OCS ENVIRONMENTAL ASSESSMENT

REVISIONS TO THE POINT ARGUELLO FIELD DEVELOPMENT AND PRODUCTION PLANS TO INCLUDE DEVELOPMENT OF THE EASTERN HALF OF LEASE OCS-P 0451

ARGUELLO INC.

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United States Department of the Interior
Minerals Management Service
Pacific OCS Region
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Camarillo, California 93010

Environmental Assessment

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Project: Revisions to the Point Arguello Field Development and Production Plans to Include Development of the Eastern Half of Lease OCS-P 0451

Operator: Arguello Inc.

Area: Southern Santa Maria Basin

Prepared by: Chief
Office of Environmental Evaluation
Pacific OCS Region

RELATED ENVIRONMENTAL DOCUMENTS[1]

Arthur D. Little, 1984. Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS. Prepared for the County of Santa Barbara, Minerals Management Service, California State Lands Commission, California Coastal Commission, and California Secretary of Environmental Affairs. Prepared by Arthur D. Little, Santa Barbara, CA.

U.S. Department of the Interior, Bureau of Land Management, 1980. Final Environmental Impact Statement for Proposed 1981 Outer Continental Shelf Oil and Gas Lease Sale Offshore Central and Northern California, OCS Lease Sale No. 53. Bureau of Land Management, Pacific OCS Region, Los Angeles, CA.

[1] Also see References Cited

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ABBREVIATIONS AND ACRONYMS

ACTI	Advanced Cleanup Technology, Inc.
ADT	average daily trips
AFB	Air Force Base
APCD	Santa Barbara County Air Pollution Control District
AQAP	Air Quality Attainment Plan
AQIA	Air Quality Impact Analysis
ARB	Air Resources Board
ASBS	Area of Special Biological Significance
ATC	Authority to Construct
BACT	Best Available Control Technology
BEACH	Beaches Environmental Assessment, Closures, and Health
BETX	benzene, ethylbenzene, toluene, and xylene
BLM	Bureau of Land Management
CAAA	Clean Air Act Amendments of 1990
CAMP	California Monitoring Program
CAP	Clean Air Plan
CCC	California Coastal Commission
CCNM	California Coastal National Monument
CDAS	Marine Mammal and Seabird Computer Database Analysis System
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CINMS	Channel Islands National Marine Sanctuary
CINP	Channel Island National Park
CO	carbon monoxide
COA	corresponding onshore area
DPP	Development and Production Plan
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERD	extended-reach drilling
ESA	U.S. Endangered Species Act
ESU	Evolutionarily Significant Unit
FORT	Fishermen's Oil-Spill Response Team
FR	Federal Register
FRSB	fast-response support boat
FWS	U.S. Fish and Wildlife Service
H_2S	hydrogen sulfide
LOS	Level of Service
MBNMS	Monterey Bay National Marine Sanctuary
ND-PSCA	Nipomo Dunes–Point Sal Coastal Area National Natural Landmark
NEPA	National Environmental Policy Act
NNL	National Natural Landmark
NOAA	National Oceanic and Atmospheric Administration

NO_x	oxides of nitrogen
NMFS	National Marine Fisheries Services
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRDC	Natural Resources Defense Council
NS&T	National Status and Trends Program
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSRA	Oil Spill Risk Assessment model
OSRO	oil spill response organization
OSRP	oil spill response plan
OSRV	oil spill response vessel
PAPCO	Point Arguello Pipeline Company
PM	particulate matter
PTO	Permit to Operate
ROC	reactive organic compounds
RPU	Rocky Point Unit
SBCAPCD	Santa Barbara County Air Pollution Control District
SBCEP	Santa Barbara Channel Ecological Preserve
SBCPDD	Santa Barbara County Planning and Development Department
SCB	Southern California Bight
SCBPP	Southern California Bight Pilot Project
SCCWRP	Southern California Coastal Water Research Project
SEIR	Supplemental Environmental Impact Report
SO_x	oxides of sulfur
USCG	U.S. Coast Guard

1.0 Introduction

1.1 The Proposed Action

Arguello Inc. proposes to develop the eastern half of Federal Outer Continental Shelf (OCS) Lease OCS-P 0451 by drilling a maximum of eight extended-reach wells from two existing OCS platforms in the Point Arguello Unit, Platforms Hermosa and Hidalgo. Lease OCS-P 0451 is considered a developed lease by virtue of the existing production on the western half, in the Point Arguello Unit. Previously, the eastern half of Lease OCS-P 0451 was part of the Rocky Point Unit, but has since been contracted out of the Unit. Therefore, it is no longer unitized with the undeveloped leases of the Rocky Point Unit, and production from this portion of the lease will have no effect on holding the Rocky Point Unit leases, nor will it cause production of the undeveloped Rocky Point Unit leases.

The project area is located offshore about 13 km (8 mi) northwest of Point Conception, Santa Barbara County, California. It is projected that five wells will be drilled from Platform Hermosa and three wells from Platform Hidalgo. The proposed action is described in detail in Arguello Inc. (2003a), "Revisions to the Point Arguello Field Development and Production Plans to Include Development of the Eastern Half of OCS-P 0451." Supporting information may be found in Arguello Inc. (2003b). These documents are incorporated herein by reference. MMS's action is to approve, require modification of, or disapprove Arguello Inc.'s proposed project. Refer to individual resource sections within Section 2 of this EA, "Description of the Affected Environment and Impact Analysis," for specific details regarding project impacting agents, including discharges and emissions.

Development of the eastern half of Lease OCS-P 0451 would occur within the environmental time-frame and footprint of the existing Point Arguello Unit facilities as actually foreseen and evaluated in the Point Arguello/Southern Santa Maria Basin Area Study EIS/EIR (ADL, 1984a). The total number of wells drilled for the Point Arguello Unit and the eastern half of Lease OCS-P 0451 would be significantly less (about half) than the number of wells originally anticipated and approved for the Point Arguello Unit alone. In addition, drilling and production from the eastern half of Lease OCS-P 0451 would be completed within the remaining productive life of the Point Arguello Unit.

All of the wells would be directionally drilled using existing well slots on the platforms. Drilling of the wells on the eastern half of Lease OCS-P 0451 is expected to last 2 to 3 years, with production lasting between 8 and 10 years. Drilling of the first well would begin on Platform Hidalgo during the first quarter of 2004. The drilling program is expected to be completed by the end of the second quarter of 2006. First production would begin in the second quarter of 2004. The last well from the eastern half of Lease OCS-P 0451 should complete its productive life between the end of 2012 and the end of 2013, approximately 2-3 years before production from the Point Arguello Unit is projected to become uneconomic.

Development of the eastern half of Lease OCS-P 0451 would not require any new equipment at the Gaviota Facility. Oil and gas processing would occur offshore at the existing platforms. Oil and gas production would use the existing oil and gas production facilities on each of the platforms. The only new equipment that may be required is an oil stabilizer on Platform Hidalgo. It may also be necessary to make some minor modifications to an existing vessel on Platform Hidalgo to accommodate the increased oil production.

The oil produced from the eastern half of Lease OCS-P 0451 would be combined with Point Arguello Unit oil and transported to Gaviota in the existing PAPCO oil pipeline. From Gaviota,

combined oil production from the eastern half of Lease OCS-P 0451 and the Point Arguello Unit would be metered, heated, and transported to refineries by pipeline.

Gas from the eastern half of Lease OCS-P 0451 would be combined with Point Arguello Unit gas on the production platforms. The combined gas would be processed (to remove hydrogen sulfide and carbon dioxide) for platform use or sale to shore via the existing pipeline. Gas volumes in excess of platform needs or sales to shore would be used for gas lift or injected into the producing reservoir for later recovery. Sweetened gas that is sent to shore would be used as fuel for the turbine generators that produce steam for oil heating and electricity for facility use and sales to the existing grid. Development and production of gas from the eastern half of Lease OCS-P 0451 would enable sales of electricity to continue for a longer period of time than electricity could be produced with Point Arguello Unit gas alone.

Depending on operational power needs at Platform Hermosa, it may be necessary to temporarily exchange a turbine from Platform Hidalgo to Platform Hermosa during the drilling phase. The turbine exchange may be needed to assure that there is sufficient back up power in the event that one of the turbines on Platform Hermosa has to be shut down.

1.2 Extended-Reach Drilling Technology and Environmental Benefits

The significant advancements in extended-reach drilling (ERD) technology can in some cases replace the need to install a platform to develop adjacent hydrocarbon reservoirs. The original operator of the subject lease, Chevron, initially planned to develop the eastern half of Lease OCS-P 0451 and the Rocky Point Unit by installing Platform Hacienda on Lease OCS-P 0451. The current operator, Arguello Inc., now proposes to develop the eastern half of Lease OCS-P 0451 by drilling extended-reach wells from the existing Platforms Hermosa and Hidalgo. As ERD technology has eliminated the need to install a new platform in the case of developing the eastern half of Lease OCS-P 0451, all environmental impacts associated with installing a new platform have been eliminated or reduced; these include reductions in noise and visual impacts, in air emissions, and in impacts to marine biology and habitats relative to those that would be incurred if a new platform were constructed.

Extended-reach drilling, sometimes called directional or slant drilling, is a method by which a well is drilled intentionally in a direction laterally away from the surface location. During the past 20 years, significant advancements have been made in ERD technology. Since exploration first occurred on the eastern half of Lease OCS-P 0451 in 1982, the maximum reach of a well has increased dramatically. In 1986, the world record for reach was just over 4,572 m (15,000 ft), set by a well in Australia. Today wells reaching 10,668 m (35,000 ft) and beyond have been drilled and the distance is increasing on a regular basis.

Exxon Mobil Production Company (Exxon Mobil) is successfully using ERD technology to develop the Sacate Field in the Santa Ynez Unit, which is located about 6 km (4 mi) offshore Santa Barbara County. Exxon Company U.S.A. had originally planned to construct a new platform (Heather) to develop the Sacate Field. In 2000, Exxon Mobil completed an ERD well from Platform Heritage to the Sacate Field that had a lateral reach of 6,485 m (21,276 ft) and a vertical depth of 2,043 m (6,704 ft).

1.3 Purpose and Need

The Minerals Management Service (MMS) is required to balance orderly and optimal energy resource development with protection of the human, marine, and coastal environment consistent with the requirements of the 1978 Outer Continental Shelf Lands Act (OCSLA). The OCSLA directs the Secretary of the Department of the Interior to establish policies and procedures that expedite exploration and development of the OCS in order to achieve national energy goals,

assure national security, reduce dependence on foreign sources, and maintain a favorable balance of payments in world trade.

Arguello Inc.'s purpose is to develop and produce the oil and gas resources within the eastern half of Lease OCS-P 0451 to achieve an equitable return on invested capital.

1.4 Projects Considered in the Cumulative Analysis

The reasonably foreseeable activities in the vicinity and time-frame of the proposed action include ongoing oil and gas activities in Federal and State waters, decommissioning of some Federal and State offshore platforms, Alaskan and foreign-import tankering, shipping, military operations, commercial space launches, commercial and recreational fishing, sewage discharge, and urban, river, and storm water runoff. Discussion of these types of activities may be found in Chapter 5 of MMS, 2001.

1.5 Mitigation Applicable to the Proposed Action

All applicable lease sale stipulations, mitigation measures, and conditions of approval included in the Record of Decision for the Point Arguello/Southern Santa Maria Basin Area Study EIS/EIR (ADL, 1984a) also apply to Arguello Inc.'s proposed action. In addition, Arguello Inc. has incorporated mitigation into their proposed project, and MMS has identified two mitigation measures to minimize the potential for environmental impacts. These measures are discussed below.

MMS REQUIRED MITIGATION MEASURES

To minimize the potential for environmental impacts, MMS has identified the following mitigation measures:

1. Requirement to Obtain Approval from MMS for a Plan Demonstrating Compliance with U. S. Fish and Wildlife Terms and Conditions

In accordance with Arguello Inc.'s letter dated June 11, 2003, no later than 30 days after MMS approval of the revisions to the plans, Arguello Inc. shall submit to the MMS for approval documentation that demonstrates how Arguello Inc. will comply with the Fish and Wildlife Biological Opinion Terms and Conditions that apply to the proposed project, as described below:

a. Annual training for platform operators covering appropriate aspects of the biology of the Brown Pelican, California Least Tern, Western Snowy Plover, and the southern sea otter; and

b. A pamphlet describing the measures to be taken by platform personnel if oiled-wildlife (including listed species) is encountered.

2. Requirement to Obtain Approval from MMS for an Environmental Compliance Monitoring Plan

At least 30 days prior to commencement of activities under the approved revisions to the plans, Arguello Inc. shall submit to MMS for approval an environmental compliance monitoring plan to monitor and track compliance with all environmental protection mitigation measures to be carried out under this project. This includes all measures described in the approved revisions to the plans or supporting information, all applicable lease sale stipulations, and all applicable measures from the initial Point Arguello Unit Plans, as amended. Arguello Inc.'s plan shall specify submittal dates to report progress to MMS in ensuring operations were conducted in accordance with the approved plan and supporting information, and noting any deviations from that approved plan or supporting information.

2.0 Description of the Affected Environment and Impact Analysis

2.1 Physical Oceanography

Affected Environment

The project area is located in an oceanographically complex region. The proposed project is located south of the southern Santa Maria Basin, where the coastline orientation is north-south, and west of the Santa Barbara Channel, where the coastline orientation is east-west. This large-scale change in coastal configuration induces much of the complexity in wind, wave, and oceanic flow fields near the project area.

Along the central California coast to the north, physical processes are strongly influenced by seasonally-varying winds that blow strongly more or less southward over a wide geographic area. The east-west coastal configuration of the coastline east of Point Conception blocks the large-scale southward-directed winds that prevail west of the Santa Barbara Channel. The large-scale oceanic flow field beyond the continental slope is dominated by the roughly southward-flowing California Current, which separates from the coast near Point Arguello.

Ocean Circulation. The current flow field near the project area is influenced by a number of competing physical processes and is influenced by large- and small-scale circulation features, all of which vary with time. Waters of the California Current system are characterized by a seasonably-stable low salinity (32 to 34 ppt), low temperature (13–20°C, or 55-58°F), and high nutrient concentrations. The northward-flowing Davidson Current exhibits strong seasonal variability in intensity but maintains a sustained northward flow at depth near the project area for most of the year (Chelton et al., 1988; Coats et al., 1991). Seasonal variability in the Davidson Current near the project area coincides with large-scale fluctuations in coastal winds along the central California coast north of Point Conception. During upwelling, surface water near the coast is transported offshore and is replaced by cool, nutrient-rich water from deep offshore

Three major current flow regimes occur in the Santa Barbara Channel–Santa Maria Basin area: the upwelling flow regime, cyclonic flow regime, and the relaxation flow regime. They are driven by the alternately weakening and strengthening of the northwest wind along the California coast and the opposing poleward alongshore pressure gradient. The alongshore pressure gradient is due primarily to density differences between warm, saline Southern California Bight waters and cold, less saline central California coastal waters. All three current flow regimes occur throughout the year, but one flow regime typically is more prominent depending on the season. During the spring, from late February to early June, the northwest wind, and therefore the upwelling flow regime, dominates. During this time a strong southerly current and wind flow exists in the Santa Maria Basin and a southeasterly wind and current flow exists in the Santa Barbara Channel. A weak western flow typically persists along the Santa Barbara Channel mainland during an upwelling flow regime, but the wind and surface current flows are typically to the south and southeast in the project area.

During the summer to early fall, the cyclonic flow regime persists where the opposing northwest winds and alongshore pressure gradients are equally strong. A strong counter-clockwise gyre is generated in the western half of the Santa Barbara Channel and a strong southerly current flow persists in the Santa Maria Basin. In the project area, surface current flow is typically to the west feeding into the southerly flow further offshore. Surface winds persist to the southeast.

During the late fall and winter the relaxation flow regime dominates where the alongshore pressure gradient is strong and the winds off the central California coast are weak, and at times, variable. Surface currents are strongly to the west along the Santa Barbara Channel mainland

turning northwest at Point Arguello and proceeding in that direction along the central California coast. Currents along the northern shores of the Channel Islands continue to flow eastward, but are relatively weak. In the project area, surface currents are typically to the west and northwest, surface winds are weak and variable.

During all flow regimes a counter-clockwise gyre typically exists in the western Santa Barbara Channel. This gyre reaches its strongest intensity during a cyclonic flow regime and is least intense during an upwelling flow regime. The northwest flow (Davidson Current) observed at depth near the project area persists throughout the year except during and upwelling flow.

Superimposed on these large-scale oceanic flows are a variety of transient phenomena including intense eddies, swirls, filaments, meanders, and narrow jets of flow. These turbulent features have been observed near the project area and are capable of transporting significant quantities of heat, nutrients, and pollutants to offshore waters (Savoie et al., 1991). At shorter periods, shoaling internal and surface gravity waves also mix coastal water properties in both the horizontal and vertical directions. In addition, winter storms cause strong vertical and horizontal mixing as deep as the permanent thermocline. Upwelling that is driven by southward-directed winds in the spring and summer brings deep cool nutrient-rich water to the surface. Because of the semi-arid climate, substantial drainage from onshore is infrequent and regional water properties are largely determined by oceanographic processes. Nevertheless, river runoff during intense winter storms can greatly change marine water characteristics within localized areas along the California coast (Hickey, 2000).

Wave Climatology. As with currents, the wave climatology of the project area represents a transition from the sheltered environment of the Santa Barbara Channel to the exposed coastal region of the Santa Maria Basin. Maximum design wave heights for 100-year return periods along the central California are 60 feet compared to 45 feet in the Santa Barbara Channel because of sheltering effects from the Channel Islands and the orientation of the coastline (API, 1987). Waves generated over a large fetch can impinge on the coastline in the area near Point Conception from directions that range from north to south, nearly 180 degrees. In contrast, the Santa Barbara Channel is sheltered by its location on the coastline from waves generated by distant storms from the north and the Channel Islands limit wave propagation from the south. The dominant period of long swells in the region ranges from 12 to 15 seconds and up to 20 seconds. These long swells contact the shore and can affect vertical mixing further offshore in the Santa Maria Basin. Extra-tropical winter cyclones in the Northern Hemisphere combined with northwesterly winds during the spring transition and summer are the primary sources for the wave climate along the central California coast. Significant swell events from the south are occasionally generated from tropical disturbances offshore Mexico and extra-tropical storm swell generated in the southern hemisphere during summer (Noble Consultants, 1995).

2.2 Oil Spill Analysis.

The following sections contain an analysis of the potential for oil spills associated with the proposed project, including the most likely size of spill to occur, the likelihood of occurrence, and an analysis of oil spill trajectories. Finally, a discussion of oil spill response capability in the Pacific OCS Region is given.

2.2.1 Oil Spill Risk Assessment

From 1970 through 1999, 841 oil spills were reported in the Pacific Region. These spills have ranged in size from less than 1 bbl to 163 bbl, for a total of slightly less than 830 bbl. Of those 841 reported spills, 836, or 99 percent, were less than 50 bbl, for a total of 320 bbl and an average of 16 gallons per spill. The MMS's U.S. Oil Spill Database (C. Anderson, MMS, unpubl. data)

includes Pacific and Gulf of Mexico OCS spills of greater than 1.0 bbl recorded between 1971 and 1999. The database contains platform and pipeline spills, but no barge or tanker spills. Of the 2,125 total spills in the database, 106 are in the range of 50-999 bbl. The mean volume of these spills is 158.6 bbl; 79 (75 percent) are of less than 200 bbl, while 101 (about 95 percent) are less than 500 bbl. Given these data and the experience in the Pacific Region over the last 30 years, MMS has estimated the most likely spill volume for spills in the 50-999 bbl range to be less than 200 bbl, and almost certainly less than 500 bbl in volume.

The MMS has estimated the mean number of oil spills that could occur in the 50 to 999 bbl size range as a result of Arguello Inc.'s proposal using the U.S. Oil Spill Database and the estimated production of 21–25 million bbl of oil over the project's lifetime. Using the method of Anderson and LaBelle (2000), the estimated range of mean numbers of spills that could occur during the production of oil from the eastern half of Lease OCS-P 0451was 0.163–0.193 (Table 2.1). This number represents oil spill occurrence, not oil spill probability, and is based solely on the oil spill accident rates and oil resource volume estimate. A more meaningful statistic than a fraction of an oil spill is the probability that a spill of a particular volume will occur. The probability that one or more spills will occur in the 50-999 bbl range is estimated to be 15 to 17.5 percent (Table 2.1).

Table 2.1 Estimated range of mean numbers of oil spills and probabilities of occurrence (based on estimated production of 21–25 million bbl for the lifetime of the project).

Size Ranges	Mean No. of Spills	Probability of Occurrence (%)
≥ 50 – 999 bbl	0.163 – 0.193	15.0 – 17.5
≥ 1,000 bbl	0.03 – 0.04	3.3 – 3.9

Based on the MMS Accident Spill Rates from all U.S. platforms and pipelines (Anderson and LaBelle, 2000), the platform spill rate for spills greater than or equal to 1,000 bbl is 0.32 spills per billion barrels produced, while the pipeline spill rate is 1.32 spills per billion barrels transported. Note that there has not been a spill of greater than 1,000 bbl anywhere in the U.S. OCS since 1980. Using the combined spill rate of 1.64 results in a 3.3–3.9 percent probability of a spill of 1,000 bbl or greater occurring from the proposed project (Table 2.1).

