ExxonMobil's oil emulsion pipeline was installed in 1993, a flange/isolation assembly was installed on the 20" Oil Emulsion Pipeline inside the tunnel. According to the manufacturer's cut sheet drawing and the information provided by ExxonMobil engineers, the flange/isolation assembly has been welded, epoxy-sealed and pressure-tested. According to American Petroleum Institute (API) Recommended Practice (RP) 500, Classification of Locations for Electrical Installations at Petroleum Facilities and National Electric Code (NEC) 70, the area is classified as Class I, Division 1 due to the presence of the flange/isolation assembly inside the tunnel and below grade location of the tunnel with inadequate ventilation. Class I Division 1 locations are locations where flammable gases or vapors could be present during normal operations. Any equipment present within such classified areas must meet certain specifications for fire protection. In addition, any work in classified areas must be performed in accordance with specific safety procedures as outlined in API RP 500 and NEC 70. Due to inadequate ventilation, the tunnel is also classified as confined space.

Offshore: The proposed project would not increase the risk of fire and would not introduce new unprotected development into the area. The GIS Building to be installed in Phase 1 will have an independent fire suppression system that will be connected into the platform fire systems. Existing fire fighting equipment offshore includes adequate fire hose stations, handheld portable fire extinguishers and both dry chemical and hard line deluge fire suppression systems. Operators are required to test fire detection and suppression systems at prescribed regular intervals. BSEE conducts inspections of platform fire detection and suppression systems. There would be no additional operational risk associated with this project upon completion of the project.

1.13.3 Mitigation Measures

The Las Flores Canyon Facilities FPP was prepared pursuant to Santa Barbara County Final Development Plan Permit Condition XI-2.i to mitigate fire-related hazards associated with the project facilities. The plan addresses each area of the facility and associated risks and hazards, fire protection measures, process control and monitoring instrumentation, fire suppression systems and emergency training. As the FPP does not specifically address the tunnel, the FPP should be supplemented as necessary.

FIRE-1: A project-specific onshore Fire Protection Plan (FPP) shall be prepared for the project. The plan shall be submitted to Santa Barbara County System Safety Reliability Review Committee for review and approval prior to approval of the Santa Barbara County Coastal Development Permit.
Expected Enforcement Agency: SBC

FIRE-2: The applicant shall work with SBC Building and Safety to ensure that the proposed project complies with applicable code and with API RP 500 and NFPA 70 (NEC) for the tunnel area.
Expected Enforcement Agency: SBC.

Residual impacts would be expected to be insignificant.

1.13.4 Cumulative Impacts

Although the SYU facilities are located in a rural, high fire hazard area, the proposed project with mitigation would not exacerbate existing fire risk conditions.

1.14 Geologic Processes

1.14.1 Environmental and Regulatory Setting

Onshore: The onshore portion of the project is located within the western portion of the Transverse Ranges Province, characterized primarily by east-west trending topographic and structural elements. The local topography consists of a narrow beach area, coastal plain, foothills belt and the southern slopes of the Santa Ynez Mountains. The coastal plain is generally less than 3000 feet wide and ranges in elevation from 50 to 200 feet. The area is overlain by alluvial sediments that have been deposited on one or more of the uplifted marine abrasion platforms. The present surface is flat and slopes gradually seaward. The underlying geologic units that consist of cemented sandstone tend to develop steep canyon slopes and narrow valley floors.

The original project EIR (83-EIR-22) analyzed impacts associated with regional geologic formations, including faults. Seismic capabilities of faults within 60 miles (100 km) of the project were evaluated. Seventeen active faults and 12 potentially active faults were identified. Potential impacts from seismic conditions were not determined to be significant.

Offshore: Numerous regional and site-specific seismic investigations have been conducted to assess geologic conditions over the life of the project, including several for the proposed project. The project area is located in the Smooth Slope and Fan Provinces, two of three physiographic provinces that comprise the SYU area. Water depths range from 300 feet (at the shelf edge) to over 1500 feet.

Slope gradients are generally low, ranging from a maximum of 7 degrees (12 percent) to a minimum of 2 degrees (4 percent) or less at the slope/basin interface (Exxon, 1983).

A geophysical survey was conducted in September 2011 to document current conditions of the existing and proposed cable route (*Pre-Project Geophysical / Archaeological Survey Report*, Fugro Consultants, Inc., November 2011 (Revised December 2011). In addition, the proposed cable route in shallow water, from 15 to 75 feet ocean depth, was surveyed and reported in a separate report (*Pre-Project Nearshore Marine Biological Survey*, Padre Associates, Inc., December 2011 and *Cable Crossing Locations Diver Survey*, Padre Associates, Inc., May 2012). The objectives of the surveys included mapping the location of the proposed cable routes, identifying and mapping seabed features in the project area, identifying and mapping submarine cables and pipelines within the project area, identifying and mapping bathymetric data in the project route and providing coordinates of any anomalies.

Data was collected using single beam bathymetry, side scan sonar, sub-bottom profiler and magnetometer. Seafloor features were mapped along the proposed cable routes from the sonar data. Features identified included topographic sea floor features such as mounds, depressions, rises, scour and areas of disrupted seabed, anchor drag and trawl scars. Areas of seafloor change, debris and bedrock outcrop were also mapped as part of the survey.

Prominent seafloor features identified along the proposed cable routes primarily include anchor scars, impact depressions and rock or hard bottom areas near Platforms Harmony and Heritage and at the shelf break. In addition, a fan channel is located between Platforms Harmony and Heritage. The seabed floor surrounding Platform Heritage is relatively free of features with the exception of several large areas of rock south of the structure.

1.14.2 Project Impact Assessment

Impacts are considered potentially significant if the proposed project, including all mitigation measures, could result in substantially increased erosion, landslides, soil creep, mudslides or unstable slopes. In addition, impacts are considered significant if people or structures would be exposed to major geologic hazards upon implementation of the proposed project. Impacts related to geology have the potential to be significant if the proposed project is located on land having substantial geologic constraints or involves excessive grading or cut and fill operations. Impacts are also considered significant if they would result in a prominent permanent change in topography or bathymetry.

Onshore: The proposed project would be located within the existing SYU development. The lower canyon area where onshore work would be located is flat and graded with compact fill. Approximately 800 to 1000 cubic yards of excavation would be required to expose the north end of the tunnel and power cables. All earthmoving work would be limited to the previously graded areas. A small trench may need to be dug in native soil from the fill pad to an existing pull-box (approximately 50-100 ft.) to connect the fiber optic cable. Existing LFC protocol will be followed. Approximately 75-125 cubic yards of fill consisting of thermal material, sand and concrete would be required to stabilize the replacement cables prior to filling in the trench. Approximately 125-175 cubic yards of excess fill material would be either stored on site or transported off site to a suitable location.

The proposed project would not exacerbate or produce unstable earth conditions, due to the relatively small quantity of excavation and the location. There would be no significant cuts, fills or grading with the proposed project and no significant temporary or permanent changes in topography. The area of the proposed onshore excavation is not located in an area of any unique geologic, paleontologic or physical feature. Due to the location and limited amount of excavation, no increase in wind or water erosion of soils is expected, either on or off the site. However, a Storm Water Pollution Prevention Plan has been developed and will be implemented for the onshore activities and used during any rain events. Work in the lower canyon would be outside the creek setback and work on the south side of Highway 101 would be limited to tunnel access from a paved bike and pedestrian path.

Offshore: The replacement cables would be anticipated to conform to the fan channel; no long spans are anticipated nor would there be the need for any cable supports. The replacement cables, measuring approximately 7 inches in diameter, would likely be covered with sediment over time and not result in a measurable change to the bathymetric profile of the seafloor. No permanent modifications to the ocean floor would be anticipated as anchoring has been minimized by use of a dynamically positioned vessel. An anchoring plan has been prepared for non-DP vessels that would ensure that anchor locations are in areas with no potential for impacts (e.g., hard bottom impacts). Installation of the cables and retrieval of several sections would not cause any subsea landslides or other potentially damaging geologic process. Temporal and localized turbidity would result, however the effect of such action would not be significant (see Water Quality section).

1.14.3 Mitigation Measures

The applicant has proposed to implement the following mitigation measures to further reduce the potential for impacts to geologic resources.

GEO-1: Contractors shall be required to utilize current industry standards in engineering designs. *Expected Enforcement Agency: BSEE, SLC, SBC.*

GEO-2: Utilize an ROV that shall monitor selected portions of the installation activities during the cable installation operations. If previously unidentified hard bottom areas are observed, the cable route shall be adjusted, as necessary, with agency approval, to avoid resources.
Expected Enforcement Agency: BSEE, SLC.

Residual impacts would be expected to be insignificant.

1.14.4 Cumulative Impacts

The proposed project would not substantially contribute to any onshore cumulative impacts as the area of temporary disturbance is not in a sensitive geologic area. Further, excavation would be limited to previously developed portions of the canyon.

The proposed project would contribute to the accumulation of manmade structures and oil and gas infrastructure on the sea floor until the end of the SYU life. For the purposes of this analysis, it is not anticipated that the proposed project would significantly contribute to cumulative impacts associated with modifications to geologic processes. As conditioned, the replacement cables would be removed at the end of the SYU life so as not to contribute to manmade seafloor structures in perpetuity.

1.15 Greenhouse Gases

1.15.1 Environmental and Regulatory Setting

The Council on Environmental Quality's (CEQ) first Annual Report in 1970 discussed climate change, concluding that "man may be changing his weather." At that time, human activities had increased the mean level of atmospheric carbon dioxide to 325 parts per million (ppm). Since 1970, the concentration of atmospheric carbon dioxide has increased at a rate of about 1.6 ppm per year (1979-2008) to the present level of approximately 400 ppm (2013 globally averaged value). The atmospheric concentrations of other, more potent greenhouse gases (GHGs) have also increased to levels that far exceed their levels in 1750, at the beginning of the industrial era. As of 2004, human activities annually produced more than 49 billion tons of GHG measured in carbon dioxide equivalents (CO_2e), according to the Intergovernmental Panel on Climate Change (IPCC). Nearly every aspect of energy choices and use affect the development of fossil fuel and other energy resources, either adding to or reducing the cumulative total of GHG emissions.

It is now well established that rising global GHG emissions are significantly affecting the Earth's climate. These conclusions are built upon a scientific record that has been created with substantial contributions from the United States' Global Change Research Program (USGRP, formerly the Climate Change Science Program), which facilitates the creation and application of knowledge of the Earth's global environment through research, observations, decision support, and communication.

Based primarily on the scientific assessments of the USGCRP and National Research Council (NRC), EPA issued a finding that the changes in our climate caused by GHG emissions endanger public health and welfare. Ambient concentrations of GHGs do not cause direct adverse health effects (such as respiratory or toxic effects), but public health risks and impacts as a result of elevated atmospheric concentrations of GHGs occur via climate change. For example, EPA has estimated that climate change can exacerbate tropospheric ozone levels in some parts of the U.S. Broadly, EPA states that the effects of climate change observed to date and projected to occur in the future include, but are not limited to, more frequent and intense heat waves, more severe wildfires, degraded air quality, more heavy downpours and flooding, increased drought, greater sea-level rise, more intense storms, harm to water resources, harm to agriculture, and harm to wildlife and ecosystems. [Source: *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emission*, February 18, 2010, available at ceq.hss.doe.gov/ current_developments/new_ceq_nepa_guidance.html.]

Regulations enacted at the federal level that could potentially affect the proposed project include:

- EPA's Greenhouse Gas Reporting Rule, requiring annual reporting for specified industrial facilities, and
- EPA's Greenhouse Gas Tailoring Rule, establishing GHG emissions thresholds at which permits are required under EPA's New Source Review Prevention of Significant Deterioration and Title V Operating Permits programs.

The CEQ has also issued draft (not yet finalized) guidance on addressing GHGs and climate change under NEPA (op cit.) While CEQ has not recommended a specific threshold at which GHGs should be considered significant, CEQ recommends that agencies consider whether additional analysis is required for long-term actions with direct emissions of 25,000 metric tons CO_2e or greater per year. The CEQ notes that 25,000 metric tons CO_2e per year is a useful, presumptive threshold for GHG emissions discussion and disclosure, because it has been used and proposed in various EPA rulemakings.

Programs enacted at the state level that could potentially impact the proposed project include:

- Enactment of the California Global Warming Solutions Act (AB 32), requiring implementation of programs to reduce California's GHG emissions to 1990 levels by 2020;
- Adoption of the California Climate Change Action Plan, requiring GHG reductions from specified sources and activities; and
- Adoption of the GHG Cap-and-Trade program, establishing a system of market-based declining annual aggregate emission caps for GHG emission sources.

Under provisions of SB 97 (Dutton, 2007), the California Natural Resources Agency revised the state's CEQA guidelines in December 2009 to require analysis and mitigation of potential effects of a project's GHG emissions on climate change. The revisions, however, did not recommend a specific significance threshold. The SBCAPCD recommends that project CEQA documents include a quantification of GHG emissions from all project sources, direct and indirect, as applicable. In addition, the SBCAPCD recommends that climate change impacts be mitigated to the extent reasonably possible, whether or not they are determined to be significant. [*Scope and Content of Air Quality Sections in Environmental Documents*, December 2011, available at www.sbcapcd.org/apcd/landuse.htm.] In May 2011, the SBCAPCD proposed a GHG emissions significance threshold of 10,000 metric tons CO_2e per year for stationary sources. [*CEQA Significance Thresholds for GHGs – Questions and Answers*, May 2011, available at www.sbcapcd.org/apcd/landuse.htm.] This threshold has not yet been adopted by the District.

1.15.2 Project Impact Assessment

The impact of GHG emissions on global climate change is inherently a global and cumulative impact, not a project-specific impact. This is because no single project would be capable of generating sufficient GHG emissions to noticeably affect global temperature. However, the combination of GHG emissions from past, present, and future projects could contribute substantially to global climate change. Thus, project-specific GHG emissions are evaluated in terms of whether or not they would result in a cumulatively significant effect on global climate change.

As indicated above, the CEQ recommends use of 25,000 metric tons CO_2e per year as a useful, presumptive threshold for GHG emissions disclosure in NEPA documents, but does not recommend a specific significance threshold. The SBCAPCD has recommended 10,000 metric tons CO_2e per year as a significance threshold for stationary sources. Even through the SBCAPCD has not yet formally adopted this threshold, it has provided substantial evidence under CEQA that this threshold is appropriate. [*CEQA Significance Thresholds for GHGs – Questions and Answers*, May 2011.] Therefore, for this project, a significance threshold of 10,000 metric tons CO_2e per year is appropriate for all cable retrieval, installation, and other construction activities, onshore and offshore, proposed as part of this project. Since cable removal activities at the end of the SYU life are not proposed to be changed, these activities are not included in the analysis.

Anticipated cable retrieval and installation activities and other associated construction activities proposed as part of this project are described in Section 1.3. Based on anticipated operations, assuming compliance with SBCAPCD Rule 202, GHG emissions are expected to be 759 metric tons CO_2e over Phase 1 (15-21 months), and 3,787 metric tons CO_2e over Phase 2 (8-12 months). Since the cumulative GHG emissions for Phase 1 and Phase 2 activities fall below 10,000 metric tons CO_2e per year, the project's emissions are expected to have a less than cumulatively significant effect on global climate change.

1.15.3 Mitigation Measures

Proposed air quality mitigation measures AQ-1, AQ-2, and AQ-5 will act to reduce GHG emissions, in addition to criteria pollutant emissions.

Residual impacts would be expected to be insignificant.

1.15.4 Cumulative Impacts

As discussed above, the impact of the project's GHG emissions on climate change is inherently a global and cumulative impact, and is discussed in Section 1.15.2.

1.16 Hazardous Materials/Risk of Upset

This section provides an estimation of potential upset events associated with the proposed project and provides estimates of their probability of occurrence. The referenced analysis was conducted for the OPSR-A project and the expectation is that the results would be essentially the same for the OPSRB project due to the similarities in retrieval and installation activities.

An upset is defined as an accident or other event that results in the release of petroleum hydrocarbons or other hazardous materials. An accident or upset must occur before there is an impact to assess. This section describes upset events that could occur, regardless of how likely or unlikely the event. The information below describes the potential upset events, regulatory setting, oil spill response capability, and risk analysis methodology and probabilities. This section also describes mitigation measures agencies would require to ensure the risks of oil spills and potential environmental impacts are mitigated to the maximum extent feasible.

Cable Installation and Removal Operations

As described in the OPSRB Project Description, the project would involve retrieval of out-of-service cables and installation of three replacement cables (A2 (or B2), F2 and G2) in the vicinity of the project facilities described above.

In the nearshore area, the project would involve removing Cable A (or B) and C1 from the conduit and the tunnel that convey the cable through the surf area. After each cable is cut onshore and prepared for removal, the cables could be removed by either of two different approaches. In one case, the DP vessel would pull the cut portion of the cable through the tunnel and the conduit. This would be done using the reeling/winching equipment onboard the vessel with a control winch at the splice point in the lower LFC area. In the second case, the cable would be cut outside the conduit terminus and a winch at the splice point in the lower LFC area would pull the cut portion of the cable through the conduit and tunnel. A control line would be attached to the DP vessel.

Cables A (or B) and C1 cross the POPCO gas pipeline within the State waters approximately 1,600-1,800 feet offshore of the cable conduit terminus. A recent shallow water survey performed in May 2012 (reference *Cable Crossing Locations Diver Survey*, Padre Associates, Inc.) showed the POPCO gas line to be buried by several feet of sediment in the area of Cable C1 and relatively clear in the area of Cable A (or B). An articulated concrete mat, laid at the time of original installation, covers each power cable to keep it in place. Removal of each cable in the vicinity of the gas pipeline would be done with the help of divers and remotely operated vehicle (ROV). Divers would cut out concrete blocks along the length of the mat to free each cable. The remaining portions of the mat would remain in place.

Cable A2 (or B2) and F2 would then be installed through the same conduits and placed in the same location in the tunnel where the out-of-service Cable A (or B) and C1 are currently situated. Cable A2 (or B2) and F2 would be installed within the proposed corridors in the OCS, in the State waters the replacement cables would essentially take the place of the existing cables.

The cable installation vessel that would be involved in the cable installation and retrieval would maintain at least 250-500 feet (76-152 meters) distance from the tops of each platform, which is well within the vessel's capability to safe maneuver in the vicinity of the structures without a collision in any foreseeable weather conditions. (Under 33 CFR 147, 500 meters is the radius of the three platforms safety zone for the vessels over 100 feet long that do not service the facilities.)

The proposed cables would be installed from a cable installation vessel equipped with a dynamic positioning 2 (DP 2) system that is specifically designed for installations of cables in deep waters. The cable installation vessel is anticipated to be approximately 325 to 425 feet long, with the capability to store all of the replacement cables. The vessel will have storage space to handle the retrieved cable but may be required to return to port to unload cable during the project.

The vessel will be powered by diesel generator sets that are designed to maintain vessel position under adverse weather conditions. The vessel fuel capacity may be limited and could require refueling at a local port during the project.

The vessel will be equipped with sophisticated computer-controlled dynamic positioning systems that are capable to maintain the vessel's position over the cable in various sea conditions without use of anchors or tug boats. The same cable installation vessel would be utilized in the retrieval of the out-of-service cable portions.

Crude Oil and Gas Physical Properties

A spill of crude oil from the pipeline could damage the environment if oil is spilled on land or in rivers, creeks, or the ocean, and could produce public safety concerns from fires that may arise if the oil burns. Flammable vapors (i.e., propane, butane, and pentane) may also emanate from the crude oil, and there may be safety hazards arising from toxic vapors in the crude oil (primarily benzene and hydrogen sulfide).

Physical properties of crude oil are needed to assess the effects of a potential spill from a damaged pipeline. These data are summarized below.

Table of Project Crude Oil Properties

API Gravity at 60ºF	15.5 (Heritage) – 21.9 (Harmony)
Water Content	~40%
H_2S content, ppm	25
Sulfur Content, wt% dry	4.30-5.18
Viscosity, centistokes at 50ºF	818 (Hondo) – 36,500 (Heritage)

Source: ExxonMobil Oil Spill Response Plan, 2000.
Notes: F = Fahrenheit

Because the emulsion mixture transported by the project pipelines has a large percentage of water (approximately 40%) impacts would be limited to environmental as opposed to safety impacts. The large volume of water in the emulsion inhibits the release of flammable vapor in the event of an oil spill, thus minimizing potential fire and explosion hazards.

The gas pipelines (Heritage to Harmony, Harmony to Hondo, and Hondo to LFC) contain sour gas with an H_2S content of 3,800 to 20,000 ppm. The pipelines operate at 1,100 psig. The Hondo to LFC portion of the line has a maximum flow rate of 90 mmscfd.

1.16.1 Environmental and Regulatory Setting

Potential upset events for the proposed project can be characterized as minor accidents or major accidents (Table RMM-1). Minor accidents could result in small spills of petroleum hydrocarbons, including fuels, lubricants, waste oils, and hydraulic fluids in volumes ranging from a few drops to several gallons. For the previous similar project, SBC and MMS (currently BOEM/BSEE) identified two potential spill scenarios for minor accidents: (1) incidental spills of lubricating oils, hydraulic fluids, and waste oils, and (2) incidental spills of fuel oil during offshore refueling operations.

Major accidents are those which have the potential to result in larger spills. For the previous similar project, SBC and MMS (currently BOEM/BSEE) identified four potential major accident scenarios that could result in an oil spill: (1) anchoring damage to a pipeline, (2) dropping cable and damaging a pipeline, (3) vessel collisions with the platform, and (4) damage to a pipeline during cable installation and removal work in the onshore tunnel.

Table RMM-1: Overview of Potential Upset Events and Estimated Probability of Occurrence (OPSR-A)

Minor Accidents	***Probabilities****
1. Incidental spillage of petroleum hydrocarbons from the DP and support vessel.	Unlikely
2. Incidental fuel oil spills.	Unlikely
Major Accidents	
1.Dropping or dragging of anchor with possible damage to pipeline.	Unlikely
2. Accidental release of cable with possible damage to pipeline.	Highly Improbable
3. Impact by the DP vessel with a platform	Rare
4. Removal and installation of the cable in the conduit tunnel with possible damage to the pipeline.	Highly Improbable

* The numerical probabilities are provided in Table RMM-2

The MMS (currently BOEM/BSEE) and SBC determined for the previous similar project, based on technical information and analyses provided by ExxonMobil, and a review conducted by an independent consultant, that the potential for these upset events ranges from unlikely (such events occur, but are not likely during this project) to rare (such events have occurred on a worldwide basis, but only a few times) to highly improbable (such events have never occurred but conceivably could) (Table RMM-2). The information presented below describes the upset events that could result from routine operations and an accident in greater detail, and ExxonMobil's and industry's oil spill response capability. The information demonstrates that oil spill response planning and capabilities are more than adequate to respond to any spills that could reasonably result from this project. The text also identifies additional mitigation measures to further minimize the potential for an oil spill.

Regulatory Setting

Many regulations and standards exist to assure the safe construction and operation of pipelines carrying materials such as crude oil and natural gas, and facilities associated with these pipelines. The SYU facilities were built to meet these standards and are currently in compliance with applicable Federal, State and local pipeline safety requirements. Cable installation and retrieval activities on the OCS and State Tidelands would be conducted in accordance with Federal OCS oil and gas regulations (Title 30, Part 250, Code of Federal Regulations) and State oil and gas regulations, respectively. Furthermore, Federal, State, and local regulatory requirements would apply to any potential accidental release that could occur during power cable retrieval and installation.

Title 30, Part 254 of the Code of Federal Regulations defines the requirements for oil spill response for all operators in the OCS. In addition, condition XI-2.e of the ExxonMobil Final Development Plan issued by the County also outlines requirements for oil spill contingency planning for SYU operations. Among other things, each operator must have an approved Oil Spill Response Plan (OSRP) and be capable of implementing the plan in the event of an oil spill. ExxonMobil's OSRP was most recently updated and submitted to BSEE in the June of 2012 (ExxonMobil, 2012). The information below is provided as an overview of ExxonMobil's response capabilities.

SYU Oil Spill Response Capability

ExxonMobil maintains an OSRP for the three SYU platforms and the associated pipelines. The OSRP is approved by the BSEE and undergoes biennial revisions. The SYU OSRP contains the full range of response and coordination actions, reporting and notification information, information on the response capabilities of the company and various response contractors, spill identification and assessment procedures, sensitive resources identification and protection methods, response and cleanup planning, and oil and debris removal and disposal procedures. The plan also contains detailed description of the actions that would be undertaken in case of an oil spill at the SYU offshore facilities.

ExxonMobil and Clean Seas are the primary response equipment providers for incidents at the SYU facilities. The equipment is located on all three SYU platforms and on the crew and supply boats, and includes various booms, sorbent pads, storage bags, skimmers and hand tools (a list of the available equipment is located in Appendix E of the SYU OSRP).

Clean Seas' Oil Spill Response Vessels (OSRV) are normally moored near Santa Barbara Harbor (2.5-3.5 hours response time) and Point Conception (1.3-2 hours response time). The closest piers that can be used to load the support vessels with the response equipment from the various facilities and contractors are Ellwood Marine Terminal and the Gaviota Marine Terminal.

The company's emergency response organization operates under the tiered response concept in which resources are cascaded to the appropriate level as dictated by incident circumstances. The first tier of the response organization, comprised of onsite personnel and equipment dedicated to a specific ExxonMobil facility or operation, is the Onsite Response Team (ORT). The ORT response times range from several minutes (for the incidents at the facilities) to 1-2 hours (for incidents at different sections of the pipelines). Clean Seas fast-response vessel could also be summoned for site characterization assistance, if needed. The Clean Seas various vessels response times range from 1.3 to 2 hours.

If resources exceeding those of the ORT are required, the second tier of ExxonMobil's response organization – the Santa Barbara Channel Emergency Local Interfunctional Response Team (SBC ELIRT) - would respond. The SBC ELIRT is one of several ELIRTs established by ExxonMobil to provide spill response capabilities for regional areas of operation in the continental United States. ExxonMobil periodically holds SBC ELIRT tabletop drills involving many regulatory agencies and contract personnel. In the event that an incident is beyond the response capabilities of the SBC ELIRT, the third tier of ExxonMobil's response organization – the North America Regional Response Team (NARRT) – would be mobilized to supplement SBC ELIRT response operations.

Risk Analysis Methodology

An analysis of risk considers two components:

- The probability or likelihood of the occurrence of the upset event, and
- The result of the upset event.

Definitions of various probabilities of occurrence are presented in Table RMM-2. This table has been modified from a similar systems safety table in the Joint EIS/EIR prepared for the San Miguel Project (URS, 1985) and used in similar offshore oil projects. The occurrence of an upset event has been defined for probabilities ranging from virtually certain (0.999) to highly improbable (less than 1 in a million or 10^{-6}).

Table RMM-2: Definitions of Probability of Occurrence

Group	Descriptor	Probability of Occurrence	Description
1	Highly Improbable	Less than 1 in a million ($< 10^{-6}$)	Such events have never occurred but conceivably could
2	Rare	Between 1 in a million and 1 in ten thousand ($> 10^{-6} < 10^{-4}$)	Such events have occurred on a worldwide basis, but only a few times
3	Unlikely	Between 1 in ten thousand and 1 in one hundred ($> 10^{-4}$ to $< 10^{-2}$)	Such events occur, but are not likely during this project
4	Likely	Between 1 in one hundred and less than one ($> 10^{-2}$ to < 1)	Such events are likely to occur during this project
5	Virtually Certain	0.999	Such events can be expected to occur more than once during the project

1.16.2 Project Impact Assessment

The potential upset events that could occur for this project and result in an oil spill are:

1. Incidental spills of lubricating oils, hydraulic fluids, and waste oils.
2. Incidental fuel oil spills.
3. Anchoring accidents.
4. Accidental release of the cable during lifting operations.
5. Collision of the DP vessel or Supply/Work vessel with a platform.
6. Accident during removal and installation of the cable in the onshore tunnel.

Potential risks associated with the project are described below along with applicant recommended mitigation measures.

Potential Upset Event 1 - Incidental Spills of Lubricating Oils, Hydraulic Fluids and Waste Oils

The operation of supply and crew vessels as well as the DP vessel would involve the use of petroleum hydrocarbons. Such materials include:

- Lubricating oils
- Hydraulic fluids
- Waste oils

Transfer of these materials to or from the DP vessel or spillage of these materials on any vessel could result in their release to the marine environment. The probability that this upset event would occur is estimated to be unlikely (such events occur, but are not likely during this project).