Federal regulations concerning oil spill response plans (OSRPs) for OCS facilities require operators to calculate worst-case discharge volumes using the criteria specified in 30 CFR §254.47. These include 1) the maximum capacity of all oil storage tanks and flow lines on the facility, 2) the volume of oil calculated to leak from a break in any pipelines connected to the facility, and 3) the daily production volume from an uncontrolled blowout of the highest capacity well associated with the facility. These are worst-case estimates based on unlikely events, intended to insure that an operator has the capacity to respond to the largest oil spill as required by MMS regulations in 30 CFR §254.26.

The MMS estimates that the most likely maximum size of an oil spill from the proposed development of the eastern half of Lease OCS-P 0451 is the maximum volume of oil calculated to

be spilled from a break in the longest Point Arguello Unit pipeline, the Hermosa to shore (PAPCO) pipeline. This is calculated to be 2,217 bbl (Arguello Inc., 2002). This figure is substantially less than the 7,600 bbl calculated for the 1984 Point Arguello Field EIR/EIS (A.D. Little, 1984). The current estimate is based on the actual maximum throughput volume and operating pressure for the pipeline (both much lower than estimated in 1984), the installation of modern, automatic oil spill leak detection systems, and the actual elevation profile and water cut (the proportion of water in the pipeline stream) of the existing PAPCO pipeline (Arguello Inc., 2003b).

However, the very small probability (3.3 to 3.9 percent) of a spill equal to or greater than 1,000 bbl indicates that it is highly unlikely that a major spill will occur as a result of the proposed development activities. As discussed above, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume. The oil spill impact analyses in this chapter assume that one accidental oil spill of 200 bbl or less will occur as a result of the proposed project

The level of impacts from such spills will depend on many factors, including the type, rate, and volume of oil spilled, the weather and oceanographic conditions at the time of the spill, and the oil spill response capabilities. Other parameters that would determine the fate of spilled oil include the amount that is dispersed into the water column; the degree of weathering, evaporation, and dispersion of the oil before it contacts a shoreline; the actual amount, concentration, and composition of the oil at the time of shoreline or habitat contact, and the toxicity of the oil.

2.2.2 Oil Spill Trajectory Analysis

The combination of the effects of the wind at the ocean surface and the flow of the surface layer of the sea determine the transport of spilled oil and the potential for contact to any particular stretch of coastline. Subsurface flows dictate the transport and dispersion of produced waters and drilling fluids that will be discharged from the Platforms Hermosa and Hidalgo during the proposed project.

Two separate analyses were conducted to provide possibilities of oil spill trajectory and landfall to determine environmental resource impact. They include the MMS Oil Spill Risk Analysis (OSRA) Model calculation and a separate analysis of free-floating surface drifter trajectories. A full discussion of these analyses can be found in the MMS Biological Evaluation of Threatened and Endangered Species, prepared for the Endangered Species Act Section 7 consultation on the Rocky Point Unit development project (MMS, 2000a).

In order to determine the areas that might be contacted by potential oil spills, MMS has generated conditional oil spill probability data. Johnson et al. (2000) describe the OSRA Model and provide the seasonal synopses of the conditional model runs for the launch points included in the analysis for the proposed project: Platforms Hermosa and Hidalgo and the Hermosa-to-shore pipeline. For each season, the OSRA Model calculated probabilities of contact to shoreline segments and offshore blocks for spills from each of the launch points over 3-, 10-, and 30-day periods.

The drifter analysis provides a different picture of possible oil spill trajectory by describing and presenting statistics on actual trajectories of free-floating surface drifters. The free-floating surface drifters were designed to follow the surface current (top 1 meter of the water column) and not to track or mimic an oil spill. However, the drifter analysis provides good information on surface currents, which are a major component determining spill movement, by describing statistics on actual trajectories of free-floating surface drifters. This gives the analyst a view of possible oil spill trajectories based on actual current observations. While the results of the two

analyses do not agree, they both provide important insights that help present a more complete picture of what may occur when oil is spilled.

MMS OSRA Model trajectories make very few shoreline contacts north of Point Arguello throughout the year. One of the reasons for this is that the OSRA model is heavily dependent on wind fields in performing its trajectory calculations. It calculates numerous trajectories from the same launch point by varying the wind over a static ocean-current field and applying the deep-ocean 3.5-percent wind rule to account for the supposed movement of oil over the surface layer of the water. The prevailing wind characteristic of the SBC–SMB area is from the northwest. Therefore, the probabilities computed from the OSRA model runs are based on oil spill trajectories that tend toward the south and southeast. This has produced relatively higher probabilities of shoreline contacts to the north shores of the northern Channel Islands and relatively lower probabilities of shoreline contacts along the central California coast.

The drifter data and analysis above provide a measure of the likelihood that a drifter, and therefore possibly an oil spill, will be transported in a certain direction. Based on the drifter data, it can be surmised that an oil spill originating in the project area has an equal likelihood of moving north, west, or south and, if an oil spill were to move in any of these directions, there also would be a reasonable possibility of shoreline contact. An oil spill originating from the project area would be likely to move north or west during the fall and winter, south and east in the spring, and west and south in the summer. This is because the relaxation and cyclonic circulation flow regimes are dominant in the fall and winter, the upwelling circulation flow regime is dominant in the spring, and the cyclonic circulation flow regime is dominant in the summer. The uncertainty of direction of movement during a particular season is due to the fact that all of these oceanic flow regimes (including their transition states) characteristic of the SBC–SMB area may occur during any time of the year.

2.2.3 Oil Spill Response

The OPA 90 and MMS regulations at 30 CFR Part 254 require that each OCS facility have a comprehensive oil spill response plan (OSRP). Response plans consist of an emergency response action plan, and supporting information that includes an equipment inventory, contractual agreements with subcontractors and oil spill response cooperatives, a worst-case discharge scenario, a dispersant use plan, an in-situ burning plan, and details on training and drills. The current oil spill response plan for the Point Arguello facilities was approved by the MMS in November 2002 (Arguello Inc., 2002).

Since 1970, oil companies operating in the Santa Barbara Channel and Santa Maria Basin have funded and operated a non-profit oil spill response organization (OSRO) called Clean Seas (Clean Seas, 1999). Clean Seas acts as a resource to its member companies by providing an inventory of state-of-the-art oil spill response equipment, trained personnel, training, and expertise in planning and executing response techniques. Clean Seas personnel and equipment are on standby, ready to respond to an oil spill, 24 hours a day, 365 days a year. Its area of responsibility stretches from Point Dume north to approximately Cape San Martin, and includes the northern Channel Islands.

The primary oil spill response for the Point Arguello facilities is provided by Clean Seas' oil spill response vessel (OSRV) *Mr. Clean III* (Clean Seas, 1999). *Mr. Clean III* is normally moored adjacent to Platform Harvest or, when sea conditions dictate, in the Cojo Bay anchorage approximately 15 km (8 nm) from Platform Hermosa. Secondary oil spill response would be provided by the OSRV *Mr. Clean*, moored outside Santa Barbara harbor. *Mr. Clean* could arrive at the Point Conception area in about 5 to 6 hours.

In addition to the OSRVs, Clean Seas maintains smaller response vessels, including two 32-foot Spill Response Vessels (SRVs), Fast Response Support Boats (FRSB), and miscellaneous small

boats. These vessels are based in Santa Barbara Harbor and at Clean Seas' Carpinteria facility. If needed in support of *Mr. Clean III*, they could reach the Point Arguello facilities in 3 to 4 hours.

Clean Seas also is equipped and prepared to respond to oil spill threats to sensitive shoreline areas within its area of responsibility. Detailed and up-to-date information on sensitive areas and response strategies in the Clean Seas' area is provided in the Northern Sector, Los Angeles/Long Beach Area Contingency Plan prepared by the U.S. Coast Guard and the California Office of Oil Spill Prevention and Response, and in the Clean Seas Regional Response Manual.

Based on OSRO mutual-aid agreements, additional levels of oil spill response to the Point Arguello facilities would be provided, if needed, by Clean Coastal Waters, a cooperative based in Long Beach. Onshore cleanup capabilities are available through a contracted oil spill response organization, Advanced Cleanup Technology, Inc (ACTI), located throughout California**.**

In conjunction with the Ventura County Commercial Fishermen's Association, Clean Seas founded the Fishermen's Oil-Spill Response Team (FORT) in 1990. More than 300 area fishermen have been trained to respond to spill situations as members of FORT. FORT vessels have acted in support of Clean Seas' response efforts both in drills and at a number of offshore spills, where they have deployed boom, assisted logistics, and served as wildlife rescue platforms.

The Clean Coastal Waters area of responsibility stretches from Point Dume south to the Mexican Border, including the offshore islands and waters extending to the outer boundary of the Pacific OCS. To provide spill response coverage in this area of operation, Clean Coastal Waters maintains three OSRVs and equipment at strategic locations in the southern California area. The OSRVs are based in Long Beach Harbor. Like Clean Seas, Clean Coastal Waters personnel and equipment are ready to respond to an oil spill 24 hours a day and could reach the Point Arguello facilities in approximately 14 to 16 hours.

ACTI is a primary contractor for onshore and shoreline cleanup and has sufficient resources and trained personnel to satisfy all federal and state shoreline response planning requirements. In the event an onshore or shoreline response is required, ACTI personnel and equipment can respond in approximately 4 hours.

2.3 Air Quality

Affected Environment

The proposed project is located in the OCS, offshore 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 2001 Clean Air Plan (CAP) (SBCAPCD, 2001). 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 which 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.

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 except the 1-hour ozone standard. Santa Barbara County is presently classified as a "serious"

nonattainment designation for the ozone standard. The SBCAPCD Board of Directors adopted the 2001 CAP in November of 2001, which includes a request for the EPA to redesignate the County as a 1-hour ozone standard attainment area due to Santa Barbara County not violating the one-hour federal ozone standard for the three year period 1997-2000. The CAP includes an approved Maintenance Plan for the Federal 1-hour ozone standard as well as providing for attainment of the 1-hour state ozone ambient air quality standard at the earliest practicable date and demonstration that the County will continue to attain the federal standard through 2015. Santa Barbara County is also considered a nonattainment area for both the California ozone and 24-hour PM_{10} air quality standards.

Section 328 of the 1990 Clean Air Act Amendments (CAAA) transfers authority for air quality on the OCS to the 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. Platforms Hermosa and Hidalgo in the Point Arguello Unit are currently permitted and within the jurisdiction of the SBCAPCD.

The following significance criteria are given in the *County of Santa Barbara Environmental Thresholds and Guidelines Manual (Updated in January 1995)*:

"A significant adverse air quality impact may occur when a project, individually or cumulatively, triggers any one of the following:

- Interferes with progress toward the attainment of the ozone standard by releasing emissions which equal or exceed the established long-term quantitative thresholds (25 pounds per day) for NO_x or ROC;
- Equals or exceeds the state or federal ambient air quality standards for any criteria pollutant (as determined by modeling);

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 Air Quality Attainment Plan (AQAP) should be determined for all projects (i.e., whether the project exceeds the AQAP emission projections or growth assumptions)."

Table 2.2 provides a summation of the Santa Barbara County Planning and Development Department thresholds and APCD threshold requirements relating to the application of Best Available Control Technology (BACT), Air Quality Impact Analysis (AQIA), and emission offsets.

Emissions resulting from the proposed project may have a potential to increase concentrations of pollutants onshore. The primary regulated pollutants of concern in Santa Barbara County are oxides of nitrogen (NOx) and reactive organic compounds (ROC). Both NOx and ROC are considered precursors to ozone formation, for which Santa Barbara County is presently in nonattainment. 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.

The original Point Arguello Development and Production Plan (DPP), an Environmental Impact Statement/Report (EIS/R) (ADL, 1984a), a Supplemental Environmental Impact Report (SEIR), the 1999 Reconfiguration and Tri-Party Modification EIR Addenda, and the 2001 Gas Disposition EIR Addendum provide discussions of air quality impacts associated with the Point Arguello Project activities. Various Authority to Construct (ATC) permits and Permits to

Operate (PTOs) have been issued by the SBCAPCD regarding Point Arguello modifications and operations.

Table 2.2 Santa Barbara County Planning and Development, APCD BACT, AQIA, and emission offset requirements.

Planning and Development Requirements	$\geq$ 25 lbs/day for either NO_x or ROC (ozone precursors)
BACT Requirements	$\geq$ 25 lbs/day for any non-attainment pollutant (except CO) $\geq$ 150 lbs/day for CO, based on Potential to Emit
AQIA Requirements	$\geq$ 120 lbs/day for any non-attainment pollutant; $\geq$ 550 lbs/day for CO; $\geq$ 80 lbs/day for PM_{10}, based on Net Emissions Increase
Offsets Requirements	$\geq$ 55 lbs/day or $\geq$10 tons/yr. for any non-attainment pollutant; $\geq$ 150 lbs/day or $\geq$25 tons/yr. for CO; $\geq$ 80 lbs/day or $\geq$15 tons/yr. for PM_{10}, based on Net Emissions Increase

Impact Discussion

The Point Arguello platforms are existing emissions sources in Santa Barbara County that are regulated by and have been issued Permits to Operate by the SBCAPCD. As a condition of their Permit to Operate, the existing Point Arguello Project provides emission offsets for the maximum allowable project emissions.

Arguello, Inc. provided Supporting Information in support of their Project Description containing an analysis of the potential air quality impacts associated with the development of the eastern half of Lease OCS-P 0451 (Arguello Inc., 2003b). The evaluation contained a comparative review of the incremental air quality impacts and potential cumulative effects expected with the proposed project in relation to those previously described and analyzed in the Point Arguello DPP EIR/EIS and the existing Point Arguello air quality permit. Information contained within that report was used in this analysis to determine if significant impacts to air quality could occur and to verify compliance with emission limitations imposed upon this project pursuant to SBCAPCD Rules and Regulations. The air quality evaluation has been conducted assuming that all 8 wells are developed for the project and that each of these wells has new wellheads.

Drilling Emissions: The primary impact-producing activities associated with the proposed project include drilling and production operations with associated support activities. The major impact agents expected from the proposed activity are emissions from equipment associated with extended reach drilling operations and emissions from crew/supply vessels needed to support the drilling operations.

A comparison of the projected air quality impacts contained in the Point Arguello DPP EIR/EIS to the applicability of projected impacts expected with the proposed project was evaluated. The primary impact analyzed in the Point Arguello DPP EIR/EIS was that NOx and ROC emissions from offshore platforms and support activities may contribute to violations of the ozone standard. The potential impacts expected with the development of the proposed project during drilling operations would be an increase in emissions from increased loads to the turbines, an increase in supply boat trips, and fugitive emissions associated with the additional production wells.

Table 2.3 presents the estimated emissions expected with the proposed project from drilling operations. The annual emissions assume that each well takes 3.5 months to complete and that

drilling operations occur for 12 calendar months for Platform Hermosa and 10.5 months for Platform Hidalgo. The total drilling emissions assume that a total of 8 extended reach wells would be drilled from Platforms Hermosa and Hidalgo.

Table 2.3 Estimated turbine emission increase from proposed drilling operations.

OCS-P 0451 Drilling Emissions	NO_X	ROC	CO	SO_X	PM	PM_{10}
Platform Hermosa						
lbs/hr	5.14	0.54	3.39	0.21	0.07	0.07
lbs/day	123.36	12.89	81.28	5.01	1.79	1.79
tons/qr.	5.63	0.59	3.71	0.23	0.08	0.08
tons/yr	22.51	2.35	14.83	0.91	0.33	0.33
Platform Hidalgo						
lbs/hr	5.14	0.54	3.39	0.21	0.07	0.07
lbs/day	123.36	12.89	81.28	5.01	1.79	1.79
tons/qr.	5.63	0.59	3.71	0.23	0.08	0.08
tons/yr	19.70	2.06	12.98	0.80	0.29	0.29
Total Drilling Emissions (tons)						
Eastern Half OCS-P 0451	***52.53***	***5.49***	***34.61***	***2.13***	***0.76***	***0.76***

1. Assumes 3 wells at Hidalgo and 5 at Hermosa.
2. Tons/yr assumes drilling occurs on Hermosa for 12 consecutive calendar months. Hidalgo at 10.5 consecutive months (3 wells)
3. Assumes each well takes 3.5 months to complete.

The drilling phase of the project is expected to last approximately two to three years assuming each well takes 3.5 months to drill. During the drilling phase of the project there will be an increased load placed on the offshore turbines due to the drill rig and mud handling equipment. The turbines are expected to have sufficient design capacity to provide the power requirements for the proposed drilling program. However, to ensure that Platform Hermosa has adequate power requirements for ongoing operations and drilling, Arguello Inc. may elect to exchange the 2,800-kW standby turbine on Hermosa with the 2,800-kW full time turbine on Platform Hidalgo. This would allow Hermosa a standby turbine that could operate full time in the event that one of the other turbine generators is down. Any turbines to be exchanged between platforms would be by regularly scheduled supply boat trips. The projected emissions increase associated with the increased load to the offshore turbines is within existing allowable permitted limits and is presently fully offset per SBCAPCD Rules and Regulations. No new air permitting should be needed to operate the drill rig.

All of the drilling equipment would be electrically driven with the exception of the well logging unit, the cement pump, the acidizing pump, and an emergency generator (Table 2.4). The emergency generator would only be used if power is lost on the platform to assure a safe shut down of the drilling equipment. The Supporting Information in support of the Project Description provided by Arguello (Arguello Inc., 2003b) contains detailed emission calculations for the additional drilling operations equipment, and includes emission factors, usage factors, hourly, daily, quarterly, and annual emission estimates and may be referenced as necessary.

Table 2.4 Estimated emissions from Lease OCS-P 0451 drilling operation support equipment engines.

OCS-P 0451 Drilling Emissions	NO_X	ROC	CO	SO_X	PM	PM_{10}
			lbs/hr			
Well Logging Unit	1.85	0.25	0.67	0.05	0.22	0.22
Acidizing Pump	1.85	0.25	0.67	0.05	0.22	0.22
Emergency Generator	25.00	3.39	9.02	0.63	2.98	2.98
Cement Pump	3.70	0.50	1.34	0.09	0.44	0.44
Slurry Pump	18.52	2.51	6.68	0.46	2.20	2.20
Total Hourly Emissions	***50.93***	***6.91***	***18.37***	***1.27***	***6.06***	***6.06***
			lbs/day			
Well Logging Unit	44.45	6.03	16.03	1.11	5.29	5.29
Acidizing Pump	14.82	2.01	5.34	0.37	1.76	1.76
Emergency Generator	50.00	6.79	18.04	1.25	5.95	5.95
Cement Pump	29.63	4.02	10.69	0.74	3.53	3.53
Slurry Pump	148.15	20.11	53.44	3.70	17.64	17.64
Total Daily Emissions	***287.04***	***38.96***	***103.54***	***7.18***	***34.17***	***34.17***
			tons/qr.			
Well Logging Unit	0.67	0.09	0.24	0.02	0.08	0.08
Acidizing Pump	0.04	0.01	0.01	0.00	0.00	0.00
Emergency Generator	0.08	0.01	0.03	0.00	0.01	0.01
Cement Pump	0.09	0.01	0.03	0.00	0.01	0.01
Slurry Pump	5.19	0.70	1.87	0.13	0.62	0.62
Total Quarterly Emissions	***6.05***	***0.82***	***2.18***	***0.15***	***0.72***	***0.72***
			tons/yr.			
Well Logging Unit	2.67	0.36	0.96	0.07	0.32	0.32
Acidizing Pump	0.15	0.02	0.05	0.00	0.02	0.02
Emergency Generator	0.30	0.04	0.11	0.01	0.04	0.04
Cement Pump	0.36	0.05	0.13	0.01	0.04	0.04
Slurry Pump	20.74	2.81	7.48	0.52	2.47	2.47
Total Annual Emissions	***24.21***	***3.29***	***8.73***	***0.61***	***2.88***	***2.88***
			Total Drilling Emissions (tons)			
Total Project	***56.49***	***9.58***	***25.47***	***1.77***	***8.41***	***8.41***

1. Assumes 5 wells drilled at Hermosa, and 3 drilled at Hidalgo.
2. Assumes each well takes 3.5 months to complete.
3. Slurry pump would only be needed if the oil/synthetic-based cuttings were injected at the platforms.

Included in Table 2.4 is a slurry pump that would only be needed if the oil/synthetic-based cuttings were injected into the formation. This is a possible option that could be used to eliminate the need to take the cuttings ashore via supply boat for onshore disposal. With this option, there could be a reduction in the number of supply boat trips, which could reduce boat emissions.

No new air permitting should be needed to operate the drill rig since emissions associated with drilling operations are exempt if the total NO_x emissions are less then 25 tons per year (SBCAPCD Rule 202.F6).

Table 2.5 provides an estimate of the hydrocarbon emissions that would be expected from the mud handling system. Hydrocarbon emissions can be emitted from the drilling muds and cuttings only while drilling through an interval that contains gas. The majority of the entrained gas would be removed in the mud-gas separator, and mud degasser (98%). The remaining hydrocarbon vapors would be released as fugitive emissions from the mud pits.

Table 2.5 Estimated emissions from the mud handling equipment.

Source	ROC Emissions				
	lbs/hr	lbs/day	lbs/well	lbs/yr.	Total (lbs)
Mud-gas Separator/Mud Degasser Vent	0.041	0.980	19.590	68.099	158.897
Fugitives from Mud Tanks	0.001	0.020	0.400	1.390	3.243
Total Emissions	0.042	0.999	19.990	69.489	162.140

Truck trips necessary to transport used oil-based and synthetic drilling muds and cuttings to recycling and disposal facilities would take place within Ventura, Los Angeles, and Kern Counties and would not impact air quality within Santa Barbara County. Therefore, these truck trip emissions would not count towards the 25 lbs/day significance threshold. Additionally, there would be no impacts expected from worker commuter vehicle emissions within the county.

The County of Santa Barbara Environmental Threshold and Guideline Manual states that the long-term operational emission threshold of significance is 25 lbs per day of either NO_x or ROCs. Conversely, the SBCAPCD Regulations considers drilling emissions to be exempt from permit if emissions are below 25 tons per year. The project's peak emissions during short-term drilling operations would generate approximately 410.40 lbs per day of NO_x and approximately 52.85 lbs per day of ROCs, both above the 25 lbs per day County threshold, although below the SBCAPCD exemption limit. However, these new emissions could be considered by the County to be significant if these short-term drilling emissions are to be applied to the long-term operational threshold of 25 lbs per day. Long-term operational emissions associated with the production phase of the project are primarily fugitive emissions estimated at 17.54 lbs per day of NO_x and 0.73 lbs per day of ROC and are below the 25 lbs per day Santa Barbara County long-term air quality significance threshold~~s~~. All emissions estimated with the proposed project are within the allowable emissions limits established in the current PTOs as regulated by the SBCAPCD for the Point Arguello Platforms, and the proposed project is fully included and offset in the existing PTOs for the Point Arguello Project. Therefore, the project as proposed is fully permitted, controlled, and offset by all applicable SBCAPCD Rules and Regulations, and no significant impacts to air quality are expected.

Because drilling emissions would not exceed the permitted emission limits specified by the APCD in the existing Point Arguello PTO, no additional drilling operation air quality impacts are expected to occur.

Supply Boat Emissions: Supply boat trips during the drilling phase would increase. For this analysis, it has been assumed that an additional one trip per week would be needed over the entire drilling period. Table 2.6 provides an estimate of the increase in air emissions for the supply boat trips.

Table 2.6 Estimated emissions from drilling operation supply boats.

Estimated Supply Boat Emissions	NO_X	ROC	CO	SO_X	PM	PM_{10}
Drill Rig Transport from Port Hueneme to the Platforms (round-trip) [a]						
lbs/hr[b]	127.18	5.20	19.79	9.13	7.79	7.48
lbs/day[c]	1,631.60	58.04	241.19	117.97	98.01	94.09
tons/qr[d].	11.09	0.58	2.41	1.18	0.98	0.94
tons/yr[d]	11.09	0.58	2.41	1.18	0.98	0.94
Drill Rig Transport Between Platforms (round-trip)[a]						
lbs/hr[b]	127.18	5.20	19.79	9.13	7.79	7.48
lbs/day[c]	288.34	13.17	46.90	20.58	17.97	17.25
tons/qr[d].	2.16	0.13	0.47	0.21	0.18	0.17
tons/yr[d]	2.16	0.13	0.47	0.21	0.18	0.17
Drilling Operations[e]						
lbs/hr[b]	127.18	5.20	19.79	9.13	7.79	7.48
lbs/day[c]	1,631.60	58.04	241.19	117.97	98.01	94.09
tons/qr[d].	7.21	0.38	1.57	0.77	0.64	0.61
tons/yr[d]	28.84	1.51	6.27	3.07	2.55	2.45

a. Drill rig transport based on 20 round trips total over one month, once per year.
b. Lbs/hr maximum based on all engines running simultaneously, and assumes uncontrolled main engines.
c. Assumes one round trip per day, and assumes uncontrolled main engines.
d. Assumes that uncontrolled main engines are used 10% of the time. (Same assumption as PTOs 9103, 9104, and 9105.)
e. Supply boat trips for operations assume 2 round trips per week for 52 weeks per year.

The 1984 EIR/EIS assumed 13 supply boat trips per week for drilling and 4.5 per week for production. For development of the eastern half of Lease OCS-P 0451, it is estimated that an additional one supply boat trip would be needed per week. When this is added to the current supply boat trips of one per week, the total would be two supply boat trips per week, which is less then the level estimated for production in the 1984 EIR/EIS. However, if the emissions based on fuel usage for supply boat trips exceed APCD permitted levels, new offsets would be required. It is expected that the applicant would not use additional boat trips beyond those currently permitted by the APCD, and therefore no additional air quality impacts are expected to occur as a result of supply boat emissions from this project.

The boats that would be used are all registered and permitted with the SBCAPCD and are currently available for use for the Point Arguello project. Transportation of the drill rig would take 20 supply boat round trips. The rig would be moved from Port Hueneme to Platform Hidalgo. Once the wells have been drilled at Hidalgo, the drill rig would be moved to Platform Hermosa. This would take 20 round trips between each of the platforms. Once all the wells are

completed, the drill rig would be disassembled and taken back to Port Hueneme. This would require approximately 20 round trips.

The SBCAPCD permits the fuel use and horsepower limits on the main and auxiliary engines and the emission factors for the engines. The Point Arguello Project is permitted to consume 90,269 gallons per quarter of fuel on supply boat main engines within Santa Barbara County. In the fourth quarter of 1999, the actual fuel use for supply boat main engines was 28,000 gallons in the County. The estimated main engine fuel use per quarter for drill rig transportation and drilling operations are 39,325 gallons and 25,561 gallons, respectively. Even with these additional supply boat trips, the quarterly fuel use is estimated to be below the permitted levels. The SBCAPCD also limits the daily fuel use by the supply boat main engines to 1,967 gallons. This represents one round trip per day. With the development of the proposed project, it is not expected that more than one supply boat would service the platforms in any one day. Therefore, no new permitting would be required for the supply boat trips associated with the eastern half of Lease OCS-P 0451 development and no additional air quality impacts are expected from supply boat emissions as a result of this project.

Production Emissions: Once the wells are brought into production, there would be fugitive emissions associated with the components on each of the wells. For this analysis, it has been assumed that 8 wells would be drilled, that each Lease OCS-P 0451 well would use a new wellhead, and that each wellhead has 229 leak-paths estimated from existing well data. Table 2.7 provides an estimate of the fugitive emissions associated with the producing wells.

The fugitive emissions are relatively small when compared with the entire project ROC emissions. The peak daily ROC emissions are estimated to be 17.5 lbs, which is below the deminimus level of 24 lbs/day contained in Santa Barbara County APCD Rule 202.D.6.

Table 2.7 Estimated fugitive emission increase from Lease OCS-P 0451 production wells.

Component Type	Quantity[2]	Emission Factor[1] (lbs/day-clp)	ROC Emissions			
			lbs/hr	lbs/day	tons/qr.	tons/yr.
Oil - controlled[5]	1,000	0.0009	0.038	0.900	0.041	0.164
Oil - unsafe	0	0.0044	0.000	0.000	0.000	0.000
Gas - controlled[5]	1,132	0.0147	0.693	16.640	0.759	3.3037
Gas - unsafe	0	0.0736	0.000	0.000	0.000	0.000
Total Eastern Half of OCS-P 0451	***2,132***		***0.731***	***17.540***	***0.800***	***3.201***

1. Emission Factors from SBCAPCD PTOs 9103, 9104, and 9105.
2. Component counts are estimates only. Actual counts would be developed when wells are installed.
3. Numbers may not add up due to rounding.
4. Oil stabilization and dehydration equipment (Hidalgo: 136 leak paths; Hermosa: 164 leak paths)

However, it is possible that some of these wells could use existing wellheads from Point Arguello Field wells that have reached the end of their productive life. If the new Proposed wells plus the other Point Arguello Field deminimus emissions result in fugitive ROC emissions of 24 lbs/day or greater, then offset would be required. In addition, if the proposed wells result in new fugitive ROC emissions of 25 lbs/day or greater, then BACT requirements would have to be met consistent with SBCAPCD Rules and Regulations.

The increased emissions projected with the proposed drilling program have been compared to current allowable permitted emissions to determine if any additional permitting or emission thresholds would be exceeded. Table 2.8 provides a comparison of the permitted emissions for Platform Hermosa and Hidalgo in relation to the proposed project estimated emissions. A comparison of the most recent 2001 inventory of actual emissions for the Point Arguello platforms with the projected emissions demonstrates that the proposed project is well within the allowable permitted emissions limits. Thus, the emission increases projected for the project are within the allowable permitted emission limits for all existing platforms, and the project emissions are within the Point Arguello Project allowable emissions that have been fully offset per SBCAPCD Rules and Regulations. Therefore, no additional production-related air quality impacts are expected to occur as a result of this project.

Accident/Upset Emissions: As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

When oil is spilled into the ocean, a number of processes that alter the chemical and physical characteristics of the original hydrocarbon mixture occur. This weathering of the oil, together with atmospheric and oceanographic conditions, determines the time that the oil remains on the surface of the water and the characteristics of the oil at the time of contact with a particular resource. A primary agent in the weathering process is the evaporation of volatile hydrocarbons into the atmosphere.

A 200-bbl spill would result in insignificant impacts to air quality due to the rapid volatilization of the hydrocarbons. Information from OCS accidents indicates that the majority of the aromatic compounds would be lost to volatilization within 24 to 48 hours, with a high percentage evaporating within the first hours of the spill (Jordan and Payne, 1980). Therefore, insignificant impacts to air quality are expected due to the low volume of oil projected in the probable oil spill and the resulting short duration of emissions.

The risk of a H_2S release into the atmosphere at the Point Arguello offshore facilities is not expected to change as a result of the proposed project. H_2S mitigations and safety requirements in place at the Point Arguello platforms and pipelines are expected to handle any additional negligible risk imposed by the proposed project. For this analysis, it is assumed that there is no impact expected from a hydrogen sulfide release into the atmosphere. No additional accident or upset air quality impacts are expected to occur as a result of this project with the existing mitigation measures in place.

Conclusion: The potential impacts to onshore air quality resulting from the development and production of the eastern half of Lease OCS-P 0451 are considered to be insignificant based on the significance criteria utilized in this analysis. Increased emissions from drilling operations are within allowable emission levels currently permitted by the SBCAPCD, and have been fully offset in accordance with SBCAPCD Rules and Regulations. All crew and supply vessels projected to be utilized are presently registered and permitted by SBCAPCD and the additional project emission increases are expected to be covered by existing emission offset agreements. Estimated fugitive emission increases from additional oil and gas components needed to bring the wells into production are below APCD deminimus levels and do not require emission offsets. If the combined new wells and other Point Arguello fugitive emissions exceed deminimus levels, offset and potential BACT would be required. Thus, impacts to air quality as a result of the fugitive hydrocarbon emissions would be insignificant.

Table 2.8 Comparison of Lease OCS-P 0451 peak annual emissions to total permitted facility emissions.

Platform/Emission Category	NO_X	ROC	CO	SO_X	PM	PM_{10}
Platform Hermosa[1]						
Total Permitted Emissions (tons/yr.) [PTO 9104]	109.35	69.00	90.46	40.04	9.42	9.23
2001 Actual Emissions (tons/yr.)	48.09	40.82	42.78	26.14	4.25	4.21
Estimated Peak OCS-P 0451 Emissions (tons/yr.) [2]	46.72	6.16	23.57	1.52	3.21	3.21
Excess Permitted Emissions (tons/yr.)[3]	14.53	22.02	24.11	12.38	1.96	1.81
Platform Hidalgo[1]						
Total Permitted Emissions (tons/yr.) [PTO 9105]	111.19	50.35	69.76	31.32	9.31	9.16
2001 Actual Emissions (tons/yr.)	50.24	30.16	35.24	12.11	2.72	2.67
Estimated Peak OCS-P 0451 Emissions (tons/yr.) [4]	38.42	5.37	19.00	1.23	2.77	2.77
Excess Permitted Emissions (tons/yr.)[3]	22.53	14.83	15.52	17.98	3.82	3.72
Supply Boats						
Total Permitted Emissions (tons/yr.) [PTOs 9103, 9104, 9105]	76.24	3.99	16.67	8.18	6.79	6.51
2001 Actual Emissions (tons/yr.)	33.84	1.90	7.61	3.62	3.04	2.95
Estimated Peak OCS-P 0451 Emissions (tons/yr.) [5,6,7]	28.90	1.53	6.28	3.05	2.54	2.44
Excess Permitted Emissions (tons/yr.)[3]	13.49	0.56	2.78	1.50	1.20	1.12

1. Supply, Crew and Emergency Response vessel emissions not included.
2. Peak year at Hermosa assumes drilling for 12 months and 17 well months of production.
3. The excess permitted emissions = total permitted emissions-2001 actual emissions-estimated peak annual project emissions.
4. Peak year at Hidalgo would include 10.5 months of drilling and 12 well-months of production.
5. Boat emissions are from SB County line to the platforms, consistent with Total Permitted Emissions from the PTOs.
6. Assumes one round trip per day for 30 days (rig mobilization) and one round trip per week for 10.5 months (drilling) from Port Hueneme to Platform Hidalgo. The numbers also include one round trip per day for 15 days between Hidalgo and Hermosa (interplatform rig move). These peak year emissions assuming mobilization started the beginning of January. If mobilization was later than January, the peak year emissions would be less.
7. The estimated peak supply boat emissions are conservative as it assumes all boat trips are in addition to boat trips already occurring for the Pt. Arguello Field. It is projected that approximately one-half of the projected boat trips will occur as part of the regularly scheduled boat trips for the Point Arguello project.

Accidental oil spills occurring as a result of the proposed project are expected to have insignificant impacts to air quality due to the low volume of oil projected in the probable oil spill and the rapid volatilization of the hydrocarbons. The potential for violations of the ambient air standards from the proposed project is negligible through implementation of the existing permit requirements in place for the Point Arguello Project. Truck trips necessary for disposal of drilling muds and cuttings would take place within Ventura, Los Angeles, and Kern Counties and would not impact air quality within Santa Barbara County.

The potential air quality impacts from the proposed eastern half of Lease OCS-P 0451 development would not exceed the existing SBCAPCD or SBCPDD significance criteria since the project would be covered by the offsets provided within the existing Point Arguello Platform air permits consistent with SBCAPCD Rules and Regulations. Therefore, no additional air quality impacts are expected to occur as a result of this project.

Cumulative Analysis: Potential sources of cumulative air quality impacts in the project area that overlap both spatially *and* temporally include emissions from on-going oil and gas activities in Federal and State waters and offshore shipping and tankering operations. All of the cumulative projects and activities listed in Section1.4 of this document occur in the South Central Coast Air Basin composed of San Luis Obispo, Santa Barbara, and Ventura Counties and were considered. For this analysis, it is assumed that due to the prevailing onshore wind conditions, the geographic scope for cumulative air quality impacts would be those projects or actions that exist or are pending or approved in the central Santa Barbara Channel and Southern Santa Barbara County. The temporal overlap considered for this analysis is the 2003–2013 proposed project timeframe.

On-going Oil and Gas Activities: The existing energy related projects considered in Federal and State waters include air emissions from Platform Irene, the Point Arguello Unit, and the Santa Ynez Unit. The existing platforms identified within the vicinity of the proposed project are within the jurisdiction of the SBCAPCD and have current Permits to Operate. The emission sources from those facilities have been controlled and fully offset and are in full compliance with SBCAPCD Rules and Regulations. Thus, the additional incremental emissions levels expected with the proposed project have been offset and are not expected to have a cumulative air quality impact with existing controlled and fully offset Federal oil and gas activities.

Marine Shipping and Tankering: Other OCS related emission sources considered in this analysis are shipping and tankering operations. Emissions from marine vessels traversing the Santa Barbara Channel are not regulated by Federal, State, or local air authorities and may combine with emissions from the proposed project to affect onshore air quality. Approximately 80 percent of the vessels calling on the Ports of Los Angeles and Long Beach are of foreign registry and most use engines produced outside the United States (CARB, 2000).

The most recent published emission inventory for Santa Barbara County estimates that emissions from ships and commercial boats account for approximately 1 ton per day of NOx, or about 2.7 percent of the total NOx inventory. As emissions from the proposed project are within allowable permitted levels that have been fully offset per Santa Barbara APCD Rules and Regulations, the contribution of the proposed project to the cumulative air quality impact of marine shipping and tankering would be insignificant.

Onshore Projects: No major onshore projects are pending or approved in the vicinity of the proposed project that have the potential of cumulatively impacting regional air quality.

Overall Conclusions: The potential impacts to onshore air quality resulting from the development and production of the eastern half of Lease OCS-P 0451 are considered to be insignificant. Increased emissions from drilling operations are within allowable emission levels currently permitted by the SBCAPCD and the offshore turbines on Platforms Hermosa and Hidalgo have been fully offset in accordance with SBCAPCD Rules and Regulations. Emission increases projected with the proposed project are well within the activities and emission limits previously analyzed and mitigated in the Point Arguello EIR/EIS. The proposed project represents an insignificant increase to overall cumulative air quality. Thus, the potential for violations of the ambient air standards from the proposed project are considered to be negligible, through existing emission offset agreements and the implementation of the existing permit requirements in place for the Point Arguello Project.

2.4 Water Quality

Affected Environment

Water quality has been studied extensively in the Southern California Bight (Dames and Moore, 1982; SAI, 1984; ADL, 1984a, b; and Chambers Group, 1987 a, b). In addition, the Southern

California Coastal Water Research Project (SCCWRP) found that almost all of the surface waters were fully saturated with oxygen, and more than 99 percent of the Bight met California Ocean Plan water quality objectives for dissolved oxygen and water clarity (SCCWRP, 1998). Areas of reduced water clarity were mostly located in shallow water, and probably resulted from the natural re-suspension of bottom sediments. Specific water quality parameters, typical for the Point Arguello area, such as temperature, salinity, dissolved oxygen, nutrient concentrations, are given in Table 2.9.

Table 2.9 Point Arguello area key water quality parameters.

Parameter (Units)	Characteristics
Temperature (°C)	At surface ranges from 12-13 °C in April to 15-19 °C in July-October
Salinity (ppt)	33.2-34.3 ppt (parts per thousand)
Dissolved oxygen (mg/L or ml/L)	Maximum (5-6 ml/L) at the surface, decreasing with depth to 2 ml/L at 200 m; below 350 m, as low as 1 ml/L.
pH (unitless)	pH values range from about 7.8 to 8.1 at surface and with depth
Nutrients (µg-atoms/L)	Nutrients important for primary production include nitrogen, phosphorus, and silicon; other micronutrients include Fe, Mn, Zn, Cu, Co, Mo, V, vitamin B12, thiamin and biotin. Depletion near the surface but increasing with depth.
Turbidity (% transmittance)	Suspended sediment concentrations 1mg/L in the nearshore, surface waters. Higher values in near-bottom waters (and after storms); lower levels (0.5 mg/L) in offshore regions.
Metals (mg/kg)	Metals include barium (Ba), chromium (Cr), cadmium (Cd), copper (Cu), zinc (Zn), mercury (Hg), lead (Pb), silver (Ag), and nickel (Ni).
Organics (ug/L)	May enter the marine environment from municipal and industrial wastewater discharges, runoff, natural oil seeps, and offshore oil and gas operations. Total dissolved hydrocarbon concentrations near Point Conception are in the range of 0.2-3.5 ug/L.

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

Sources of Pollution. The two primary sources of pollution are municipal discharges (sewage treatment plants) and nonpoint sources such as storm drains and river runoff. These are briefly discussed below.

Municipal Discharges. A total of six municipal dischargers exist in the Santa Barbara Channel (Goleta, Santa Barbara, Montecito, Summerland, Carpinteria, and Oxnard). The nearest, Goleta, is about 50 miles to the east of the Point Arguello Unit. The average volume of the effluent discharged at Goleta in 2000 was 5.7 million gallons/day (mgd; Goleta Sanitary District, pers. comm., September 2000) at a mixed primary/secondary level of treatment (SCCWRP, 1996).

Nonpoint Sources of Pollution. The two primary nonpoint sources of pollution into the Southern California Bight are rivers and storm drains. Storm drains are commonly associated with urban areas. Since the proposed project is over 50 miles from the nearest urban center (Santa Barbara); storm drain-associated pollutants are not a factor in the water quality of the project area.

The Santa Ynez and Santa Maria rivers are 15 and 35 miles, respectively, north of the project area. Pollutants that could be associated with these rivers are predominantly agriculturally based and may include dairy and ranching-related pollutants (for example, animal wastes) and pesticides. During winter, high runoff followed by strong northwesterly winds have driven these

river plumes south past Point Conception, occasionally entering the proposed project area (Hickey and Kachel, unpubl.). However, the only time the plumes would reach the vicinity of the project area would be during times of high flow and high dilution. Thus, pollutants carried by the plume would be well-diluted, but perhaps still detectable, upon entering the project area.