MMS (currently BOEM/BSEE) believed for a previous similar project that incidental spillage of lubricating oil, hydraulic fluids, and waste oil would be very unlikely to result in a significant impact to the marine environment due to the small volume of such spills, oil spill response capability, and resources in the immediate area.

SBC considers any reportable spill to the marine environment to be potentially significant. SBC has therefore determined that Potential Upset Event 1 could result in potentially significant impacts. The risk of such an occurrence, however, would be mitigated to a level of insignificance by implementing mitigation measure RMM-1 (see Section 1.16.3).

Potential Upset Event 2 - Incidental Fuel Oil Spills

Project vessels would refuel at Port Hueneme or another local port. Although allowed, refueling will not occur at the platforms using tote tanks. The SYU project is permitted to use this method of refueling and has used it on rare occasions in the past.

There would be no boat-to-boat fuel transfers. Skiffs on the DP vessel would be fueled only when they are onboard the DP vessel. The DP vessel carries a 20-40 day fuel supply. Due to the duration (~1 to 2 months) of cable installation and retrieval activities, refueling of the DP vessel may be required during the project. Refueling would take place at a local port.

Supply boats currently transfer diesel fuel to permanent tanks onboard the platforms. These refueling operations are comparable in scope to refueling operations involving tote tanks. From January 1993 to November 2000, a total of 36 diesel spills occurred during supply boat refueling operations at Pacific OCS platforms. The spills resulted in a total release of approximately 50 gallons (189 liters) of diesel fuel. Of these, 11 spills occurred at ExxonMobil facilities where a total of about 5 gallons (19 liters) were spilled.

Refueling of the project vessels from platform-based tote tanks will not occur during the project and therefore, there is no possibility of a release of diesel oil to the marine environment due to a leaking connection, failed loading hose or incorrect practices and procedures. The probability that this upset event would occur is estimated to be very unlikely (such events occur but are not likely during this project). This risk would be present in the OCS region (offshore environment) only, since that is where the platforms are located. The risk would be mitigated to insignificance through implementation of the measures outlined in Section 1.16.3.

Potential Upset Event 3 - Anchoring Accidents

Some project activities would require the use of anchors, some of which would be as large as 10,000 pounds (4,500 kg). While anchors would only be placed in pre-surveyed locations, a safe distance from the existing cable and pipeline facilities, the potential exists for inadvertent anchor placement and damage to the existing cables and pipelines. The probability that this upset event would occur is estimated to be unlikely (such events occur, but would not be likely during this project). There have been no upset events involving anchors and pipelines in the history of oil and gas operations in the Pacific Region. Only one event has occurred in State waters. That event resulted in a spill of 126 gallons of oil (Platform Emmy in the Long Beach area, 1989). Anchoring accidents have occurred in the Gulf of Mexico Region where the location of many pipelines was not known, or where other forces, such as hurricanes, caused mobile drilling or vessels to drag their anchors. In the Pacific Region, the locations of offshore pipelines and power cables have been accurately mapped and the severity of storms is much less severe. Consequently, the chances of similar events occurring are very remote.

ExxonMobil will anchor within previously surveyed anchor zones that are located a safe distance from pipelines, cables, platforms, hard bottom areas, and cultural features. Pursuant to SLC requirements, all anchors must be set a minimum of 250 feet (75 meters) from active pipelines and power cables in State waters.

ExxonMobil estimates the following preliminary information on vessels and anchoring requirements for the proposed project based on a previous similar project (OPSR-A):

1. Pre-Installation Marine Biological Surveys
    a. Dive support vessel would deploy 2-4 anchors of up to 5,000 pounds (2,268 kg) each.
    b. Anchors would be placed in one of 9 pre-surveyed anchoring zones or another surveyed anchor zone.
2. Inspection of Conduit Terminus
    a. Support vessel would deploy 4-6 anchors spread of up to 10,000 pounds (4,536 kg) each.
    b. Anchors would be placed in one of 9 pre-surveyed anchoring zones or another surveyed anchor zone.
3. Conduit Preparation, Clearance and Cable Cutting at Conduit Terminus
    a. Support vessel would deploy 4-6 anchors spread of up to 10,000 pounds (4,536 kg) each.
    b. Anchors would be placed in one of 9 pre-surveyed anchoring zones or another surveyed anchor zone.
4. Conduit Cable Installation Support
    a. Support vessel would deploy 4-6 anchors spread of up to 10,000 pounds (4,536 kg) each.
    b. Anchors would be placed in one of 9 pre-surveyed anchoring zones or another surveyed anchor zone.
5. Post-Installation Marine Biological Survey

a. Dive support vessel would deploy 2-4 anchors of up to 5,000 pounds (2,268 kg) each.
b. Anchors would be placed in one of 9 pre-surveyed anchoring zones or another surveyed anchor zone.

If an anchor was accidentally dropped on a power cable or if an anchor came into contact with a cable (e.g. an anchor drag due to storm conditions or during retrieval operations), damage to the cable could occur and result in a partial or total shutdown of the SYU operations. All three SYU platforms have back up generator equipment for controlled safe shutdowns in the event of a power failure. Depending on when the incident occurs in the project, one or more of the SYU platforms would have redundant power supply cable; therefore, the power to these platforms could be quickly restored. For platforms without a redundant power supply, the platform would be shutdown until one of the replacement power cables could be energized and used to power the platform.

An anchor that is dropped on a pipeline or comes into contact with a pipeline could cause a rupture in the pipeline. If a gas pipeline were punctured, some produced gas could reach the surface, depending on the depth of the release. A gas release would have minimal public health or environmental impacts due to the remote location of the platforms and the natural process of water-soluble components in the produced gas being absorbed by seawater. Dispersion through the water column would prevent toxic concentrations of hydrogen sulfide gas, which is soluble in water, from being present at the sea surface.

A release from the SYU treated water pipeline would cause a release of water that meets the NPDES Permit requirements for ocean discharge and would have minimal impacts on the marine environment.

Assuming that anchor damage to an oil pipeline has occurred and the impact is great enough to produce a leak in the pipeline, the fate of the released crude oil can be estimated using both the National Oceanic and Atmospheric Administration (NOAA) GNOME model and the BOEM/BSEE (formerly MMS) OSRA models (see ExxonMobil OSRP 2012). Oil spill trajectories were reviewed in previous environmental analyses for the SYU Project (SAIC, 1984; ADL 1987). Emergency response operations would rely on the local ExxonMobil and regional Clean Seas capabilities. Additional information on response capabilities are discussed in ExxonMobil's SYU Oil Spill Response Plan.

The likelihood of an oil spill from the emulsion pipeline under this scenario is considered very unlikely due to the design of the pipeline (concrete coated) and the protective measures that have been taken to minimize the potential for anchoring accidents. However, under the SBC significance criteria, risks from anchoring would be considered potentially significant. The mitigation measure described in Section 1.16.3 would reduce the risk to insignificant levels.

Potential Upset Event 4 – Accidental Release of Cable and Damage to Nearby Structures

Under one potential upset event scenario, an accidental release of cable during cable retrieval and/or installation activities could damage existing oil and gas infrastructure, thereby causing a release of crude oil, produced gas or produced water to the marine environment. The probability that this upset event would occur is considered to be highly improbable (such events have never occurred but conceivably could). Four things would have to happen in order for this upset event scenario to occur:

1. The cable would have to be accidentally and uncontrollably released in water depths in excess of 400 feet (120 meters);
2. The cable would have to fall in the “plunging stalk” mode, as described below;
3. A simultaneous failure of the DP vessel navigation system (or human error) would have to occur; and,
4. The dropped cable would have to hit a pipeline and produce a leak.

If these four events occurred, the cable could potentially impact one of the existing emulsion, gas, or water pipelines causing failure of those facility components.

Risks to seafloor facilities (pipelines and power cables) are a function of the length of cable associated with the break (the depth), the associated weight of any equipment attached to the cable and the mode of cable laydown. A study conducted for ExxonMobil for the previous similar OPSR-A project by Petro-Marine (September 2002) assessed various potential cable "failure" locations and the associated dynamics and potential impact damage. This report is included as Appendix B of this document. [A similar study will be completed for OPSRB once detailed information is available to update the results of the analysis.]

The chance of an accident that resulted in the release of the cable was assumed to be one-in-a-thousand. ExxonMobil was not able to find any statistical data to better define this situation. Discussions between ExxonMobil and installation contractors determined that this estimate was appropriate for the types of activities contemplated for this project. This is based on the installation contractor’s cable installation and removal experience, which spans a period of 17 years (1986-2003). Only two cables has ever been dropped during that time; therefore this probability analysis is considered to be conservative. In addition, SBC’s independent risk consultant, MRS Environmental, supports the use of this release rate based on work performed on similar offshore fiber optics cable installation and retrieval projects off the California Coast.

The report indicated that there are a number of different cable laydown modes that could occur given a cable failure. These are:

1. Stiff catenary laydown - the cable essentially lays down on the seabed floor, most likely in shallow water (< 50 feet [15 m]);
2. Hammerhead laydown - the cable end lays down quicker than the rest of the cable causing a more sudden impact, most likely in shallow water (< 50 feet [15 m]);
3. “Spaghetti pile” without clamp - the cable loops around like spaghetti with no clamp attached to the end, normally occurs in deeper water; [This was mode for the release of Cable D1]
4. “Spaghetti pile” with clamp - the cable loops like spaghetti but has a 200 pound (91 kg) clamp on the end, normally occurs in deeper water, and
5. Plunging stalk - the cable plunges directly downward, normally occurs in deeper water (> 400 feet [122 m]).

Velocities and impact forces were based on engineering calculations made by ExxonMobil and reviewed by MMS, SLC and an independent consultant MRS Environmental, under contract to

SBC. Damages to seafloor equipment were assessed using finite element analysis assuming that any deformation of the pipe or other electrical cables would constitute damage.

As seen in Table RMM-3, for OPSR-A the plunging stalk failure mode produces substantially more force upon impact than any other failure mode. The plunging stalk mode is the only mode that could cause damage to the emulsion pipeline. Both the “spaghetti pile” with clamp and the plunging stalk modes could cause damage to the electrical cables. Analysis of failures at 1,250 feet (380 meters) depth produced the same results.

Table RMM-3: Cable Laydown and Damage Assessment Results at 450 Ft (135 meter) Depth

Impact Mode	Velocity (ft/sec)	Water Depth (ft/m)	Impact Force (lbs./kg)	Cable Damage	Pipeline Damage
Stiff catenary laydown	NA	<50/15	NA	None	None
Hammerhead laydown	NA	<50/15	NA	None	None
Spaghetti pile without clamp	5.5	All depths	1,248/566	None	None
Spaghetti pile with clamp	5.5	All depths	1,883/854	Yes	None
Plunging stalk	67.3	>400/122	137,000/62,143	Yes	Yes

Source: ExxonMobil SYU Offshore Power System Repair, Amended Project. Cable Retrieval Risk Assessment, PMBCI, September 2002.

A “plunging stalk” failure mode cannot occur in water depths less than 400 feet (120 meters). This occurs primarily on the shelf and is where the cables are in close proximity to the emulsion, gas or water pipelines.

Failure in the “hammerhead laydown” mode could cause damage and potential failure to one of the existing electrical cables.

An inadvertent cable release during retrieval would most likely occur if the cable has been cut and is suspended from the vessel while being raised or lowered. This could occur during cable removal at the shelf break where the existing out-of-service cable would be cut on the sea floor by the ROV and raised to the DP vessel. It could also occur at Platform Harmony or Heritage during cable installation and at the near-shore location near the conduit entrance.

Risks to the existing facilities on the seafloor would be similar in all of the above listed cases and would be a strong function of water depth and the mode of cable laydown. Current facility design and environmental conditions would help to minimize the impact damage. These include coating of some of the pipelines with concrete and self-burying of the near shore pipelines and power cables.

In order to put the potential risk in context, event probabilities have been estimated for the various accident scenarios and potential consequences (e.g., damage to existing cables and pipelines). Tables RMM-2 and RMM-3 present the probabilities of occurrence of damage to seafloor infrastructure in the event a cable is dropped during OPSR-A cable installation or retrieval. Table RMM-4 provides a more detailed evaluation of potential for damage to active SYU pipelines and power cables from a dropped cable during OPSR-A, taking into consideration factors such as the distance to these existing structures and water depth. As these tables show, the probability of the various cable accidents and resultant equipment failures range from zero to seven in ten million. While these low probabilities indicate that most events are highly improbable for damage to seafloor infrastructure to occur**,** to meet the CEQA requirements to address potential worst-case impacts, and to identify mitigation measures, all potential damage scenarios to the project cables and pipelines were evaluated.

Damage to other power cables and the pipelines by a dropped cable would be similar to those from anchoring accidents. The potential for releases of gas, water and oil, would also be similar. The possibility of damaging multiple cables is considered extremely remote because the only scenarios that could cause cable damage are those that have small impact areas (the clamp and the plunging stalk), and thus a low likelihood of occurring. Damage to a power cable could result in a partial or total shutdown of SYU operations. Due to the depths at which the plunging stalk mode would occur (minimum 400 feet), any gas that could be released from a ruptured gas pipeline would dissipate before it reached the surface.

As discussed for Upset Event 3, the fate of a crude oil release can be estimated using both the NOAA GNOME model and the BOEM/BSEE OSRA models, as was done in the ExxonMobil OSRP. The likelihood of an oil spill from the emulsion pipeline under this scenario is considered to be virtually impossible, because the following series of very unlikely events would have to occur: (1) the cable would have to be accidentally and uncontrollably released in water depths in excess of 400 feet (120 meters), (2) the cable would have to fall in the "plunging stalk" mode (described above), (3) a simultaneous failure of the DP vessel navigation system (or human error) would have to occur, and (4) the dropped cable would have to hit an oil pipeline and produce a leak.

Due to remote possibility of such an event occurring, a discussion of impacts associated with such an event is limited to this section of the document. The mitigation measures outlined below would reduce potential impacts to insignificant levels

Potential Upset Event 5 – Collision of the DP Vessel or Supply/Work Vessel with a Platform

A DP vessel or a supply/work vessel operating near a platform could collide with a platform due to human error or if the propulsion systems of the vessels failed. Such an event could result in an oil spill. ExxonMobil estimates that the DP installation vessel would remain at least 245 to 500 feet (76-152 meters) from the platform during the cable retrieval and installation operations. Both types of vessels would have state-of-the-art navigation and GPS positioning systems. The vessels would also have back-up propulsion systems that can be used if the primary power supply system fails. This would minimize the potential for a vessel/platform collision. The probability that this upset event would occur is estimated to be rare (such events have occurred on a worldwide basis, but only a few times) and therefore considered insignificant for this project. Therefore there are no mitigation measures proposed for this upset scenario.

Table RMM-4: Evaluation of Potential for Damage to Active SYU Components from Dropped Cable [OPSR-A]

(Evaluation assumes worst case where cable can fall within an area formed by a cone with an apex angle of 90 deg at water surface.)

Activity	Location	Water Depth (ft)	Potential ImpactZone (ft^2)	Active P/L & PC Within Zone	Distance To P/L and PC (ft)	Potential For Impact	Plausible Damage Mode (Note 1)	Probability (Note 2 & 3)
OPSR-A Project Cable C1 and D1 Installation								
Cable Installation (Cable C1)	Conduit Terminus	25	1,965	Cable A	10	Yes	None (Buried)	Zero
				Cable B	5	Yes	None (Buried)	Zero
				POPCO P/L	70	No	N/A	
				HA Emulsion P/L	55	No	N/A	
				Treated Water P/L	50	No	N/A	
Cable Installation (Cable C1)	Platform Heritage Remove Cable C from J-Tube	1100	3,801,340	Cable E	300	Yes	SP w/C & PS	1.95×10^{-7}
				HE Gas P/L	645	Yes	PS	3.28×10^{-7}
				HE Emulsion P/L	1,015	Yes	None (Beyond PS Impact Zone)	Zero
Cable Installation (Cable C1)	Platform Heritage Cable C1 J-Tube Pull-In	1090	3,732,535	Cable E	30	Yes	SP w/C	1.80×10^{-7}
				HE Gas P/L	385	Yes	None (Cable Swinging Not Falling)	Zero
				HE Emulsion P/L	710	Yes	None (Cable Swinging Not Falling)	Zero
Cable Installation (Cable D1)	Platform Hondo Remove OS&T Cable from J-Tube	790	1,960,670	Cable A	690	Yes	SP w/C	1.99×10^{-7}
				Cable B	765	Yes	SP w/C	9.69×10^{-8}
				POPCO Gas P/L	360	Yes	PS	6.43×10^{-7}
				HA Gas P/L	805	No	N/A	
				HO Emulsion P/L	740	Yes	None (Beyond PS Impact Zone)	Zero
				HA Emulsion P/L	1,320	No	N/A	
				Treated Water P/L	1,245	No	N/A	

Table RMM-4 Continued

Activity	Location	Water Depth (ft)	Potential ImpactZone (ft^2)	Active P/L & PC Within Zone	Distance To P/LAnd PC (ft)	Potential For Impact	Plausible Damage Mode (Note 1)	
Cable Installation (Cable D1)	Platform Harmony Cable D1 J-Tube Pull-In	1195	4,486,285	Cable E	60	Yes	SP w/C	1.76×10^{-7}
				HE Gas P/L	330	Yes	None (Cable Swinging Not Falling)	Zero
				HE Emulsion P/L	430	Yes	None (Cable Swinging Not Falling)	Zero
				HA Emulsion P/L	575	Yes	None (Cable Swinging Not Falling)	Zero
Cable Installation (Cable D1)	Platform Hondo Cable D1 J-Tube Pull-In (Dwg. No. 8783-9)	800	2,010,625	Cable A	710	Yes	SP w/C	2.04×10^{-7}
				Cable B	805	No	N/A	
				POPCO Gas P/L	330	Yes	None (Cable Swinging Not Falling)	Zero
				HA Gas P/L	535	Yes	None (Cable Swinging Not Falling)	Zero
				HO Emulsion P/L	480	Yes	None (Cable Swinging Not Falling)	Zero
				HA Emulsion P/L	1,260	No	N/A	
				Treated Water P/L	1,165	No	N/A	

Note 1: SP w/C-Spaghetti Pile with Clamp; PS-Plunging Stalk; SP w/C & PS-Spaghetti Pile with Clamp & Plunging Stalk; N/A-Not Applicable
Note 2: Assumption: 1 time out of a 1000 cable will be dropped (no data available) Calculation: (Area of each P/L or PC in potential impact zone / Area of impact zone)
Note 3: E-7 equal to 1 / 10,000,000

Potential Upset Event 6 - Accidental Damage to Pipelines/Cables in the Onshore Tunnel

Removal and installation of cables in the conduit tunnel could cause damage to the existing cables or to the pipelines in the tunnel; however it would be highly unlikely for the reasons described below. The cable removal and installation operations would be conducted by winching the cables through the tunnel on a specially designed tray equipped with rollers for easy movement. The three power cables located in the tunnel are located on a tray above the emulsion pipeline. A treated water pipeline is also located in the tunnel. The POPCO gas pipeline is separated by a walkway and a handrail from the other pipelines and cables. This arrangement provides for protective spacing between the cables and the pipelines. Therefore, abrasion of the cable against existing pipelines is not possible. In addition, the tension and alignment of the cable during retrieval and installation would be continuously monitored through the tunnel and controlled on both ends. Consequently, it would be very unlikely that a pipeline or cable could be damaged by abrasion during cable removal and installation operations. ExxonMobil will prepare detailed execution procedures for cable installation and retrieval in the tunnel that will be available for review by any of the agencies to ensure appropriate safety measures are incorporated. The potential for a more severe accident resulting in a rupture of an oil, gas or treated water line is considered highly improbable (such events have never occurred but conceivably could). Absent execution of proper engineering and safety practices, SBC would consider this impact to be potentially significant but mitigable. Under NEPA, the impact would be considered insignificant due to the remote probability of occurrence. The mitigation measures in section 1.16.3 will be implemented to minimize risk.

Damage to one of the other cables could cause operational problems by partially or totally shutting down the platforms. In addition, damage to one of the other cables could require the replacement of the damaged cable, which would be a project similar to the one being evaluated in this document. This impact is considered to be insignificant. In addition, as discussed in Section 1.13 (Fire Protection), because of the classification of the tunnel (Class 1, Division 2), all work in the tunnel must comply with API RP 500 and NEC 70.

Conclusions – Proposed Project

Table RMM-5 presents the upset events, probabilities, impact classifications, mitigation measures, and residual impacts with mitigation measures for the upset events that were assessed for the previous similar OPSR-A project. The classification of impacts as potentially significant for Upset Events 1 and 2 is based on SBC's environmental impact significance criteria (any reportable oil spill is considered potentially significant). The BSEE would be expected to consider potential impacts from the incidental spillage of petroleum hydrocarbons from the DP and support vessel or incidental fuel oil spills to be insignificant. With proper planning, procedures, and safety plans, as well as good vessel housekeeping operations, all potentially significant impacts can be mitigated to insignificant levels.

Table RMM-5: Probability, Potential Impact, Mitigation, and Residual Impact for Potential Upset Events

(This information is required by the California Environmental Quality Act.)

Upset Event	Probability of Upset Event	Impact Classification*	Mitigation Measure	Residual Impact
1. Incidental spillage of petroleum hydrocarbons from the DP and support vessel.	Unlikely	CEQA: Potentially significant NEPA: Insignificant	RMM-1 through 4	Insignificant with mitigation (Class II)
2. Incidental fuel oil spills.	Unlikely	CEQA: Potentially significant NEPA: Insignificant	RMM-5	Insignificant with mitigation (Class II)
3. Anchoring accidents.	Unlikely	CEQA: Potentially significant NEPA: Insignificant	RMM-6 and 7	Insignificant with mitigation (Class II)
4. Accidental release of cable with plausible damage to pipeline.	Highly Improbable	CEQA: Potentially significant NEPA: Insignificant	RMM-8 and 9	Insignificant with mitigation (Class II)
5. Impact by the DP vessel with a platform	Rare	Insignificant	None	Insignificant (Class III)
6. Potential damage to existing pipelines or power cables during removal and installation of cable in tunnel.	Highly Improbable	CEQA: Potentially significant NEPA: Insignificant	RMM-10 through 12	Insignificant with mitigation (Class II)

* The classification impact levels differ under CEQA vs. NEPA due to differences in agency significance criteria.

1.16.3 Mitigation Measures

Mitigation Measures for Potential Upset Event 1 – Incidental Spills of Lubricating Oils, Hydraulic Fluids, and Waste Oils

RMM-1: ExxonMobil shall ensure that all installation contractors maintain good housekeeping practices to avoid washing of lubricants or other hydrocarbons from deck into the ocean or dropping of debris overboard. All lubricating oils, hydraulic fluids, waste oils and related materials shall be stored in contained areas.
Expected Enforcement Agency: BSEE, SLC.

RMM-2: ExxonMobil shall ensure that all materials related to cable retrieval and installation operations are loaded on the DP vessel at applicable port locations and transfer of materials at sea should be avoided to the extent feasible. No crane lifts of materials and equipment shall be made over operating pipelines and power cables.
Expected Enforcement Agency: BSEE, SLC, SBC

RMM-3: ExxonMobil shall prepare a project-specific addendum to the SYU Oil Spill Response Plan (OSRP) that clearly identifies responsibilities of contractor and ExxonMobil personnel. The plan shall list and identify the location of oil spill response equipment and response times for

deployment. The addendum shall be submitted to the BSEE, SLC and SBC prior to commencement of cable installation and retrieval operations.
Expected Enforcement Agency: BSEE, SLC, SBC.

RMM-4: ExxonMobil shall provide OSPR training to primary contractors and sub-contractors to ensure clear understanding of responsibilities and prompt oil spill response procedures. If any contractors are to be responsible for boom deployment, ExxonMobil shall conduct a boom deployment drill prior to commencement of power cable removal and installation operations. ExxonMobil shall notify BSEE at least 72 hours before the drill so BSEE can witness boom deployment operations.
Expected Enforcement Agency: BSEE, SLC, SBC.

Mitigation Measure for Potential Upset Event 2 - Incidental Fuel Oil Spills

RMM-5: ExxonMobil shall refuel all vessels involved in the project at onshore facilities (ports/piers) or in accordance to a Fueling Plan. ExxonMobil shall submit the Fueling Plan to BSEE, SLC, and SBC prior to commencement of cable installation and retrieval operations. There shall be no boat-to-boat fuel transfers, with the exception of skiffs on the DP Lay vessel, which are only fueled when on the vessel.
Expected Enforcement Agency: BSEE, SLC, SBC.

Risk Mitigation Measures for Potential Upset Event 3 – Anchoring Accidents

RMM-6: ExxonMobil shall set all anchors a minimum of 250 feet (75 meters) from active pipelines and power cables.
Expected Enforcement Agency: SLC, BSEE.

RMM-7: ExxonMobil shall submit an Anchoring Plan to SBC, SLC and BSEE prior to commencement of cable installation and retrieval operations. The plan shall list all of the vessels that will anchor during the project and the number and size of anchors to be set. The plan shall include detailed maps showing anchoring sites identified during the pre-installation biological surveys, including re-positioning of anchors to ensure that they are at least 40 feet (12 m) from rocky habitat. The plan shall also describe the navigation equipment that would be used to ensure anchors are accurately set and anchor handling procedures that would be followed to prevent or minimize anchor dragging.
Expected Enforcement Agency: BSEE, SLC, SBC.

Mitigation Measures for Potential Upset Event 4 – Accidental Release of the Cable and Damage to Nearby Structures

RMM-8: ExxonMobil shall prepare a Critical Operations and Curtailment Plan for offshore cable installation and retrieval operations that describes weather and sea conditions that would require curtailment of operations. The plan shall be submitted to BSEE, SLC, and SBC prior to commencement of the cable installation and retrieval operations.
Expected Enforcement Agency: BSEE, SLC, SBC.

RMM-9: ExxonMobil shall prepare and submit a Cable Release Prevention Plan which details the specific measures to be taken at all locations where a cable is suspended and could fail and fall to the ocean floor. The plan shall detail design measures, engineering measures, safety

measures, and redundancy in safety equipment. The plan shall be submitted to BSEE and SLC prior to commencement of the cable installation and retrieval operations.
Expected Enforcement Agency: BSEE, SLC, SBC.

Mitigation Measure for Potential Upset Event 6 – Accidental Damage to Pipelines/Cables in the Onshore Tunnel

RMM-10: ExxonMobil shall prepare a Safety Plan for Tunnel Cable Installation and Removal Operations that describes procedures that will followed and safety measures that will be taken to ensure damage to other cables and pipelines does not occur. The plan shall include the method proposed to enable continuous monitoring of cable pull activities in the tunnel. The procedures shall identify activities during which SYU operations will be shutdown. The plan shall include a hazards study evaluation of cable installation and removal operations in the tunnel using an appropriate method (e.g., "What-If" or "Checklist"). The study shall identify potential failure modes, protection devices or systems, safety procedures and redundant safety equipment or measures (levels of protection). Procedures and safety plan shall be submitted to SBC prior to commencement of the cable installation and retrieval operations and to the Santa Barbara County System Safety Reliability Review Committee (SSRRC).
Expected Enforcement Agency: SBC.

RMM-11: ExxonMobil shall prepare an Execution Plan describing cable removal and installation procedures in the onshore tunnel. The plan shall describe measures that will be taken to minimizing the tension/stress that will be placed on cables during cable pulling operations. Detailed plans shall be submitted to SLC and SBC prior to commencement of cable removal and installation operations and to the Santa Barbara County System Safety Reliability Review Committee (SSRRC).
Expected Enforcement Agency: SBC, SLC.

RMM-12: ExxonMobil shall de-energize the cables and shutdown the oil and gas pipelines in the tunnel during cable pulling operations in the tunnel, unless ExxonMobil can clearly demonstrate to SBC and SLC that cable pulling operations can be performed safely while the cables and pipelines in the tunnel are operating.
Expected Enforcement Agency: SBC, SLC.

See also mitigation measure FIRE-2.

Residual impacts would be expected to be insignificant.

1.16.4 Cumulative Impacts

The proposed project is not expected to significantly contribute to risk of upset conditions on a cumulative basis based on similarity to OPSR-A analysis. Risks associated with the cable installation and retrieval operation in conjunction with ongoing SYU operations are described in Section 1.16.2. There are no other significant offshore operations expected to take place during the cable retrieval and installation operations in this area.