Indicators of Pollution. Two indicators of pollution are discussed here to show possible sources, types and trends of anthropogenic-based inputs to the marine environment. While these, in part, show the state of the affected environment; oil and gas operations would not necessarily contribute to the same types of pollution discussed below.

Beach Postings. The Natural Resources Defense Council (NRDC) has published its 12th Annual report entitled, "Testing the Waters 2002: A Guide to Water Quality at Vacation Beaches" (NRDC, 2002). This report listed the number of nationwide beach closures due to pollution for the year 2001. Virtually all of Santa Barbara County's 843 closings were due to monitoring that revealed elevated bacteria levels. More than half (54 percent) were from urban and rural runoff emptying into creeks, rivers, and storm drains, while 45 percent were of unknown origin. About one percent was from known sewage spills.

Mussel Watch. The National Oceanic and Atmospheric Administration's National Status and Trends Program (NS&T) has been monitoring the U.S. coastline since 1984 by examining the tissues of mussels. Parameters measured included heavy metals, chlorinated hydrocarbons, polycyclic aromatic hydrocarbons and butyl tin. Data from this database (NOAA, 1998) indicate that levels of pollutants are generally decreasing along the southern California coast (Catalina Island to San Luis Obispo). None of the monitored sites in Santa Barbara County (Point Santa Barbara, Santa Cruz Island, and Point Conception), exhibited high levels of any contaminant.

Overall, water quality in the proposed offshore project area is nearly pristine. This is due to the lack of both local and remote point or nonpoint pollution sources such as any major sewage outfalls, urban-associated storm drains, and major river out flow. While, beach posting indicate a mainly urban-based pollution indication, the mussel data shows little pollution problems near the project area.

Impact Discussion

A determination of significant impact to water quality in this EA is based on significance criteria developed specifically for this resource. A significant adverse impact on water quality is any liquid effluent or solid material discharged to the marine receiving waters that cause changes in standard water quality parameters (see Table 2.9) resulting in unreasonable degradation to the water quality[1].

Routine Operations: The potential impact-producing activities associated with the proposed project that could affect water quality during routine operations are discharges of drilling muds and cuttings and continuing produced water discharges from Platforms Hidalgo and Hermosa. The parameters that could affect water quality are turbidity, oil and grease and other organic substances, metals, and various inorganic materials such as ammonia and sulfides.

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[1] EPA's regulations at 40 CFR 125.121(e)(1-3) state unreasonable degradation of the marine environment means: (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.

Platforms Hidalgo and Hermosa were installed in 1986 and 1985, respectively. Drilling from these platforms occurred from 1986 to 1989; produced water discharges began in 1994. Other discharges, such as sanitary and domestic wastes, deck drains, desalination unit discharge, fire control system test water, and noncontact cooling water, have all occurred since the platforms were installed.

NPDES Permit Status and Comparison. Discharges from offshore platforms are regulated by the Environmental Protection Agency (EPA) via National Pollutant Discharge Elimination System (NPDES) permits. The following discussion includes references to three versions of NPDES permits:

- The existing permit (hereinafter referred to as the existing General NPDES permit), by which Platforms Hermosa and Hidalgo are currently covered. This permit expired in June, 1984 and has been administratively extended by EPA;
- A draft General permit (hereinafter referred to as the draft General NPDES permit) that will cover all of the platforms in the Pacific OCS at a more stringent level of monitoring; The draft General NPDES permit was initially made public by EPA in the fall of 1999.

  The California Coastal Commission granted Federal Consistency Certification for the draft General NPDES permit at the January 2000 meeting. One of the conditions applied by the Commission was the incorporation of the more stringent of the Federal NPDES limits and the California Ocean Plan (COP) limits for produced water. EPA accepted these conditions.
- The revised draft General NPDES permit (hereinafter referred to as the revised draft General NPDES permit), which the EPA anticipates finalizing by the end of 2003.

The draft General NPDES permit includes monitoring requirements for 22 effluents consisting of 5 major discharges and 17 minor ones. Table 2.10 compares the requirements between the existing General NPDES permit and the draft General NPDES permit (which has not yet been finalized) for the five major discharges. The revised draft General NPDES permit and the Arguello Inc. Agreement both contain the same limits as those in the draft General NPDES permit (Table 2.10).

On May 14, 2003, the California Coastal Commission (CCC) requested that Arguello Inc. submit an analysis of the project's conformity with California Ocean Plan (COP) requirements (see Appendix B). On June 12, 2003, Arguello Inc. sent a letter voluntarily modifying the project description (see Appendix B) to the CCC and MMS. Arguello Inc. modified the draft General NPDES permit specifically to cover only Platforms Hermosa and Hidalgo, hereinafter known as the Arguello Inc. Agreement. It includes the COP requirements requested by the CCC. As discussed below, with or without the Arguello Inc. Agreement, impacts to water quality from routine discharges are expected to be insignificant. The Arguello Inc. Agreement will be superceded in the future if EPA issues a duly authorized general or individual NPDES permit that has complied with the Federal consistency review requirements of the Coastal Zone Management Act.

Drilling Discharges. Increases in turbidity would arise from the discharge of drilling muds and cuttings. Turbidity is directly regulated by any NPDES permit in effect. The heavier drilling fluid particulates will settle quickly while the lighter particles will be transported with the current, settling and dispersing over a wide area. These lighter, smaller particles have been calculated to dilute to greater than 1,500:1 beyond a distance of 100-300 feet from the point of discharge (ADL, 1984a). Modeled seafloor deposition of solids showed that only 17-20% of the solids settled out within a 16.6 hour period. During this time, the discharge plume may travel up to 6.8 km (4.25 miles), generally agreeing with Coats (1994). The remaining 80 percent of the solids

would be distributed over an increasingly large volume of water and area of seafloor resulting in very small, and probably undetectable, addition to the ambient levels of particulate material.

Table 2.10 Permit comparison of effluent limits.

Effluent	Existing General NPDES Permit Limits	Draft General NPDES Permit Limits
001 Drilling Discharges (mud and cuttings)	Daily visual sheen observation Monthly volume estimate Continuous constituent and additive inventory Once per mud system toxicity test if unapproved mud are discharged1 No discharge of oil-based drilling mud Annual report of heavy metal contaminants in barite Use of generic mud	Total volume limits applied to each platform End-of well toxicity No discharge of oil-based drilling mud or mud contaminated with diesel Limits on cadmium and mercury in barite Continuous constituent and additive inventory Static sheen test Use of generic muds
002 Produced Water	Monthly oil and grease samples Monthly flow estimate (daily max = 72 mg/l) Yearly metals and phenols analysis	Weekly oil and grease samples (29 mg/l monthly average; 42 mg/l daily max.) Flow limits applied for each platform Quarterly monitoring of metals and other parameters Whole effluent toxicity (chronic)
003 Well Treatment, Completion and Workover Fluids	Volume monitoring No discharge of free oil monitored by visual observations	Volume monitoring No discharge of free oil monitored by static sheen test Once per job oil and grease samples (29 mg/l monthly average; 42 mg/l daily max.)
004 Deck Drainage	Volume monitoring No discharge of free oil monitored by visual observations	Volume monitoring No discharge of free oil monitored by visual observations
005 Domestic and Sanitary Wastes	Flow rate Residual chlorine	Flow rate Observation of floating solids (for facilities manned by 9 or fewer persons) Residual chlorine and foam for domestic wastes (for facilities manned by 9 or more persons)

[1]Operators commonly conduct toxicity tests on drilling mud whenever they are discharged into the sea.

The most common metal used during drilling operations is barium and sometimes iron (as an alternative to barium), both used as weighting agents. Neither barium nor iron have been monitored in the existing General NPDES permit, nor will they be monitored by any NPDES permit in effect at the time of the project. Only mercury and cadmium are monitored in the barite (Table 2.10).

ADL (1984a) concluded that no significant impact would occur if all the available well slots were used and the drilling muds discharged (536,000 bbl). However, the actual amount discharged (153,080 bbl) is only about 28 percent of the ADL (1984a) amount. Arguello Inc. (2003b) has projected drilling mud discharge volume for the 8 proposed wells to be 112,553 bbl. This combined with the discharge from other projected wells from Platforms Hidalgo and Hermosa

(78,720 bbl) is 191,273 bbl (Arguello Inc., 2001b), or about 35 percent of that analyzed in ADL (1984a).

Additionally, the Point Arguello platform DPPs (ADL, 1984a) projected cuttings discharges of 447,492 bbl if all available wells slots had been used. However, the actual amount discharged (34,020 bbl) is only about 8% of the ADL (1984a) amount. Arguello Inc. (2003b) has projected cuttings discharge volume for the 8 proposed wells to be 40,683 bbl. This, combined with the discharge from other projected wells from Platforms Hidalgo and Hermosa (20,412 bbl) is 61,095 bbl (Arguello Inc., 2001b), or about 14 percent of that analyzed in ADL (1984a).

The draft General NPDES permit contains annual volume limits for drilling muds and cuttings (Table 2.10). For Platforms Hidalgo and Hermosa, the limits for drilling muds are 23,000 and 43,000 bbl, respectively. Similarly, the annual cuttings limits for Platforms Hidalgo and Hermosa are 6,000 bbl and 11,250 bbl, respectively. Arguello Inc's. June 12, 2003 Agreement meets these limits.

Arguello Inc. (2003b) notes that it is possible that synthetic or oil-based muds might be used for drilling the longer, horizontal portions of the wells. Synthetic or oil-based muds cannot be discharged into the sea under any of the permits discussed above. Instead they are recycled and returned to the company who manufactures them for cleaning and reconstitution.

If some combination of water-based and synthetic/oil-based muds is used for the proposed project wells, Arguello Inc, states that a total of 65,523 bbl of water-based muds and 22,899 bbl of uncontaminated cuttings could be discharged (Arguello Inc., 2003b). This would constitute about 58 and 56 percent of the muds and cuttings, respectively, compared to using water-based muds only.

Arguello Inc. may chose to reinject oil-contaminated drilled cuttings. If oily cuttings are not re-injected, they would need to be barged to shore for disposal. Possible onshore disposal sites include any of several sites in Kern County (Arguello Inc., 2003b).

Produced Water. Peak volumes of produced water are estimated for the proposed project to be 53,100 bbl per day (2.23 mgd). The maximum discharge of produced water from the combined eastern half of Lease OCS-P 0451 and the Point Arguello Unit are estimated to be approximately 250,000 bbl per day (10.5 mgd).

Table 2.11 presents produced water data from Discharge Monitoring Report (DMR) and EPA/MMS compliance data compiled by MMS since the platforms began discharging produced water (1993 for Platform Hidalgo and 1994 for Platform Hermosa). Oil and grease data has been collected by the operator monthly while the remainder of the parameters are sampled and analyzed annually, both according to the requirements of the existing General NPDES permit.

Table 2.11 also shows the historical averages of the parameters which have been monitored in produced water for Platforms Hermosa and Hidalgo and compares them with the limits of the existing General NPDES, the draft General NPDES, and the COP permits. In addition, produced water toxicity data are given, although there is no requirement in the existing General NPDES permit for these platforms that toxicity be monitored. The produced water toxicity data are compiled from EPA/MMS-collected samples in anticipation of the issuance of the draft or revised draft General NPDES permit. All of the data, except oil and grease which are end-of-pipe limits, include EPA-determined dilution factors. The Federal limits must be met at 100 meters from the point of the discharges from platforms. EPA calculates these factors by using a standard, well-established model (PLUMES), applying it to end-of-pipe values.

Table 2.11 Comparison of the historical averages of monitored constituents of produced water from Platforms Hermosa and Hidalgo and the existing and draft General NPDES permit limits and the California Ocean Plan limits. (Note: the limits in the revised draft NPDES General permit and the Arguello Inc. Agreement are the same as given for the draft General NPDES permit below).

Constituent	Platform Hermosa	Platform Hidalgo	Federal NPDES Limits		California Ocean Plan Limits
			Existing	Draft	
Oil and Grease (mg/l)	17.1	18.9	72	29/42*	25
Arsenic (µg/l)	0	0	32	36	8
Cadmium (µg/l)	0	0.000071	12	9.3	1
Chromium (µg/l)	0.0044	0.0016	8	50**	2
Copper (µg/l)	0.337	0.29	20	3.1	3
Cyanide (µg/l)	0.000006	0	20	1	1
Lead (µg/l)	0	0	32	8.1	2
Mercury (µg/l)	0	0	0.56	0.051	0.04
Nickel (µg/l)	0.0065	0.0061	80	8.2	5
Silver (µg/l)	0.0039	0	1.8	1.9	0.7
Zinc (µg/l)	1.39	0.65	80	81	20
Total Phenols (µg/l)	0.55	0.25	120	--	30
Phenol (µg/l)	--	--	--	4,600,000	--
Toxicity (TUc)	None observed	None observed	1	1	1

*29 mg/l = monthly average; 42 mg/l = daily maximum;
**The existing General NPDES permit requires a measurement of total chromium while both the draft General NPDES permit and the COP give limits for hexavalent chromium; a discharger may comply with this limit by measuring total chromium.

The COP limits, given in Table 2.11, are based on a 6-month (180-day) moving median which assumes daily sampling. Central Coast Regional Water Quality Control Board personnel have indicated that the appropriate sampling frequency for this limit is most often determined through discussions with the discharger, arriving at a reasonable sampling frequency according to the characteristics of the discharge, and other factors (pers. comm. Mike Higgins, Central Coast Regional Water Quality Control Board, May 21, 2003). The appropriate level of sampling is approved by the Regional Board within whose jurisdiction the discharge falls. As Table 2.11 indicates, the historically monitored parameters in the produced water discharge clearly meet the COP 6-month moving median limits at the 100-meter mark. The values calculated for Platforms Hermosa and Hidalgo are one to six orders of magnitude less than the COP limits.

Concentrations of monitored constituents have also been historically well below the limits given in the existing General NPDES permit. Since the Point Arguello platforms began discharging produced water, oil and grease levels have averaged less than 25 percent of permitted levels. Other monitored parameters, heavy metals, cyanides, and phenols, have also been two to six orders of magnitude less than the limits given in the existing General NPDES permit (David Panzer, MMS, unpubl. data; Arguello Inc., 2003b).

Brandsma (2003) conducted modeling of the produced water plumes from Platforms Hidalgo and Hermosa. Produced waters from the offshore Point Arguello Field have salinities lower than ambient seawater and they are hot (near 80° C, or 180° F) when discharged. Hence, the produced water plume would be slightly buoyant and dilute rapidly within a short distance from the point of discharge (Neff, 1997). Also, subsurface current velocities are generally more than 10 cm/sec (0.2 knots) and often exceed 30 cm/sec (0.6 knots), ensuring rapid mixing of produced water plumes with ambient seawater. At 20 m from the point of discharge, a 100-fold dilution would occur increasing to near a two thousand-fold dilution at 100 m from the point of discharge.

The cross-sectional dimension of the plume 20 m from the discharge point is on the order of 30 m (100 ft) or less at both Platforms Hermosa and Hidalgo (Brandsma, 2003). At this distance from the discharge point, all monitored constituent concentrations are less than the existing General NPDES permit discharge limits. Additionally, the volume of the plume is very small compared to the volume of water into which the plume is mixing. Thus, the concentrations of the monitored constituents could only be elevated within the limited volume of water occupied by the plume.

Other Discharges. The remaining three major discharges – well treatment, completion, and workover fluids; deck drainage; and sanitary and domestic wastes – are all much less in volume than produced water. Well completion fluids are associated with drilling activities and occur intermittently when a well is completed (after drilling). They usually consist of seawater mixed with a potassium salt and sometimes other materials that help ensure the well bore stays clean and corrosion-free. These fluids could be discharged if a producing well requires workover activities (maintenance).

Deck drainage is also intermittent and, for Platforms Hermosa and Hidalgo, goes to a sump where any oil is allowed to float to the surface. The oil is then pumped to the production stream, and the water is commingled with the produced water discharge. The deck drain component of the discharge is monitored according to the produced water limits, particularly for oil and grease.

Sanitary and domestic wastes (sewage) are required to be treated with chlorine to kill fecal coliform bacteria. The chlorine level is monitored to be as close as possible to 1 mg/l, the concentration that is enough to kill the bacteria but not so high as to harm organisms in the receiving water. Chlorine is also sometimes used as an antifouling treatment to ensure that pipes within systems, such as fire control water and noncontact cooling water, are kept reasonably free of fouling organisms.

None of the discharges discussed above, nor any other effluent discharged from the platforms, will affect water quality in the Monterey Bay National Marine Sanctuary. The Sanctuary is about 100 km (60 mi) from the Point Arguello platforms and is too far away to be affected.

Accidents/Upsets: There is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range could occur during the life of the project (Section 2.2). ADL (1984a) noted that smaller spills up to a few tens of barrels are likely to occur about once in 10 years. As discussed in Section 2.2, experience in the Pacific Region over the last 30 years indicates that the most likely spill volume for spills in the 50- to 999-bbl range to be less than 200 bbl. The 200-bbl spill easily falls within this previously analyzed footprint (ADL, 1984a).

Expected water quality effects due to the estimated 200-bbl oil spill that could occur in the top 10 to 20 m of the water column, depending on sea state, include turbidity, biological and chemical oxygen demand, and increases in levels of light-end hydrocarbons, such as BETX (benzene, ethylbenzene, toluene, and xylene) and naphthalene. The slick, on the surface and at depth, should disperse in a few days because of wind and wave action, dissolution, and volatilization losses. The dissolved components (BETX and others) make up about 20 to 50 percent of local crude oils and would be subject to dispersion, dilution, and volatilization, as well as to microbial

and photo-degradation. The majority of these low molecular weight aromatic compounds will be lost to volatilization within 24 to 48 hours (Jordan and Payne, 1980). Clean-up actions (Section 2.2.3) would also contribute to the minimization of impacts to water quality. Concentrations of hydrocarbons in the water column would likely return to near-normal conditions within a few days of the time the main oil slick is cleaned up or drifts from the area.

Conclusion: Discharges from routine operations, drilling muds and cuttings, produced water, and other effluents associated with development and production of the eastern half of Lease OCS-P 0451 will result in an increase of turbidity, some metals, dissolved hydrocarbons, and other pollutants. The majority of the drilling mud discharge particulates would settle quickly while the remainder would be transported beyond the project area. As shown above, the size of the produced water plume would be small in comparison to the receiving water and would be rapidly diluted. Additionally, historical, long-term monitoring has shown that components of the produced water discharge have been well below the limits of the three permits discussed above (existing General NPDES permit, draft General NPDES permit, and the COP). Thus, impacts to water quality are expected to be insignificant.

Accidental oil spills occurring as a result of the proposed project would have a transient effect on water quality in the form of increases in light-end hydrocarbons in the water column. This effect is estimated to dissipate within a week.

Since the significance criteria used for this analysis are not exceeded, impacts to water quality are expected to be insignificant.

Cumulative Impacts:

Oil and Gas Projects. As discussed in Section 1.4, the cumulative oil spill risk for the project area results from several ongoing and projected sources in the Santa Barbara Channel and Santa Maria Basin, and the tankering of Alaskan and foreign-import oil through area waters. The nearest offshore oil and gas platforms are Platforms Irene and Heritage, approximately 16 km (10 mi) to the north and 32 km (20 mi) to the east, respectively. Discharges from these platforms will not affect the water quality of the proposed project area.

Non-Oil and Gas Projects and Actions. The projects and actions considered in the cumulative analysis are given in Section 1.4. For routine operations, the only action that could overlap temporally or spatially with the water quality-associated aspects of the proposed project is intermittent river runoff. As discussed above, these high runoff periods are associated with winter storm conditions followed by upwelling-favorable winds which can drive the Santa Ynez and Santa Maria river plumes south past Point Conception. Thus, the proposed project water quality could be occasionally affected by these river plumes. However, the greatest dilution and dispersion of any pollutants also occurs during the only time the plumes would reach the vicinity of the proposed project, that is, during times of high flow. Thus, pollutants carried by the plume would have little effect and be well-diluted, probably to background, by the time any of the plume reached the project area. No additive water quality effect with routine discharges would occur.

Overall Conclusions: The potential impacts to water quality resulting from the development and production of the proposed project are considered to be insignificant because no unreasonable degradation to the water quality from the project will occur (see the Significance Criteria).

2.5 Biological Resources

The impact analysis for the marine biological resources in this EA 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 normal 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 measurable loss or irreversible modification of habitat in several localized areas or in 10 percent of the habitat in the affected area. An example of a significant change in habitat would be one that prevents the re-establishment of pre-disturbance biological communities over a significant portion of their range. Loss or irreversible modification of habitat protected by Federal, State or local laws or regulations is considered significant.
- Disturbance resulting in biologically important effects on behavior patterns.

2.5.1 Marine Mammals

Affected Environment

Marine mammals in the Santa Barbara Channel and Santa Maria Basin 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, 1984c; Barlow, 1995; Barlow et al., 1995, 1997; Barlow and Gerrodette, 1996; MMS, 1996a, 2001; Koski et al., 1998; Forney et al., 2000; FWS, 2001, 2003; DeLong and Melin, 2000; Stewart and Yochem, 2000). At least 34 species of marine mammals inhabit or visit California waters. These include six species of pinnipeds (seals and sea lions), 27 species of cetaceans (whales, porpoises, and dolphins), and the sea otter. 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, 2003).

Of the marine mammals occurring in project area waters, six species of large whales (blue, fin, sei, humpback, northern right, and sperm) are listed as endangered, and two species of pinnipeds (Guadalupe fur seal and Steller sea lion) and the southern sea otter are listed as threatened under the Endangered Species Act. The biology of these species in the project area is discussed in detail in the biological evaluation prepared for the Endangered Species Act Section 7 consultation on the Rocky Point Unit development project (MMS, 2000a). That information is incorporated by reference in this document and summarized below.

Two of the endangered whale species, the blue whale (*Balaenoptera musculus*) and humpback whale (*Megaptera novaeangliae*), feed on krill in the western Santa Barbara Channel and southern Santa Maria Basin during summer and fall (Calambokidis et al., 1990, 1996, 2001; Calambokidis, 1995; Reeves et al., 1998; Mate et al., 1999). 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; Bonnell and Ford, 2001). The other two endangered baleen whales, sei (*Balaenoptera borealis*) and northern right whales (*Eubalaena glacialis*), are rare in California waters (Barlow et al., 1997; Forney et al., 2000).

Sperm whales (*Physeter macrocephalus*) are present in California offshore waters 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). They are primarily a pelagic species and are generally found offshore in waters with depths of greater than 1,000 m (3,300 ft) (Watkins, 1977; Dohl et al., 1983; 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., 1987; Bonnell and Dailey, 1993; Koski et al., 1998; Angliss et al., 2001).

Southern sea otters (*Enhydra lutris nereis*) now range in nearshore waters from near Año Nuevo Island south to approximately Point Conception (Riedman and Estes, 1990; FWS, 2003). 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, 2003).

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 island for California sea lions, which are the most frequently encountered marine mammals in Southern California waters (Bonnell and Dailey, 1993; Koski et al, 1998; Bonnell and Ford, 2001). Sea lions haul out on the lower decks and structures of OCS platforms and on associated mooring buoys.

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 at near the Ellwood Pier, Point Conception, and Rocky Point (Hanan et al., 1992). Individual harbor seals are frequently sighted in waters near the Point Arguello facilities (Bonnell and Ford, 2001).

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; Bonnell and Ford, 2001). Elephant seals range widely at sea and spend much of their time under water (Le Boeuf et al., 1989; DeLong et al., 1992). Fur seals forage in deeper waters beyond the continental shelf, generally 40 km (25 mi.) or more from shore (Bonnell et al., 1983; Bonnell and Dailey, 1993; Bonnell and Ford, 2001).

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*), northern right whale dolphin (*Lissodelphis borealis*), bottlenose dolphin (*Tursiops truncatus*), killer whale (*Orcinus orca*), and, north of Point Conception, harbor porpoise (*Phocoena phocoena*) (Bonnell and Daily, 1993; Barlow et al., 1997; Koski et al., 1998; Forney et al., 2000; Bonnell and Ford, 2001). Common dolphins, the most abundant cetaceans off California, move through area waters in groups of up to several thousand animals.

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). Gray whales are generally absent from Southern California waters from August through November.

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; Koski et al., 1998; Forney et al., 2000), where they are often sighted near the northern Channel Islands (Leatherwood et al., 1987; Bonnell and Dailey, 1993).

Impact Discussion

The impact analysis for the marine biological resources in this EA adopts significance criteria developed for all biological resources, including threatened and endangered species. The significance criteria are presented in Section 2.5.

For marine mammals (including threatened and endangered species), the phrase "biologically important length of time" as used in the criteria 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).

Impacts to marine mammals below the levels described in the criteria are considered to be less than significant. Impacts involving no death or life-threatening injury of any marine mammal, no displacement from preferred habitat, and no more than minor disruption of behavioral patterns, are defined as negligible.

Routine Operations: The primary impact-producing activities associated with the proposed project include drilling and production operations with associated support activities. The major impact agents expected from these proposed activities are noise and disturbance and platform discharges. The following sections describe the sources and types of these potential impacts. The original Point Arguello EIR/EIS (1984c) concluded that routine operations would have only Class III (insignificant) impacts on marine mammals in the project area.

Offshore Drilling and Production: As described in Section 1.1, Arguello Inc. has requested approval to drill up to 8 wells to develop Lease OCS-P 0451. The proposed wells would be drilled from the existing Platforms Hidalgo and Hermosa in the Point Arguello Unit. Drilling is scheduled to begin during the first quarter of 2004 and continue until the middle of 2006.

The sound levels produced by drilling from conventional, bottom-founded platforms are relatively low and are similar to levels generated by production activities (Gales, 1982; Richardson et al., 1995). Gales (1982) recorded noise produced by one drilling and three drilling and production platforms off California. The noises produced were so weak that they were nearly undetectable even alongside the platform in sea states of Beaufort 3 (winds 12-19 kph, or 7-10 kts) or better. No source levels were computed, but the strongest received tones were very low frequency, about 5 Hz, at 119-127 dB re 1 μPa. The highest frequencies recorded were at about 1.2 kHz. Richardson et al. (1995) predicted that the radii of audibility for baleen whales for production platform noise would be about 2.5 km (1.6 mi.) in nearshore waters and 2 km (1.2 mi.) near the shelf break.

For gray whales off the coast of central California, Malme et al. (1984) recorded a 50-percent response threshold to playbacks of drilling noise at 123 dB re 1 μPa (and about 117 dB re 1 μPa in the 1/3-octave band). This is well within 100 m (330 ft) in both nearshore and shelf-break waters; therefore, the predicted radius of response for grays, and probably other baleen whales as well, would also be less than 100 m (330 ft). Richardson et al. (1995) predicted similar radii of response for odontocetes and pinnipeds.

Riedman (1983, 1984) observed sea otter behavior during underwater playbacks of drillship, semi-submersible, and production platform sounds and reported no changes in behavior or use of the area in response to received sound levels usually at least 10 dB above the ambient noise level (Malme et al., 1983; 1984). Drilling activities associated with the proposed action would occur more than 11 km (7 mi.) offshore. California sea otters rarely move more than 2 km (1.2 mi.) offshore (Riedman, 1987; Estes and Jameson, 1988; Ralls et al., 1988), and thus could be expected to be at least 9 km (6 mi.) away from the nearest drilling activity. No impacts on sea otters from this activity are expected.

Vessel Traffic: As described in Arguello Inc. (2003b), the proposed drilling operations on Platforms Hidalgo and Hermosa would be supported by an estimated 2 to 3 supply boat trips per week over a 2- to 3-year period. This would be in addition to the current level of 6 boat trips per month in support of ongoing Point Arguello Unit production activities. All service traffic would remain in the established traffic corridors, which pass 4 km (2.5 mi.) or more offshore between the support base at Port Hueneme and the Point Arguello platforms. At the end of the drilling period, vessel traffic would be expected to return to approximately current levels for the duration of the Lease OCS-P 0451 production activities.

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).

Odontocetes also often tolerate vessel traffic, but may react at long distances if confined (e.g., in shallow water) or previously harassed by boats (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).

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).

Based on historical data from southern California, accidental collisions between endangered whales and support vessel traffic are considered to be unlikely events. Although large cetaceans have occasionally been struck by freighters or tankers, and sometimes by small recreational boats (Barlow et al., 1995, 2001; Forney et al., 2000), no such incidents have been reported with crew or supply boats off California (MMS, unpubl. data). The same is true for southern sea otters.

Although pinnipeds are very nimble, animals are occasionally struck by vessels (Barlow et al., 2001). 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 the Santa Barbara Channel in June 1999.

In summary, as described in the EIR/EIS for the Point Arguello Field development plans (ADL, 1984c), the activities associated with routine platform operations associated with development and production of the eastern half of Lease OCS-P 0451 are not expected to cause population level impacts to marine mammals in the project area. Some impacts to individual animals, involving mostly avoidance responses to noise and disturbance, may occur. However, these impacts would be brief (lasting less than one hour) and very localized and would not be significant. Collisions between support vessels and marine mammals, while possible, are considered to be highly unlikely.

Effluent Discharges: Section 2.4 discusses the potential impacts of effluent discharges from the proposed project on water quality in the area. The potential effects of OCS platform discharges

on marine mammals include 1) direct toxicity (acute or sublethal), through exposure in the waters or ingestion of prey that have bioaccumulated pollutants; and 2) a reduction in prey through direct or indirect mortality or habitat alteration caused by the deposition of muds and cuttings (SAIC, 2000a, b). However, there is no toxicity information on the effects of muds and cuttings and produced-water discharges on marine mammals. Comprehensive reviews by the National Academy of Sciences (1983), the U.S. Environmental Protection Agency (1985), and Neff (1987) do not address the potential effects of routine OCS discharges on these groups of animals (MMS, 1996a). Measurable impacts from routine OCS discharges have not been associated with marine mammals, because they are highly mobile and capable of avoiding such discharge, and their ranges far exceed the extent of the discharge plume.

The EPA biological assessment for the proposed reissuance of its general NPDES permit for offshore OCS facilities in Southern California waters concluded that direct toxicity to listed marine mammals, or their food base, should be minimal (SAIC, 2000a, b). All such discharges are required to meet NPDES water quality criteria, which were established to protect biological resources outside the mixing zone. Therefore, any contact with OCS discharges likely would be extremely limited. As described in the EIR/EIS for the Point Arguello Field development plans (ADL, 1984c), no effects to marine mammals in the project area from platform discharges are expected.

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

Marine mammals vary in their susceptibility to the effects of oiling (Geraci and St. Aubin, 1990; Williams, 1990; Loughlin, 1994a). Oil may affect marine mammals through various pathways: surface contact, oil inhalation, oil ingestion, and baleen fouling (Geraci and St. Aubin, 1990). Cetaceans risk a number of toxic effects from accidental oil spills at sea (Geraci, 1990). Since cetaceans (like most adult pinnipeds) rely on layers of body fat and vascular control rather than pelage to retain body heat, they are generally resistant to the thermal stresses associated with oil contact. However, exposure to oil can cause damage to skin, mucous, and eye tissues. The membranes of the eyes, mouth, and respiratory tract can be irritated and damaged by light oil fractions and the resulting vapors. If oil compounds are absorbed into the circulatory system, they attack the liver, nervous system, and blood-forming tissues. Oil can collect in baleen plates, temporarily obstructing the flow of water between the plates and thereby reducing feeding efficiency. Reduction of food sources from acute or chronic hydrocarbon pollution could be an indirect effect of oil and gas activities.

It has been suggested that cetaceans could consume damaging quantities of oil while feeding, although Geraci (1990) believes it is unlikely that a whale or dolphin would ingest much floating oil. However, during the *Exxon Valdez* oil spill in 1989, killer whales were not observed to avoid oiled sections of Prince William Sound, and the potential existed for them to consume oil or oiled prey (Matkin et al., 1994). Fourteen whales disappeared from one of the resident pods in 1989-90, and although there was spatial and temporal correlation between the loss of whales and the spill, no clear cause-and-effect relationship was established (Dahlheim and Matkin, 1994). Fin, humpback, and gray whales were observed entering areas of the Sound and nearby waters with oil and swimming and behaving normally; no mortality involving these species was documented (Harvey and Dahlheim, 1994; Loughlin, 1994b; von Ziegesar et al., 1994; Loughlin et al., 1996).

Baleen whales in the vicinity of a spill may ingest oil-contaminated food (especially zooplankters, which actively consume oil particles) (Geraci, 1990). However, since the principal prey of most

baleen whales (euphausiids and copepods) have a patchy distribution and a high turnover rate, an oil spill would have to persist over a very large area to have more than a local, temporary effect.

Since oil can destroy the insulating qualities of hair or fur, resulting in hypothermia, marine mammals that depend on hair or fur for insulation are most likely to suffer mortality from exposure (Geraci and St. Aubin, 1990). Among the pinnipeds, fur seals and newborn pups are the most vulnerable to the direct effects of oiling. Frost et al. (1994) estimated that more than 300 harbor seals died in Prince William Sound as a result of the *Exxon Valdez* oil spill and concluded that pup production and survival were also affected. Indeed, the majority of the dead harbor seals recovered were pups (Spraker et al., 1994). It should also be noted, however, that this mortality estimate has been questioned (Hoover-Miller et al., 2001). In contrast, although Steller sea lions and their rookeries in the area were exposed to oil, none of the data collected provided conclusive evidence of an effect on their population (Calkins et al., 1994).

Sea otters, which rely almost entirely on maintaining a layer of warm, dry air in their dense underfur as insulation against the cold, are among the most sensitive marine mammals to the effects of oil contamination (Kooyman et al., 1977; Geraci and St. Aubin, 1980; Geraci and Williams, 1990; Williams and Davis, 1995). Even a partial fouling of an otter's fur, equivalent to about 30 percent of the total body surface, can result in death (Kooyman and Costa, 1979). This was clearly demonstrated by the *Exxon Valdez* oil spill (Davis, 1990; Ballachey et al., 1994; Lipscomb et al., 1994). Earlier experimental studies had indicated that sea otters would not avoid oil (Barabash-Nikiforov, 1947; Kenyon, 1969; Williams, 1978; Siniff et al., 1982), and many otters were fouled by oil during the Alaskan spill; approximately 360 oiled otters were captured and taken to treatment centers over a 4-month period, and more than 1,000 dead sea otters were recovered (Geraci and Williams, 1990; Zimmerman et al., 1994). Ballachey et al. (1994) concluded that several thousand otters died within months of the spill, and that there was evidence of chronic effects occurring for at least 3 years.

Based on the conditional OSRA Model runs (Section 2.2.2), the probability that a spill from the proposed project area would contact San Miguel Island ranges from 0.3 to 40.6 percent, depending on the origin, seasonal timing, and duration of a possible spill. The greatest probabilities of contact to San Miguel occur during the spring, when they range from about 13 to 41 percent over 10 days. Contact probabilities are lowest in the fall (2-6 percent) and more variable during the remaining two seasons (<1-17 percent for summer and 2-26 percent for winter). However, San Miguel is at least 50 km (30 mi.) from the Point Arguello platforms. Due to weathering and dispersal, a 200-bbl spill would be unlikely to reach the island and would not be considered a threat to marine mammals on San Miguel (or the other Channel Islands). Rapid oil spill containment and cleanup response would further reduce the likelihood that a spill of this size would contact sensitive resources (see Section 2.2.3).

Along the mainland, the conditional OSRA Model runs indicate that a spill from the proposed project area during fall or winter has about a 5-percent chance of contacting the Point Arguello area within 3 days. Slight (less than 1-percent) chances of contact to mainland areas as far north as Cape San Martin on the Big Sur coast appear over the 30-day model run period.

Data from the surface-drifter analysis (Section 2.2.2) indicate that the OSRA Model runs may underestimate the probability that an oil spill occurring in the proposed project area would move northward along the mainland coast. However, although individual drifters released in the vicinity of the Point Arguello facilities made landfall along the coast as far north as Point Piedras Blancas, more than 70 percent of the shoreline contacts occurred between Point Arguello and Point Conception (MMS, 2000a).

Thus, there is a small chance that a 200-bbl spill would contact the shoreline in this area, which is in the vicinity of several harbor seal haul-outs and near the southern end of the current southern sea

otter range. Predicting the length of coastline affected by an oil spill that comes ashore is extremely difficult due to the complexity of the process, which depends on factors such as nearshore wind patterns and currents, coastal bathymetry, tidal movements, and turbulent flow processes. Based on the multiple regression equations developed by Ford, a 200-bbl spill would be expected to oil a mean stretch of 4-5 kilometers (2.5-3 mi.) of shoreline, with a 5-percent probability that it would contact a length of shoreline greater than about 19 kilometers (12 miles) (Ford, 1985). Rapid spill response would further limit shoreline contact. Based on experience with past spills, continuous contact along such a length of shoreline would be unlikely.

If a 200-bbl spill were to contact a harbor seal haul-out in the Point Conception area, a few animals could be oiled. The *Exxon Valdez* oil spill demonstrated that harbor seals are susceptible to the effects of oiling (Frost et al., 1994; Lowry et al., 1994). However, based on experience with past spills, it is doubtful that a spill of this size would result in the loss of more than a few individuals. This level of mortality would not be significant. Any disturbance or displacement of animals by such a spill would likely be temporary, lasting less than one season, and would not be significant.

For the Endangered Species Act Section 7 consultation on the proposed Rocky Point Unit development project, R.G. Ford Consulting conducted an analysis of the risk of oil spills to the southern sea otter (Ford, 2000; MMS, 2000a). For spill sizes, the model used volumes ranging from 1 bbl up to 7,600 bbl, the maximum likely pipeline spill size identified in the Point Arguello EIR/EIS (ADL, 1984a). The model predicted that no sea otters would be contacted 99 percent of the time, with only a 1 in 1,000 chance that 7 otters would be contacted, and an extremely small (1 in 100,000) chance that as many as 112 otters would be contacted. Seven (7) otters represent about 0.3 percent of the estimated 2002 population (FWS, 2003). Thus, the model analysis indicated that there is a very low probability of sea otter contacts occurring as a result of a spill associated with the project, even when incorporating spill volumes much larger than that likely to occur. Similarly, Ford and Bonnell (1995), who analyzed the potential impacts of tanker spills (including *Exxon Valdez*-sized spills) on the southern sea otter, concluded that oil spills occurring at the southern end of the otter range present the smallest risk to the population.

In their biological opinion on the proposed Rocky Point Unit development project, the U.S. Fish and Wildlife Service (FWS, 2001) stated their belief that as many as 90 sea otters could be oiled by a springtime spill in the project area (3.6 percent of the estimated 2003 population; USGS, 2003). However, they also acknowledged that there was a low probability of a large oil spill occurring during the spring in combination with strong wind, waves, and currents. Considering that level of risk, the small percentage of the otter range likely to be affected by a spill, MMS's spill minimization measures, and the intermittent presence of otters in the proposed action area, they concluded that the overall effect on the southern sea otter population was likely to be negligible.

It is also unlikely that a 200-bbl spill would have more than a negligible impact on pinniped or cetacean populations at sea in the project area. As discussed in the 1984 EIR/EIS (ADL, 1984a), likely impacts could involve the oiling of a few individuals and/or temporary displacement from small areas of the western Santa Barbara Channel or southern Santa Maria Basin.

Conclusion: Routine activities associated with development and production of the eastern half of Lease OCS-P 0451 are expected to cause negligible impacts to marine mammals in the project area, including federally listed species. Accidental oil spills occurring as a result of the proposed project are expected to result in no more than minor mortality and temporary displacement of marine mammals. No significant impacts on marine mammal populations are expected.

Cumulative Analysis: Section 1.4 describes the projects considered in the cumulative analysis for the proposed project. Possible sources of cumulative impacts to marine mammals in the project area include on-going and proposed oil and gas activities in Federal and State waters,

Alaskan and foreign-import tankering, and military operations. For marine mammals, commercial fishing operations and shipping activities are additional sources of potential cumulative impacts. More detailed discussion of potential cumulative impacts to marine mammals in California waters is provided in MMS (2001).

Oil Spills: As discussed in Section 1.4, the cumulative oil spill risk for the proposed project area results from several sources: ongoing and projected oil and gas production from existing OCS facilities in the Santa Barbara Channel and Santa Maria Basin, ongoing production from one facility in State waters in the Santa Barbara Channel, and the tankering of Alaskan and foreign-import oil through area waters. The greatest risk of a large oil spill comes from tankering (MMS, 2001).

For the proposed project, it was estimated that there is a 15- to 17.5-percent chance that one or more spills in the 50- to 999-bbl range would occur over the life of the project, and that such a spill likely would be less than 200 bbl in volume. Such a spill is expected to be relatively brief in duration (days to a few weeks; see Section 2.2) and have a minimal impact on marine mammal resources in the area. This represents a minor incremental increase to the overall cumulative oil spill risk for marine mammals in area waters.

Commercial Fisheries: Marine mammals are taken incidentally in a number of commercial fisheries along the U.S. west coast. Off California, greatest mortality in recent years has been recorded in the nearshore set gillnet and offshore drift gillnet fisheries, although this has apparently dropped substantially since the implementation of a take reduction plan form the fishery in 1997 (Barlow et al., 1997; Ferraro et al., 2000; and Forney et al., 2000). Other fisheries in which marine mammal mortality has been documented include the offshore groundfish trawl fisheries, purse seine fisheries for squid and other species, troll fisheries for salmon and other species, the salmon net pen fishery, and the commercial passenger fishing vessel industry (Forney et al., 2000).

The minimum total fisheries-related take of California or west coast marine mammals currently appears to be more than 1,500 animals per year (Barlow et al., 1997; Ferraro et al., 2000; and Forney et al., 2000). More than 1,000 of these are taken in the California angel shark/halibut set gillnet fishery. Most of the remainder are taken in the California/Oregon thresher shark/swordfish drift gillnet fisheries. Most of this mortality involves pinnipeds and small cetaceans.