1.17 Historic Resources

1.17.1 Environmental and Regulatory Setting:

Two historic structures are located near the mouth of Corral Canyon north of U.S. Highway 101 (Exxon EIR, 83-EIR-22). The structures are believed to have been built in the 1870s by Bruno Orella, a local cattle rancher (Heff, 1983). Both buildings are listed in the California Inventory of Historic Resources and are considered historically significant. One of the structures was reconstructed prior to construction of the original Exxon project. The adobes were rehabilitated and given landmark status by Resolution 94-436 adopted by the Board of Supervisors in August 1993 as mitigation for original construction of the Exxon project.

1.17.2 Project Impact Assessment

Onshore: Excavation work would be located approximately ½-mile south of the Orella Adobes and therefore there would be no foreseeable impacts from the proposed project. The applicant does not propose to use the structures for offices or any other function associated with the project.

Offshore: Not applicable.

1.17.3 Mitigation Measures

No mitigation would be required and no residual impacts would result from the proposed project.

1.17.4 Cumulative Impacts

There would be no cumulative impacts associated with the proposed project.

1.18 Land Use

1.18.1 Environmental and Regulatory Setting

The onshore and coastal land use plans/policies that govern the SYU project are contained within the California Coastal Act, Santa Barbara County Comprehensive Plan and implementing Article III Zoning Ordinance and the Local Coastal Plan and implementing Article II Coastal Zoning Ordinance. While the majority of ExxonMobil's onshore processing facilities are located on the inland side of the coastal zone boundary, the onshore portion of the proposed project lies within the coastal zone.

The CCC concurred with the consistency certification made by ExxonMobil for the offshore portion of the original project. The CCC found that while the proposed development adversely affected the coastal zone, it met the policies of the California Coastal Management Plan and was therefore found to be generally consistent with the CCMP and the policy requirements of Chapter 3 of the Coastal Act.

Onshore: The Las Flores Canyon property is a parcel comprised of approximately 1500 acres owned by ExxonMobil. Thirty four acres are developed with the ExxonMobil and former Pacific Offshore Pipeline Company (POPCO) oil and gas processing facilities. The surrounding parcel is zoned AG-II-100, Agriculture, 100-acre minimum parcel size and both facilities are located on property zoned M-CR, Coastal-Related Industry. The Comprehensive Plan land use designation is

AG-II-100, 100-acre minimum parcel size with a Petroleum Resource Industry Overlay. Historic land use was agricultural and oil and gas development.

The project site is located within the South Coast Consolidation Planning Area and is one of two designated consolidated oil and gas processing sites on the Santa Barbara County South Coast (Exxon Final EIR/S, 83-EIR-22). Continued oil and gas processing is allowed, and any new processing would be encouraged to occur, in Las Flores Canyon.

The County is finalizing Oil and Gas Abandonment Policies that would put into effect standards for on and offshore decommissioning and abandonment of oil and gas processing facilities in Santa Barbara County. While there are no officially adopted County policies to-date, the practice has been to require removal of abandoned structures located in dynamic environments, especially stream crossings, surf zone areas, etc. unless there are significant and compelling environmental reasons to allow them to remain.

Offshore: The existing pipelines and cables are located within a State Lands lease to the OCS boundary (3 nautical miles offshore). The pipelines and cables continue into OCS waters under existing OCS oil and gas leases with the BSEE (formerly MMS). The California Coastal Commission issued a permit for the onshore and State Waters portion of the original project and has consistency review authority over federal action(s) taken on the project under the Coastal Act. The CCC found the original project consistent with the California Coastal Act as part of the State's obligation to determine federal consistency with projects located in federal jurisdiction that may affect state waters.

Condition #3 of the applicant's CCC permit addresses the abandonment of project facilities as follows:

> *Prior to termination of the operation of any of the facilities authorized by this permit, Exxon shall apply for a coastal permit for the abandonment of the subject facilities. A permit application for facility abandonment shall include plans for site restoration.*

ExxonMobil proposes to meet this condition by submitting a plan for retrieval of the out-of-service cables from the nearshore area to just beyond the State-Federal Boundary as part of this project with the remaining cables removed at the end of the SYU project life.

1.18.2 Project Impact Assessment

A project could be expected to have the potential for significant land use impacts if it conflicts with existing regulations, policies or requirements or if the proposed project introduces structures incompatible with surrounding land uses.

Onshore: As currently proposed, the project would not introduce any land uses incompatible with existing land uses nor would it involve the installation of any incompatible structures. The proposed project involves the retrieval and replacement of the out-of-service power cables and the installation of a fiber optic cable to the facilities located at the upper canyon facilities. The power cables would be installed in the same conduit as the out-of-service cables. The fiber optic cable would be installed within existing or new facilities; no significant structural modifications would be required. The proposed project is consistent with all local land use plans, policies and existing project conditions.

Offshore: The proposed project would not result in incompatible land uses beyond those evaluated in the original project EIR (SAIC, 1984) for installation and operation of all the SYU facilities (platforms, pipelines and power cables). Potential conflicts with fishing activities – commercial and sport – were addressed in previous environmental analyses as discussed in Section 1.6 (Commercial Fishing) of this document.

As proposed, the project would not result in conflicts with existing land use regulations, policies or requirements currently in place. The project would result in the installation of two approximately 5 mile lengths of armored cables in state waters within the existing pipeline/power cable corridor leased from the State Lands Commission. An equal amount of cables (out-of-service Cables A or B and C1) would be retrieved from state waters.

In federal waters, approximately 19 miles (31 km) of replacement cable would be installed (Cables A2 (or B2), and F2 from shore to Platform Harmony and G2 from Platforms Harmony to Platform Heritage) and 11 to 16 miles (18-26 km) of power cable (out-of-service Cable A and C1) would remain on the OCS sea floor until the end of the SYU project life. The portion of the replacement cable on the OCS would be installed within the identified surveyed corridors (reference OPSRB Project Description). With the installation of the three replacement cables and without removal of the OCS portion of the out-of-service cables, the project would result in an increase of approximately 0.1-0.2 acres of oil and gas infrastructure on the seafloor until the end of the life of SYU operations.

As discussed in the OPSRB Project Description, all of the remaining sections of the out-of-service Cables C1 and A (or B) in the OCS would be removed consistent with a plan which calls for removal of the these cable simultaneous with the removal of other facilities at the end of SYU project life. Further, ExxonMobil agrees to accept a condition on the OPSRB Project that specifically requires removal of the cables at the end of the SYU project life. The applicant's plan is consistent with its contractual OCS lease instruments with BSEE (formerly MMS) and OCS oil and gas regulations which require that, within one year of the termination of a lease in whole or in part, ExxonMobil must remove all structures, machinery, equipment, tools, and materials from the lease. The requirement to remove all structures and other facilities is the joint and several responsibility of all leases and owners of operating rights under the lease at the time the obligation accrues, and each future lessee or owner of operating rights, until the obligation is satisfied. Thus, if ExxonMobil should decide to sell its interests in SYU before the end of the SYU project life, it would retain full responsibility for removing all structures and facilities should a future lessee not be able to meet its obligations.

To further ensure compliance with OCS lease terms and conditions, BSEE (formerly MMS) uses various financial security instruments (bonds) to ensure compliance with lease and regulatory requirements. The BSEE requires OCS operators to provide a General Lease Surety Bond before it would issue a lease or approve a lease assignment or an operational activity plan. General Surety Bond levels are set at the following levels based on the level of lease activity: \$50,000 (no development), \$200,000 (exploration) and \$500,000 (development and producing) and Areawide Bonds of \$300,000, \$1,000,000, and \$3,000,000. ExxonMobil has a \$3,000,000 Areawide Bond for its SYU OCS operations. The BSEE can also require operators to obtain supplemental bonds to insure financial capability to meet the decommissioning and site clearance obligations. If an operator defaults on its decommissioning and site clearance obligations and the existing bond is insufficient to meet remaining its obligations, BSEE can require the previous lessees to cover any decommissioning or site clearance obligations they were responsible for creating.

The proposed deferral of removal of the out-of-service cables in OCS waters differs from the Rigs to Reefs approach in that the applicant does not propose to abandonment the cable in-place past the end of the project life. As stated above, the applicant has agreed to accept a permit condition that requires removal of the remaining out-of-service cables as well as the replacement cables at the end of the SYU project life. It has been the position of the CCC that offshore structures should be promptly removed when no longer in use. The CCC will review this project to determine its consistency with the California Coastal Act.

1.18.3 Mitigation Measures

The following measure is recommended to ensure consistency with land use policies and potential impacts on a project-specific basis:

LUS-1: The applicant shall remove replacement power cables as well as the remaining out-of-service cables in their entirety at the end of the SYU project life. Application for removal shall be submitted to appropriate federal, state, and local agencies within one year of ceased production unless an extension is granted. Full cable removal shall occur within one year of obtaining discretionary permits unless an extension is granted.
Expected Enforcement Agency: BSEE, SLC, CCC, SBC.

Residual impacts would be expected to be less than significant.

1.18.4 Cumulative Analysis

As stated above, the proposed project complies with existing land use regulations and policies. Allowing the out-of-service cables (in OCS waters) to remain in place until the end of the life of the project would add to the total oil and gas-related structures in the Santa Barbara Channel. However, given that these cables are located in the same general area and would be removed along with the existing pipelines and power cables associated with the SYU project at the end of the SYU project life, it would not be considered a significant impact. Existing BSEE regulations could be invoked to require removal of all or portions of the cables in the future if it should conflict with other users of the OCS. Further, a condition of project approval would mandate that the cables be removed in a timely manner at the end of project life.

1.19 Noise

1.19.1 Environmental and Regulatory Setting

Onshore: Current noise in the project area is generated from traffic on U.S. Highway 101 and Calle Real, ranching operations and the ExxonMobil and former POPCO facilities. Sensitive receptors in the general vicinity of the project site are rural residences and recreationalists enjoying Refugio and El Capitan State Beach Parks. The project site is located in an agriculturally and recreationally zoned area with few residences. The closest residence is located approximately one mile southwest of the project site.

The final SEIR (83-EIR-22) prepared for the ExxonMobil SYU project identified short and long term noise impacts ranging from Class I to Class III. A Baseline Noise Survey and Noise Monitoring and Control Plan were prepared in 1987 for the project. Primary sources of noise were identified from construction, highway and railroad traffic, plant operation, crew and supply boats, helicopters and offshore facilities. Impacts were mitigated through the following measures: penalties for unnecessary helicopter noise exposure; restrictions on the hours and travel routes of operation of crew and supply boats; strict adherence to daytime construction hours; and monitoring and reporting of noise levels along property boundaries.

Noise complaints were filed with the county from residents of adjacent canyons. The applicant implemented the LFC Integrated Noise Monitoring and Control Plan in 1997 to mitigate impacts associated with facility noise related to construction and ongoing operations. Equipment modifications were implemented between 1997 and 1998 to address the complaints. In 2001, ExxonMobil requested that the annual noise monitoring requirement be suspended as the compliance goals set forth in the LFC Integrated Noise Monitoring and Control Plan had been met since the implementation of the plan. Further, no noise complaints for operational or construction activities had been received over the last few years. Based on the record of compliance and no complaints, Santa Barbara County suspended the requirement for annual surveys with the understanding that the requirement may be reinstated at any time if any noise complaints are received.

Offshore: As stated above, the Final SEIR (83-EIR-22) identified construction-related noise from crew and supply boats, helicopters and offshore facilities as a Class I impact. Noise generated by crew and supply boats was determined to have a potentially significant but mitigable (Class II) impact on coastal residents. Noise generated by offshore oil activities and the potential impact on the California gray whale was a controversial aspect discussed in the original project EIR. The impacts from the original project were considered insignificant, however, the cumulative impact of noise from all such oil and gas-related projects was considered potentially significant. Changes in migration patterns of the California gray whale were determined to be a potential result of oil and gas production-related noise. However, subsequent studies performed during construction operations concluded that project-related construction did not affect migratory patterns. The proposed project is not anticipated to cause significant impacts on gray whales or other marine mammals. Please see Section 1.7, Marine Mammals, for further discussion of noise impacts related to marine mammals.

1.19.2 Project Impact Assessment

Magnitude of sound involves determining three variables: magnitude, frequency and duration. A proposed project would be considered to have a significant impact on the public if it generated noise levels in excess of 65 dBA and could affect sensitive receptors or outdoor living areas. In addition, noise from grading and construction activity proposed within 1600 feet of sensitive receptors, including schools, residential development, commercial lodging facilities, hospitals or care facilities, would generally result in a potentially significant impact. Significance criteria for offshore work and potential impacts to marine mammals are discussed in the Marine Mammal section.

Onshore: Short term noise impacts would be generated from construction-related activities, including excavation in the lower canyon and work in the tunnel. In addition, while not anticipated to be significant or of lasting duration, access needed to the south end of the tunnel would be on a public bike path. Typical construction equipment noise levels would be expected to be approximately 65 dBA at 1600 feet, thereby only impacting receptors within this range. No sensitive receptors are located within 1600 feet of the project site. El Capitan State Beach and campground is located to the south of the project site and residences are located in adjacent canyons. However, these facilities are all located more than 1600 feet from any construction activity. There would be no long or short-term exposure of people to noise levels exceeding County thresholds; however, campers at El Capitan could consider construction noise at night a nuisance. Long-term ambient noise levels would not change as a result of the proposed project.

Onshore construction activities are expected to occur during daylight hours each day with periods where operations would occur 24 hours a day (cable removal and installation in tunnel). The oil and gas facilities operate continuously, although they are located more remotely, over one mile north of the project site. The duration of the impacts would be expected to last ,at least some of the time, during the duration of the onshore activities, approximately 7-10 months.

Offshore: Due to the limited time that offshore vessels would be near shore, no onshore noise impacts from offshore sources would be anticipated. Please refer to the Marine Mammals section for a discussion of potential noise impacts to marine mammals.

1.19.3 Mitigation Measures

Existing agency permit conditions in place for the SYU facility are adequate to ensure noise impacts associated with the project remain insignificant. No additional mitigation measures are recommended for onshore noise impacts.

Please refer to the Marine Mammal section for a discussion of recommended mitigation measures for offshore noise impacts as they relate to marine mammals.

1.19.4 Cumulative Impacts

The proposed project would temporarily exacerbate cumulative noise impacts, however, such impacts are temporary in nature would be considered insignificant.

1.20 Public Facilities

1.20.1 Environmental and Regulatory Setting

This section focuses on solid waste disposal as the only public facility that could potentially be impacted by the proposed project is landfill capacity and/or that of a recycling center(s).

Demand for public facilities was reviewed extensively in previous environmental documents prepared for the SYU onshore and offshore facilities (FEIR and SEIR, 83-EIR-22). Demands for wastewater treatment and solid waste disposal were anticipated to increase as a result of the original project; however, the impact was ultimately determined to be adverse but not significant.

The closest landfill to the project site is Tajiguas Landfill located along the Gaviota coast in Santa Barbara County. ExxonMobil routinely uses the privately-owned and operated Buttonwillow Landfill in Kern County to dispose of its SYU non-hazardous wastes.

1.20.2 Project Impact Assessment

A project is considered to have a significant impact on public facilities if it would generate such substantial amount of waste as to exceed established national standards or thresholds for waste generation or exceed existing landfill capacity. The County of Santa Barbara Solid Waste Thresholds includes information provided through the adopted Source Reduction and Recycling Element (County of Santa Barbara, 1996). A project is considered to result in significant impacts to landfill capacity if it would generate 196 tons per year of solid waste. The County Thresholds also mandate consideration of recycling efforts when evaluating waste impacts from new projects in the county. Kern County has no established waste disposal thresholds of significance (personal Communication, D. Ferguson, Kern County Waste Management Department, July 2002).

The primary source of solid waste generated from the proposed project would be from recycling of the retrieved cables from shore to the shelf break (approximately 10 miles or 16 km) and adjacent to Platform Harmony and Heritage (approximately 2-8 miles or 12-13 km). Private recycling facilities have been identified that would recover all usable components and send the remaining waste material to an approved disposal facility. At this time there is not an accurate estimate of the amount of material that would be sent to a disposal site.

With the exception of the waste components remaining from the recycling of the out-of-service cables, waste generated during construction would not be anticipated to be different from or significantly more than current operational wastes.

Currently there are 60 miles of subsea power cable associated with the SYU project. The proposed project would result in a net increase of about 11-17 miles of cable (29 miles for replacement Cables A2 (or B2), F2 and G2; 12-18 miles of out-of-service Cable A (or B) and C1 removed). The proposed project would therefore increase the amount of power cable ultimately requiring removal and landfilling or recycling by 18-28%. This could present a potentially significant impact; however the options for recycling and disposal would be fully evaluated at the end of the SYU project life.

Consistent with County policies and practice, the County of Santa Barbara is expected to request that the applicant recycle the retrieved cable to the extent feasible. ExxonMobil has required the bidders to evaluate this option. At this time several private recycle companies in the area have indicated that they have the equipment to recycle the out-of-service cables. ExxonMobil will require the successful bidder to send the out-of-service retrieved cable to one of the recycle companies.

1.20.3 Mitigation Measures

The following mitigation measure is recommended to mitigate impacts to the maximum extent feasible:

PUB-1: Require contractor to recycle the out-of-service cables to the extent feasible. Contractor to conduct tests of cable recycling at selected recycle company and determine any conditions and/or limitations to recycling.
Expected Enforcement Agency: SBC.

PUB-2: ExxonMobil shall submit a Recycling Feasibility Analysis for agency review and approval for the replacemently installed cable in state waters and onshore as part of its facility-wide abandonment application at the end of the SYU life.
Expected Enforcement Agency: SLC, SBC.

Residual impacts would be expected to be insignificant.

1.20.4 Cumulative Analysis

The proposed project would add a net 11-17 miles (18-27 km) of power cable to the approximately 60 miles (96 km) of existing cable offshore which would ultimately need to be properly removed and disposed of at the end of the project life. The cumulative impacts associated with the proposed project involve the capacity of local companies to recycle the retrieved cable. Recycling of unused equipment would be an even greater concern at the end of the SYU project life when tens of miles of pipelines, power cables, as well as other equipment from platforms and the onshore plant will need to be removed. As indicated above, recycling of the retrieved appears to be feasible with local companies. On a cumulative basis, the project's contribution of up to 17 miles (27 km) of cable is not considered a significant impact compared to other oil and gas infrastructure present on the Santa Barbara Channel seafloor that will need to be removed at some point in the future.

1.21 Recreation

1.21.1 Environmental and Regulatory Setting

Construction of the original SYU project led to a finding of Class I (adverse and unavoidable) and Class II (adverse but mitigable) socioeconomic impacts. These findings were in part due to the closure and potential damage to the coastal bikeway during project construction (Santa Barbara County *Findings of Approval*, September 15, 1987). As mitigation, Santa Barbara County permit condition (IV.e.7) required that ExxonMobil reconstruct a total of 1.6 miles of coastal bikeway after the completion of nearshore SYU construction (1990) and abandonment of the El Capitan Marine Terminal facilities (1991). In 1993, Santa Barbara County Parks and Recreation Department indicated that ExxonMobil had satisfied this condition (letter to Santa Barbara County Planning and Development from Santa Barbara County Parks and Recreation Department, April 23, 1993).

In addition, Class II recreational impacts were identified in the original project EIR (83-EIR-22) (overcrowding of campgrounds by temporary workers) and were fully mitigated. Class III impacts were identified in relation to potential impacts to recreational fishing. These impacts were determined to be insignificant.

1.21.2 Project Impact Assessment

A project would be determined to have the potential for significant impacts to recreation if it could have a substantial impact on the quality or quantity of existing recreational opportunities, conflict with established recreational uses of an area or conflict with biking, hiking or equestrian trails on a long-term basis.

The majority of the onshore work is located on private property zoned M-CR, coastal-related industry and would therefore not impact adjacent recreational areas (El Capitan State Beach and campground). Onshore work off of private property would be limited to accessing the tunnel via a manhole on the south side of US Highway 101. Access to the manhole would be by way of the county bike path, which runs along the bluff above the beach. Based on the current estimates, the tunnel manhole would be open for approximately 20-25 days. Equipment to be brought along the bike path would include an ATV, generator, air blower, safety equipment and proofing equipment. There is an existing vehicle turn around area at the southern tunnel access point; therefore, none of the necessary equipment and vehicles needed to access the manhole would block the bike path.

It is anticipated that a State Parks Temporary Use Permit (TUP) would be required to utilize the bike path. Impacts would be expected to be greater if the project is conducted during summer months, when there is significantly more recreational traffic along the bike path, however, with mitigation, the impacts are not expected to be significant. Currently the bike path is closed from just east of the manhole on the south side of the tunnel to El Capitan State Beach.

The offshore portion of the project has the potential to temporarily impact recreational boating activities as well as temporarily impacting the quality of existing recreational activities (El Capitan State Beach) due to the presence of increased construction and supply vessels. Nearshore work would require several months to complete. Based on the temporary nature of the project, impacts would not be considered significant.

1.21.3 Mitigation Measures

The following mitigation measures are recommended to mitigate impacts to recreational resources to the maximum extent feasible:

REC-1: The applicant shall obtain and comply with all conditions of approval set forth in its State Parks TUP. The permit shall be obtained and a copy submitted to the County of Santa Barbara Planning & Development prior to onshore construction work.
Expected Enforcement Agency: State Parks, SBC.

REC-2: During any time that the south tunnel access manhole is open, safety barriers shall be erected in the immediate area to ensure public safety. In addition, speed limits for vehicle traffic along the bike path shall be adhered to pursuant to State Parks rules implemented for public safety. The County EQAP monitor shall verify compliance in the field.
Expected Enforcement Agency: State Parks, SBC.

REC-3: In order to ensure public safety, signs shall be posted alerting cyclists and pedestrians to project-related work being conducted along the bike path when access to the tunnel is required. Notices shall be posted at least 24 hours prior to any vehicle access. The County EQAP monitor shall verify compliance in the field.
Expected Enforcement Agency: State Parks, SBC.

REC-4: The applicant shall submit photo-documentation of the physical condition of the bike path at the work area before and after access to the south manhole tunnel. ExxonMobil shall be responsible for any maintenance or repair work necessary, if there is evidence of damage during construction. The applicant shall coordinate with El Capitan and Refugio State Parks for pre and post-construction inspections.
Expected Enforcement Agency: State Parks, SBC.

Residual impacts would be expected to be insignificant.

1.21.4 Cumulative Impacts

Impacts from the proposed project would be temporary and localized. While there may be other projects along the Gaviota coast that would occur contemporaneously, impacts associated with this project would not substantially contribute to adverse impacts to recreational resources.

1.22 Transportation/Circulation

1.22.1 Environmental and Regulatory Setting

Access to the project site and the main roadways in the vicinity include US Highway 101 and Calle Real. Highway 101 handles most traffic to and from the site, Calle Real, a frontage road, is used to access the facility within several miles east and west of the site. The applicant has an agreement with the County of Santa Barbara to upgrade Calle Real to meet current design specifications regarding roadway safety.

As identified in the project EIR (83-EIR-22), transportation impacts were identified related to parking during peak construction periods. Mitigation resulting from this impact was the Parking and Transportation Plan (1987 and Revised TSMP, 1990), which identified appropriate ridesharing and/or shuttle services for offsite parking. The TSMP also included development of a new parking lot (referred to as the Goleta Parking Lot) at the West End of Hollister Avenue in Goleta. The Goleta lot was intended to supplement an existing lot to accommodate both onshore and offshore workers during peak construction periods. The Goleta Parking Lot required a separate County Final Development Plan (88-FDP-017) and preparation of a Supplemental EIR (89-SD-01). Additional mitigation was developed during the Planning Commission's review of the parking lot, including the revised TSMP to reduce traffic and associate short term air quality impacts. After use during project construction, ExxonMobil relinquished its lease on the Goleta Parking Lot in 1999.

1.22.2 Project Impact Assessment

A project will ordinarily have a significant effect on transportation/circulation if it will cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system. The need for private or public road maintenance or the need for new roads would also cause a potentially significant effect on the environment. In addition, effects on existing parking facilities or the demand for new parking could result in a potentially significant impact.

The largest traffic-related impacts of oil-related projects are due to the temporary effects of construction, start up and drilling compared with long term impacts associated with operations (83-EIR-22). The onshore construction workforce would average 10-20 additional workers (round trips) per day during average construction periods. The peak increase would be approximately 25 additional workers per day. During onshore work, trucks delivering materials and equipment and removing construction debris and equipment would be expected to generate an additional 0 to 5 truck trips per day over current levels. These numbers are well below those evaluated and mitigated for during original SYU project construction. The increase would be temporary and there would be no permanent increase in employees working onsite or truck trips. The additional traffic on Highway 101 and Calle Real would not be considered significant.

The proposed project would not result in the need for private or public road maintenance or construction nor would the proposed project affect existing parking facilities or create the demand for new facilities. As previously mentioned, the existing roadways are adequate for the temporary increase in vehicular traffic and parking for onshore and offshore work could be adequately handled through existing parking facilities. No transit systems (including rail) would be impacted as a result of the proposed project as no public roadways would be closed.

Temporary impacts to waterborne traffic may be expected as vessels may be required to modify routes to accommodate project construction vessels. No increase in helicopter trips would be anticipated. However, these impacts would be considered temporary and insignificant.

During work necessary to access the manhole tunnel on the south side of US Highway 101, small recreation vehicles would need to travel on a county bike path. This is not expected to limit recreational access or travel along the bike path (see Recreation section). However, impacts to the bikeway could occur, as they did during project construction in 1993. As discussed in Section 1.22, this was mitigated through a condition requiring that ExxonMobil fund and repair any damage caused to the bikeway from construction-related activities. A similar requirement for this project would ensure no permanent damage to the bikeway (See Mitigation Measure REC-4).

1.22.3 Mitigation Measures

The project would not result in any significant impacts to traffic or circulation. No mitigation measures are required.

1.22.4 Cumulative Analysis

Impacts from the proposed project would be temporary and localized. There are no other significant projects anticipated to overlap in timing. There is currently ample capacity on Calle Real and Highway 101 in this area to handle truck and construction worker traffic for anticipated activities. The proposed project would not substantially contribute to cumulative adverse impacts on transportation or circulation.

1.23 Water Quality

1.23.1 Environmental and Regulatory Setting

Onshore: The onshore portion of the project would be located within the developed portion of the existing facilities in the lower Las Flores Canyon area. The nearest water body to the onshore portion of the proposed project is Corral Creek, located approximately 500 feet west of the existing pipeline/cable right of way and proposed construction area. Water quality in the creek is monitored regularly by ExxonMobil in accordance with their RWQCB-required Storm Water Pollution

Prevention Plan (SWPPP) and Santa Barbara County-required Surface Water Quality Monitoring Program.

Water used at the facility is obtained from onsite groundwater wells (83-EIR-22); no additional water usage would be required for operation of the installed facilities. Temporary water use will be required for dust control at the onshore construction site.

Offshore: Marine water quality in the project area has been fully described in Dames and Moore (1982); SAI (1984); ADL (1984); Chambers Group (1987a, b), and MMS (2001). The commonly measured chemical oceanographic parameters and their ranges are given in Table WQ.1.

Three agencies provide regulations for water quality issues: the U.S. Environmental Protection Agency (EPA), the U.S. Coast Guard (USCG) and the California State Central Coast Regional Water Quality Control Board (CCRWQCB). The EPA, through the Clean Water Act (as amended), resulting in the National Pollutant Elimination Discharge System (NPDES) regulations, sets limits on specific discharges.

The USCG vessel regulations, via the Federal Water Pollution Control Act, ensure that vessel effluents such as sewage and cooling water do not leave a sheen or other foreign material on navigable waters.

Table WQ-1: Key Water Quality Parameters Typical Units of Measure and Characteristics

Parameter (Units)	Characteristics
Temperature (°C)	Ocean surface temperatures minimums of 12-13 °C in April and maximums of 15-19 °C in July-October
Salinity (°/oo – parts per thousand)	33.2-34.3 °/oo
Dissolved oxygen (DO) (mg/L or ml/L)	5-6 ml/l at the surface, decreasing with depth to about 2 ml/l near 200 m to as low as 1 ml/l below 350 m.
pH (unitless)	7.8 to 8.1.
Nutrients (µg-atoms/l)	Nutrients and micronutrients include nitrogen, phosphorus, and silicon iron (Fe), manganese (Mn), Zn, Cu, cobalt (Co), molybdenum (Mo), vanadium (V), vitamin B12, thiamin and biotin. Concentrations show depletion near the surface, increasing with depth.
Turbidity (mg/L)	Concentrations average near 1 mg/L, but range from 0.93 – 1.5 mg/L in the nearshore, surface waters (BLM, 1978). Levels near the sea floor average 0.4 mg/L and range from 0.1 to 1.4 mg/L; offshore regions average 0.15 mg/L and range from 0.07 – 0.32 mg/L. Periods of highest turbidity correspond to periods of highest upwelling, highest primary production, river runoff, and nearshore current and wave action.
Organic materials (µg/l)	Naturally-occurring organic materials include a variety of molecules ranging from hydrocarbons to biogenic-based substances.

Sources: Dames and Moore (1982); SAI (1984); ADL (1984); Chambers Group (1987a, b).

Sources of marine pollution in the Santa Barbara Channel include publicly owned treatment works (municipal sewage), power plant discharges, and river runoff (MMS, 2001). Very few industrial or power plant outfalls exist in the area.

The nearest municipal discharge to the proposed project area is from the Goleta Municipal Wastewater Treatment Plant. This plant collects and treats wastewater from the cities of Goleta, Santa Barbara, and other outlying communities. The municipality discharges over 5 million gallons per day of wastewater at a mixed primary/secondary level of treatment (Table WQ-2). Specific components (concentrations and mass emissions of metals, hydrocarbons, synthetic organics, etc.) of this and other Santa Barbara Channel outfalls are found in publications by the Southern California Coastal Water Research Project (SCCWRP), in particular see SCCWRP (1996).

Table WQ-2: Publicly-owned Treatment Works Discharging into Santa Barbara Channel

POTW Name	Level of Treatment	Volume (millions gallon/day)	Distance from Project Area (miles)
Goleta	Primary/Secondary	5	1
Santa Barbara	Secondary	8	22
Montecito	Secondary	1	29
Summerland	Tertiary	0.2	30
Carpinteria	Secondary	2	32
Oxnard	Secondary	25	51

Source: SCCWRP (2008 Report for 2005 data)

River runoff could contribute various natural and man-made pollutants ranging from suspended sediments to pesticides. River runoff is difficult to quantify and is seasonally variable. Nevertheless, material from the Santa Ynez River sometimes flows eastward around Point Conception and provides sediment to the project area, particularly during periods of high flow. In addition, the numerous small, intermittent creeks which drain into coastal waters near the SYU area, may also provide a sizeable amount of sediment during periods of high flow (pers. comm. Jon Warrick, August, 2002).

1.23.2 Project Impact Assessment

Onshore: The replacement of the out-of-service cables onshore in the lower canyon would not alter the movement of water in fresh water stream or drainages. All construction activities would occur in the lower canyon parking area, a dirt lot, and would not impact percolation rates, drainage patterns or the rate and amount of surface water runoff. No impacts, including drainage into or out of surface waters (i.e., Corral Creek) would be anticipated as construction activities would be limited in scope and duration and located well outside the 100-foot buffer zone. However, a site-specific Stormwater Pollution Prevention Plan has been prepared for use during construction work. The plan is designed to control erosion from the construction area that could conceivably reach Corral Creek and cause a temporary increase in sediment loading. As discussed in Section 1.4 (Onshore Biological Resources), the creek provides habitat for several protected species. In this instance, erosion control measures should be employed to avoid temporary degradation of water quality in the creek.

Offshore: The impact analysis for water quality in this document adopts the following significance criteria:

- An impact from the proposed project is considered to be significant if it causes in an unreasonable degradation to water quality as measured by contributions to changes in standard, measurable parameters (see Table WQ-1 for water quality parameters);
- Persistent and not reversed by natural dispersive processes within a few days;
- Extend beyond the project area; or
- Cause physiochemical changes that impact the marine ecosystem.

The term "unreasonable degradation" follows EPA's regulations at 40 CFR 125.121(e)(1-3): (1) Significant adverse changes in ecosystem diversity, productivity and stability of the biological community within the area of discharge and surrounding biological communities; (2) Threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms; (3) Loss of esthetic, recreational, scientific or economic values which is unreasonable in relation to the benefit derived from the discharge.

State of California Ocean Plan Water Quality Standards requirements (California State Water Resources Control Board, 2001) are substantively included in this significance criteria. Applicable requirements include physical, chemical and biological characteristics which prohibit such things as discoloration of the ocean surface, reduction of natural light, increases in the deposition of inert solids which result in changes in biological communities, changes in dissolved oxygen and pH, and degradation of marine communities.

Cable Retrieval and Installation Impacts:
As described in the OPSRB Project Description, the project would involve the removal of approximately 12-18 miles (19-29 km) of out-of-service power cable and the installation of 29 miles (47 km) of replacement cable in the general vicinity of the existing SYU facilities. This section analyses impacts to water quality that would be expected to occur as a result of cable retrieval and installation activities. Impacts that would occur from installation of the replacement cables (A2 (or B2), F2 and G2) and the retrieval of the out-of-service cables as well as the removal of all remaining cables at the end of SYU life are analyzed in the following section. Impacts to water quality could also occur from the anchoring of support vessels. The location and timeframe, the type of activity, and the estimated amounts and type of sediment that could be resuspended are estimated in Table WQ-3.

The major sources of impacts to water quality from the project during conduit excavation, and cable retrieval and installation would be:

- Water jetting to expose the ends of the conduit and the cables at the POPCO crossing nearshore and the locations where the cables would be cut and removed offshore;
- Flushing and pigging, if necessary, of the conduits and J-tubes;
- Anchoring of support vessels;
- Removal and cleaning of short segments of cable in conduits in preparation for installation of the replacement cables;
- Installation of the replacement power cables;
- Retrieval of the out-of-service cables from nearshore to the State-Federal Boundary;

- Retrieval of the out-of-service cables adjacent to the platforms.

Water jetting: The applicant proposes to use water jetting to expose the nearshore conduits, approximately 50 feet of cable offshore of the conduits, and the cables at the POPCO crossing. Diver-supported water jets would be used to clear sediment from above and around the end of the conduits and for a distance along the cable route to allow working room. The cables are expected to be buried at the conduit terminus, offshore of the conduits, the POPCO crossing and possibly at the offshore locations where the out-of-service cables will be cut. In addition, the out-of-service cables are partially buried along the route from the shelf break to the conduit terminus. The amounts of sediment which could be suspended in the area of the conduits are estimated to range from 10- to 20 cubic yards (yd^3) depending on buried depth and 1-5 cubic yards at the POPCO crossing. The sediment in this area is sand-sized. In these areas, divers would sidecast the sediment into an adjacent sand channel. Jetting activities would raise this sandy particulate into the water column, but since sand is relatively heavy, it would sink to the sea floor within a few feet from the point of disturbance. In addition, a Sampling and Analysis Plan will be utilized to sample and measure the chemical composition of the sediment in these areas before removal to verify that there are no harmful substances present.

Further offshore, near the shelf break and the platforms, sediments are characterized by finer silt-sized particles with some clay. Most of this clayey silt would be settle within a few tens of feet of the point of disturbance, while the remainder would disperse with the ambient currents. In order to cut the cables prior to retrieval, the ROV would need to clear the area around the cable to allow access for the cutting tool. An estimated less than one cubic yard would be expected to be disturbed at each of the four locations (two at shelf break, one at Platform Harmony and one at Platform Heritage). The sediment would be expected to settle relatively quickly and not degrade water quality.

Flushing and Pigging: Prior to the installation of the replacement cables, the nearshore conduits and the possibly the existing J-tubes that are to be reused may need to be flushed and pigged to remove sediment or other material that could impede the insertion of the replacement cable. It is anticipated that <1 cubic yard of sediment would be displaced from inside each conduit and J-tube to outside and be dissipated by the local currents. Other material inside the conduits and J-tubes might include minor amounts of rust and some organic material. This would also be dissipated by the local currents and not degrade the water quality.

Anchoring: Anchoring by dive-support vessels would also slightly contribute to increased turbidity. At all locations where anchoring is necessary, <1 cubic yard would be resuspended when anchors are placed onto the sea floor and when the anchors are raised. Negligible impacts to water quality would occur due to anchoring activities.

The applicant will use a dynamically positioned (DP) vessel to install and retrieve the power cables; as such, no anchoring will be required. A dive support vessel will be required to be anchored in one or more locations near the conduit terminus and the POPCO crossing.

Cutting, Retrieval and Cleaning of Portions of Out-of-Service Cables Adjacent to Platforms as Part of the Installation Process: Approximately 1-6 miles of out-of-service Cable A (or B) would be removed at Platform Harmony and 1-2 miles of Cable C1 would be removed at

Platform Heritage. The cables are partially to completely buried adjacent to the platforms. This activity would result in the resuspension of approximately 40-180 cubic yards of clayey silt sediments in the immediate vicinity of the cable and is not expected degrade water quality.

Cleaning the cable of marine fouling organisms and sediment would be necessary before it is stored on the cable installation vessel. This process involves pulling the cut end of the cable to the surface, scrapping and water blasting it to remove any adhering sediment and marine growth, and winding it onto a reel for storage. Approximately 5-45 yd^3 of material would be removed from the cable during this part of the project. The cleaning process would result in a turbid cloud around and down current of the cable installation vessel and would be expected to dissipate within a short period of time.

Power Cable Installation: The installation of the replacement power cable from the nearshore conduit to Platform Harmony and from Platform Harmony to Platform Heritage would resuspend approximately 3yd^3 of sediment from the seafloor. Sediment characteristics would range from sandy in the nearshore area to silty sand on the outer shelf to clayey silt near the platforms. A negligible impact to water quality would occur from this phase of the project.

Cutting, Retrieval and Cleaning of the Out-of-Service Cables to the State-Federal Boundary: This portion of the project involves retrieval of the out-of-service power Cables A (or B) and C1 from the nearshore conduit to just beyond the State-Federal Boundary near the shelf break, a distance of approximately 5 miles (8 km) for each cable. Retrieval of the remaining portion of the power cables would be deferred until the SYU offshore facilities are decommissioned. Cable retrieval operations are expected to take 1-2 weeks.

Activities during this portion of the proposed project that could result in turbidity and impacts to water quality would be:

- Retrieval of the cables from the seafloor;
- Cleaning the exposed cables onboard the cable installation vessel; and
- Covering the remaining ocean bottom cable ends with a concrete mat at the shelf break and adjacent to the platforms.

Retrieval of the State Waters Cables from the Seafloor: About 200-250 yd^3 of sediment would be disturbed over a distance of 10 miles (16 km) as the out-of-service cables are cut and retrieved from the seafloor to the cable installation vessel. The cables are completely buried for approximately the first 2 miles (3.5 km) and embedded in the seafloor the remaining 3 miles (4.5 km), in water depths greater than approximately 200 feet (60 m). Most of the turbidity would occur close to the seafloor, particularly where the sediments are sandy. These would settle within a few feet of the point of disturbance. Further offshore, where the sediments are finer and the proportion of silt increases, the turbid cloud would stay in suspension longer and be dispersed by bottom currents. It is estimated that much of the disturbed sediment would settle to the bottom within a few tens of feet of the point of disturbance while the finer sediments would drift down-current, gradually dispersing. No significant impact to water quality would be anticipated from this turbidity.

Some sediment would adhere to the cable on its way to the surface, leaving a gradually decreasing trail of sediment in the water column. Most of the disturbed sediment would remain close to the sea floor, settling out relatively quickly, as discussed above, while the remainder would be dissipated by the currents throughout the water column. Impacts to the water quality would be negligible.

Cleaning of the State Waters Cables: Once onboard the cable installation vessel, scrapping and water blasting would be used to clean the cable of any remaining sediment and marine organisms that are still adhering to the cable. Approximately 50-60 yd^3 of material would be removed from the cables and onto the sea surface, generating a continuous cloud of turbidity below and around the vessel. However, while the clouds of sediment raised by these operations would be continuous while the activity is occurring, it would be spread over a wide area and be dissipated by local waves and currents. Thus, impacts to water quality would be negligible.

Covering the Ocean Bottom Cable Ends With Concrete mats: A very small amount of sediment would be released (about 2-4 yd^3) during the setting of concrete mats (total of 4) on top of the cut end of the out-of-service cables that will be left on the ocean bottom. Impacts to water quality would be negligible.

Cable Removal and Cleaning Impacts at the End of SYU Life: Estimates of the amounts of sediment disturbed from the removal of the replacement and out-of-service cables at the end of SYU life is difficult to determine, but is expected to be in the range of 300-400 yd^3.

Some sediment would adhere to the cable on its way to the surface, leaving a gradually decreasing trail of sediment in the water column. Impacts to the water quality would be negligible because most of the disturbed sediment would remain close to the sea floor, settling relatively quickly while the remainder will be dissipated by the currents throughout the water column.

Once onboard the cable installation vessel, scrapping and water blasting would be used to clean the cable of any remaining sediment and marine organisms that are still adhering to the cable. An estimated 250-275 yd^3 of material would be removed from the cables and onto the sea surface, generating a continuous cloud of turbidity below and around the cable lay vessel. Expected impacts would be the same as those described for the proposed project. However, while the clouds of sediment raised by these operations would be continuous while the activity is occurring, it would be spread over an estimated 60 miles (97 km) and be dissipated by local waves and currents. Thus, impacts to water quality would be negligible.

1.23.3 Mitigation Measures

WQ-1: If flushing of one of the reused J-tubes is required, provide results of samples taken of the seawater in the J-tubes to EPA and submit other information (such as volume, number of times to discharge, etc.) to EPA in order to receive permission to conduct flushing.
Expected Enforcement Agency: EPA, BSEE.

WQ-2: Work with the CCRWQCB by providing samples of the material within the conduit and, if required by the CCRWQCB, submit a Low Threat Permit in order to receive permission to conduct conduit flushing operations.
Expected Enforcement Agency: CCRWQCB, BSEE, SLC, SBC.

WQ-3: Utilize a site-specific Stormwater Pollution Prevention Plan for use during construction work. The plan has been designed to control erosion from the construction area that could conceivably reach Corral Creek and cause a temporary increase in sediment loading.
Expected Enforcement Agency: RWQCB, SBC.

In addition to these mitigation measures, please refer to the following mitigation measures from other resource sections: BE-1 and BE-2.

Residual impacts would be expected to be insignificant.

Conclusions – Proposed Project
According to the significance criteria established for this document, an impact to marine water quality is considered to be significant if changes in water quality parameters result in unreasonable degradation to the water quality. The only notable impacting agent is turbidity raised from various seafloor-associated activities. No significant impacts to water quality would be expected.

1.23.4 Cumulative Impacts

Onshore: The proposed project could result in temporary and localized impacts to onshore water resources. However, these impacts would be fully mitigated through proper erosion control measures. No other significant projects are expected to occur during the project that would exacerbate adverse impacts to water quality.

Offshore: The draft EIS for Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California (MMS, 2001) provides a detailed discussion of cumulative impacts on water quality offshore southern California. The EIS identifies ongoing and proposed oil and gas development and production projects in federal and state waters and various non-oil and gas activities including, municipal and industrial wastewater discharges, river runoff, and other nonpoint sources. While there are no major point-source discharges near the project area, the Santa Ynez River and the small creeks located along the local coastline do contribute nonpoint source material to the project area, especially during winter storms. The relatively small amount of turbidity produced by project activities would be effectively hidden in the large natural sedimentation signal contributed from these natural sources. In conclusion, no significant cumulative impacts to water quality would be expected to occur from the proposed project.

Table WQ-3: Activities from the Proposed Project that Could Result in Turbidity in the Water Column

(OPSRB impacts estimated from an analysis of OPSR-A impacts adjusted for amounts of cable retrieved and installed)

Location/Timeframe	Activity	Amount and Type of Sediment Resuspended*
Nearshore Pre- and Post-construction Biological Surveys	Anchoring of diver-support vessel (2-4 anchors up to 5,000 lb ea.)	<1 yd^3 – Sand
Retrieval and Installation of Cables at Nearshore Conduit Terminus	Exposure of the conduit terminus, approximately 50 feet of cable offshore of conduits and cables at POPCO crossing by water jetting (depends on depth)	10-20 and 1-5 yd^3 – Sand
	Diver-support vessel (4-6 anchors up to 10,000 lb ea.) Three separate events: • Inspection of conduit terminus • Conduit preparation, clearance and cable cutting • Cable retrieval and conduit pigging	4 yd^3 – Sand
	Water flushes of conduit (if necessary)	2 yd^3 – Sand
	Exposure by water jetting of cable segments to be cut and removed	10-20 yd^3 – Sand
	Cleaning of portion of cable removed from conduit; store on CIV	2 yd^3 – Sand
Installation of Cables from Nearshore to Platform Harmony and at Platform Harmony	Cable cutting, retrieval and cleaning of cable adjacent and in J-Tube (1-6 miles); Store on CIV	25-150 yd^3 – Silty/clay (Sediment and organic debris)
	Installation of the two replacement cable from LFC to Platforms Harmony	2 yd^3 – Silty/clay
	Water flushing (if necessary) and pigging J-Tube	<1 yd^3 – Silty/clay (Sediment and organic debris)
Installation of Cable from Platform Harmony to Heritage and at Platform Heritage	Cable cutting, retrieval and cleaning of cable adjacent to and in J-Tube (1-2 miles); Store on CIV	25-50 yd^3 – Silty/clay (Sediment and organic debris)
	Water flushing (if necessary) and pigging J-Tube	<1 yd^3 – Silty/clay (Sediment and organic debris)
	Installation of replacement cable from Platform Harmony to Platform Heritage	1 yd^3 – Silty/clay
		Installation Total: 850-260 yd^3
* The term <1 yd^3 indicates any amount of sediment or other material ranging from 1 to 27 ft^3 (27 ft^3 = 1 yd^3).		

Table WQ-3 (cont') Activities from the Proposed Project that Could Result in Turbidity in the Water Column		
Location/Timeframe	***Activity***	**Amount and Type of Sediment Resuspended***
Retrieval of Cables from Nearshore Conduit Area to Just Beyond state-Federal Boundary	Removal and cleaning of 10 miles (total) of retrieved cable; • Sediment from seafloor • Marine growth • Burying cable end with concrete mat	 200-250 yd^3 – Range from sandy nearshore to silty sand offshore 50-60 yd^3 – Sediment plus organic debris from marine growth 2-4 yd^3 – Silty sand **Total Retrieval: 252-314 yd^3**
Nearshore Post-construction biological survey (1-2 days)	Anchoring of diver-support vessel (2-4 anchors up to 5,000 lb ea.)	<1 yd^3 – Sand
Removal of cables at end of SYU life Timeframe: ~20-30 days		**Disturbed Sediment:** – range from sandy nearshore to silty sand offshore plus some organic debris from marine growth from cable cleaning.
Conduit to Platform Harmony	Removal of the replacement Cable A2 (or B2) and F2: 22.5 miles (36 km)	175-200 yd^3
Shelf break to Platform Heritage	Removal of the OCS portion of the Cable A (or B) and C1: 17 miles (27 km)	65-75 yd^3 from current sediment plus an additional 65-75 yd^3 sedimentation in years prior to removal
Between Platforms Harmony and Heritage	Removal of replacement Cable G2: 7.3 miles (12 km)	30-40 yd^3 **Subtotal – 335-390 yd^3** **Marine Growth Removal: - organic debris** 260-270
* The term <1 yd^3 indicates any amount of sediment or other material ranging from 1 to 27 ft^3 (27 ft^3 = 1 yd^3).		

2.0 EXPECTED CEQA MANDATORY FINDINGS OF SIGNIFICANCE

All adverse impacts identified for the proposed ExxonMobil Offshore Power System Reliability-B Project are expected to be found to be fully mitigable with the incorporation of mitigation measures. Cumulative impacts are discussed throughout the document to address CEQA-required elements. Based on the evaluation of potential impacts and mitigation measures discussed in this document, ExxonMobil believes that the state and local agencies will determine that the cumulative impacts will be found to be insignificant.

3.0 EXPECTED NEPA FINDINGS

All adverse impacts identified for the proposed ExxonMobil Offshore Power System Reliability-B Project are expected to be found to be fully mitigable with the incorporation of mitigation measures. Cumulative impacts are discussed throughout the document to address NEPA-required elements. Based on the evaluation of potential impacts and mitigation measures discussed in this document, ExxonMobil believes that the federal agencies will determine that the OPSRB Project does not constitute a major Federal action significantly affecting the quality of the human environment, in the sense of NEPA (Section 102(2)(C)).

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APPENDIX A

Southern California Eelgrass Mitigation Policy

APPENDIX B

Offshore Power System Repair Project OPSR-A

Cable Retrieval Risk Assessment

(Analysis of Risk of Damage to Existing Components from a Dropped Cable During Retrieval)

September 2002

and Supplement 1: Shallow Water Addendum

October 2002

Prepared by: Petro Marine / BCI Engineering

[Analysis of OPSRB cable-specific analysis under way and will be provided as soon as it is available.]

SOUTHWEST REGIONAL OFFICE
National Marine Fisheries Service

SOUTHERN CALIFORNIA EELGRASS MITIGATION POLICY

(Adopted July 31, 1991)

(From: http://swr.nmfs.noaa.gov/hcd/eelpol.htm)

Eelgrass (Zostera marina) vegetated areas function as important habitat for a variety of fish and other wildlife. In order to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources, the following policy has been developed by the Federal and State resource agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game). This policy should be cited as the Southern California Eelgrass Mitigation Policy (revision 8).

For clarity, the following definitions apply. "Project" refers to work performed on-site to accomplish the applicant's purpose. "Mitigation" refers to work performed to compensate for any adverse impacts caused by the "project". "Resource agencies" refers to National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game.

1. **Mitigation Need.** Eelgrass transplants shall be considered only after the normal provisions and policies regarding avoidance and minimization, as addressed in the Section 404 Mitigation Memorandum of Agreement between the Corps of Engineers and Environmental Protection Agency, have been pursued to the fullest extent possible prior to the development of any mitigation program.

2. **Mitigation Map.** The project applicant shall map thoroughly the area, distribution, density and relationship to depth contours of any eelgrass beds likely to be impacted by project construction. This includes areas immediately adjacent to the project site which have the potential to be indirectly or inadvertently impacted as well as areas having the proper depth and substrate requirements for eelgrass but which currently lack vegetation.

Protocol for mapping shall consist of the following format:

1) Coordinates

Horizontal datum - Universal Transverse Mercator (UTM), NAD 83, Zone 11

Vertical datum - Mean Lower Low Water (MLLW), depth in feet.

2) Units

Transects and grids in meters.

Area measurements in square meters/hectares.

All mapping efforts must be completed during the active growth phase for the vegetation (typically March through October) and shall be valid for a period of 120 days with the exception of surveys completed in August - October.

A survey completed in August - October shall be valid until the resumption of active growth (i.e., March 1). After project construction, a post-project survey shall be completed within 30 days. The actual area of impact shall be determined from this survey.

3. **Mitigation Site.** The location of eelgrass transplant mitigation shall be in areas similar to those where the initial impact occurs. Factors such as, distance from project, depth, sediment type, distance from ocean connection, water quality, and currents are among those that should be considered in evaluating potential sites.

4. **Mitigation Size.** In the case of transplant mitigation activities that occur concurrent to the project that results in damage to the existing eelgrass resource, a ratio of 1.2 to 1 shall apply. That is, for each square meter adversely impacted, 1.2 square meters of new suitable habitat, vegetated with eelgrass, must be created. The rationale for this ratio is based on, 1) the time (i.e., generally three years) necessary for a mitigation site to reach full fishery utilization and 2) the need to offset any productivity losses during this recovery period within five years. An exception to the 1.2 to 1 requirement shall be allowed when the impact is temporary and the total area of impact is less than 100 square meters. Mitigation on a one-for-one basis shall be acceptable for projects that meet these requirements (see section 11 for projects impacting less than 10 square meters).

Transplant mitigation completed three years in advance of the impact (i.e., mitigation banks) will not incur the additional 20% requirement and, therefore, can be constructed on a one-for-one basis. However, all other annual monitoring requirements (see sections 8-9) remain the same irrespective of when the transplant is completed.

Project applicants should consider increasing the size of the required mitigation area by 20-30% to provide greater assurance that the success criteria, as specified in Section 9, will be met. In addition, alternative contingent mitigation must be specified, and included in any required permits, to address situation where performance standards (see section 9) are not met.

5. **Mitigation Technique.** Techniques for the construction and planting of the eelgrass mitigation site shall be consistent with the best available technology at the time of the project. Donor material shall be taken from the area of direct impact whenever possible, but also should include a minimum of two additional distinct sites to better ensure genetic diversity of the donor plants. No more than 10% of an existing bed shall be harvested for transplanting purposes. Plants harvested shall be taken in a manner to thin an existing bed without leaving any noticeable bare areas. Written permission to harvest donor plants must be obtained from the California Department of Fish and Game.

Plantings should consist of bare-root bundles consisting of 8-12 individual turions. Specific spacing of transplant units shall be at the discretion of the project applicant.

However, it is understood that whatever techniques are employed, they must comply with the stated requirements and criteria.

6. **Mitigation Timing.** For off-site mitigation, transplanting should be started prior to or concurrent with the initiation of in-water construction resulting in the impact to the eelgrass bed. Any off-site mitigation project which fails to initiate transplanting work within 135 days following the initiation of the in-water construction resulting in impact to the eelgrass bed will be subject to additional mitigation requirements as specified in section 7. For on-site mitigation, transplanting should be postponed when construction work is likely to impact the mitigation. However, transplanting of on-site mitigation should be started no later than 135 days after initiation of in-water construction activities. A construction schedule which includes specific starting and ending dates for all work including mitigation activities shall be provided to the resource agencies for approval at least 30 days prior to initiating in-water construction.

7. **Mitigation Delay.** If, according to the construction schedule or because of any delays, mitigation cannot be started within 135 days of initiating in-water construction, the eelgrass replacement mitigation obligation shall increase at a rate of seven percent for each month of delay. This increase is necessary to ensure that all productivity losses incurred during this period are sufficiently offset within five years.

8. **Mitigation Monitoring.** Monitoring the success of eelgrass mitigation shall be required for a period of five years for most projects. Monitoring activities shall determine the area of eelgrass and density of plants at the transplant site and shall be conducted at 3, 6, 12, 24, 36, 48, and 60 months after completion of the transplant. All monitoring work must be conducted during the active vegetative growth period and shall avoid the winter months of November through February. Sufficient flexibility in the scheduling of the 3 and 6 month surveys shall be allowed in order to ensure the work is completed during this active growth period. Additional monitoring beyond the 60 month period may be required in those instances where stability of the proposed transplant site is questionable or where other factors may influence the long-term success of transplant.

The monitoring of an adjacent or other acceptable control area (subject to the approval of the resource agencies) to account for any natural changes or fluctuations in bed width or density must be included as an element of the overall program.

A monitoring schedule that indicates when each of the required monitoring events will be completed shall be provided to the resource agencies prior to or concurrent with the initiation of the mitigation.

Monitoring reports shall be provided to the resource agencies within 30 days after the completion of each required monitoring period.

9. **Mitigation Success.** Criteria for determination of transplant success shall be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the project and mitigation sites. Extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is defined by the number of turions per area

present in representative samples within the control or transplant bed. Specific criteria are as follows:

a. a minimum of 70 percent area of eelgrass bed and 30 percent density after the first year.

b. a minimum of 85 percent area of eelgrass bed and 70 percent density after the second year.

c. a sustained 100 percent area of eelgrass bed and at least 85 percent density for the third, fourth and fifth years.

Should the required eelgrass transplant fail to meet the established criteria, then a Supplementary Transplant Area (STA) shall be constructed, if necessary, and planted. The size of this STA shall be determined by the following formula:

$STA = MTA \times (|A_t + D_t| - |A_c + D_c|)$

MTA = mitigation transplant area.

A_t = transplant deficiency or excess in area of coverage criterion (%).

D_t = transplant deficiency in density criterion (%).

A_c = natural decline in area of control (%).

D_c = natural decline in density of control (%).

Four conditions apply:

1) For years 2-5, an excess of only up to 30% in area of coverage over the stated criterion with a density of at least 60% as compared to the project area may be used to offset any deficiencies in the density criterion.

2) Only excesses in area criterion equal to or less than the deficiencies in density shall be entered into the STA formula.

3) Densities which exceed any of the stated criteria shall not be used to offset any deficiencies in area of coverage.