Although some mortality of large whales may occur (Heyning and Lewis, 1990; Mazzuca et al., 1998), large rorquals (such as blue and fin whales) are reported to be capable of swimming through nets without entangling (Forney et al., 2000). Because of their nearshore migration route, gray whales may be somewhat more susceptible to fisheries-related mortality than other large whales, although the current take is low enough to be considered insignificant on the population level (Ferraro et al., 2000).

Coastal set net fisheries have intensified within the southern sea otter range in recent years (FWS, 2003). Set gillnets in Monterey Bay are estimated to have killed 25-130 sea otters from 1994 through 1998, averaging about 5-26 sea otters per year (Cameron and Forney, 2000; Forney et al., 2001). An emergency closure in waters less than 60 fathoms (110 meters) deep was implemented for this fishery north of Yankee Point in Monterey County in September 2000 to protect sea otters and seabirds. In September 2002, the State of California imposed a permanent ban on gillnet fishing in waters shallower than 60 fathoms between Point Reyes in Marin County and Point Arguello in Santa Barbara County. This ban is expected to virtually eliminate sea otter mortality in set gillnets north of Point Arguello (FWS, 2003).

Other Sources of Human-Related Mortality: Ship strikes are a recognized source of whale mortality. Eleven species are known to have been hit, including fin, right, humpback, sperm, gray, and minke whales (Laist et al., 2001). Most lethal or severe injuries to whales appear to be caused by ships measuring 80 m (260 ft) or more in length and traveling at speeds of 26 kph (14 kts) or greater (Laist et al., 2001). As is the case with fisheries-related mortality, the gray whale's nearshore migration may increase the potential for collision with ships (Rugh et al., 1999). Vessel strikes of the smaller toothed whales are rarely observed (Forney et al., 2000).

As discussed above, pinnipeds are occasionally killed in collisions with boats (Barlow et al., 2001). Other sources of human-related pinniped mortality in California include shooting, entrainment in power plants, and entanglement in marine debris.

With a few exceptions, marine mammal populations in southern California appear to be stable or increasing (Bonnell and Dailey, 1993; Barlow et al., 1997; Forney et al., 2000). Currently, the primary source of human-related impacts to marine mammals is incidental take in commercial fishing operations. However, these impacts are likely to decrease as additional restrictions and mitigation measures are imposed on coastal fisheries.

Although the effects of noise and disturbance generated by the proposed project are not expected to be significant, they would add to the cumulative noise and disturbance levels that marine mammals are subject to in the project area. In general, the presence of multiple sources of noise and disturbance, such as stationary OCS activities (construction, drilling, and production), vessel traffic, and aircraft should result in more frequent masking of communications, behavioral disruption, and short-term displacement. In other areas, there is also 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). Although some OCS activities off Southern California, such as construction and seismic surveys, have declined over the past decade, overall vessel traffic, including commercial, military, and private vessels, is increasing. However, there is no evidence that the noise and disturbance created by offshore oil and gas activities and by increasing vessel traffic (of which oil and gas support vessels are a small part) have resulted in adverse impacts on marine mammal populations. The very minor effects in space and time projected to occur as a result of the proposed project are not expected to add measurably to cumulative impacts to marine mammals in the area.

Overall Conclusions: No significant impacts to marine mammals from either routine operations or accidental oil spills are expected to occur from the proposed project. These impacts are substantially less than those identified for marine mammals in the original EIR/EIS for the Point Arguello platforms. No cumulative impacts are expected from routine operations, and the potential for an oil spill from the proposed project represents a minor incremental increase to the overall cumulative oil spill risk for marine mammals in the area.

2.5.2 Marine and Coastal Birds

Affected Environment

The marine and coastal bird population off Southern California is both diverse and complex, being composed of as many as 195 species (Baird, 1993). This community of birds has been described in detail in previous studies and environmental documents (e.g., Sowls et al., 1980; Briggs et al., 1981; 1987; Hunt et al., 1981; ADL, 1984a; Carter et al., 1992; Baird, 1993). Of the many different types of birds that occur in this area, two groups are generally the most sensitive to the potential impacts of OCS development: seabirds (e.g., loons, grebes, auks, shearwaters, sea ducks, and gulls) and shorebirds (e.g., sandpipers and plovers). While some of these breed in the area, others may spend their non-breeding or "wintering" period there or may simply pass through during migration.

Seabirds: Seabirds can be divided into four major groups based on habitat use, behavior, and/or phylogenetic relationships: nearshore, pelagic, breeding species, and non-breeding gulls and terns.

- Nearshore species generally occupy relatively shallow waters close to shore. While in Southern California, these species spend almost their entire time on the water surface and are particularly vulnerable to oil spills. In the proposed project area, the most common nearshore species are red-throated, Pacific, and common loons (*Gavia stellata*, *G. pacifica*, and *G. immer*); western/Clark's grebes (*Aechmophorus occidentalis* and *A. clarkii*); and surf scoters (*Melanitta perspicillata)*. In southern California, nearshore species occur in highest numbers during the winter months; relatively few remain during the summer. Based on information in MMS Marine Mammal and Seabird Computer Database Analysis System (CDAS) (Bonnell and Ford, 2001), densities of nearshore species in the project area range from 0-240 birds/km^2 (mean = 5.1). However, about 80 percent of these birds are usually found within 8 kilometers (5 miles) of the mainland shore, and average densities can be much higher in this area. Although at least some of these birds are found along the entire coastline of both the mainland and islands, an important concentration occurs between Point Sal and Purisima Point in northern Santa Barbara County.

- Pelagic species generally occupy deeper waters than nearshore species and may be found far from shore. These species spend much of their time on the water surface or diving for food and are very vulnerable to oil spills. In the proposed project area, the most common offshore species are sooty, black-vented, and pink-footed shearwaters (*Puffinus griseus*, *P. opisthomelas*, and *P. creatopus*); northern fulmars (*Fulmarus glacialis*), red and red-necked phalaropes (*Phalaropus fulicaria* and *P. lobatus*); Pomarine and parasitic jaegers (*Stercorarius pomarinus* and *S. parasiticus*); and common murres (*Uria aalge*). Although the period of highest density varies from species to species, none of these pelagic birds breeds in Southern California. Based on information in the MMS CDAS (Bonnell and Ford, 2001), densities of pelagic species in the proposed project area range from 0-2,232 birds/km^2 (mean = 20.9).

- Breeding species in the vicinity of the proposed project area nest mainly on the Channel Islands, although a few also nest on the mainland. The most common local breeding species are Leach's, ashy, and black storm-petrels (*Oceanodroma leucorhoa*, *O. homochroa*, and *O. melania*); California brown pelicans (*Pelecanus occidentalis*); Brandt's, pelagic, and double-crested cormorants (*Phalacrocorax penicillatus*, *P. pelagicus*, and *P. auritus*); western gulls (*Larus occidentalis*); California least terns (*Sterna antillarum browni*); and several alcids, including pigeon guillemots (*Cepphus columba*), Cassin's auklets (*Ptychoramphus aleuticus*), and rhinoceros auklets (*Cerorhinca monocerata*). In 1989-1991, the total breeding seabird population in the proposed project area was estimated at over 100,000 birds (Carter et al., 1992). Location, numbers of nests, and at-sea densities vary greatly from species to species.

- Many gulls and terns (excluding the western gull and least tern, which are local breeders), although an important component of southern California avifauna, do not readily fit into any of the above categories. Some are coastal in nature (e.g., ring-billed gull, *Larus delawarensis*), while others remain far offshore (e.g., arctic tern, *Sterna paradisaea*). In the proposed project area, the most common non-breeding gulls and terns are California, ring-billed, Heermann's, and Bonaparte's gulls (*Larus californicus*, *L. delawarensis*, *L. heermanni*, and *L. Philadelphia*) and Forster's, Caspian, and elegant terns (*Sterna forsteri*, *S. caspia*, and *S. elegans*). Based on information in the MMS CDAS (Bonnell

and Ford, 2001), densities of non-breeding gulls and terns in the proposed project area range from 0-360.8 birds/km^2 (mean = 7.2).

Shorebirds: Shorebirds also are an important component of the avifauna of southern California. More than 40 shorebird species have been recorded in southern California (Garrett and Dunn, 1981; Lehman, 1994). However, many of these are extremely rare, and only about 24 species occur regularly in the area. Almost all shorebirds migrate to southern California from northern breeding areas; very few shorebirds breed in this area. Although the majority of shorebirds occupy coastal wetlands, including estuaries, lagoons, and salt and freshwater marshes, they also utilize other coastal habitats, including sandy beaches and rocky shores. Common shorebird species in southern California and the proposed project area include black-bellied plovers (*Pluvialis squatarola*), willets (*Catoptrophorus semipalmatus)*, whimbrels (*Numenius phaeopus*), marbled godwits (*Limosa fedoa*), black turnstones (*Arenaria melanocephala*), sanderlings (*Calidris alba*), western and least sandpipers (*Calidris mauri* and *C. minutilla*), dunlins (*Calidris alpina*), and short- and long-billed dowitchers (*Limnodromus griseus* and *L. scolopaceus*). Locally breeding shorebirds are limited to black oystercatchers (*Haematopus bachmani*), black-necked stilts (*Himantopus mexicanus*), American avocets (*Recurvirostra americana*), killdeer (*Charadrius melodus*), and the threatened western snowy plover (*Charadrius alexandrinus nivosus)*, which nests and winters on sandy beaches in southern California.

Because of their migratory nature and the fact that few breed in Southern California, shorebirds are most abundant in this area from fall through spring; comparatively few shorebirds remain in Southern California during the summer months (McCrary and Pierson, 2002). Shorebirds may begin the fall migration to their southern wintering grounds in August, and by October, most have moved to points south of Alaska. Wintering areas vary from species to species, with most species wintering from California southward (in some cases as far south as southern Chile).

Available habitat for shorebirds has been greatly reduced over the last several decades due to urban and recreational development projects, especially in California. Large percentages of California's coastal wetlands have disappeared, resulting in the loss of valuable habitat for several coastal birds that are dependent on wetlands. Within the area of concern for the proposed project, remaining shorebird use areas include the Carpinteria Marsh, Goleta Slough, and the Santa Ynez River mouth. Shorebird densities are not available for these or other areas in southern California, but are generally considered to be lower than heavily used areas, such as the San Francisco Bay. Although densities are not available, shorebirds occupying sandy beaches in nearby Ventura County averaged about 44 birds per linear kilometer of beach (McCrary and Pierson, 2002).

Threatened and Endangered Species: Five Federally threatened and endangered species (California brown pelican; bald eagle, *Haliaeetus leucocephalus*; light-footed clapper rail, *Rallus longirostris levipes*; western snowy plover; and California least tern) are potentially vulnerable to the effects of the proposed project. The biology of these species in the project area is discussed in detail in the biological evaluation prepared for the Endangered Species Act Section 7 consultation on the Rocky Point Unit development project (MMS, 2000a). That information is incorporated by reference in this document and summarized below.

Within the area of concern for the proposed project, the California brown pelican is the most abundant of the five threatened and endangered species, especially in summer and fall when many pelicans from Mexico move north to southern California. In California, the vast majority of pelicans nest on Anacapa Island; a smaller colony also occurs on Santa Barbara Island. Day and night roosts are a critical aspect of pelican habitat requirements. Mainland roost sites in the proposed project area include the areas between Point Arguello and Point Sal and the Santa Barbara area. The Channel Islands, especially Santa Cruz Island, are also important roost areas.

Bald eagles disappeared as a breeding species from southern California by the late 1950s. However, a few eagles have been reintroduced to Santa Catalina Island, which is located well to the south of the proposed project area. Currently, about 10-15 eagles live on the island.

Light-footed clapper rails are restricted to coastal salt marshes of southern California, many of which have been lost or altered due to agricultural and construction activities. The nearest occupied marsh to the proposed project area is the Carpinteria Marsh.

Western snowy plovers nest and winter on California beaches, including some in the area of concern for the proposed project. Critical habitat for this species (64 FR 68507) includes several nesting beaches on Vandenberg AFB in northern Santa Barbara County. Although not listed as critical habitat, San Miguel and Santa Rosa islands are also important nesting areas.

Another bird that nests on southern California beaches is the endangered California least tern. Least terns occupy beaches from about April through August each year. In the proposed project area, least tern colonies are located on Vandenberg AFB (Keane, 2000). Colonies in this area are generally small (<50 pairs) compared to other areas.

Impact Discussion

The impact analysis for the marine biological resources in this EA adopts significance criteria developed for all biological resources, including threatened and endangered species. The significance criteria are presented in Section 2.5.

For marine and coastal birds (including threatened and endangered species), the phrase "biologically important length of time" in the criteria is assumed to mean one season or more. Depending on the species and the circumstances, a season could be a breeding season (e.g., western gull breeding season), wintering period (e.g., sooty shearwaters during the summer off southern California), or a migratory period (e.g., red phalarope migration period).

Routine Operations: Helicopter flights can affect birds, depending on the species involved and the location, altitude, and number of flights. Helicopter flights are a particular problem in undisturbed areas and for species that nest on cliffs and offshore rocks (e.g., common murres). However, no additional helicopter flights are planned for this project, and no project-specific impacts from helicopters are expected.

Because all drilling activities would occur about 11 km (7 mi.) from the nearest land, noise and disturbance associated with this project are not expected to have measurable effects on any nesting seabirds or shorebirds in the area. Platform discharges are not expected to have a measurable effect due to the high degree of dilution that would occur and the fact that bioaccumulation of associated pollutants is not expected (SAIC, 2000b).

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

Spilled oil may affect birds in several ways: 1) direct contact with floating or beached oil, 2) toxic reactions, 3) damage to bird habitat, and 4) damage to food organisms. Disturbance from cleanup efforts to remove spilled oil may also affect birds. Oil-related mortality is highly dependent on the life histories of the bird species involved. Birds that spend much of their time feeding or resting on the surface of the water are more vulnerable to oil spills (King and Sanger, 1979). Direct contact with even small amounts of oil can be fatal, depending on the species involved. The principal cause of mortality from oil contact in birds is from feather matting, which destroys the insulating properties of the feathers (Erasmus et al., 1981) and leads to death from hypothermia. Studies have found that exposure to as little as 3 ml of oil (less than a teaspoon)

spread evenly on the wings and breast of Cassin's auklets caused severely matted plumage and was a lethal dose (Nero and Associates, 1987).

Oiling can also result in a loss of buoyancy, which inhibits a bird's ability to rest or sleep on the water (Hawkes, 1961) and can diminish swimming and flying ability (Clark, 1984). Also, an oiled bird's natural tendency is to preen itself in an attempt to remove oil from the plumage. The acute toxicity of such ingested oil (crude or refined) depends on many factors, including the amount of weathering and amount of oil ingested. Birds that receive lethal doses succumb to a host of physiologic dysfunctions (e.g., inflammation of the digestive tract, liver dysfunction, kidney failure, lipid pneumonia and dehydration) (Hartung and Hunt, 1966). Oil that is ingested as a result of preening or eating contaminated prey also can cause abnormalities in reproductive physiology, including adverse effects on egg production (Ainley et al., 1981; Holmes, 1984; Nero and Associates, 1987). In addition, the transfer of oil from adults to eggs can result in reduced hatchability, increased incidence of deformities, and reduced growth rates in young (Patten and Patten, 1977; Stickel and Dieter, 1979). Growth reduction may also be the indirect result of an oiled parent's inability to deliver sufficient food to nestlings (Trivelpiece et al., 1984).

Cleanup efforts to remove spilled oil may have impacts of their own. Oil spill response and cleanup activities may involve intrusion into sensitive areas. Human presence while booming off an area, cleaning oil off beaches, or attempting to capture oiled wildlife for rehabilitation near seabird colonies may cause flushing from nests or temporary abandonment. Additionally, many seabirds react to disturbance by leaving their roosts or nests to sit on the water somewhere nearby. In other words, disturbance of the colony may have the effect of flushing the birds into oiled water. This potential should be evaluated on a case-by-case basis in the event of a spill, prior to a decision to approach a roost or breeding colony.

The level of impact on birds from an oil spill depends on a variety of factors, including the type, rate, and volume of oil spilled and the weather and oceanographic conditions at the time of the spill. These parameters would determine the quantity of oil that is dispersed into the water column; the degree of weathering, evaporation, and dispersion of the oil before it contacts a shoreline; the actual amount, concentration, and composition of the oil at the time of shoreline or habitat contact; and a measure of the toxicity of the oil. As discussed previously, the marine and coastal bird community in southern California is also complex, with the number of species, the abundance of each species, and their activity (e.g., nesting, migrating, or wintering) in the area varying with location and time of year. There are also varying degrees of vulnerability to the effects of an oil spill, with shorebirds being generally less sensitive than seabirds.

Although there is not a high degree of correlation between the size of a spill and the number of birds affected, a 200-bbl spill would generally have far less impact than one of several thousand barrels. However, a spill in the range of 200 bbl would likely result in the loss of at least some seabirds and a few shorebirds. For example, more than 200 marine birds are known to have died following the approximately 167-bbl Torch pipeline spill off Vandenberg AFB in 1997 (OWCN, 1998), and actual mortality may have been two or three times higher (CDFG, 2003). The birds that would most likely be affected would be those in the vicinity of the source of the spill. Although a large number of seabird species can occur in this area, the species most likely to be affected would include murres, loons, western grebes, shearwaters, California brown pelicans, cormorants, surf scoters, and western gulls. A few species, mainly pelagic cormorants and pigeon guillemots, nest along the mainland in the vicinity of the proposed project, but in very low numbers. Small numbers of shorebirds may also occur along the mainland in the vicinity of the project area, including black-bellied plovers, whimbrels, marbled godwits, willets, black turnstones, and sanderlings. A small number of black oystercatchers nest in the sections of rocky intertidal habitat that occur in this area, and the threatened western snowy plover winters on local sandy beaches.

Based on the conditional OSRA Model runs (Section 2.2.2), an oil spill originating from the proposed project area is likely to move southward, especially during the spring and summer. During the fall and winter, there would still be a greater tendency for an oil spill to move to the south, but there could also be movement to the west and, to a lesser extent, to the north. Eastward movement into the Santa Barbara Channel is not projected to occur in any season, and coastal and marine birds in this area, including threatened and endangered species, are not expected to be affected by this project. San Miguel Island, located more than 50 km (30 mi.) south of the proposed project area, is an important seabird nesting area. Based on OSRA results, the likelihood of an oil spill from the proposed project area contacting San Miguel Island ranges from 0.3 to about 41 percent, depending on the launch point and time of year. However, taking into account the distance involved, weathering and dispersal, and the cleanup effort, which is expected to be very rapid, a 200-bbl oil spill from the proposed project area would be unlikely to reach the island. If oil were to reach this area, however, some seabirds could be lost.

Although the results of the OSRA Model show very little movement of oil northward from a project area spill, especially during spring and summer, data from the surface-drifter analysis point to a greater likelihood of northward movement (Section 2.2.2). Both least terns and snowy plovers nest on sandy beaches north of Point Arguello on Vandenberg AFB. If a spill were to occur from the project area during the spring or summer when these species are nesting and move northward, impacts could occur. However, spill response is expected to be rapid, and, due to weathering and dispersal of the oil, only a small portion of oil from a 200-bbl spill would be likely to reach nesting beaches on Vandenberg AFB. If oil were to reach these beaches during the breeding season, cleanup efforts could exacerbate impacts on nesting birds.

Conclusion: Routine activities associated with development and production of the eastern half of Lease OCS-P 0451 are not expected to have an impact on marine and coastal birds in the project area, including federally listed species. Although some mortality could occur from accidental oil spills resulting from the proposed project, the loss of birds is expected to be so low as to be indistinguishable from normal variation. Therefore, no significant impacts to marine and coastal bird populations are expected.

Cumulative Analysis: Of the projects considered in the cumulative analysis for the proposed project, which are described in Section 1.4, cumulative impacts on marine and coastal birds could result from on-going and proposed oil and gas activities in Federal and State waters and Alaskan and foreign-import oil tankering. The cumulative oil spill risk for the proposed project area results from several sources: ongoing and projected oil and gas production from existing OCS facilities in the Santa Barbara Channel and Santa Maria Basin, ongoing production from a facility in State waters in the Santa Barbara Channel, and the tankering of Alaskan and foreign-import oil through area waters. For the proposed project, there is an estimated 15- to 17.5-percent chance that one or more spills in the 50- to 999-bbl range would occur over the life of the project, and that such a spill would be less than 200 bbl in volume. Such a spill is expected to be relatively brief in duration (days to a few weeks; see Section 2.2) and have a minimal impact on marine and coastal bird resources in the project area. This represents an insignificant incremental increase to the overall cumulative oil spill risk for marine and coastal birds in area waters.

Overall Conclusions: No significant impacts on marine and coastal birds from either routine operations or accidental oil spills are expected to occur from the proposed project. These impacts are substantially less than those identified for marine and coastal birds in the 1984 EIR/EIS for the Point Arguello platforms (ADL, 1984c). No cumulative impacts are expected from routine operations, and the risk of an oil spill from this proposed project is negligible compared to the overall existing cumulative oil spill risk for marine and coastal birds.

2.5.3 Intertidal Resources

Affected Environment

Regional and local intertidal resources in southern California have been described in many reports and studies. The EISs for Lease Sales 53 and 68 provide excellent descriptions of the intertidal communities found in the Santa Barbara Channel and Santa Maria Basin, including species lists and information on zonation and natural history (BLM, 1980, 1981). The Point Arguello EIR/EIS describes the habitats and resources found in the project area (ADL, 1984a). A number of shoreline mapping studies include information on shoreline types, intertidal species lists, and shoreline dimensions (e.g., beach width) (Littler, 1978; Woodward-Clyde Consultants, 1982; Chambers Group, Inc., 1991). Field biological surveys (Dames and Moore, 1983; McClelland Engineers, 1984) provide characterization of habitats and species lists for flora and fauna identified in pipeline corridors in the Point Conception/Point Arguello area.

Approximately half of the shoreline from Point Conception north to the Santa Ynez River is rocky, forming either broad benches or cliffs (Woodward-Clyde Consultants, 1982; Dugan et al., 1998a, b). Boulder and cobble beaches are patchily distributed within this same area (Woodward-Clyde Consultants, 1982; Dames and Moore, 1983). Within sandy beach areas, dune-backed and bluff-backed beaches are evenly represented (Dugan et al., 1998a, b). North of Point Conception, where strong and constant wave action prevails, sandy beaches are found in the lee of each point due to depositional patterns (NOAA, 1998).

South of Point Conception in Santa Barbara County, more than three-fourths of the shoreline is sandy (Dugan et al., 1998a, b), and the wave exposure changes dramatically, with wave heights roughly half the size of those found north of Point Conception. Bluff-backed beaches are often ephemeral and lose their sand seasonally, exposing rocky platforms. Many beaches are associated with ephemeral creeks and rivers, which dry up in the summer (Dugan et al., 1998a, b).

Rocky Intertidal Resources: Rocky intertidal resources on the mainland have been the subject of numerous research efforts funded by the MMS and other agencies (Littler, 1978; Woodward-Clyde Consultants, 1982; Chambers Group, Inc., 1991; Ambrose et al., 1994; Raimondi et al., 1999). Ongoing monitoring of rocky intertidal resources in Santa Barbara County has been a joint venture of MMS, Santa Barbara County, and the University of California for the past 12 years. Resources such as mussels, abalone, barnacles, algae, limpets, and surf grass have been actively monitored in the project area from Point Sal to Carpinteria since 1991 (Ambrose et al., 1994).

The most significant change over this period of study has occurred north of Point Conception with the drastic decline of the black abalone (*Haliotis cracherodii)*, once commonly found in large numbers (Murray and Littler, 1979; Ambrose et al., 1994). This decline was first observed on the Channel Islands in 1985, and on the mainland at Government Point near Point Conception in 1992 (Ambrose et. al, 1994). Since then, steady declines due to "withering foot syndrome," a fatal bacterial infection, have been documented along the coast from Government Point to Purisima Point (Ambrose et al., 1994; Raimondi et al., 1999). Current abalone populations at MMS-monitored sites north of Point Conception are estimated at 5-10 percent of levels identified in 1991 (M. Wilson, UC Santa Cruz, pers. comm.).

Sandy Intertidal Resources: Sandy intertidal beaches have been recently characterized by MMS to better understand shorebird abundance in Santa Barbara County (Dugan et al., 1998a, b). The common sand crab (*Emerita analoga*) dominates the community along sand beaches north of Point Conception, with biomasses ranging from 50-90 percent (J. Dugan, UC Santa Barbara, pers. comm.). Beaches are characterized by the presence of common sand or mole crabs and spiny sand crabs (*Blepharipoda occidentalis*) in the intertidal zone, while flies, beach hoppers

(*Megalorchestia* spp.) and isopods (*Alloniscus* spp.) frequent the wrack line ("wrack" is kelp that washes up onto the sand) (Ricketts et al., 1985). Pismo clams (*Tivela stultorum*) are more common on flat, fine sand beaches and are not usually found on pocket beaches (J. Dugan, UC Santa Barbara, pers. comm.). Large tar patties and tarballs from natural seepage are commonly observed at beaches both north and south of Point Conception (Ambrose, 1994; Raimondi, 1998).

Impact Discussion

The impact analysis for the marine biological resources in this EA adopts significance criteria developed for all biological resources, including threatened and endangered species. The significance criteria are presented in Section 2.5.

For sandy and rocky beach resources, impacts to both individual species and habitat are important. Direct impacts to multiple beaches would be considered significant; assuming changes in species abundance were measurable at the regional or population level. The "region" for rocky and sandy beach habitat is defined as the Santa Maria Basin. Irreversible changes to the substrate, such as removing rock, would be considered significant if 10 percent of a regional area were affected. Localized or short-term impacts are considered insignificant. Impacts involving minor disruption of habitat or species are defined as negligible.

Routine Operations: There are no identified impacts to intertidal resources from the routine operations associated with the proposed project, since none of the project activities occur near these resources.

Accidents/Upsets: Oil spills are the primary source of impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

Along the mainland, the conditional OSRA Model runs indicate that a spill from the proposed project area during fall or winter has about a 5-percent chance of contacting the Point Arguello area within 3 days. Slight (less than 1-percent) chances of contact to mainland areas as far north as Cape San Martin on the Big Sur coast appear over the 30-day model run period.

Data from the surface-drifter analysis (Section 2.2.2) indicate that the OSRA Model runs may underestimate the probability that an oil spill occurring in the proposed project area would move northward along the mainland coast. However, although individual drifters released in the vicinity of the Point Arguello facilities made landfall along the coast as far north as Point Piedras Blancas, more than 70 percent of the shoreline contacts occurred between Point Arguello and Point Conception (MMS, 2000a).

There are no expected impacts to these resources in addition to those discussed in the original Point Arguello EIR/EIS. Mitigation measures already in place for the Point Arguello Field are aimed at preventing oil spills and maximizing cleanup response capabilities (see Section 2.2.3). The chance of a spill of 200 bbl or less is low, and impacts from the proposed project on rocky and sandy beaches are expected to be insignificant (see discussion below).

The risks of accidents occurring at the Point Arguello platforms and their potential impacts were addressed in the original Point Arguello EIS/EIR (ADL, 1984a). The likelihood of a large spill from the Point Arguello platforms is low in general, and this risk does not change with the addition of the proposed project (see Section 2.2). Risks from oil spills over the life of the platforms were discussed and analyzed in the original document.

Rocky Intertidal Resources: Numerous studies have examined the effects of oiling on rocky intertidal habitats. The Point Arguello EIR/EIS discusses many of these effects (ADL, 1984a). Intertidal areas along exposed benches that are briefly or patchily exposed to oil may recover

quickly or show no measurable changes due to the cleaning action of the waves. On the other hand, intertidal areas that are heavily impacted by stranded oil or cleanup activities may require many years to return to pre-spill health (KLI, 1992; MMS and KLI, 1996; Lees et al., 1999).

The most likely landfall for an oil spill from the proposed project is along the shoreline between Jalama Beach and Point Arguello.

Based on the multiple regression equations developed by Ford (1985), a 200-bbl spill would be expected to oil a mean stretch of 4-5 kilometers (2.5-3 mi.) of shoreline. Within that area, one would expect a small portion of the shoreline to be more heavily oiled where initial contact is made and other sections to be moderately or lightly oiled. In oiled areas, tarballs are often patchily distributed or form discreet bands. Based on the Ford model, there is only a small probability that a spill of 200 bbl or less would contact more than 8 km (5 mi) of shoreline.

During the September 1997 Torch pipeline spill, approximately 167 bbl of oil was spilled 5 km (3 mi) offshore Surf Beach, located 16-24 km (10-15 mi) north of the Point Arguello platforms. The amount of oiling along the shoreline from the Torch spill is consistent with the Ford model; only a small segment of beach at Surf at the initial spill contact was heavily oiled, with a segment measuring about 5 kilometers receiving moderate to very light oiling. Based on observers' accounts, very little oil became stranded in rocky intertidal areas from Purisima Point to Rocky Point. Oiling was sighted throughout the lower to middle intertidal zone at a site south of Surf Beach near Point Arguello. Sticky globs of tar were seen on sea stars and covering the respiratory pores of some abalone (Raimondi, 1998).

Statistical analyses performed on four representative species following the spill at monitored sites found that no significant changes in species abundance that could be attributed to the Torch spill (Raimondi, 1998). This analysis could not be done for the black abalone due to the species' population decline, but based on visual observations, it is believed that some abalone mortality occurred at Point Arguello as a result of the spill (Raimondi, 1998).

Based on information from the Torch pipeline spill, should a 200-bbl spill occur as a result of the proposed project, it is expected that the area closest to the initial spill contact would be oiled the most, and that the oiling of the shoreline would be patchy in nature. A 200-bbl oil spill would not be expected to significantly impact rocky intertidal habitat. In general, exposed sections of coastline such as those directly adjacent to the Point Arguello platforms would be expected to receive fewer impacts due to strong wave action than the relatively more protected rocky intertidal areas in the Channel or in coves where oil could strand. Due to the viscous nature of the oil, it is likely that most of the area affected by a spill would be exposed to patches of oil in the form of tar patties and tar balls. This entire section of coastline is exposed to oil seepage from natural oil seeps. Exposure to patchy tar and tarballs from a small spill would be unlikely to cause measurable impacts beyond the natural variability of the communities.

However, if a rocky beach close to the origin of a 200-bbl spill were to be oiled and the oil stranded in the high intertidal, impacts could be felt at a local level for several years. The primary concern would be direct contact with long-lived animals such as sea stars, limpets, and abalone and important communities such as algal assemblages and mussel beds. Impacts on these animals and communities from oil could result in mortality and/or sublethal changes affecting reproduction, recruitment, or settling. Recovery time for the local population on a given beach could be 7-10 years if a substantial number of adult animals were impacted. However, it is unlikely a small spill would oil more than one rocky beach or affect more than one local population. Therefore, a spill of 200 bbl or less would be unlikely to cause impacts sufficient to be felt at the population level, and impacts to rocky beaches are expected to be insignificant overall.

Sandy Intertidal Resources: Much of the time, oil moves in the same direction as sand, and therefore depositional sandy beaches would be the most likely landfall for any spill. North of Point Conception, such beaches are located just to the south of each point. Oil spills can cause a range of possible impacts on sandy beaches depending on the nature of the spill. Oil on a highly depositional beach may be buried quickly, making cleanup difficult and exposure to oil longer. Exposed beaches, on the other hand, may be cleaned quickly by the natural removal and cleansing of sand through wave action. Since sandy beaches are highly transient, impacts from an oil spill are generally shorter in duration than for other shoreline resources, such as those in the rocky intertidal. Impacts include direct mortality from toxicity and smothering and changes leading to reduced productivity.

In oiled sections of beach, common sand crabs quickly uptake the toxic components in the oil; after the Torch pipeline spill, sand crabs collected near the spill origin and within a kilometer of the origin showed significant hydrocarbon contamination (J. Dugan, UC Santa Barbara, 2000). The extent of contamination and how long the crabs retained the hydrocarbons in their system are unknown (J. Dugan, UC Santa Barbara, pers. comm.). If crabs retain hydrocarbons in their system, this could cause a food-chain impact for foraging birds and other animals lasting several months, until the oiled crabs, which generally have a short life span, were replaced with uncontaminated animals from adjacent areas (assuming the contaminated sand was removed or cleaned). Since sand crabs were contaminated after the oil spill, it can also be assumed that other invertebrates such as mysids, amphipods, and polychaetes were affected. Although Pismo clams occur between Baja California and Half Moon Bay, concentrations are not known along the shoreline in the project area, and it is not expected that impacts to the population from a 200-bbl spill would be significant.

Impacts from an oil spill on a sandy beach can often be compounded by impacts from the cleanup operation itself. The use of heavy machinery to collect soiled sand, for example, can crush intertidal animals such as clams and crabs. Removal of wrack is a common practice used as a preventative measure to reduce re-oiling of the sand. However, wrack is a primary source of beetles, insects, and worms for shorebirds. When it involves the unnecessary removal of unoiled wrack, this practice may cause or lengthen impacts to lightly oiled or unoiled beaches (J. Dugan, UC Santa Barbara, pers. comm.; Dugan et al., 2000).

Based on the oil spill analysis (Section 2.2), it is possible that a 200-bbl spill could impact a 4-5 km (2.5-3 mi) stretch of sandy beach at Jalama or in the lee of Point Arguello. Oiling within the spill zone would be expected to be patchy and consist of both heavily oiled areas nearest the contact point and lightly oiled areas. Required oil spill response capabilities would be expected to reduce the amount of oil to reach the shoreline. While impacts could be sustained at an individual beach, it is unlikely that a 200-bbl spill would contact and injure populations at several beaches. Given recruitment of uncontaminated animals from adjacent areas, impacts to the local sandy beach population would be expected to be of relatively short duration. Therefore, the overall impact to sandy beach resources would not be significant.

Conclusion: Routine operations from the drilling of wells for the proposed project are not expected to impact shoreline intertidal resources. The only potential oil spill impact not discussed in the Point Arguello EIR/EIS is to the black abalone, given its recent decline. While impacts could occur to a few black abalones, it is not expected that oil from a small spill would contact sufficient area or individuals to have a significant impact on the overall population. Potential impacts from a 200-bbl accidental oil spill would, therefore, be insignificant overall for sandy and rocky intertidal habitats.

Cumulative Analysis: Section 1.4 describes the projects considered in the cumulative analysis for the proposed project. Possible sources of cumulative impacts to intertidal resources in the

project area include on-going and proposed oil and gas activities in Federal and State waters, Alaskan and foreign-import tankering, disease, collecting for public use and consumption, and non-point source pollution.

As discussed in Section 1.4, the cumulative oil spill risk for the proposed project area results from several sources: ongoing and projected oil and gas production from existing OCS facilities in the Santa Barbara Channel and Santa Maria Basin, ongoing production from one facility in State waters in the Santa Barbara Channel, and the tankering of Alaskan and foreign-import oil through area waters. Potential oil spills from the proposed project represent a minor incremental increase to the overall cumulative oil spill risk for intertidal resources in area waters.

One past spill that contacted the coastline along Vandenberg AFB (primarily Surf Beach) is the Torch pipeline spill. Analysis of impacts from that spill, however, indicates that impacts from development of the eastern half of Lease OCS-P 0451 would not overlap with residual impacts from the Torch spill, either temporally or spatially.

The primary factor currently affecting rocky intertidal resources is the withering-foot disease affecting black abalone. This disease has significantly reduced local populations of black abalone along the Central coast and Channel Islands to 5-10 percent of documented counts over the past 15 years.

While generally high in southern California, the level of human "taking" of rocky intertidal resources is low in the project area. Taking activities include legal and illegal collection of animals such as mussels, limpets, urchins, and sea stars by the public for personal consumption or decorative purposes, collection of mussels and octopus by sport fishermen for bait, and scientific collection for research and education. While collection activities and public trampling in tidepools have been documented as serious problems in southern California (Murray et al., 1999), the coastline adjacent to the proposed project is away from large population centers. Public access to local beaches is limited due to private and government land ownership.

Non-point source pollution affects intertidal resources through the uptake of heavy metals and other pollutants. Relative to other areas along the southern California coastline, the project area is relatively uncontaminated by non-point pollution sources (see Section 2.4).

Overall Conclusions: Potential impacts from the proposed project are insignificant overall for sandy and rocky intertidal habitats and are well within those discussed in the Point Arguello EIR/EIS. Accidental oil spills from cumulative sources present an ongoing source of potential impacts to sandy and rocky intertidal resources. Impacts to the black abalone from withering-foot syndrome have caused significant declines in the population along the central coast. Accidental oil spills from any source that contact black abalones in more that one area could further exacerbate the existing population declines. The potential for an oil spill occurring from the proposed project represents an insignificant incremental increase to the overall cumulative oil spill risk for intertidal resources in the project area.

2.5.4 Benthic Resources

Affected Environment:

More than a dozen biological surveys have mapped benthic resources on soft and hard substrate in the western Santa Barbara Channel and Santa Maria Basin (Nekton, 1981, 1983; Dames and Moore, 1982, 1983, 1984; Ecomar, 1982; Engineering Sciences, 1984; McClelland Engineers, 1984, 1987; Benech Biological Associates, 1986a, b). Additionally, prior to the installation of the three Point Arguello platforms, MMS conducted a large reconnaissance benthic survey of the Santa Maria Basin and western Santa Barbara Channel, which included comprehensive sampling of soft- and hard-substrate communities (SAI, 1986). This served as the baseline for the long-

term monitoring of drilling operations at the Point Arguello platforms (Battelle, 1991). Post-pipeline-installation biological surveys were also conducted to ensure mitigation measures were implemented during the platform and pipeline construction (Hardin et al., 1997).

Hard Substrate: Several hard substrate features in the Santa Maria Basin support long-lived, biologically diverse communities (Ecomar, 1982; Nekton, 1983; Hardin et al., 1994; Diener and Lissner, 1995). Many of these features are in deep water; features have been surveyed in the Basin in water depths up to 518 m (1,700 feet). Important resources are found on very large features such as the feature 32 km (20 miles) northwest of the project area, which measures 10 km (6 miles) at its widest point; on much smaller features, such as the feature south of Platform Hidalgo measuring 14 hectares (34 acres); and on small isolated pinnacles and outcrops.

Absolute relief and bottom currents are key factors in determining whether undisturbed, long-lived resources exist on a given feature. Low-relief features or features that are heavily disturbed by river runoff or periodic sediment deposition contain less diverse, shorter-lived communities. In a cumulative sense, these features are important natural reefs. Individually, however, they are characterized by a less rich biota than those on undisturbed or higher relief features. In the Point Arguello area, due to the currents, distance from shore, and specific relief and substrate of the features, many of the most productive features are found in water depths exceeding 183 m (600 feet) of water (Dames and Moore, 1982; Nekton, 1983).

Photographs taken during Phase II of the California Monitoring Program (CAMP) study yielded 286 separate hard-bottom taxa (Diener and Lissner, 1995). Analysis of the photographs indicated that water depth was the most significant factor in determining community structure, while feature relief was the next most significant. Diverse biological communities found on high-relief features are characterized by the presence of a variety of long-lived organisms such as sponges, corals, and feather stars. The three dominant phyla encountered on the features include Cnidaria (branching, cup, and encrusting corals and large anemones), Echinodermata (feather stars, brittle stars, basket stars, and sea urchins) and Porifera (vase, barrel, and shelf sponges). Taxonomy of new species identified in these surveys has been detailed in a fourteen-volume document (Blake and Lissner, 1993).

Soft Substrate: In all, 1,207 species of soft-substrate (sandy-bottom) benthic invertebrates were identified in the reconnaissance survey of the Santa Maria Basin and western Santa Barbara Channel (SAI, 1986). During the CAMP Phase II monitoring program, 886 species representing 15 phyla were identified from 344 box cores (Hyland et al., 1990a, b; Blake and Lissner, 1993). Peracarid crustaceans (34 percent), polychaetes (31 percent), and molluscs (18 percent) dominated the fauna. Roughly 25 percent of these species were new to science.

Analysis of community parameters such as species richness, diversity, and density indicated that the Santa Maria Basin supports a rich, highly productive benthic invertebrate fauna (Blake, 1993). The highest number of species, highest species diversity, and highest densities were all found at near-shore stations. This decline in species richness with depth was in contrast to findings along the North Atlantic, where diversity increases with water depth. The significantly lower dissolved oxygen levels present in California slope waters as compared with the East Coast may explain this difference (Blake and Lissner, 1993).

Impact Discussion

The impact analysis for the marine biological resources in this EA adopts significance criteria developed for all biological resources, including threatened and endangered species. The significance criteria are presented in Section 2.5. For benthic resources, an impact is considered significant if irreversible modification of habitat exceeds 10 percent in the region. The "region" is defined for this study as the Santa Maria Basin. An example of a significant change in habitat

would be one that prevents the re-establishment of pre-disturbance biological communities over a significant portion of their range (i.e., an impact that changes the rock substrate from boulders to cobbles or completely covers rock habitat with soft substrate). Localized impacts or those of a short duration are defined as insignificant. Minor disturbances to individuals are defined as negligible.

Routine Operations: The Point Arguello EIR/EIS identified relatively few impacts during routine platform operations (ADL, 1984a). The only identified impacts from the proposed project on benthic resources are from drilling muds and cuttings and produced water discharges. Impacts from drilling discharges were discussed in detail in the EIR/EIS for the Point Arguello platforms (ADL, 1984a), and discharges associated with the proposed project are within the footprint of impacts discussed in that document. Potential impacts to benthic resources due to the presence of aromatic hydrocarbons in produced water discharges are within the spatial and temporal scope of the original EIR/EIS.

Drilling Muds and Cuttings: Since the wells would be drilled from the existing platforms, the only change from the original document is the temporal shift in impacts to benthic resources; that is, the impacts from drilling muds and cuttings from these wells are projected to occur much later than originally proposed. Originally, it was presumed that all the wells would be drilled in the first 5 years (1985-1990) of the Point Arguello Field. However, only 17 of Hidalgo's 56 well slots and 17 of Platform Hermosa's 48 well slots have been drilled to date. For the proposed project, it is estimated that 8 of the remaining 70 slots will be drilled between 2004 and 2006. Discharges from workovers and an occasional new well were expected on an infrequent basis throughout the life of the project. However, the larger discharges associated with drilling several new wells were not projected to occur after 1990 in the original DPP.