4) Any required STA must be initiated within 120 days following the monitoring event that identifies a deficiency in meeting the success criteria. Any delays beyond 120 days in the implementation of the STA shall be subject to the penalties as described in Section 7.

10. **Mitigation Bank.** Any mitigation transplant success that, after five years, exceeds the mitigation requirements, as defined in section 9, may be considered as credit in a "mitigation bank". Establishment of any "mitigation bank" and use of any credits accrued from such a bank must be with the approval of the resource agencies and be consistent with the provisions stated in this policy. Monitoring of any approved mitigation bank shall be conducted on an annual basis until all credits are exhausted.

11. **Exclusions.**

1) Placement of a single pipeline, cable, or other similar utility line across an existing eelgrass bed with an impact corridor of no more than ½ meter wide may be excluded from the provisions of this policy with concurrence of the resource agencies. After project construction, a post-project survey shall be completed within 30 days and the results shall be sent to the resource agencies. The actual area of impact shall be determined from this survey. An additional survey shall be completed after 12 months to insure that the project or impacts attributable to the project have not exceeded the allowed ½ meter corridor width. Should the post-project or 12 month survey demonstrate a loss of eelgrass greater than the ½ meter wide corridor, then mitigation pursuant to sections 1-11 of this policy shall be required.

2) Projects impacting less than 10 square meters. For these projects, an exemption may be requested by a project applicant from the mitigation requirements as stated in this policy, provided suitable out-of-kind mitigation is proposed. A case-by-case evaluation and determination regarding the applicability of the requested exemption shall be made by the resource agencies.

(last revised 2/2/99)

ExxonMobil

Santa Ynez Unit

Offshore Power System Repair: Amended Project
OPSR:A

Cable Retrieval Risk Assessment
(Analysis of Risk of Damage to Existing Components from a Dropped Cable During Retrieval)

September 2002

Prepared by:
PMBCI
Gene Pharr, PE

Study Summary

PMBCI examined the risk of physical damage to the active SYU cables and pipelines from the dropping of the failed "C" cable with or without the recovery tools attached during retrieval from the seabed. The study evaluated two water depths and three locations: 1) seaward of the shelf break in about 450 feet of water depth and 2) at two gas pipeline crossings of the "C" cable west of the Harmony platform each in about 1250 feet of water depth. The study methodology included the following three steps: 1) analysis of the falling cable dynamics; 2) analysis of the collision impact dynamics and 3) estimation of pipeline or cable damage. As a result of the analysis, five cable laydown modes were examined and three were found to be plausible under study conditions.

1) Stiff Catenary Laydown – (Very shallow water only < 50 ft) [Not considered plausible]
2) Hammerhead Laydown – (Does not occur under assumptions used) [Not considered plausible]
3) Spaghetti Pile Without Clamp – (All water depths)
4) Spaghetti Pile With Clamp – (All water depths)
5) Plunging Stalk – (Deep water only > ~400 ft)

The plausible damage to either a pipeline or a power cable was determined using elastic collision impact analysis. The results of this analysis obtained the following conclusions:

a) None of the pipelines or submarine power cables can be damaged by stiff catenary laydown mode.
b) None of the pipelines or submarine power cables can be damaged by the hammerhead laydown mode.
c) None of the pipelines or submarine power cables can be damaged by the spaghetti pile without clamp laydown mode.
d) None of the pipelines can be damaged by the spaghetti pile with clamp laydown mode.
e) All of the submarine power cables can be damaged by the spaghetti pile with clamp laydown mode.
f) All of the pipelines can be damaged by the plunging stalk mode.
g) All of the submarine power cables can be damaged by the plunging stalk mode.

As shown above, a plausible risk to the operating pipelines and power cables exists at each of the study locations, specifically in the deeper water. It should be noted that the spaghetti pile mode would more easily impact a long linear target such as the submarine cable. For the spaghetti pile with clamp or the plunging stalk modes to damage a pipeline or power cable, they would have to have a direct hit on the component. A tabular summary is provided in the report.

Study Premise

ExxonMobil commissioned PMBCI to examine the risk of damage to the SYU power cables and pipelines if the existing failed "C" cable is dropped during retrieval from the seabed while either the existing cables and pipelines are still in active service or the same operation after all of the cables and pipelines have been decommissioned and removed from service at the end of the SYU field life.

The primary risk examined in this study is that of possible physical damage caused by a dropped object such as the cable being retrieved with or without the recovery tools attached. One phase of this study will be to examine the loading required to cause such a failure. For the situation where the existing power cables or pipelines are still in service, an impact sufficient to cause plastic (e.g. inelastic permanent) deformation of the cable jacket armor wires or the pipeline is defined (for the purposes of this study) as failure. Depending on the actual damage, this type of deformation could require the repair of the cable or pipeline. For the situation where the cables and pipelines have been decommissioned, no repair would be required.

The study assumes, as an obvious conclusion, that the cable being retrieved, and the recovery clamp or end fittings to be employed are not themselves heavy enough to cause damage if they were lowered gently to the sea bottom. The major part of the study will focus on the estimation of the kinetic energy of the falling body. Due to the required calculation assumptions, the unknown physical condition of the cable to be retrieved, and for consistency with common engineering practice for heavy lift marine rigging and salvage operations, a safety factor of at least 3.0 is recommended. Without an adequate safety factor it is not practical to predict that a given scenario avoids damage with consequent risks of loss of service, pollution, and increased risks associated with or arising in additional or corrective work.

Site and Operations

The study evaluates the retrieval of the failed "C" power cable (5.83 inch diameter 35 kv submarine power cable) that has been removed from service and will be replaced as part of the OPSR:A Project. The cable runs between the shore and the Heritage offshore platform passing South of the Hondo and Harmony platforms as shown on the marine survey drawings (reference Pre-Lay Cable Route Survey, September 2001).

The OPSR:A Project purposes to retrieve the portion of the cable from the conduit terminus to the shelf break. The inshore portion of the cable will be retrieved to about 400-450 feet of water to the seaward side of the shelf break in the OCS. As a future operation, the OCS portion of the failed "C" cable could be retrieved from the shelf break to the first gas pipeline crossing west of Harmony platform and then from the second crossing of the gas pipeline to the Heritage platform. Another future operation could be the removal of the entire OCS portion of the failed "C" cable at the end of the SYU field life after the facilities have been shut down.

In the area of the shelf break the purposed approach is for the seaward portion of the "C" cable to be cut at the tension machine on the vessel and lowered to the sea bottom with a nominal 100 pound pulling head attached for future recovery. The cable is nominally parallel and adjacent to the "B" power cable, the "A" power cable, and the 12-inch POPCO pipeline at this location. The first objective of this study is to evaluate if damage could occur to these in-service power cables or pipelines if the "C" cable were dropped at this point.

The future retrieval operation of the OCS portion of the "C" cable would proceed by lifting the inshore end of the cable at the 400-450 water depth and recovering it onto the cable recovery vessel through a traction device. A nominal 3-knot current from approximately West to East will contribute to the cable catenary tension during recovery.

For this analysis the recovery of the cable on the OCS will proceed to a point to the East and slightly South of the Harmony platform. The point will be selected such that the catenary lift-off point remains short of where the "C" cable crosses under the 12-inch gas pipeline West of the Harmony platform. The cable will be cut at this point and lowered to the sea bottom with a nominal 100 pound pulling head attached.

The second objective of this study is to determine if this cable were dropped at this point would it damage any of the in-service power cables or pipelines at that location. The cables at that location are the "A", "B", and "D" submarine power cables. The pipelines are the 20-inch oil emulsion pipeline, the 12 inch treated water pipeline, the 14-inch oil emulsion pipeline, and the 12-inch sales gas pipeline.

For this analysis the recovery of the cable on the OCS will continue West of the second crossing of the 12 inch gas pipeline located West of the Harmony platform to the Heritage platform. At this location, the cable will be cut on the sea bottom and lifted with a 200-pound cable clamp.

The third objective of this study is to determine if the cable, with the clamp tool attached, were dropped at this point would it damage any of the in-service cables or pipelines at this location. The "E" power cable, 12-inch gas pipeline, and 20 inch oil emulsion pipelines are at this location.

Study Methodology

The study methodology included the following three steps to address the study objectives:

1.) **Falling Cable Dynamics**

For each of the three locations, how can the cable fall? How fast will it go? With what kinetic energy will it strike the seafloor or one of the study target cables or pipelines? In simple terms, how hard does it hit?

2.) **Collision Impact dynamics**

The "C" cable being retrieved and the lifting clamp or end fitting will be falling on the study target bodies with kinetic energies predicted in step 1. The force imparted to the target body will be predicted as a collision of elastic bodies. The work done to bring the falling body to rest is the integral of the force exerted with respect to the falling body deformation. The same amount of work is done by the equal and opposite forces deforming the target body.

3.) **Pipeline or Cable Damage Estimate**

The pipelines are analyzed by a linear finite element analysis to determine the magnitude of force applied in the anticipated patterns that would result in initiation of a failure if acting alone. As it is not practical to evaluate other actual stresses as may be present, a safety factor of three is recommended to provide rational assurance that damage will not result from combined stresses due to both the predicted impact event and "ambient" stresses from operating and service conditions.

The cables spiral armor will be effective principally in resisting transverse cuts or abrasion. It will not be effective in preventing lateral loads from being transferred to the conductors. The HV Kerite conductor insulation is a material with physical behavior characteristics like a high durometer rubber and a tensile strength of 550 psi. The target cables are primarily subject to damage either by a stabbing type of impact in which the armor wires are pushed aside, perhaps by broken armor wires protruding from the falling cable, or by direct

crushing forces transmitted through the armor to the conductor core. This high rate impact load can cause a longitudinal splitting and consequent failure if the peak tensile stresses exceed the tensile strength.
A linear finite element analysis of the conductor has been performed to determine the loading that would initiate such a failure. A safety factor of at three is recommended to insure the validity of safe loading predictions. No data is available for the known characteristic of most insulating materials to exhibit reduced dielectric strength under high shear stress loadings therefore the suggested safety factor of three may not be adequate to prevent dielectric breakdown if the cables are energized at the time of impact.

Falling Cable Dynamics

Analyses of the cable catenaries with loading from typical water currents were performed for a wide variety of conditions at 450 and 1250 water depths. These analyses indicated that to avoid exceeding allowable cable tension the horizontal force at the traction (upper) end must be limited. The maximum cable tension without current loading would be at the upper end. Due to the current forces transverse to the cable, both the horizontal and vertical forces are markedly increased and the maximum cable tension will occur in the sag bend rather than the upper end. The profile that must be adopted to prevent excessive tension in the three knot current is steeper at the upper end than might be used for a "no-current" cable laying or recovery operation. The manufacturers suggested maximum cable tension of 21,680 pounds should be observed. As the cable is known to have failed, the possibility of a local physical defect either due to fault currents or galvanic action is considered high. Although the cable is being retrieved without expectation of reuse, higher tension than the manufacturer has recommended could cause a tensile failure at a local physical defect. There is no assurance that such a failure will not occur at an even lower load. All normal precautions to stay clear of highly tensioned multipart lines should be observed. If such an unanticipated tension failure does occur at a tension less than the recommended 21,680 pound limit, the results will be very similar to the cases considered at the previously described three locations.

The cable could be dropped due to a rigging failure or handling error at any of the three study locations. The first analysis is for a 3-knot current loaded catenary in 450 feet of water, within permissible maximum tension limits. Two time steps for a direct integration time-history dynamic analysis are shown in Figure 1. This analysis does not converge to a solution as instabilities develop from the inability of the modeled cable to sustain compressive loads.

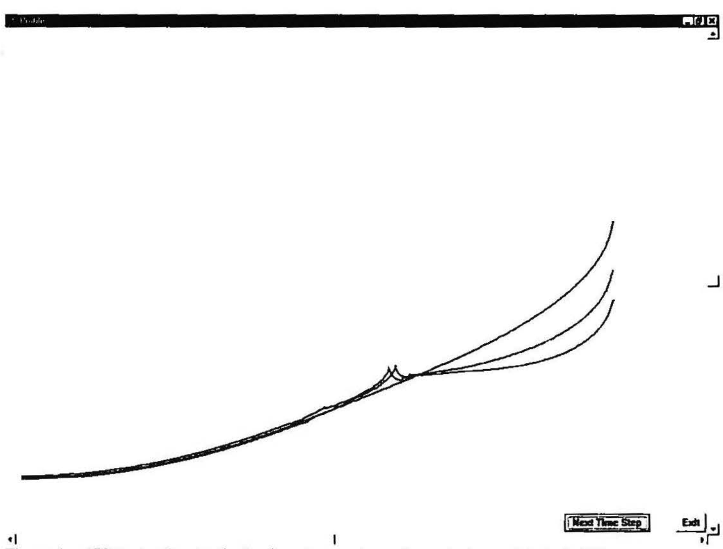

Figure 1 – 450-foot water depth simple catenary dynamic analysis predicts instability

Several useful inferences may be drawn even though a full direct solution fails. These will be discussed further after looking at other examples. The water depth for this case is 450 feet. The lift-off point is 842.28 feet from the able head, which is 11.17 feet above the waterline.

A second analysis using a similar profile for 1250 feet of water follows. This current loaded profile is for minimum tension while retaining control of the lift-off point. The lift-off point is 341.34 feet from the cable head, which is 11.14 feet above the waterline. Note that for this minimum tension case in 1250 feet of water, the cable head is nearly vertical. Five time steps from the cable release are shown in Figure 2. Just as in the 450-foot water depth case, compressive instabilities develop, and the solution fails to converge.

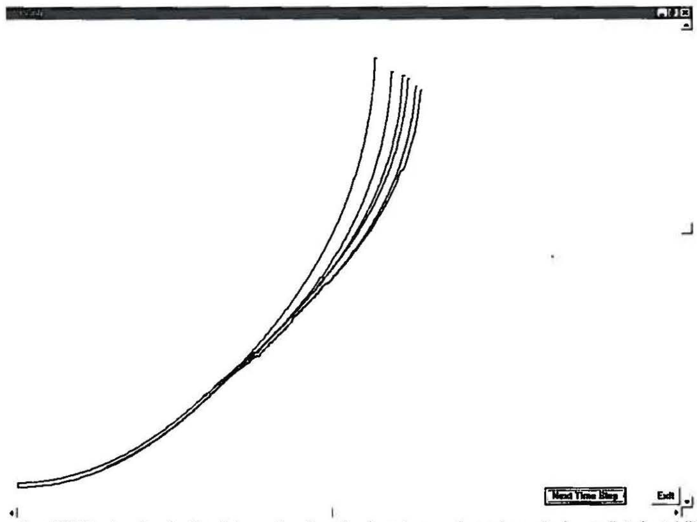

Figure 2 – 1250-foot water depth minimum tension simple catenary dynamic analysis predicts instability

By contrast, the current loaded profile for maximum tension was also evaluated. The lift-off point is 1482.88 feet from the cable head, which is 11.38 feet above the waterline. For this maximum tension case in 1250 feet of water the cable head is still at a high angle. Two time steps from the cable release are shown in Figure 3. Just as in the other cases, compressive instabilities develop, and the solution fails to converge.

The maximum tension profile for 1250 feet of water follows.

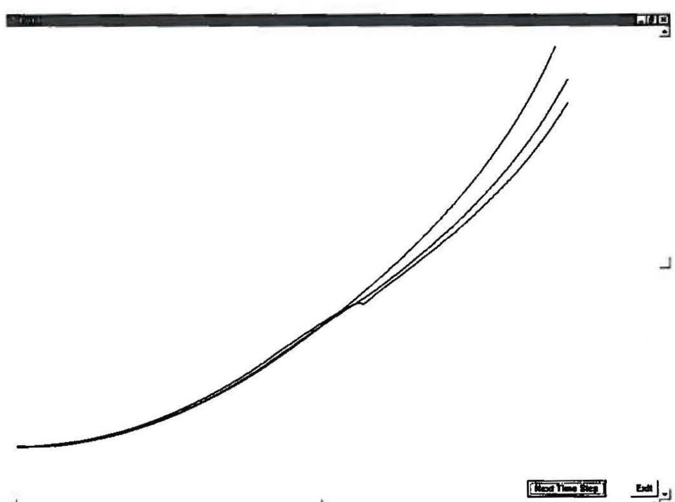

Figure 3 – 1250-foot water depth maximum tension simple catenary dynamic analysis predicts instability

These analyses and others all failed to converge to simple solutions with the cable on bottom and in every case the development of instability due to axial compression was the reason.

The "C" cable has three HV insulated conductors and a single layer of 46 BWG #4 galvanized steel wires coated with 55 mils of high density polyethylene. The coated armor wires are in a single left lay layer with a 39-inch spiral pitch. The armor wires are not contained within a sheath or connected together.

Traditional rational analysis to proceed beyond the above evaluation suggests five specific modes to consider for the manner in which the dropped cable may reach the sea bottom:

1.) Stiff Catenary Laydown Mode

If the cable were able to sustain the compression that arises without significant local buckling or out of plane deformation, it would come down with in-plane lateral motion only. A single touchdown point would move along the seabed from the prior-to-release lift-off point to the cable head.

A number of factors work against development of this case. The single layer spiral armor will cause the slacking cable to spiral and compression will amplify the inherent spiral. This effect will cause out of plane motion to initiate. The spiral armor itself is unable to sustain direct compression and it can open up forming basket(s). At any local defect such as where a basket exists or armor wires are displaced from their normal lay or wires have been broken, corroded, or damaged in any way, a weak spot is formed where compressive force will cause a concentration of p-delta moment amplification effects.

The simple stiff catenary laydown can only occur in very shallow water (perhaps less than 50 feet of water depth). This mode is not expected in the study water depth range. Further analysis of this mode was not pursued as it is not expected to occur.

2.) Hammerhead Laydown Mode

This laydown mode is the same as above except that the cable end fixture acting as a concentrated weight causes the cable end to fall faster such that it hits bottom ahead of the adjacent cable.

This mode is also not expected to develop in the study water depths. The Stiff Catenary Laydown from which this mode would develop does not occur and the cable end fittings employed are not heavy enough to have significant effect.

3.) Spaghetti Pile Mode Without Clamp

As the cable cannot sustain compressive loading without lateral displacement and bending it will curl into a spaghetti pile. As the curling cable falls, there will be multiple touchdown points in unpredictable locations and sequences along and to both sides of the nominal cable path. In all cases the touchdown velocity will be approximately the terminal velocity for lateral motion of the cable. The individual impact points may be very slightly higher than the nominal terminal velocity as adjacent cable segments are inclined with respect to the general motion.

This mode is expected to occur at all the study location water depths. The lateral distribution of the impact points could be higher in the deeper water but remains unpredictable. As the cable reaches its terminal velocity in less than its own diameter there is no other significant difference between the 450 and 1250-foot water depths.

A typical impact point kinetic energy for the spaghetti pile would be approximately:

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{200}{32.2}\right)\cdot\left(3.75^2\right)}{2} = 43.7 \ ft \cdot lbf$$

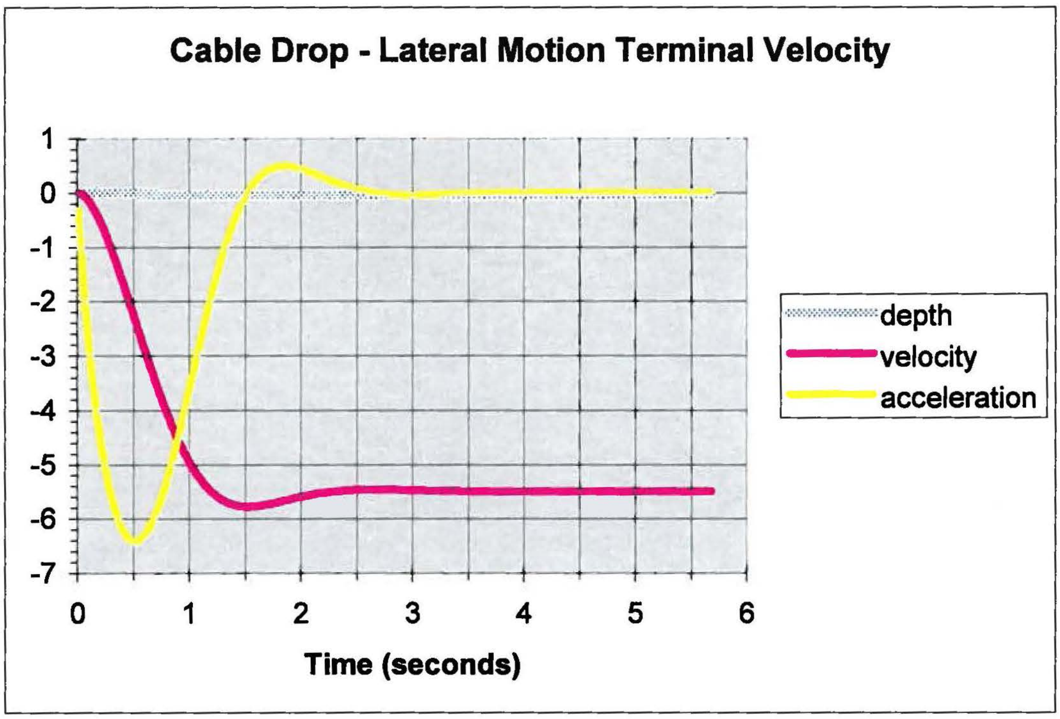

Figure 4 – Dynamic Terminal Velocity Study by Morison's Equation

The terminal velocity for the "C" cable free falling in seawater at 70° F is 5.50 feet per second. The cable diameter is 5.38 inches. The values for Cd and Cm are 0.70 and 1.6.

As can be seen in Figure 4, starting from rest the terminal velocity is reached in about 2.5 seconds and with a lateral motion of less than the cable diameter.

[5.5 feet per second is 3.75 miles per hour; about walking speed.]

4.) Spaghetti Pile Mode With Clamp

This mode is the same as the previous mode except that a 200-pound end clamp is located a few feet from the end of the cable. The edge of this clamp can strike the pipe like a knife-edge and at a slightly higher kinetic energy.

At the end clamp the kinetic energy could be:

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{400}{32.2}\right) \cdot \left(4.00^2\right)}{2} = 99.4 \ ft \cdot lbf$$

5.) Plunging Stalk Mode

The axial hydrodynamic forces, which are commonly ignored in many cases, are substantially less than the lateral forces described by Morison's Equation. If a segment of cable is falling in the direction of its longitudinal axis then its terminal velocity is governed by the weaker axial flow surface boundary layer effects and it will fall faster and for a much greater distance before reaching terminal velocity.

Figure 5 shows a 400-foot "stalk" falling vertically. It reaches terminal velocity at 67.3 feet per second (45.9 miles per hour) when the drag equals the submerged weight of 3500 pounds after plunging 122 feet. Note this is radically different from the lateral terminal velocity.

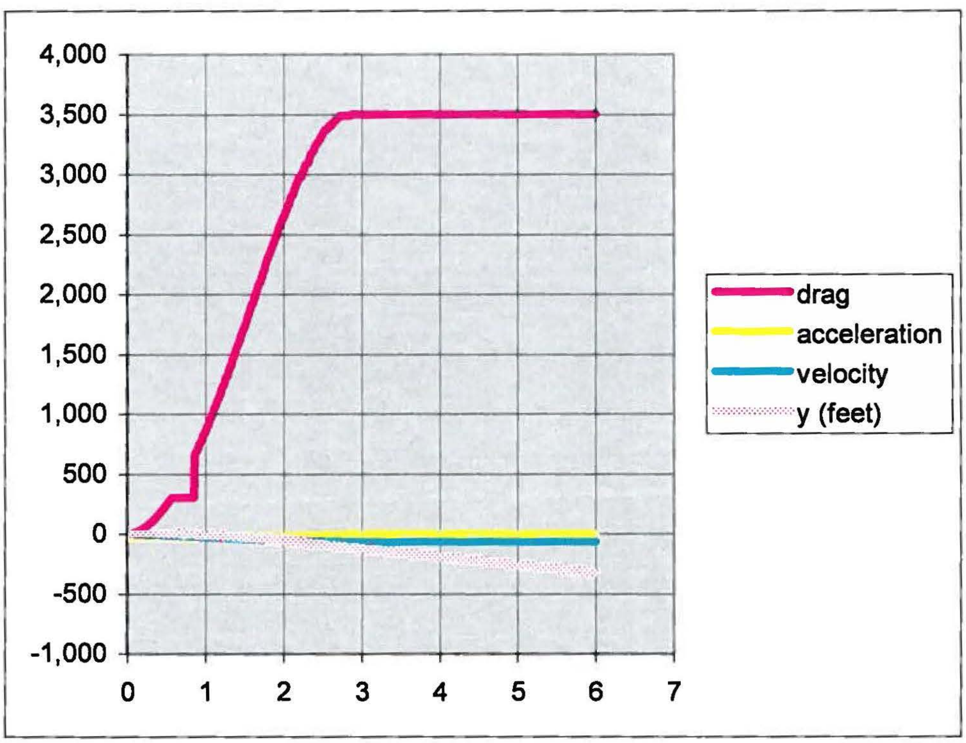

Figure 5 – Axial Flow Terminal Velocity Study

The kinetic energy for a 400-foot stalk at terminal velocity, as could develop in 1250 feet of water, is:

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{400 \cdot 18.85}{32.2}\right) \cdot (67.3^2)}{2} = 530293 \ ft \cdot lbf$$

This is a plausible worst case for the 1250 water depth locations. At the 450-foot water depth the plausible stalk length is more like 150 feet.

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{150 \cdot 18.85}{32.2}\right) \cdot (39.9^2)}{2} = 69898 \ ft \cdot lbf$$

This mode is more plausible in deeper water depths. It is also more likely to be initiating at points of existing cable damage.

Elastic Collision Impact Dynamics

1) 400 foot Plunging Stalk Impact

Weight of impacting object (in force units): $W := 7540 \, lbf$

Velocity of the impacting object: $V := 67.3 \cdot fps$

Stiffness of object being impacted: $k_1 := 1.5 \cdot kpi$

Stiffness of the impact object - This value is typically just estimated. As a guide line, some selected values of k_2, and the corresponding combined stiffness k, follows: $k_2 := 150 \cdot kpi$

for $k_2 = k_1$ — $k = 1/2*k_1$ (for equal stiffnesses)
$k_2 = 2*k_1$ — $k = 2/3*k_1$
$k_2 = 3*k_1$ — $k = 3/4*k_1$
$k_2 = 7*k_1$ — $k = 7/8*k_1$
$k_2 = 10^{15}$ — $k = k_1$ (for infinitely stiff impact object)

Calculate the kinetic energy at impact as a function of the velocity at impact, V:

$$E_F(V) := \frac{W}{2 \cdot g} \cdot V^2 \qquad E_F(V) = 6368.645 \text{in} \cdot \text{kips}$$

Derive the formula for converting energy of a moving object into an impact force on the body being impacted:

The energy absorbed by the impacted object, as well as the energy absorbed by the impacting object , is equal to the area under each one 's force/deflection curve. Since th e area is a triangle, the energy , $E = \frac{1}{2} \cdot R \cdot y$, where R is the force, which is equal between the two objects, and y is the deflection. The total energy is equal to the sum of the energy absorbed by both.

Therefore $E = \frac{1}{2} \cdot R \cdot y_1 + \frac{1}{2} \cdot R \cdot y_2$ and by substitution $E = \frac{1}{2} \cdot R \cdot \frac{R}{k_1} + \frac{1}{2} \cdot R \cdot \frac{R}{k_2}$

Simplifying $E = \frac{1}{2} \cdot R^2 \cdot \left(\frac{1}{k_1} + \frac{1}{k_2} \right)$ and $R = \sqrt{\frac{2 \cdot E}{\frac{1}{k_1} + \frac{1}{k_2}}}$

And further simplifying $R = \sqrt{2 \cdot \frac{k_1 \cdot k_2}{k_1 + k_2} \cdot E}$

Where the effective stiffness of the two body combination is:

$$k := \frac{k_1 \cdot k_2}{k_1 + k_2} \qquad k = 1.5 \text{kpi}$$

Calculate the impact force as a function of the combined stiffness and the speed of the impacting body:

$$R(k, V) := \sqrt{2 \cdot k \cdot E_F(V)}$$

Therefore for the 400 foot plunging stalk at a 1250 foot water depth:

The resulting impact force between bodies is: $R(k, V) = 137.538 \text{kips}$

2) Similarly, for the 150 foot plunging stalk at a 450 foot water depth:

The resulting impact force between bodies is: $R(k, V) = 49.93 \text{kips}$

3) For the Spaghetti Pile Mode with Clamp Mode:

The resulting impact force between bodies is: $R(k, V) = 1.883 \text{kips}$

4) For the Spaghetti Pile without Clamp Mode:

The resulting impact force between bodies is: $R(k, V) = 1.248 \text{kips}$

Pipeline and Cable Damage Estimates

The most easily damaged pipeline would be the 20-inch diameter pipe with a 0.5-inch wall thickness (oil emulsion line). The force required to yield the pipe is 42,730 pounds. With a safety factor of 3.0, as recommended, this says the applied force should be limited to 14,243 pounds. As shown in Figure 6, this is substantially less than the plunging stalk forces of 137,530 or 49,930-pound forces for the 400 and 150-foot cases, respectively. Damage to the 20-inch pipeline at any of the three study locations is therefore plausible.

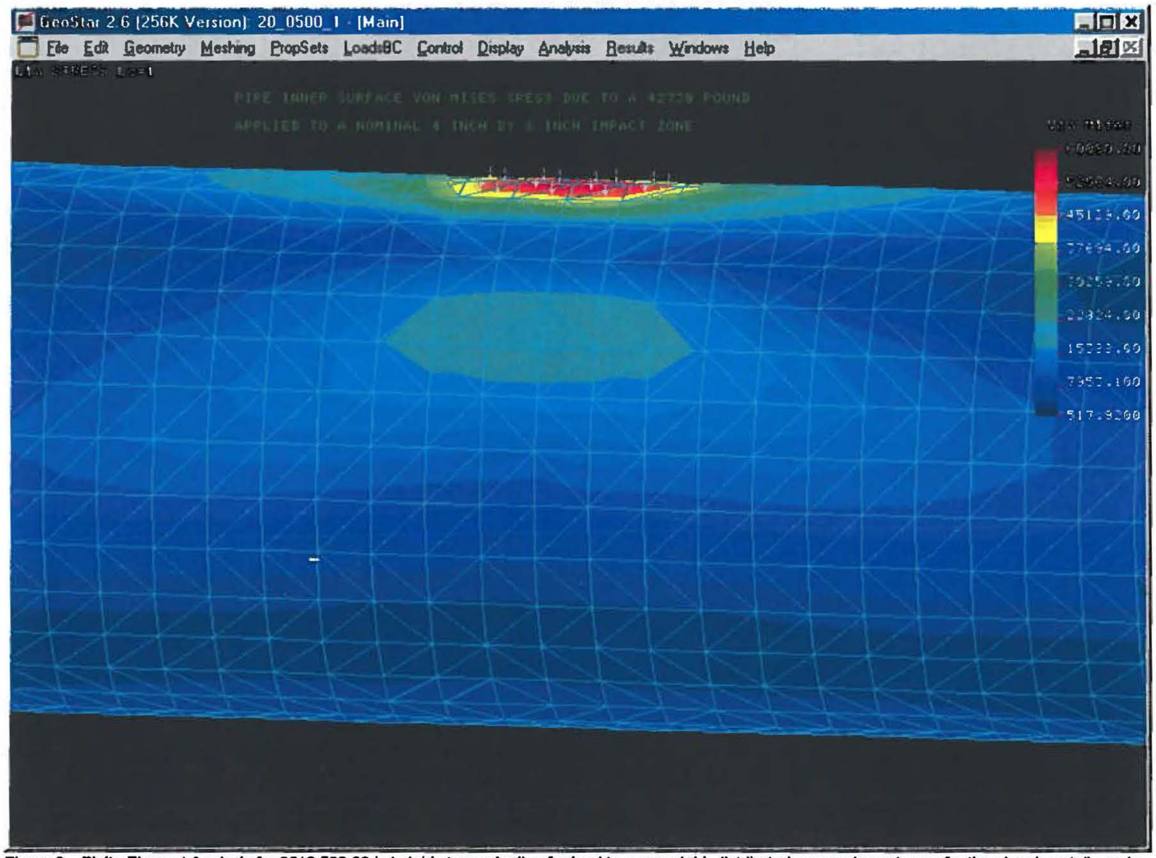

Figure 6 – Finite Element Analysis for 20ϕ0.500 60-ksi-yield stress pipeline for load to cause yield, distributed over an impact zone for the plunging stalk mode

Conversely, for the general case of the spaghetti pile mode, the 1,248 pounds is insufficient to cause damage to the most easily damaged pipeline.

For the spaghetti pile with clamp impact case, the force required to yield the pipe is 31,796 pounds as shown in Figure 7. This force is less than the case shown in Figure 6 since the clamp impact is applied for the finite element analysis as a concentrated line load transversely to the pipe axis rather than spread over a larger impact area. This simulates the knife edge effect of the clamp edge striking the pipe at an angle. With the recommended safety factor of 3.0, the applied load should be limited to 10,599 pounds. As this is substantially more than the 1,883 pounds for the clamp impact in the spaghetti pile with clamp mode, no pipeline damage will occur.

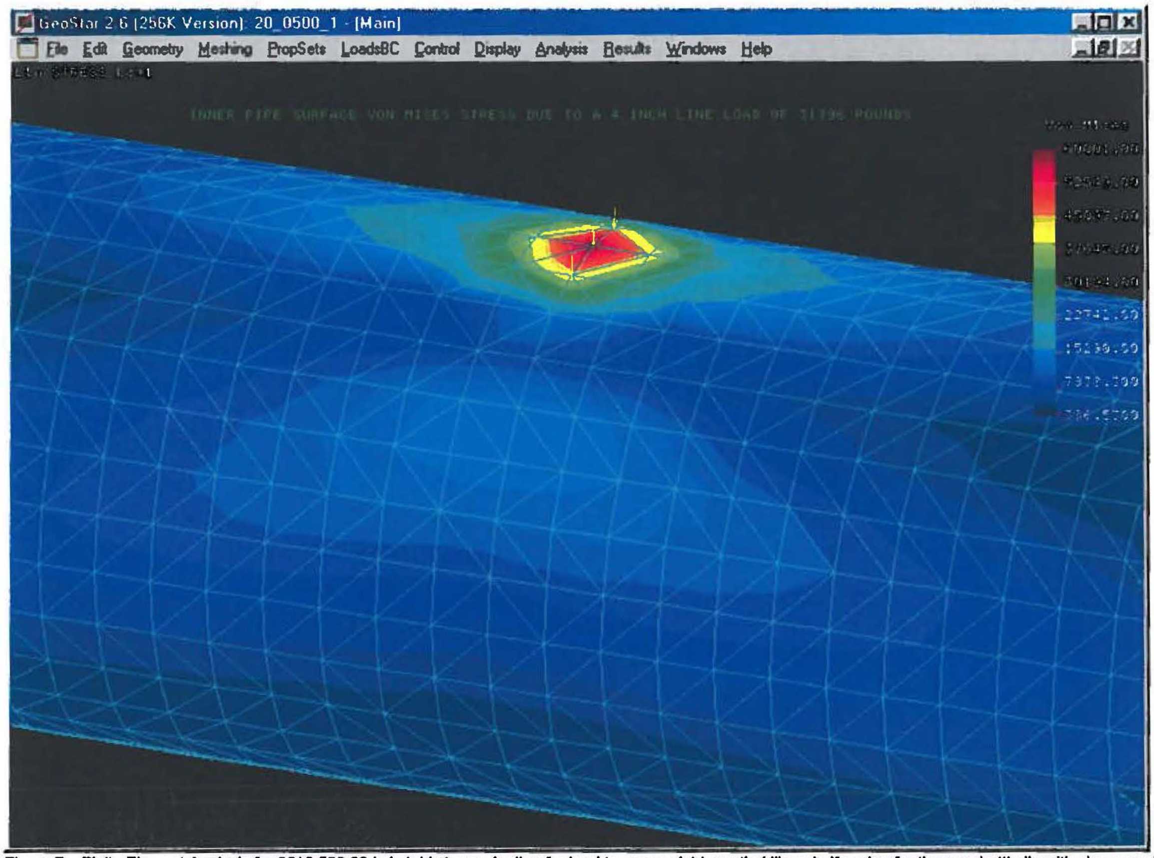

Figure 7 – Finite Element Analysis for 20ϕ0.500 60-ksi-yield stress pipeline for load to cause yield, applied like a knife-edge for the spaghetti pile with clamp mode.

The pipeline most resistant to impact damage would be the nominal 12-inch pipe with a 0.625-inch wall thickness (gas pipeline). The load required to yield the pipe is 107,500 pounds. With the safety factor of 3.0, the load should be limited to 35,833 pounds. The impact pattern assumed on the pipe is shown in Figure 8.

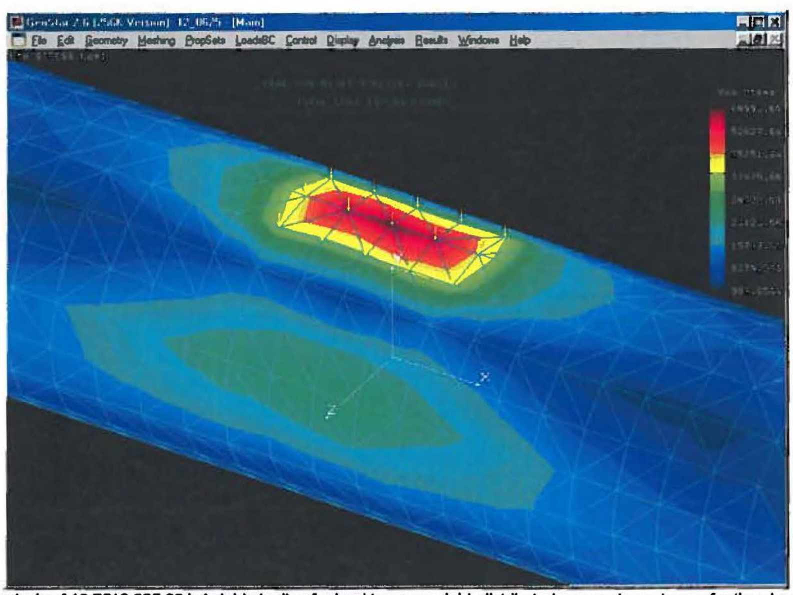

Figure 8 - Finite Element Analysis of 12.75ϕ0.625 60 ksi yield pipeline for load to cause yield, distributed over an impact zone for the plunging stalk mode

The 137,530-pound and 49,930 pound forces from the 400 and 150 foot plunging stalk modes, respectively, both exceed 35,833 pounds. Therefore, any of the pipelines at any of the study locations can plausibly be damaged by an impact in the plunging stalk mode.

Finite element analysis of the cable primary conductor assembly reveals the HV Kerite insulation reaches a 550-psi Von Mises stress with a 5223 pound per inch transverse loading. The spiral armor is deemed to be effective to distribute the knife-edge load for about one inch, or 4 armor wire diameters.

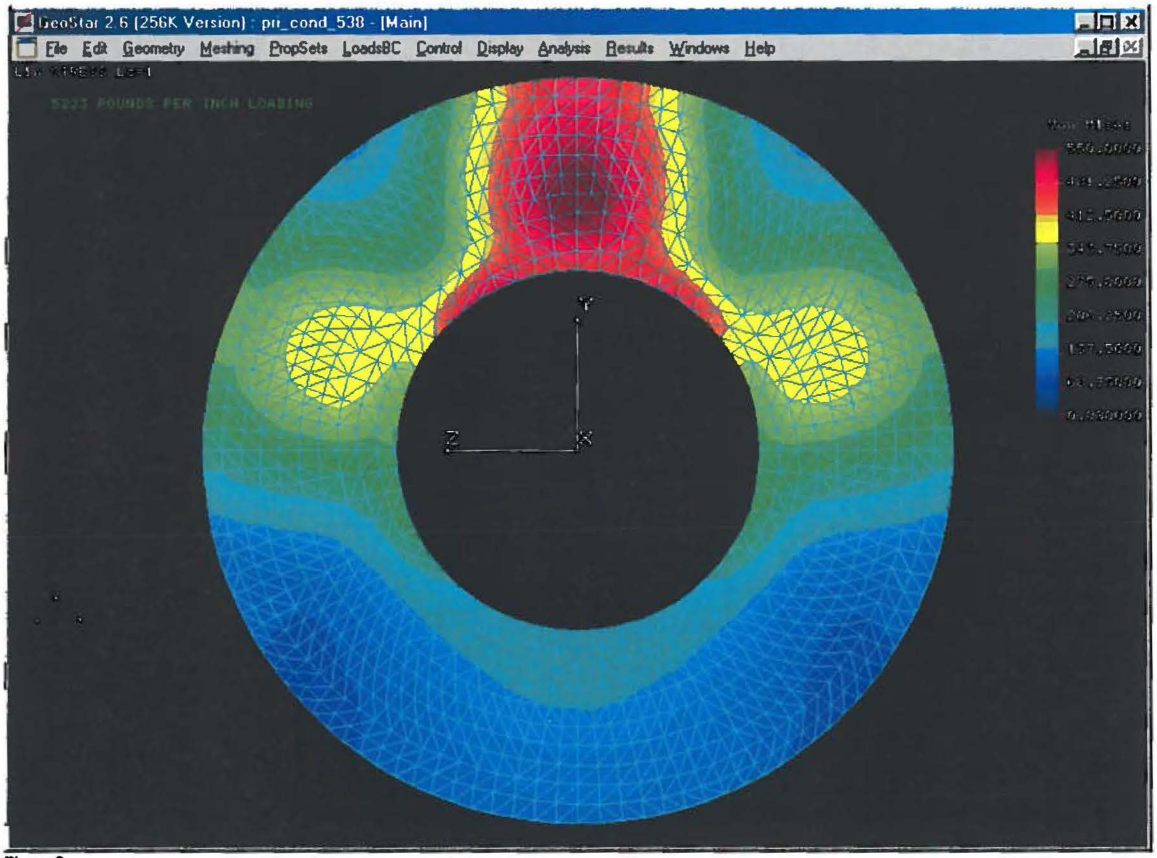

Figure 9 –

The cable analysis stress plot in Figure 9 shows a loading of 5,223 pounds per inch will cause a longitudinal splitting of the HV Kerite insulation layer of the conductors. With a safety factor of 3.0, the loading should be limited to 1,741 pounds. This means that the spaghetti pile with clamp mode impact (1883 pounds) or either plunging stalk mode impact can fail any of the cables.

A summary tabulation of plausible damage is shown in the following table:

location – water depth	Item	Plausible damage during retrieval operation from dropped "C" cable				
		stiff catenary laydown mode (mode 1)	hammerhead laydown mode (mode 2)	spaghetti pile mode without clamp (mode 3)	spaghetti pile mote with clamp (mode 4)	plunging stalk mode (mode 5)
1 - 450	12 inch POPCO	no	no	no	no	yes
1 - 450	"A" cable	no	no	no	yes	yes
1 - 450	"B" cable	no	no	no	yes	yes
2 - 1250	"A" cable	no	no	no	yes	yes
2 - 1250	"B" cable	no	no	no	yes	yes
2 - 1250	"D" cable	no	no	no	yes	yes
2 - 1250	20 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch treated water	no	no	no	no	yes
2 - 1250	14 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch sales gas	no	no	no	no	yes
3 - 1250	"E" cable	no	no	no	yes	yes
3 - 1250	12 inch gas	no	no	no	no	yes
3 - 1250	20 inch oil emulsion	no	no	no	no	yes

ExxonMobil

Santa Ynez Unit

Offshore Power System Repair: Amended Project
OPSR:A

Cable Retrieval Risk Assessment
(Analysis of Risk of Damage to Existing Components from a Dropped Cable During Retrieval)

Supplement 1: Shallow Water Addendum
(Supplementary findings Italicized)

October 2002

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PMBCI
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Study Summary

PMBCI examined the risk of physical damage to the active SYU cables and pipelines from the dropping of the failed "C" cable with or without the recovery tools attached during retrieval from the seabed. The study evaluated two water depths and three locations: 1) seaward of the shelf break in about 450 feet of water depth and 2) at two gas pipeline crossings of the "C" cable west of the Harmony platform each in about 1250 feet of water depth. The study methodology included the following three steps: 1) analysis of the falling cable dynamics; 2) analysis of the collision impact dynamics and 3) estimation of pipeline or cable damage. As a result of the analysis, five cable laydown modes were examined and three were found to be plausible under study conditions.

A supplementary examination of damage potential at 300, 150, and 50-foot water depths was performed to consider plausible damage. The same five cable laydown modes were considered with the following summary findings:

1) Stiff Catenary Laydown – (Very shallow water only < 50 ft) [Not considered plausible]

This mode and the Spaghetti Pile Without Clamp mode (mode 3) converge to the same thing when the curl radius of the Spaghetti Pile is very long. In very shallow water this would be the case. The upper bound of kinetic energy for this case may therefore reasonably be taken as the same as mode 3.

2) Hammerhead Laydown – (Does not occur under assumptions used) [Not considered plausible]

This mode and the Spaghetti Pile With Clamp mode (mode 4) converge to the same thing when the curl radius of the Spaghetti Pile is very long. In very shallow water this would be the case. Although considered implausible at the 450 foot and higher water depths considered in the original study, this mode is indistinguishable from mode 4 in very shallow water and would occur. The upper bound of kinetic energy for this case may reasonably be taken as the same as mode 4 thereby eliminating the need for separate consideration.

3) Spaghetti Pile Without Clamp – (All water depths)

This mode, and mode 1 which is identical for very shallow water, will occur at the supplementary study water depths of 300, 150 and 50 feet. The kinetic energy at impact will be the same as for deeper study depths. The impact kinetic energy is the same as the falling cable reaches terminal velocity for transverse motion in a very short distance. The distance to reach terminal velocity is small with respect to even the shallowest supplementary study depth of 50 feet.

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4) Spaghetti Pile With Clamp – (All water depths)

This mode, and mode 1 which is identical for very shallow water, will occur at the supplementary study water depths of 300, 150 and 50 feet. The kinetic energy at impact will be the same as for deeper study depths. The impact kinetic energy is the same as the falling cable reaches terminal velocity for transverse motion in a very short distance. The distance to reach terminal velocity is small with respect to even the shallowest supplementary study depth of 50 feet.

5) Plunging Stalk – (Deep water only > ~400 ft)

For the base study this mode was considered as requiring a water depth of 400 feet or more to develop. The reason for this is best understood by considering the mechanism by which this mode develops. If an arbitrary length of cable is falling at an arbitrary angle, being neither perfectly horizontal nor perfectly vertical, it has a component of motion transverse to the cable and another longitudinal with respect to the cable axis. The longitudinal motion is trivial if the cable is nearly horizontal. The transverse motion becomes trivial as the cable axis approaches vertical. The hydrodynamic forces resisting these two motions are very different in character. The transverse drag forces can be very large and terminal velocity can be reached in less than one foot when cable submerged weight is the only driving force. The longitudinal drag force is very much smaller and a vertical segment may accelerate for approximately 100 feet to reach terminal velocity.

As the falling cable reaches lateral terminal velocity very rapidly, but it requires a considerably longer time (and distance) to reach longitudinal terminal velocity, then the axis of the falling cable will rotate from nearly horizontal to nearly vertical during this acceleration. This mode is also predicated on the assumption that a kink, defect, or point of local damage in the cable exists at the lower end of the developing plunging stalk. Sufficient falling time and falling distance exist for the original study water depths of 450 feet or more.

At the supplementary study depths of 300, 150, and 50 feet these conditions are not met.

At 50 feet the development of a plunging stalk cannot have proceeded significantly. The seabed impact geometry would closely approximate mode 3.

At 150 feet a shorter plunging stalk could develop but there would not be sufficient time and distance for it to reach longitudinal terminal velocity. It is estimated that a stalk of quarter the mass of that considered by the original study could reach one-third the original study velocity. This means that a developing plunging stalk in 150 feet of water might impact a target with approximately one thirty-sixth (2.8%) of the energy of a deep water plunging stalk.

At 300 feet, if the stalk length were one-third that of a deep-water plunging stalk and the impact velocity was two-thirds of terminal velocity then the impact kinetic energy would be 4/27ths (14.8%) of the deep-water plunging stalk.

These reduced kinetic energy impacts were evaluated in the same way as the original deeper water cases and added to the tabulations below.

The plausible damage to either a pipeline or a power cable was determined using elastic collision impact analysis. The results of this analysis obtained the following conclusions:

a) None of the pipelines or submarine power cables can be damaged by stiff catenary laydown mode *at any water depth.*
b) None of the pipelines or submarine power cables can be damaged by the hammerhead laydown mode *at any water depth.*
c) None of the pipelines or submarine power cables can be damaged by the spaghetti pile without clamp laydown mode *at any water depth.*
d) None of the pipelines can be damaged by the spaghetti pile with clamp laydown mode *at any water depth.*
e) All of the submarine power cables can be damaged by the spaghetti pile with clamp laydown mode *at any water depth.*
f) All of the pipelines, *in water depths exceeding 450 feet* can be damaged by the plunging stalk mode. *At the shallow water depths considered by this supplement:*
    a. In 50 feet of water a plunging stalk mode cannot be expected to initiate.
    b. For the partially developed plunging stalk mode in 150 feet of water the force exerted on the target is 8.3 kips. As this is less than the 14.2 kip maximum safe load for the weakest of the pipelines, no pipeline damage from a partially developed plunging stalk mode impact will occur in 150 feet of water.
    c. For the partially developed plunging stalk mode in 300 feet of water the force exerted on the target is 19.2 kips. As this is more than the 14.2 kip maximum safe load for the weakest of the pipelines, but less than the 35.8 kip maximum safe load for the strongest pipeline, some of the pipelines could be damaged by a partially developed plunging stalk mode impact in 300 feet of water.
g) All of the submarine power cables can be damaged by the plunging stalk mode *at any water depth.*

As shown above, a plausible risk to the operating pipelines and power cables exists at each of the study locations, specifically in the deeper water. It should be noted that the spaghetti pile mode would more easily impact a long linear target such as the submarine cable. For the spaghetti pile with clamp or the plunging stalk modes to damage a pipeline or power cable, they would have to have a direct hit on the component. A tabular summary is provided *below to include the supplementary locations at 300, 150, and 50 feet of water.*

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A summary tabulation of plausible damage is shown in the following table:

location – water depth	Item	Plausible damage during retrieval operation from dropped "C" cable				
		stiff catenary laydown mode (mode 1)	hammerhead laydown mode (mode 2)	spaghetti pile mode without clamp (mode 3)	spaghetti pile mote with clamp (mode 4)	plunging stalk mode (mode 5)
1 - 450	12 inch POPCO	no	no	no	no	yes
1 - 450	"A" cable	no	no	no	yes	yes
1 - 450	"B" cable	no	no	no	yes	yes
2 - 1250	"A" cable	no	no	no	yes	yes
2 - 1250	"B" cable	no	no	no	yes	yes
2 - 1250	"D" cable	no	no	no	yes	yes
2 - 1250	20 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch treated water	no	no	no	no	yes
2 - 1250	14 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch sales gas	no	no	no	no	yes
3 - 1250	"E" cable	no	no	no	yes	yes
3 - 1250	12 inch gas	no	no	no	no	yes
3 - 1250	20 inch oil emulsion	no	no	no	no	yes
4 - 300	*12 inch POPCO*	*no*	*no*	*no*	*no*	*no*
4 - 300	*"A" cable*	*no*	*no*	*no*	*yes*	*yes*
4 - 300	*"B" cable*	*no*	*no*	*no*	*yes*	*yes*
4 - 300	*"C" cable*	*no*	*no*	*no*	*yes*	*yes*
4 - 300	*12 inch treated water*	*no*	*no*	*no*	*no*	*no*
4 - 300	*20 inch oil emulsion*	*no*	*no*	*no*	*no*	*yes*
5 - 150	*12 inch POPCO*	*no*	*no*	*no*	*no*	*no*
5 - 150	*"A" cable*	*no*	*no*	*no*	*yes*	*yes*
5 - 150	*"B" cable*	*no*	*no*	*no*	*yes*	*yes*
5 - 150	*"C" cable*	*no*	*no*	*no*	*yes*	*yes*
5 - 150	*12 inch treated water*	*no*	*no*	*no*	*no*	*no*
5 - 150	*20 inch oil emulsion*	*no*	*no*	*no*	*no*	*no*
6 - 50	*12 inch POPCO*	*no*	*no*	*no*	*no*	*no*
6 – 50	*"A" cable*	*no*	*no*	*no*	*yes*	*no*
6 - 50	*"B" cable*	*no*	*no*	*no*	*yes*	*no*
6 – 50	*"C" cable*	*no*	*no*	*no*	*yes*	*no*
6 - 50	*12 inch treated water*	*no*	*no*	*no*	*no*	*no*
6 – 50	*20 inch oil emulsion*	*no*	*no*	*no*	*no*	*no*

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ATTACHMENT F

ExxonMobil Santa Ynez Unit

Offshore Power System
Reliability– B Project

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August 2013
Rev 0

OPSRB Project
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SOUTHWEST REGIONAL OFFICE

National Marine Fisheries Service

SOUTHERN CALIFORNIA EELGRASS MITIGATION POLICY

(Adopted July 31, 1991)

(From: http://swr.nmfs.noaa.gov/hcd/eelpol.htm)

Eelgrass (Zostera marina) vegetated areas function as important habitat for a variety of fish and other wildlife. In order to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources, the following policy has been developed by the Federal and State resource agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game). This policy should be cited as the Southern California Eelgrass Mitigation Policy (revision 8).

For clarity, the following definitions apply. "Project" refers to work performed on-site to accomplish the applicant's purpose. "Mitigation" refers to work performed to compensate for any adverse impacts caused by the "project". "Resource agencies" refers to National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game.

1. **Mitigation Need.** Eelgrass transplants shall be considered only after the normal provisions and policies regarding avoidance and minimization, as addressed in the Section 404 Mitigation Memorandum of Agreement between the Corps of Engineers and Environmental Protection Agency, have been pursued to the fullest extent possible prior to the development of any mitigation program.

2. **Mitigation Map.** The project applicant shall map thoroughly the area, distribution, density and relationship to depth contours of any eelgrass beds likely to be impacted by project construction. This includes areas immediately adjacent to the project site which have the potential to be indirectly or inadvertently impacted as well as areas having the proper depth and substrate requirements for eelgrass but which currently lack vegetation.

Protocol for mapping shall consist of the following format:

1) Coordinates

Horizontal datum - Universal Transverse Mercator (UTM), NAD 83, Zone 11

Vertical datum - Mean Lower Low Water (MLLW), depth in feet.

2) Units

Transects and grids in meters.

Area measurements in square meters/hectares.

All mapping efforts must be completed during the active growth phase for the vegetation (typically March through October) and shall be valid for a period of 120 days with the exception of surveys completed in August - October.

A survey completed in August - October shall be valid until the resumption of active growth (i.e., March 1). After project construction, a post-project survey shall be completed within 30 days. The actual area of impact shall be determined from this survey.

3. **Mitigation Site.** The location of eelgrass transplant mitigation shall be in areas similar to those where the initial impact occurs. Factors such as, distance from project, depth, sediment type, distance from ocean connection, water quality, and currents are among those that should be considered in evaluating potential sites.

4. **Mitigation Size.** In the case of transplant mitigation activities that occur concurrent to the project that results in damage to the existing eelgrass resource, a ratio of 1.2 to 1 shall apply. That is, for each square meter adversely impacted, 1.2 square meters of new suitable habitat, vegetated with eelgrass, must be created. The rationale for this ratio is based on, 1) the time (i.e., generally three years) necessary for a mitigation site to reach full fishery utilization and 2) the need to offset any productivity losses during this recovery period within five years. An exception to the 1.2 to 1 requirement shall be allowed when the impact is temporary and the total area of impact is less than 100 square meters. Mitigation on a one-for-one basis shall be acceptable for projects that meet these requirements (see section 11 for projects impacting less than 10 square meters).

Transplant mitigation completed three years in advance of the impact (i.e., mitigation banks) will not incur the additional 20% requirement and, therefore, can be constructed on a one-for-one basis. However, all other annual monitoring requirements (see sections 8-9) remain the same irrespective of when the transplant is completed.

Project applicants should consider increasing the size of the required mitigation area by 20-30% to provide greater assurance that the success criteria, as specified in Section 9, will be met. In addition, alternative contingent mitigation must be specified, and included in any required permits, to address situation where performance standards (see section 9) are not met.

5. **Mitigation Technique.** Techniques for the construction and planting of the eelgrass mitigation site shall be consistent with the best available technology at the time of the project. Donor material shall be taken from the area of direct impact whenever possible, but also should include a minimum of two additional distinct sites to better ensure genetic diversity of the donor plants. No more than 10% of an existing bed shall be harvested for transplanting purposes. Plants harvested shall be taken in a manner to thin an existing bed without leaving any noticeable bare areas. Written permission to harvest donor plants must be obtained from the California Department of Fish and Game.

Plantings should consist of bare-root bundles consisting of 8-12 individual turions. Specific spacing of transplant units shall be at the discretion of the project applicant.

However, it is understood that whatever techniques are employed, they must comply with the stated requirements and criteria.

6. **Mitigation Timing.** For off-site mitigation, transplanting should be started prior to or concurrent with the initiation of in-water construction resulting in the impact to the eelgrass bed. Any off-site mitigation project which fails to initiate transplanting work within 135 days following the initiation of the in-water construction resulting in impact to the eelgrass bed will be subject to additional mitigation requirements as specified in section 7. For on-site mitigation, transplanting should be postponed when construction work is likely to impact the mitigation. However, transplanting of on-site mitigation should be started no later than 135 days after initiation of in-water construction activities. A construction schedule which includes specific starting and ending dates for all work including mitigation activities shall be provided to the resource agencies for approval at least 30 days prior to initiating in-water construction.

7. **Mitigation Delay.** If, according to the construction schedule or because of any delays, mitigation cannot be started within 135 days of initiating in-water construction, the eelgrass replacement mitigation obligation shall increase at a rate of seven percent for each month of delay. This increase is necessary to ensure that all productivity losses incurred during this period are sufficiently offset within five years.

8. **Mitigation Monitoring.** Monitoring the success of eelgrass mitigation shall be required for a period of five years for most projects. Monitoring activities shall determine the area of eelgrass and density of plants at the transplant site and shall be conducted at 3, 6, 12, 24, 36, 48, and 60 months after completion of the transplant. All monitoring work must be conducted during the active vegetative growth period and shall avoid the winter months of November through February. Sufficient flexibility in the scheduling of the 3 and 6 month surveys shall be allowed in order to ensure the work is completed during this active growth period. Additional monitoring beyond the 60 month period may be required in those instances where stability of the proposed transplant site is questionable or where other factors may influence the long-term success of transplant.

The monitoring of an adjacent or other acceptable control area (subject to the approval of the resource agencies) to account for any natural changes or fluctuations in bed width or density must be included as an element of the overall program.

A monitoring schedule that indicates when each of the required monitoring events will be completed shall be provided to the resource agencies prior to or concurrent with the initiation of the mitigation.

Monitoring reports shall be provided to the resource agencies within 30 days after the completion of each required monitoring period.

9. **Mitigation Success.** Criteria for determination of transplant success shall be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the project and mitigation sites. Extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is defined by the number of turions per area

present in representative samples within the control or transplant bed. Specific criteria are as follows:

a. a minimum of 70 percent area of eelgrass bed and 30 percent density after the first year.

b. a minimum of 85 percent area of eelgrass bed and 70 percent density after the second year.

c. a sustained 100 percent area of eelgrass bed and at least 85 percent density for the third, fourth and fifth years.

Should the required eelgrass transplant fail to meet the established criteria, then a Supplementary Transplant Area (STA) shall be constructed, if necessary, and planted. The size of this STA shall be determined by the following formula:

$STA = MTA \times (|A_t + D_t| - |A_c + D_c|)$

MTA = mitigation transplant area.

A_t = transplant deficiency or excess in area of coverage criterion (%).

D_t = transplant deficiency in density criterion (%).

A_c = natural decline in area of control (%).

D_c = natural decline in density of control (%).

Four conditions apply:

1) For years 2-5, an excess of only up to 30% in area of coverage over the stated criterion with a density of at least 60% as compared to the project area may be used to offset any deficiencies in the density criterion.

2) Only excesses in area criterion equal to or less than the deficiencies in density shall be entered into the STA formula.

3) Densities which exceed any of the stated criteria shall not be used to offset any deficiencies in area of coverage.

4) Any required STA must be initiated within 120 days following the monitoring event that identifies a deficiency in meeting the success criteria. Any delays beyond 120 days in the implementation of the STA shall be subject to the penalties as described in Section 7.

10. **Mitigation Bank.** Any mitigation transplant success that, after five years, exceeds the mitigation requirements, as defined in section 9, may be considered as credit in a "mitigation bank". Establishment of any "mitigation bank" and use of any credits accrued from such a bank must be with the approval of the resource agencies and be consistent with the provisions stated in this policy. Monitoring of any approved mitigation bank shall be conducted on an annual basis until all credits are exhausted.

11. **Exclusions.**

1) Placement of a single pipeline, cable, or other similar utility line across an existing eelgrass bed with an impact corridor of no more than ½ meter wide may be excluded from the provisions of this policy with concurrence of the resource agencies. After project construction, a post-project survey shall be completed within 30 days and the results shall be sent to the resource agencies. The actual area of impact shall be determined from this survey. An additional survey shall be completed after 12 months to insure that the project or impacts attributable to the project have not exceeded the allowed ½ meter corridor width. Should the post-project or 12 month survey demonstrate a loss of eelgrass greater than the ½ meter wide corridor, then mitigation pursuant to sections 1-11 of this policy shall be required.

2) Projects impacting less than 10 square meters. For these projects, an exemption may be requested by a project applicant from the mitigation requirements as stated in this policy, provided suitable out-of-kind mitigation is proposed. A case-by-case evaluation and determination regarding the applicability of the requested exemption shall be made by the resource agencies.

(last revised 2/2/99)

ExxonMobil

Santa Ynez Unit

Offshore Power System Repair: Amended Project
OPSR:A

Cable Retrieval Risk Assessment
(Analysis of Risk of Damage to Existing Components from a Dropped Cable During Retrieval)

September 2002

Prepared by:
PMBCI
Gene Pharr, PE

Study Summary

PMBCI examined the risk of physical damage to the active SYU cables and pipelines from the dropping of the failed "C" cable with or without the recovery tools attached during retrieval from the seabed. The study evaluated two water depths and three locations: 1) seaward of the shelf break in about 450 feet of water depth and 2) at two gas pipeline crossings of the "C" cable west of the Harmony platform each in about 1250 feet of water depth. The study methodology included the following three steps: 1) analysis of the falling cable dynamics; 2) analysis of the collision impact dynamics and 3) estimation of pipeline or cable damage. As a result of the analysis, five cable laydown modes were examined and three were found to be plausible under study conditions.

1) Stiff Catenary Laydown – (Very shallow water only < 50 ft) [Not considered plausible]
2) Hammerhead Laydown – (Does not occur under assumptions used) [Not considered plausible]
3) Spaghetti Pile Without Clamp – (All water depths)
4) Spaghetti Pile With Clamp – (All water depths)
5) Plunging Stalk – (Deep water only > ~400 ft)

The plausible damage to either a pipeline or a power cable was determined using elastic collision impact analysis. The results of this analysis obtained the following conclusions:

a) None of the pipelines or submarine power cables can be damaged by stiff catenary laydown mode.
b) None of the pipelines or submarine power cables can be damaged by the hammerhead laydown mode.
c) None of the pipelines or submarine power cables can be damaged by the spaghetti pile without clamp laydown mode.
d) None of the pipelines can be damaged by the spaghetti pile with clamp laydown mode.
e) All of the submarine power cables can be damaged by the spaghetti pile with clamp laydown mode.
f) All of the pipelines can be damaged by the plunging stalk mode.
g) All of the submarine power cables can be damaged by the plunging stalk mode.

As shown above, a plausible risk to the operating pipelines and power cables exists at each of the study locations, specifically in the deeper water. It should be noted that the spaghetti pile mode would more easily impact a long linear target such as the submarine cable. For the spaghetti pile with clamp or the plunging stalk modes to damage a pipeline or power cable, they would have to have a direct hit on the component. A tabular summary is provided in the report.

Study Premise

ExxonMobil commissioned PMBCI to examine the risk of damage to the SYU power cables and pipelines if the existing failed "C" cable is dropped during retrieval from the seabed while either the existing cables and pipelines are still in active service or the same operation after all of the cables and pipelines have been decommissioned and removed from service at the end of the SYU field life.

The primary risk examined in this study is that of possible physical damage caused by a dropped object such as the cable being retrieved with or without the recovery tools attached. One phase of this study will be to examine the loading required to cause such a failure. For the situation where the existing power cables or pipelines are still in service, an impact sufficient to cause plastic (e.g. inelastic permanent) deformation of the cable jacket armor wires or the pipeline is defined (for the purposes of this study) as failure. Depending on the actual damage, this type of deformation could require the repair of the cable or pipeline. For the situation where the cables and pipelines have been decommissioned, no repair would be required.

The study assumes, as an obvious conclusion, that the cable being retrieved, and the recovery clamp or end fittings to be employed are not themselves heavy enough to cause damage if they were lowered gently to the sea bottom. The major part of the study will focus on the estimation of the kinetic energy of the falling body. Due to the required calculation assumptions, the unknown physical condition of the cable to be retrieved, and for consistency with common engineering practice for heavy lift marine rigging and salvage operations, a safety factor of at least 3.0 is recommended. Without an adequate safety factor it is not practical to predict that a given scenario avoids damage with consequent risks of loss of service, pollution, and increased risks associated with or arising in additional or corrective work.

Site and Operations

The study evaluates the retrieval of the failed "C" power cable (5.83 inch diameter 35 kv submarine power cable) that has been removed from service and will be replaced as part of the OPSR:A Project. The cable runs between the shore and the Heritage offshore platform passing South of the Hondo and Harmony platforms as shown on the marine survey drawings (reference Pre-Lay Cable Route Survey, September 2001).

The OPSR:A Project purposes to retrieve the portion of the cable from the conduit terminus to the shelf break. The inshore portion of the cable will be retrieved to about 400-450 feet of water to the seaward side of the shelf break in the OCS. As a future operation, the OCS portion of the failed "C" cable could be retrieved from the shelf break to the first gas pipeline crossing west of Harmony platform and then from the second crossing of the gas pipeline to the Heritage platform. Another future operation could be the removal of the entire OCS portion of the failed "C" cable at the end of the SYU field life after the facilities have been shut down.

In the area of the shelf break the purposed approach is for the seaward portion of the "C" cable to be cut at the tension machine on the vessel and lowered to the sea bottom with a nominal 100 pound pulling head attached for future recovery. The cable is nominally parallel and adjacent to the "B" power cable, the "A" power cable, and the 12-inch POPCO pipeline at this location. The first objective of this study is to evaluate if damage could occur to these in-service power cables or pipelines if the "C" cable were dropped at this point.

The future retrieval operation of the OCS portion of the "C" cable would proceed by lifting the inshore end of the cable at the 400-450 water depth and recovering it onto the cable recovery vessel through a traction device. A nominal 3-knot current from approximately West to East will contribute to the cable catenary tension during recovery.

For this analysis the recovery of the cable on the OCS will proceed to a point to the East and slightly South of the Harmony platform. The point will be selected such that the catenary lift-off point remains short of where the "C" cable crosses under the 12-inch gas pipeline West of the Harmony platform. The cable will be cut at this point and lowered to the sea bottom with a nominal 100 pound pulling head attached.

The second objective of this study is to determine if this cable were dropped at this point would it damage any of the in-service power cables or pipelines at that location. The cables at that location are the "A", "B", and "D" submarine power cables. The pipelines are the 20-inch oil emulsion pipeline, the 12 inch treated water pipeline, the 14-inch oil emulsion pipeline, and the 12-inch sales gas pipeline.

For this analysis the recovery of the cable on the OCS will continue West of the second crossing of the 12 inch gas pipeline located West of the Harmony platform to the Heritage platform. At this location, the cable will be cut on the sea bottom and lifted with a 200-pound cable clamp.

The third objective of this study is to determine if the cable, with the clamp tool attached, were dropped at this point would it damage any of the in-service cables or pipelines at this location. The "E" power cable, 12-inch gas pipeline, and 20 inch oil emulsion pipelines are at this location.

Study Methodology

The study methodology included the following three steps to address the study objectives:

1.) Falling Cable Dynamics

> *For each of the three locations, how can the cable fall? How fast will it go? With what kinetic energy will it strike the seafloor or one of the study target cables or pipelines? In simple terms, how hard does it hit?*

2.) Collision Impact dynamics

> *The "C" cable being retrieved and the lifting clamp or end fitting will be falling on the study target bodies with kinetic energies predicted in step 1. The force imparted to the target body will be predicted as a collision of elastic bodies. The work done to bring the falling body to rest is the integral of the force exerted with respect to the falling body deformation. The same amount of work is done by the equal and opposite forces deforming the target body.*

3.) Pipeline or Cable Damage Estimate

> *The pipelines are analyzed by a linear finite element analysis to determine the magnitude of force applied in the anticipated patterns that would result in initiation of a failure if acting alone. As it is not practical to evaluate other actual stresses as may be present, a safety factor of three is recommended to provide rational assurance that damage will not result from combined stresses due to both the predicted impact event and "ambient" stresses from operating and service conditions.*
>
> *The cables spiral armor will be effective principally in resisting transverse cuts or abrasion. It will not be effective in preventing lateral loads from being transferred to the conductors. The HV Kerite conductor insulation is a material with physical behavior characteristics like a high durometer rubber and a tensile strength of 550 psi. The target cables are primarily subject to damage either by a stabbing type of impact in which the armor wires are pushed aside, perhaps by broken armor wires protruding from the falling cable, or by direct*

crushing forces transmitted through the armor to the conductor core. This high rate impact load can cause a longitudinal splitting and consequent failure if the peak tensile stresses exceed the tensile strength.
A linear finite element analysis of the conductor has been performed to determine the loading that would initiate such a failure. A safety factor of at three is recommended to insure the validity of safe loading predictions. No data is available for the known characteristic of most insulating materials to exhibit reduced dielectric strength under high shear stress loadings therefore the suggested safety factor of three may not be adequate to prevent dielectric breakdown if the cables are energized at the time of impact.

Falling Cable Dynamics

Analyses of the cable catenaries with loading from typical water currents were performed for a wide variety of conditions at 450 and 1250 water depths. These analyses indicated that to avoid exceeding allowable cable tension the horizontal force at the traction (upper) end must be limited. The maximum cable tension without current loading would be at the upper end. Due to the current forces transverse to the cable, both the horizontal and vertical forces are markedly increased and the maximum cable tension will occur in the sag bend rather than the upper end. The profile that must be adopted to prevent excessive tension in the three knot current is steeper at the upper end than might be used for a "no-current" cable laying or recovery operation. The manufacturers suggested maximum cable tension of 21,680 pounds should be observed. As the cable is known to have failed, the possibility of a local physical defect either due to fault currents or galvanic action is considered high. Although the cable is being retrieved without expectation of reuse, higher tension than the manufacturer has recommended could cause a tensile failure at a local physical defect. There is no assurance that such a failure will not occur at an even lower load. All normal precautions to stay clear of highly tensioned multipart lines should be observed. If such an unanticipated tension failure does occur at a tension less than the recommended 21,680 pound limit, the results will be very similar to the cases considered at the previously described three locations.

The cable could be dropped due to a rigging failure or handling error at any of the three study locations. The first analysis is for a 3-knot current loaded catenary in 450 feet of water, within permissible maximum tension limits. Two time steps for a direct integration time-history dynamic analysis are shown in Figure 1. This analysis does not converge to a solution as instabilities develop from the inability of the modeled cable to sustain compressive loads.

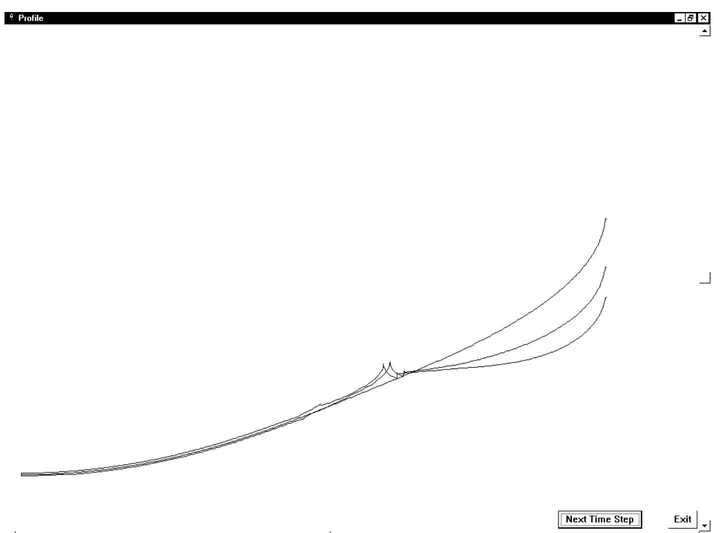

Figure 1 – 450-foot water depth simple catenary dynamic analysis predicts instability

Several useful inferences may be drawn even though a full direct solution fails. These will be discussed further after looking at other examples. The water depth for this case is 450 feet. The lift-off point is 842.28 feet from the able head, which is 11.17 feet above the waterline.

A second analysis using a similar profile for 1250 feet of water follows. This current loaded profile is for minimum tension while retaining control of the lift-off point. The lift-off point is 341.34 feet from the cable head, which is 11.14 feet above the waterline. Note that for this minimum tension case in 1250 feet of water, the cable head is nearly vertical. Five time steps from the cable release are shown in Figure 2. Just as in the 450-foot water depth case, compressive instabilities develop, and the solution fails to converge.

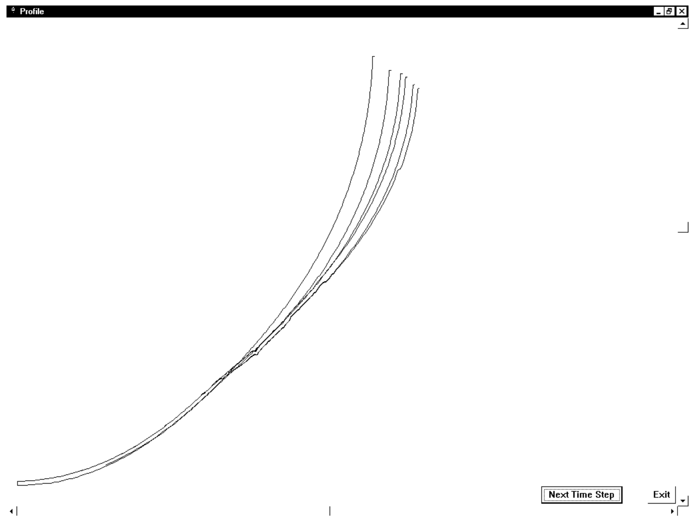

Figure 2 – 1250-foot water depth minimum tension simple catenary dynamic analysis predicts instability

By contrast, the current loaded profile for maximum tension was also evaluated. The lift-off point is 1482.88 feet from the cable head, which is 11.38 feet above the waterline. For this maximum tension case in 1250 feet of water the cable head is still at a high angle. Two time steps from the cable release are shown in Figure 3. Just as in the other cases, compressive instabilities develop, and the solution fails to converge.

The maximum tension profile for 1250 feet of water follows.

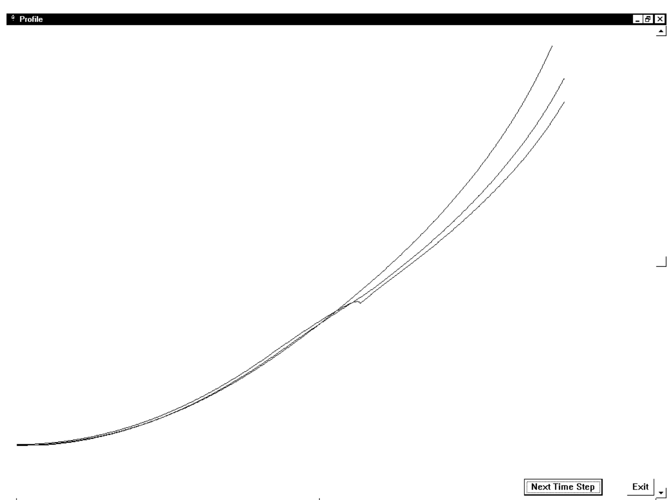

Figure 3 – 1250-foot water depth maximum tension simple catenary dynamic analysis predicts instability

These analyses and others all failed to converge to simple solutions with the cable on bottom and in every case the development of instability due to axial compression was the reason.

The "C" cable has three HV insulated conductors and a single layer of 46 BWG #4 galvanized steel wires coated with 55 mils of high density polyethylene. The coated armor wires are in a single left lay layer with a 39-inch spiral pitch. The armor wires are not contained within a sheath or connected together.

Traditional rational analysis to proceed beyond the above evaluation suggests five specific modes to consider for the manner in which the dropped cable may reach the sea bottom:

1.) Stiff Catenary Laydown Mode

If the cable were able to sustain the compression that arises without significant local buckling or out of plane deformation, it would come down with in-plane lateral motion only. A single touchdown point would move along the seabed from the prior-to-release lift-off point to the cable head.

A number of factors work against development of this case. The single layer spiral armor will cause the slacking cable to spiral and compression will amplify the inherent spiral. This effect will cause out of plane motion to initiate. The spiral armor itself is unable to sustain direct compression and it can open up forming basket(s). At any local defect such as where a basket exists or armor wires are displaced from their normal lay or wires have been broken, corroded, or damaged in any way, a weak spot is formed where compressive force will cause a concentration of p-delta moment amplification effects.

The simple stiff catenary laydown can only occur in very shallow water (perhaps less than 50 feet of water depth). This mode is not expected in the study water depth range. Further analysis of this mode was not pursued as it is not expected to occur.

2.) Hammerhead Laydown Mode

This laydown mode is the same as above except that the cable end fixture acting as a concentrated weight causes the cable end to fall faster such that it hits bottom ahead of the adjacent cable.

This mode is also not expected to develop in the study water depths. The Stiff Catenary Laydown from which this mode would develop does not occur and the cable end fittings employed are not heavy enough to have significant effect.

3.) Spaghetti Pile Mode Without Clamp

As the cable cannot sustain compressive loading without lateral displacement and bending it will curl into a spaghetti pile. As the curling cable falls, there will be multiple touchdown points in unpredictable locations and sequences along and to both sides of the nominal cable path. In all cases the touchdown velocity will be approximately the terminal velocity for lateral motion of the cable. The individual impact points may be very slightly higher than the nominal terminal velocity as adjacent cable segments are inclined with respect to the general motion.

This mode is expected to occur at all the study location water depths. The lateral distribution of the impact points could be higher in the deeper water but remains unpredictable. As the cable reaches its terminal velocity in less than its own diameter there is no other significant difference between the 450 and 1250-foot water depths.

A typical impact point kinetic energy for the spaghetti pile would be approximately:

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{200}{32.2}\right) \cdot \left(3.75^2\right)}{2} = 43.7 \quad ft \cdot lbf$$

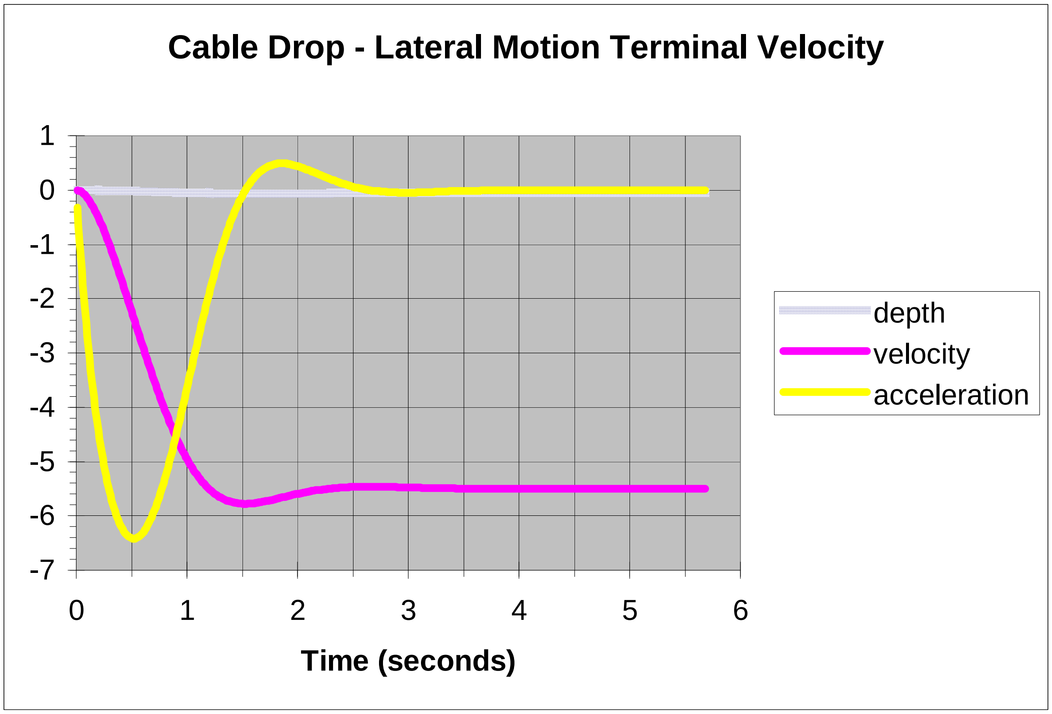

Figure 4 – Dynamic Terminal Velocity Study by Morison's Equation

The terminal velocity for the "C" cable free falling in seawater at 70° F is 5.50 feet per second. The cable diameter is 5.38 inches. The values for Cd and Cm are 0.70 and 1.6.

As can be seen in Figure 4, starting from rest the terminal velocity is reached in about 2.5 seconds and with a lateral motion of less than the cable diameter.

[5.5 feet per second is 3.75 miles per hour; about walking speed.]

4.) **Spaghetti Pile Mode With Clamp**

This mode is the same as the previous mode except that a 200-pound end clamp is located a few feet from the end of the cable. The edge of this clamp can strike the pipe like a knife-edge and at a slightly higher kinetic energy.

At the end clamp the kinetic energy could be:

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{400}{32.2}\right) \cdot \left(4.00^2\right)}{2} = 99.4 \ \ ft \cdot lbf$$

5.) Plunging Stalk Mode

The axial hydrodynamic forces, which are commonly ignored in many cases, are substantially less than the lateral forces described by Morison's Equation. If a segment of cable is falling in the direction of its longitudinal axis then its terminal velocity is governed by the weaker axial flow surface boundary layer effects and it will fall faster and for a much greater distance before reaching terminal velocity.

Figure 5 shows a 400-foot "stalk" falling vertically. It reaches terminal velocity at 67.3 feet per second (45.9 miles per hour) when the drag equals the submerged weight of 3500 pounds after plunging 122 feet. Note this is radically different from the lateral terminal velocity.

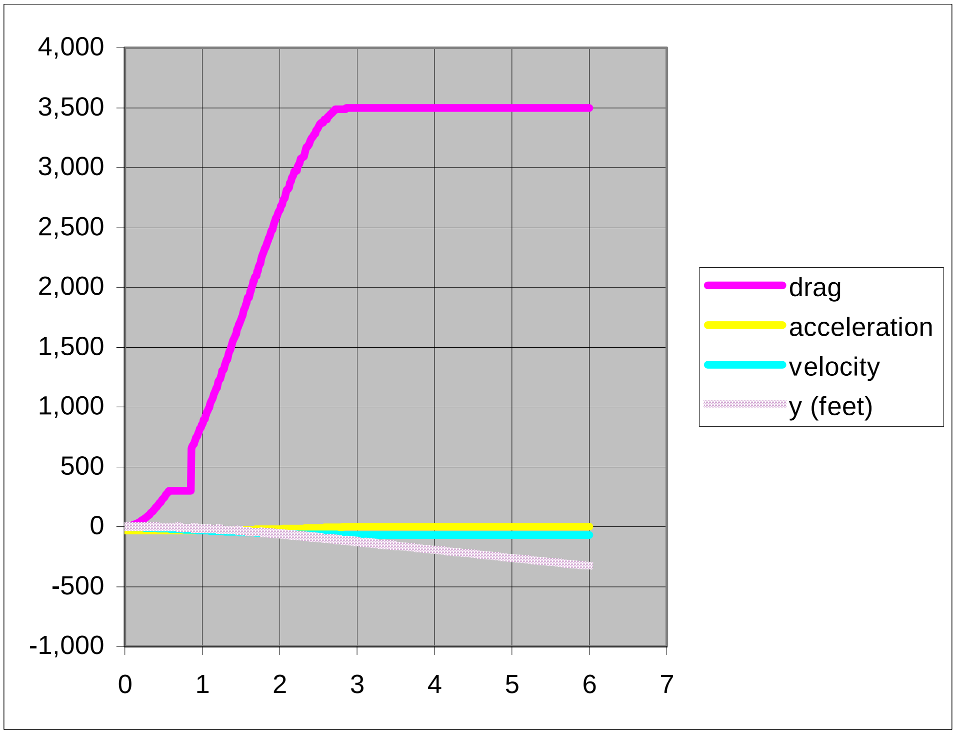

Figure 5 – Axial Flow Terminal Velocity Study

The kinetic energy for a 400-foot stalk at terminal velocity, as could develop in 1250 feet of water, is:

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{400 \cdot 18.85}{32.2}\right) \cdot \left(67.3^2\right)}{2} = 530293 \ ft \cdot lbf$$

This is a plausible worst case for the 1250 water depth locations. At the 450-foot water depth the plausible stalk length is more like 150 feet.

$$E_k = \frac{m \cdot v^2}{2} = \frac{\left(\frac{150 \cdot 18.85}{32.2}\right) \cdot \left(39.9^2\right)}{2} = 69898 \ ft \cdot lbf$$

This mode is more plausible in deeper water depths. It is also more likely to be initiating at points of existing cable damage.

Elastic Collision Impact Dynamics

1) 400 foot Plunging Stalk Impact

Weight of impacting object (in force units): $W := 7540 \cdot lbf$

Velocity of the impacting object: $V := 67.3 \cdot fps$

Stiffness of object being impacted: $k_1 := 1.5 \cdot kpi$

Stiffness of the impact object - This value is typically just estimated. As a guide line, some selected values of k_2, and the corresponding combined stiffness k, follows: $k_2 := 150 \cdot kpi$

for	$k_2 = k_1$	$k = 1/2 \cdot k_1$ (for equal stiffnesses)
	$k_2 = 2 \cdot k_1$	$k = 2/3 \cdot k_1$
	$k_2 = 3 \cdot k_1$	$k = 3/4 \cdot k_1$
	$k_2 = 7 \cdot k_1$	$k = 7/8 \cdot k_1$
	$k_2 = 10^{15}$	$k = k_1$ (for infinitely stiff impact object)

Calculate the kinetic energy at impact as a function of the velocity at impact, V:

$E_F(V) := \frac{W}{2 \cdot g} \cdot V^2$ $E_F(V) = 6368.645 \, in \cdot kips$

Derive the formula for converting energy of a moving object into an impact force on the body being impacted:

The energy absorbed by the impacted object, as well as the energy absorbed by the impacting object , is equal to the area under each one 's force/deflection curve. Since th e area is a triangle, the energy , $E = \frac{1}{2} \cdot R \cdot y$, **where R is the force, which is equal between the two objects, and y is the deflection. The total energy is equal to the sum of the energy absorbed by both.**

Therefore $E = \frac{1}{2} \cdot R \cdot y_1 + \frac{1}{2} \cdot R \cdot y_2$ **and by substitution** $E = \frac{1}{2} \cdot R \cdot \frac{R}{k_1} + \frac{1}{2} \cdot R \cdot \frac{R}{k_2}$

Simplifying $E = \frac{1}{2} \cdot R^2 \cdot \left(\frac{1}{k_1} + \frac{1}{k_2} \right)$ **and** $R = \sqrt{\frac{2 \cdot E}{\frac{1}{k_1} + \frac{1}{k_2}}}$

And further simplifying $R = \sqrt{2 \cdot \frac{k_1 \cdot k_2}{k_1 + k_2} \cdot E}$

Where the effective stiffness of the two body combination is: $k := \frac{k_1 \cdot k_2}{k_1 + k_2}$ $k = 1.5 \, kpi$

Calculate the impact force as a function of the combined stiffness and the speed of the impacting body: $R(k, V) := \sqrt{2 \cdot k \cdot E_F(V)}$

Therefore for the 400 foot plunging stalk at a 1250 foot water depth:

The resulting impact force between bodies is: $R(k, V) = 137.538 \, kips$

2) Similarly, for the 150 foot plunging stalk at a 450 foot water depth:

The resulting impact force between bodies is: $R(k, V) = 49.93 \, kips$

3) For the Spaghetti Pile Mode with Clamp Mode:

The resulting impact force between bodies is: $R(k, V) = 1.883 \, kips$

4) For the Spaghetti Pile without Clamp Mode:

The resulting impact force between bodies is: $R(k, V) = 1.248 \, kips$

Pipeline and Cable Damage Estimates

The most easily damaged pipeline would be the 20-inch diameter pipe with a 0.5-inch wall thickness (oil emulsion line). The force required to yield the pipe is 42,730 pounds. With a safety factor of 3.0, as recommended, this says the applied force should be limited to 14,243 pounds. As shown in Figure 6, this is substantially less than the plunging stalk forces of 137,530 or 49,930-pound forces for the 400 and 150-foot cases, respectively. Damage to the 20-inch pipeline at any of the three study locations is therefore plausible.

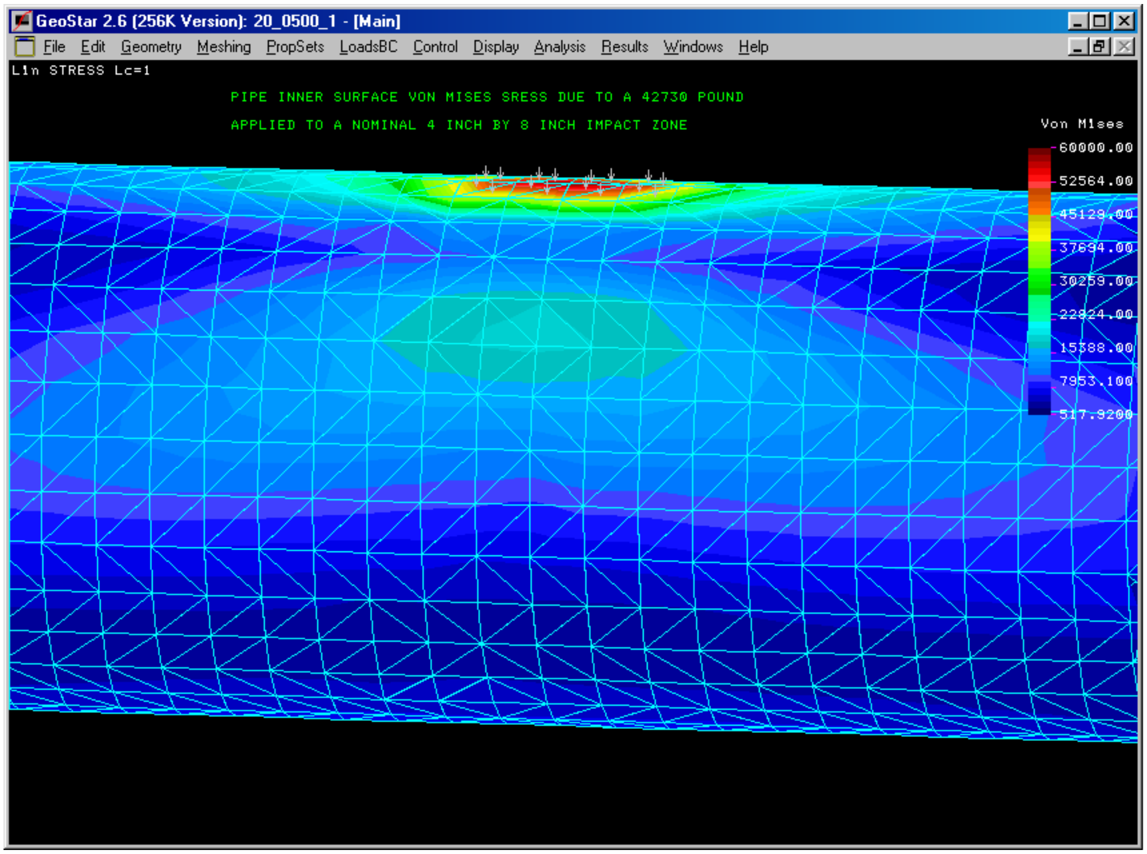

Figure 6 – Finite Element Analysis for 20ϕ0.500 60-ksi-yield stress pipeline for load to cause yield, distributed over an impact zone for the plunging stalk mode

Conversely, for the general case of the spaghetti pile mode, the 1,248 pounds is insufficient to cause damage to the most easily damaged pipeline.

For the spaghetti pile with clamp impact case, the force required to yield the pipe is 31,796 pounds as shown in Figure 7. This force is less than the case shown in Figure 6 since the clamp impact is applied for the finite element analysis as a concentrated line load transversely to the pipe axis rather than spread over a larger impact area. This simulates the knife edge effect of the clamp edge striking the pipe at an angle. With the recommended safety factor of 3.0, the applied load should be limited to 10,599 pounds. As this is substantially more than the 1,883 pounds for the clamp impact in the spaghetti pile with clamp mode, no pipeline damage will occur.

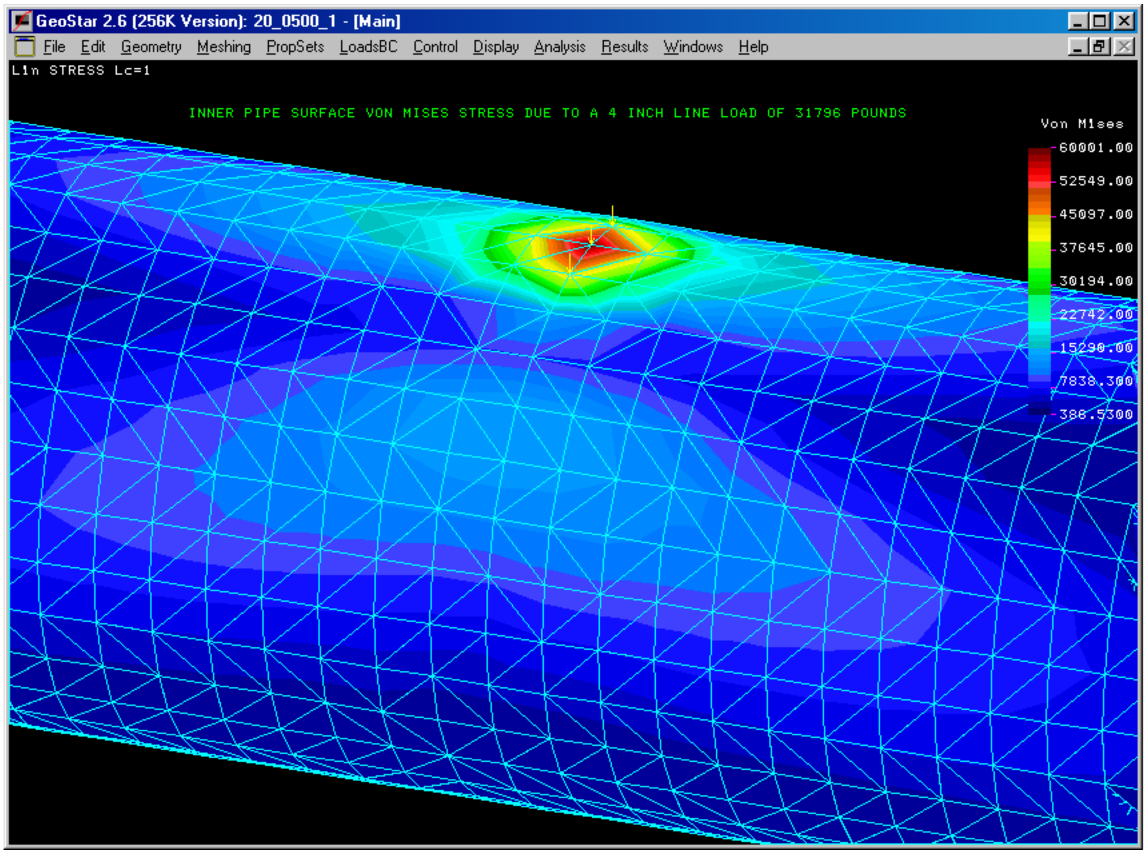

Figure 7 – Finite Element Analysis for 20ϕ0.500 60-ksi-yield stress pipeline for load to cause yield, applied like a knife-edge for the spaghetti pile with clamp mode.

The pipeline most resistant to impact damage would be the nominal 12-inch pipe with a 0.625-inch wall thickness (gas pipeline). The load required to yield the pipe is 107,500 pounds. With the safety factor of 3.0, the load should be limited to 35,833 pounds. The impact pattern assumed on the pipe is shown in Figure 8.

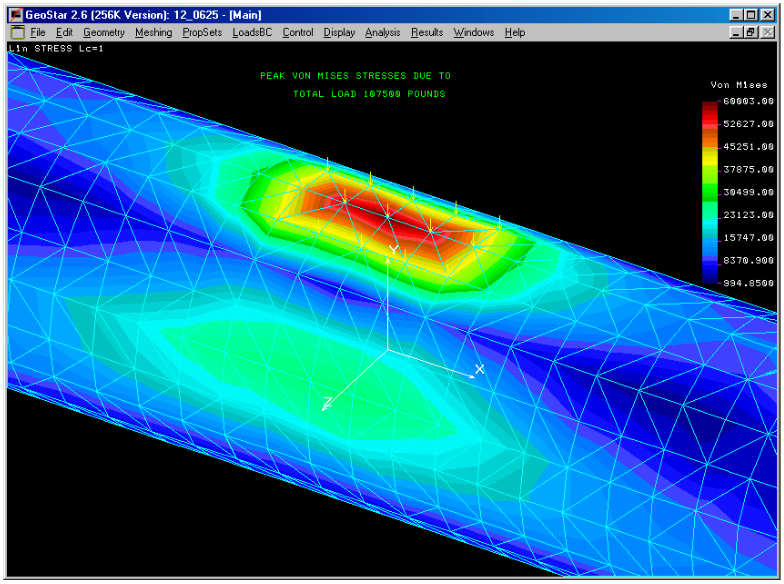

Figure 8 - Finite Element Analysis of 12.75ϕ0.625 60 ksi yield pipeline for load to cause yield, distributed over an impact zone for the plunging stalk mode

The 137,530-pound and 49,930 pound forces from the 400 and 150 foot plunging stalk modes, respectively, both exceed 35,833 pounds. Therefore, any of the pipelines at any of the study locations can plausibly be damaged by an impact in the plunging stalk mode.

Finite element analysis of the cable primary conductor assembly reveals the HV Kerite insulation reaches a 550-psi Von Mises stress with a 5223 pound per inch transverse loading. The spiral armor is deemed to be effective to distribute the knife-edge load for about one inch, or 4 armor wire diameters.

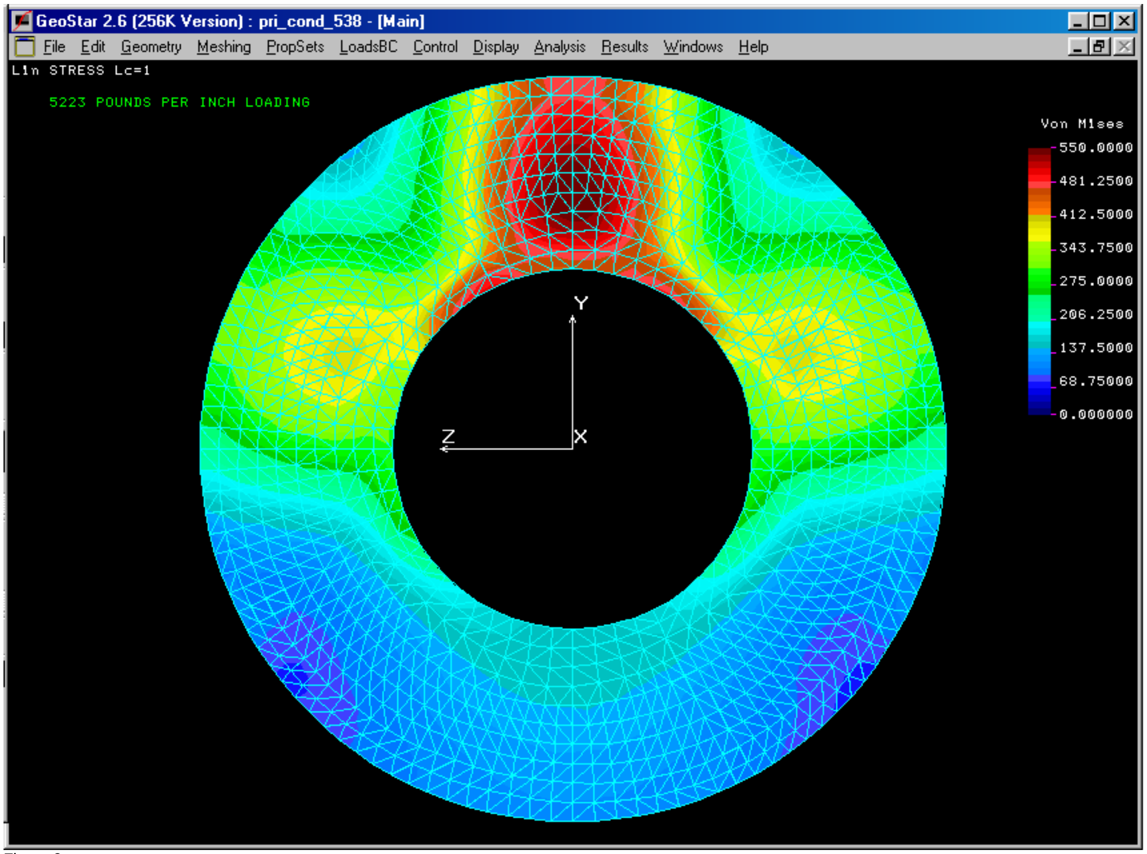

Figure 9 –

The cable analysis stress plot in Figure 9 shows a loading of 5,223 pounds per inch will cause a longitudinal splitting of the HV Kerite insulation layer of the conductors. With a safety factor of 3.0, the loading should be limited to 1,741 pounds. This means that the spaghetti pile with clamp mode impact (1883 pounds) or either plunging stalk mode impact can fail any of the cables.

A summary tabulation of plausible damage is shown in the following table:

location – water depth	Item	Plausible damage during retrieval operation from dropped "C" cable				
		stiff catenary laydown mode (mode 1)	hammerhead laydown mode (mode 2)	spaghetti pile mode without clamp (mode 3)	spaghetti pile mote with clamp (mode 4)	plunging stalk mode (mode 5)
1 - 450	12 inch POPCO	no	no	no	no	yes
1 - 450	"A" cable	no	no	no	yes	yes
1 - 450	"B" cable	no	no	no	yes	yes
2 - 1250	"A" cable	no	no	no	yes	yes
2 - 1250	"B" cable	no	no	no	yes	yes
2 - 1250	"D" cable	no	no	no	yes	yes
2 - 1250	20 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch treated water	no	no	no	no	yes
2 - 1250	14 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch sales gas	no	no	no	no	yes
3 - 1250	"E" cable	no	no	no	yes	yes
3 - 1250	12 inch gas	no	no	no	no	yes
3 - 1250	20 inch oil emulsion	no	no	no	no	yes

ExxonMobil

Santa Ynez Unit

Offshore Power System Repair: Amended Project
OPSR:A

Cable Retrieval Risk Assessment
(Analysis of Risk of Damage to Existing Components from a Dropped Cable During Retrieval)

Supplement 1: Shallow Water Addendum
(Supplementary findings Italicized)

October 2002

Prepared by:
PMBCI
Gene Pharr, PE

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Study Summary

PMBCI examined the risk of physical damage to the active SYU cables and pipelines from the dropping of the failed "C" cable with or without the recovery tools attached during retrieval from the seabed. The study evaluated two water depths and three locations: 1) seaward of the shelf break in about 450 feet of water depth and 2) at two gas pipeline crossings of the "C" cable west of the Harmony platform each in about 1250 feet of water depth. The study methodology included the following three steps: 1) analysis of the falling cable dynamics; 2) analysis of the collision impact dynamics and 3) estimation of pipeline or cable damage. As a result of the analysis, five cable laydown modes were examined and three were found to be plausible under study conditions.

A supplementary examination of damage potential at 300, 150, and 50-foot water depths was performed to consider plausible damage. The same five cable laydown modes were considered with the following summary findings:

1) Stiff Catenary Laydown – (Very shallow water only < 50 ft) [Not considered plausible]

This mode and the Spaghetti Pile Without Clamp mode (mode 3) converge to the same thing when the curl radius of the Spaghetti Pile is very long. In very shallow water this would be the case. The upper bound of kinetic energy for this case may therefore reasonably be taken as the same as mode 3.

2) Hammerhead Laydown – (Does not occur under assumptions used) [Not considered plausible]

This mode and the Spaghetti Pile With Clamp mode (mode 4) converge to the same thing when the curl radius of the Spaghetti Pile is very long. In very shallow water this would be the case. Although considered implausible at the 450 foot and higher water depths considered in the original study, this mode is indistinguishable from mode 4 in very shallow water and would occur. The upper bound of kinetic energy for this case may reasonably be taken as the same as mode 4 thereby eliminating the need for separate consideration.

3) Spaghetti Pile Without Clamp – (All water depths)

This mode, and mode 1 which is identical for very shallow water, will occur at the supplementary study water depths of 300, 150 and 50 feet. The kinetic energy at impact will be the same as for deeper study depths. The impact kinetic energy is the same as the falling cable reaches terminal velocity for transverse motion in a very short distance. The distance to reach terminal velocity is small with respect to even the shallowest supplementary study depth of 50 feet.

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4) Spaghetti Pile With Clamp – (All water depths)

This mode, and mode 1 which is identical for very shallow water, will occur at the supplementary study water depths of 300, 150 and 50 feet. The kinetic energy at impact will be the same as for deeper study depths. The impact kinetic energy is the same as the falling cable reaches terminal velocity for transverse motion in a very short distance. The distance to reach terminal velocity is small with respect to even the shallowest supplementary study depth of 50 feet.

5) Plunging Stalk – (Deep water only > ~400 ft)

For the base study this mode was considered as requiring a water depth of 400 feet or more to develop. The reason for this is best understood by considering the mechanism by which this mode develops. If an arbitrary length of cable is falling at an arbitrary angle, being neither perfectly horizontal nor perfectly vertical, it has a component of motion transverse to the cable and another longitudinal with respect to the cable axis. The longitudinal motion is trivial if the cable is nearly horizontal. The transverse motion becomes trivial as the cable axis approaches vertical. The hydrodynamic forces resisting these two motions are very different in character. The transverse drag forces can be very large and terminal velocity can be reached in less than one foot when cable submerged weight is the only driving force. The longitudinal drag force is very much smaller and a vertical segment may accelerate for approximately 100 feet to reach terminal velocity.

As the falling cable reaches lateral terminal velocity very rapidly, but it requires a considerably longer time (and distance) to reach longitudinal terminal velocity, then the axis of the falling cable will rotate from nearly horizontal to nearly vertical during this acceleration. This mode is also predicated on the assumption that a kink, defect, or point of local damage in the cable exists at the lower end of the developing plunging stalk. Sufficient falling time and falling distance exist for the original study water depths of 450 feet or more.

At the supplementary study depths of 300, 150, and 50 feet these conditions are not met.

At 50 feet the development of a plunging stalk cannot have proceeded significantly. The seabed impact geometry would closely approximate mode 3.

At 150 feet a shorter plunging stalk could develop but there would not be sufficient time and distance for it to reach longitudinal terminal velocity. It is estimated that a stalk of quarter the mass of that considered by the original study could reach one-third the original study velocity. This means that a developing plunging stalk in 150 feet of water might impact a target with approximately one thirty-sixth (2.8%) of the energy of a deep water plunging stalk.

At 300 feet, if the stalk length were one-third that of a deep-water plunging stalk and the impact velocity was two-thirds of terminal velocity then the impact kinetic energy would be 4/27ths (14.8%) of the deep-water plunging stalk.

These reduced kinetic energy impacts were evaluated in the same way as the original deeper water cases and added to the tabulations below.

The plausible damage to either a pipeline or a power cable was determined using elastic collision impact analysis. The results of this analysis obtained the following conclusions:

a) None of the pipelines or submarine power cables can be damaged by stiff catenary laydown mode *at any water depth.*
b) None of the pipelines or submarine power cables can be damaged by the hammerhead laydown mode *at any water depth.*
c) None of the pipelines or submarine power cables can be damaged by the spaghetti pile without clamp laydown mode *at any water depth.*
d) None of the pipelines can be damaged by the spaghetti pile with clamp laydown mode *at any water depth.*
e) All of the submarine power cables can be damaged by the spaghetti pile with clamp laydown mode *at any water depth.*
f) All of the pipelines, *in water depths exceeding 450 feet* can be damaged by the plunging stalk mode. *At the shallow water depths considered by this supplement:*
    a. In 50 feet of water a plunging stalk mode cannot be expected to initiate.
    b. For the partially developed plunging stalk mode in 150 feet of water the force exerted on the target is 8.3 kips. As this is less than the 14.2 kip maximum safe load for the weakest of the pipelines, no pipeline damage from a partially developed plunging stalk mode impact will occur in 150 feet of water.
    c. For the partially developed plunging stalk mode in 300 feet of water the force exerted on the target is 19.2 kips. As this is more than the 14.2 kip maximum safe load for the weakest of the pipelines, but less than the 35.8 kip maximum safe load for the strongest pipeline, some of the pipelines could be damaged by a partially developed plunging stalk mode impact in 300 feet of water.
g) All of the submarine power cables can be damaged by the plunging stalk mode *at any water depth.*

As shown above, a plausible risk to the operating pipelines and power cables exists at each of the study locations, specifically in the deeper water. It should be noted that the spaghetti pile mode would more easily impact a long linear target such as the submarine cable. For the spaghetti pile with clamp or the plunging stalk modes to damage a pipeline or power cable, they would have to have a direct hit on the component. A tabular summary is provided *below to include the supplementary locations at 300, 150, and 50 feet of water.*

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A summary tabulation of plausible damage is shown in the following table:

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1 - 450	12 inch POPCO	no	no	no	no	yes
1 - 450	"A" cable	no	no	no	yes	yes
1 - 450	"B" cable	no	no	no	yes	yes
2 - 1250	"A" cable	no	no	no	yes	yes
2 - 1250	"B" cable	no	no	no	yes	yes
2 - 1250	"D" cable	no	no	no	yes	yes
2 - 1250	20 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch treated water	no	no	no	no	yes
2 - 1250	14 inch oil emulsion	no	no	no	no	yes
2 - 1250	12 inch sales gas	no	no	no	no	yes
3 - 1250	"E" cable	no	no	no	yes	yes
3 - 1250	12 inch gas	no	no	no	no	yes
3 - 1250	20 inch oil emulsion	no	no	no	no	yes
4 - 300	*12 inch POPCO*	*no*	*no*	*no*	*no*	*no*
4 - 300	*"A" cable*	*no*	*no*	*no*	*yes*	*yes*
4 - 300	*"B" cable*	*no*	*no*	*no*	*yes*	*yes*
4 - 300	*"C" cable*	*no*	*no*	*no*	*yes*	*yes*
4 - 300	*12 inch treated water*	*no*	*no*	*no*	*no*	*no*
4 - 300	*20 inch oil emulsion*	*no*	*no*	*no*	*no*	*yes*
5 - 150	*12 inch POPCO*	*no*	*no*	*no*	*no*	*no*
5 - 150	*"A" cable*	*no*	*no*	*no*	*yes*	*yes*
5 - 150	*"B" cable*	*no*	*no*	*no*	*yes*	*yes*
5 - 150	*"C" cable*	*no*	*no*	*no*	*yes*	*yes*
5 - 150	*12 inch treated water*	*no*	*no*	*no*	*no*	*no*
5 - 150	*20 inch oil emulsion*	*no*	*no*	*no*	*no*	*no*
6 - 50	*12 inch POPCO*	*no*	*no*	*no*	*no*	*no*
6 – 50	*"A" cable*	*no*	*no*	*no*	*yes*	*no*
6 - 50	*"B" cable*	*no*	*no*	*no*	*yes*	*no*
6 – 50	*"C" cable*	*no*	*no*	*no*	*yes*	*no*
6 - 50	*12 inch treated water*	*no*	*no*	*no*	*no*	*no*
6 – 50	*20 inch oil emulsion*	*no*	*no*	*no*	*no*	*no*

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