The total volume and spatial impact from these discharges, however, were considered in the original document. The calculations in the Point Arguello EIR/EIS, therefore, included the amount of muds and cuttings to be discharged from the well slots now assigned to the proposed project.

Impacts from drilling muds and cuttings discharges include direct smothering (primarily by cuttings near the platform), increased turbidity, and elevated levels of metals on the ocean surface and in the water column. The elevated levels of metals come from the higher concentrations of heavy metals found in the deeper formations being drilled into or from the composition of the mud itself (Battelle, 1991).

Lissner et al. (1987) discussed the potential effects of drilling muds and cuttings on hard-substrate communities offshore California. They pointed out that natural sediment movements overwhelm the sediment changes documented from drilling mud discharges. Inputs from the project drilling muds and cuttings are of shorter duration, comparatively, and would be much more localized in effect (Lissner et al., 1987; Neff, 1987). Adverse biological effects on the benthos from this study, as in other documented studies, were limited to an area within one km (0.6 mile) of the discharge source (Diener and Lissner, 1995).

Based on the findings from studies of potential effects on hard-bottom communities in the project area (SAI, 1986; Battelle, 1991; SAIC and MEC, 1995), no significant impacts are predicted for hard-substrate benthic resources from the drilling of development wells associated with the proposed project. The naturally occurring hard-rock habitat would not be significantly affected, and muds or cuttings are not expected to cause a measurable change in population abundance or species composition in the project area. Similarly, the contribution of muds and cuttings to the soft-bottom benthic environment is not expected to significantly alter the natural habitat or cause population level changes in abundance or composition of species. Due to their larger grain size, the cuttings fall close to the platform and would only contribute to the existing shell mounds

found under the platforms. Muds tend to be carried and dispersed further from the platforms, at distances up to 6 km (3.7 mi) (Battelle, 1991). Results from the long-term monitoring program confirm that the sediments are not significantly altered and potential biological effects are limited to an area within one km (0.6 mi) of the discharge source (Diener and Lissner, 1995).

Accidents/Upsets: An oil spill accident or a hydrogen sulfide (H_2S) release is not expected to cause significant impacts on benthic resources. These potential effects were discussed in the original Point Arguello EIR/EIS (ADL, 1984a) and are not expected to change as a result of the proposed project.

Conclusion: Impacts to benthic resources from both routine activities and accidental oil spills associated with the development of the eastern half of Lease OCS-P 0451 are expected to be insignificant.

Cumulative Analysis: Section 1.4 describes the projects considered in the cumulative analysis for the proposed project. Possible sources of cumulative impacts to benthic resources include ongoing and proposed oil and gas activities in Federal and State waters and commercial fishing.

The only oil- and gas-related cumulative impact that overlaps project impacts to benthic resources is from ongoing operations at the Point Arguello platforms. Activities from other Federal operators in the Santa Maria Basin conducting development or abandonment projects do not overlap spatially with benthic resources affected by the proposed project.

A small rockfish fishery focused on rocky reefs exists around the project area. Commercial trawlers impact benthic communities by stirring up bottom sediments and crushing or damaging biological resources on the reefs when they trawl nearby. The fishery is small due to its distance from shore. The only fishermen willing to trawl in this area are very familiar with the locations of the rocks; many fishermen would not want to risk losing their gear. Previous surveys of the area, while identifying remnants of commercial fishing gear, have not identified significant impacts on hard-substrate communities from commercial fishing (Dames and Moore, 1982).

No significant cumulative impacts to benthic resources are expected from the proposed project. The CAMP study monitored cumulative impacts on benthic communities from drilling at all three Point Arguello platforms over a 10-year period and found no significant impacts (SAIC and MEC, 1995). These results combined impacts on the benthic communities from ongoing commercial fishing activities along with ongoing drilling activities. Based on these results, impacts from ongoing operations at the Point Arguello platforms and commercial fishing operations in combination with the development of the eastern half of Lease OCS-P 0451 would not significantly impact benthic resources.

Overall Conclusions: Benthic resources in the southern Santa Maria Basin are not currently being impacted significantly by either human or natural causes. The incremental increase in impacts placed on near-field resources by the proposed project would not alter the overall insignificant level of impacts to this resource. Implementation of this project also would not alter the conclusions presented in the Point Arguello 1984 EIR/EIS. Potential cumulative impacts from the build-out of activities in the Point Arguello area were predicated on monitoring the existing operations and determining the extent of impact from them. Since this monitoring showed no significant impacts, this analysis is consistent with that in the Point Arguello EIR/EIS.

2.5.5 Fish Resources

Affected Environment

Marine fishes in the Santa Barbara Channel and Santa Maria Basin have been described in detail in previous studies and environmental documents (e.g., Miller and Lea, 1972; Horn and Allen,

1978; ADL, 1984a; MBC, 1986; Dailey et al., 1993; Moser, 1996; Love et al., 1999). At least 554 species of California marine fishes inhabit or visit California waters. The high species richness is probably due to the complex topography, convergence of several water masses, and changeable environmental conditions (Dailey et al., 1993). Point Conception is widely recognized as a faunal boundary, with mostly cold-water species found to the north and warm-water species found to the south, although extensive migrations do occur as a result of fluctuating environmental conditions. In fact, warm- and cool-water events in the Southern California Bight (SCB) affect fish recruitment and can alter the composition of some fish assemblages for years (Love et al., 1985, 1986).

The pelagic realm is the largest habitat in the Channel and the home of 40 percent of the species and 50 percent of the families of fish. The pelagic zone includes the water column covering the shelf and the upper 150-200 m (490-650 ft) of water overlying the slope and deep basins. The fish from this zone represent a mix of permanent residents such as sardine, northern anchovy, and thresher shark and periodic visitors such as salmon, mackerel, and herring.

The offshore benthic environment is beyond the major direct impacts of tidal, wave, beach, and shoreline processes and is usually sandy or muddy, but rocky outcroppings do occur. The species common to this zone include flatfishes, lingcod, and some rockfishes, cods, and sablefish. The shallow, rocky-bottom benthic environment includes tidepools and subsurface rocky outcrops that harbor rockfish, sculpins, blennies, and eels. The shallow, sandy-bottom benthic environment is affected by wave, tide, and shoreline processes and fishes there include skates, rays, smelts, surfperches, and flatfish. Vertical-relief benthic areas, including kelp beds and manmade structures, are habitat for reef-like fishes including rockfish, kelp bass, señorita, blacksmith, and surfperches.

In concern over the extremely small remaining populations of rockfish, NOAA Fisheries declared the West Coast groundfish fishery a disaster in January 2000. This decline of many rockfish species to low population levels is due to a combination of over-harvest, life histories of slow growth with a low reproductive rate, and poor recruitment of juvenile rockfish into the stocks. At issue is the bocaccio~~,~~ which was proposed as a candidate for listing as threatened under the Endangered Species Act (ESA) in January 2001, and the cowcod~~,~~ which is a candidate for special concern to the State of California. In November 2002, NOAA Fisheries published a 12-month finding that bocaccio does not warrant listing under ESA; however, the species remains on the ESA Candidate Species list, and NOAA continues to monitor its status closely. In southern California, adults of both species occur in relatively deep water ranging from about 45-300 m (150-1000 ft).

Two of the marine fishes occurring in the proposed project area, the tidewater goby and the Southern California Evolutionarily Significant Unit (ESU) of west coast steelhead trout, are listed as endangered under the ESA. The tidewater goby, which was listed as endangered in 1994 (59 FR 5494), is found in shallow coastal lagoons, stream mouths, and shallow areas of bays in low salinity waters. The northern population of tidewater goby is found in coastal areas from Del Norte County south to Los Angeles County. The Southern California ESU of steelhead was listed as endangered in 1997 (62 FR 43937). They are migratory, anadromous rainbow trout that inhabit streams and rivers from the Santa Maria River south to Malibu Creek (Behnke 1992; Burgner et al., 1992).

Impact Discussion

The impact analysis for the marine biological resources in this EA adopts significance criteria developed for all biological resources, including threatened and endangered species. The significance criteria are presented in Section 2.5.

For fish resources, including threatened and endangered species, significant impacts are assumed to mean a measurable change in species composition or abundance beyond that of normal variability within several localized areas for a period of 1 to 5 years, a measurable change in ecological function or community structure within several localized areas for less than 5 years, or a reduction in or disturbance to locally important habitat for more than 5 years.

Impacts to fish resources below these levels are considered to be less than significant. Impacts involving no more than minor disruption of behavioral patterns and minimal mortalities or injuries to fish resources are defined as negligible.

Routine Operations: Effluent discharges are the single source of potential impacts to fish resources associated with routine operations of the proposed project. Drilling muds and cuttings and produced waters from OCS oil and gas facilities potentially could affect fish species through direct toxicity by exposure in the water or ingestion of prey that have bioaccumulated toxins from the discharges.

An assessment (SAIC, 2000a b) for the proposed project concluded that continued discharges from platforms offshore California would not adversely affect fish resources outside the discharge mixing zones, described as a 100-m (330-ft) radius from the discharge point. Within the mixing zone, discharges from oil and gas exploration, development, and production may have localized effects on water quality and resident marine organisms, including fish (SAIC, 2000c). These effects could include decreased growth and reproductive success. Such sublethal effects are symptomatic of stress and may be transient and only slightly debilitating.

In its consultation on Essential Fish Habitat (EFH) for the proposed Rocky Point Unit development project (NMFS, 2000), the National Marine Fisheries Service (NMFS) expressed concern over the potential impacts of produced water discharges within the mixing zone around the discharge point at the Arguello platforms. In response, MMS requested supporting information from the operator, including modeling of the produced water plume and constituent concentrations within the mixing zone, and an evaluation of the impacts on fish resources (Brandsma, 2001; Arguello Inc., 2003b). That information is incorporated by reference in this document and is summarized in this EA within the Section on Water Quality.

Based on the dilution modeling performed by Brandsma (2003), concentrations from muds, cuttings, or produced water that approach toxicity levels (Neff, 1997) would only occur within 20 m (65 ft) of the discharge point, if at all. Due to the very limited water volume occupied by plumes and the mobile nature of fish, it is highly unlikely that fish would remain stationary within a discharge effluent plume for considerable periods of time. Hence, direct toxicological effects on these fish species are not expected to occur from routine discharges. At Platforms Hidalgo and Hermosa, 100-fold dilution of produced water discharge would occur within 20 m to several thousand-fold dilution within 100 m from the point of discharge. Hence, fish residing beneath the platforms are not expected to bioaccumulate the chemical constituents found in produced water. No significant impacts to marine fish resources are expected from the routine operations of the proposed development and production of the eastern half of Lease OCS-P 0451.

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

An accidental 200-bbl oil spill occurring as a result of the proposed project potentially could cause short-term impacts to fish resources in the project area if the oil contacted the shoreline. Under normal conditions for the area, significant mixing and weathering of the oil would evaporate much of the toxic light-end hydrocarbons into the atmosphere, disperse the oil into the

water column, and likely break the slick into smaller patches before the oil reached land. The weathered tar balls would likely cause some mortality to intertidal macrophytes and invertebrates through smothering. Elevated hydrocarbon levels in nearshore invertebrates would be likely, leading to increased stress and potential decreases in growth and reproduction in fish feeding upon the invertebrates. Since fish have the ability to metabolize hydrocarbons, these effects would likely be short-term and result in negligible impacts. As discussed in the 1984 EIR/EIS (ADL, 1984a), insignificant impacts to fish resources would be expected. Oil spill risk to the two Federally endangered fishes in the project area was discussed in detail in the EFH consultation for the proposed Rocky Point Unit development project (NMFS, 2000); no significant impacts are expected.

Conclusion: Routine activities associated with development and production of the eastern half of Lease OCS-P 0451 are expected to cause negligible impacts to marine fish resources in the project area, including federally listed species. Accidental oil spills occurring as a result of the proposed project could cause elevated hydrocarbon levels in intertidal invertebrates if the spill contacted land. This could result in short-term stress and potential decreases in the growth and reproduction of fish feeding upon the invertebrates. Based on the significance criteria adopted for this analysis, no significant impacts on marine fish resources are expected.

Cumulative Analysis: Section 1.4 describes the projects considered in the cumulative analysis for the proposed project. Possible sources of cumulative impacts to fish resources in the project area include on-going and proposed oil and gas activities in Federal and State waters, Alaskan and foreign-import tankering, and commercial and recreational fishing. Potential cumulative impacts are discussed below.

There are currently 23 oil and gas platforms in Federal waters and 4 platforms in State waters offshore Southern California. The cumulative effects of these structures and development activities can be found in numerous reports and environmental documents (e.g., MMS 1992, 1996a, 2001, 2002; Bornholdt and Lear, 1995, 1997).

As discussed in Section 1.4, the cumulative oil spill risk for the proposed project area results from several sources: ongoing and projected oil and gas production from existing OCS facilities in the Santa Barbara Channel and Santa Maria Basin, ongoing production from one facility in State waters in the Santa Barbara Channel, and the tankering of Alaskan and foreign-import oil through area waters. The 1984 Point Arguello Field EIR/EIS (ADL, 1984a) determined that small, project-related spills (i.e., less than 100 bbl) would be expected to have negligible to insignificant adverse (Class III) effects on all marine species (i.e., marine mammals, seabirds, marine fishes, and invertebrates). The proposed project would add only a very small increment to the overall oil spill risk for fish resources in the project area (MMS, 1996a, 2001).

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. 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 and recreational fishing. Most of these activities occur throughout California, Oregon, and Washington coastal waters, and all of these activities and impacting agents exist in the southern California coastal zone.

Although marine water quality has been impacted by municipal, industrial, and agricultural waste discharges and runoff in much of the Southern California Bight (MMS, 1992), water quality north of Point Conception and offshore the Channel Islands remains good. This area is very productive and is important habitat for many marine fish species. A large oil spill would impact the water quality of this habitat. Although only minimal adverse impacts to fish populations and their prey species would be likely from such an event, EFH in the Bight is stressed due to overfishing, and

degraded water quality in estuaries south of Point Conception. Degradation of the water quality north of Point Conception due to an oil spill would cause further stress to EFH. The impacts to EFH from an open ocean spill would be short-term and not expected to last more than several days.

Overall Conclusions: No significant impacts to fish resources from either routine operations or accidental oil spills are expected to occur from the proposed project. No cumulative impacts are expected from routine operations, and the potential for an oil spill from the proposed project represents a minor incremental increase to the overall cumulative oil spill risk for fish resources and EFH in the area.

2.5.6 Wetlands Resources

Affected Environment

Wetlands in southern California have been severely impacted by residential and commercial development. Consequently, Federal, State, and local regulations have been implemented to protect remaining wetlands in the region. Descriptions of wetlands in the project area and applicable regulations are found in the Point Arguello EIR/EIS, Terrestrial Biology Appendix J (ADL, 1984d).

Streams in Santa Barbara County are perennial or intermittent. Of the 26 streambeds from Gaviota to Point Conception, 10 have perennial flow (ADL, 1984d). Only those wetlands that could be affected by a marine oil spill are discussed here. These wetlands in the project area include the Santa Ynez River, Cañada Honda Creek, Jalama Creek, Cojo Creek, Cañada de Santa Anita, and Cañada de Alegria. Resources found in these areas are described in detail in an inventory of wetland resources (Ambrose, 1995). All of the wetlands listed above have limited tidal flushing because they become seasonally closed off at the mouth by natural sand berms.

The Santa Ynez River contains by far the largest area of salt marsh, mud flats, and channels in the project area. Endangered plants have not been identified near the coastal areas, and almost half of the plant species are non-native (Ambrose, 1995). Invertebrates were found to be generally lacking at each of the wetland sites studied by Ambrose (1995) in Santa Barbara County, including the Santa Ynez River. The endangered tidewater goby was found at most of the identified creeks, with the highest number at Santa Ynez River (Ambrose, 1995); this species is discussed in Section 4.1.5. The Channel Islands do not contain wetland resources in areas that could be affected by operations associated with the proposed project.

Impact Discussion

The impact analysis for the marine biological resources in this EA adopts significance criteria developed for all biological resources, including threatened and endangered species. The significance criteria are presented in Section 2.5.

Since wetland habitat in the vicinity of the project is protected by regulation, any loss or irreversible modification of habitat due to an oil spill would be considered significant.

Routine Operations: There are no anticipated impacts to wetland resources due to routine activities associated with the proposed project, since none of the project activities occur near these resources.

Accidents/Upsets: Of greatest concern for wetlands are potential impacts from an offshore oil spill. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

As was indicated in the Point Arguello EIR/EIS (ADL, 1984a), the probability that oil from an offshore oil spill from the platform or pipeline would reach wetland resources in the project area is lower than for other shoreline resources, due to the fact that these wetlands do not have regular tidal flushing. The most likely landfall for a spill, should one occur, would be in the vicinity of Jalama Creek, a small wetland that is naturally bermed much of the year and flows toward the ocean during winter. While any wetland could be damaged if large quantities of oil were to contact it, a 200-bbl spill would not be likely to reach the shoreline in sufficient volume to breech natural berms and impact the wetland. Therefore, potential impacts to wetlands from oil spills are not expected to be significant.

Strategies to protect river mouths with deployed boom and sediment berms are tested regularly in oil spill drills throughout the area by MMS and oil spill response organizations such as Clean Seas. These measures, in effect for this project, are highly effective in keeping oil out of streams and creeks should a spill occur. In general, it is important in preventing long-term impacts in a wetland to stop oil from reaching the sediment, since the use of machinery or trampling during cleanup activities can impact wetlands (Zengel and Michel, 1996). Due to the lack of large wetlands proximal to the project, natural berming at intermittent streams nearest the project, the low likelihood of a spill, and effective spill response in the project area, it is expected that impacts to wetland resources from the proposed project would be insignificant.

Conclusion: No impacts to wetlands are expected from routine operations associated with the development and production of the eastern half of Lease OCS-P 0451. Impacts from an accidental 200-bbl oil spill from the proposed project would be unlikely, since wetlands in the area are not tidally flushed and are naturally bermed much of the year, and large wetlands are distant from the project. Mitigation measures in place for ongoing operations in the Point Arguello Unit (e.g., booming the river mouths) further reduce the chance of impact. No habitat alteration resulting in significant impacts to wetland resources is expected. Overall impacts to wetland resources are expected to be insignificant.

Cumulative Analysis: Cumulative impacts to wetlands in Southern California include decreased water quality due to agricultural runoff, loss of habitat, and habitat disturbance due to increased population pressure. Construction of residential and commercial developments could also contribute local impacts to creeks and wetlands. Local, State, and Federal statutes protecting wetlands in Santa Barbara County help reduce the direct loss and disturbance of existing wetland habitat.

Sources of cumulative oil spill risk include ongoing and projected oil and gas production from existing OCS facilities in the Santa Barbara Channel and Santa Maria Basin, ongoing production from one facility in State waters in the Santa Barbara Channel, proposed oil and gas projects in State waters, and Alaskan and foreign-import oil tankering through area waters. The cumulative risk of oil spills arising from multiple sources is tempered by mitigation such as the rerouting of American flag tankers outside the Channel Islands and modern oil spill response capabilities. The potential for an oil spill occurring from the proposed project represents an insignificant incremental increase to the overall cumulative oil spill risk to wetlands in the proposed project area.

Overall Conclusions: Accidental oil spills represent an ongoing source of potential risk to wetland resources. The proposed project represents an insignificant incremental increase to the overall cumulative oil spill risk for wetland resources and is well within the potential impacts discussed in the original Point Arguello EIR/EIS. Overall impacts to wetland resources are expected to be insignificant.

2.5.7 Refuges, Preserves, Marine Sanctuaries, and Coastal National Monuments

Affected Environment

Refuges, preserves, marine sanctuaries, and coastal monuments are areas that are legally defined and regulated by the State or Federal government, with the primary intent of protecting marine resources for their inherent biological or ecological value (for more detailed information on these areas, see ADL, 1984a and McArdle, 1997). For information on the biological resources protected within these areas, refer to the individual resource sections in this document. Additional areas that are considered by many to be unique or of significant biological importance, but not legally defined as such, may also be discussed in the appropriate resource section.

State Protected Areas: Protected areas within the proposed project area that are legally defined and controlled by the State of California include reserves, ecological reserves, and Areas of Special Biological Significance (ASBSs). These areas are discussed in some detail in MMS (2001) and are listed in Table 2.12.

Table 2.12 State and Federal designated areas in the proposed project area.

Designation	Ownership/Administration
Anacapa Island Ecological Reserve	State
Big Sycamore Canyon Marine Resources Protection Act Ecological Reserve	State
California Coastal National Monument	Federal
Channel Islands National Marine Sanctuary	Federal
Channel Islands National Park	Federal
Mugu Lagoon to Latigo Point ASBS	State
Nipomo Dunes-Point Sal Coastal Area	Federal[1]
Pismo-Oceano Beach Pismo Clam Reserve	State
San Miguel Island Ecological Reserve	State
San Miguel, Santa Rosa, and Santa Cruz Islands ASBS	State
Santa Barbara Island Ecological Reserve	State
Santa Barbara Channel Ecological Preserve	Federal
Vandenberg Marine Resources Protection Act Ecological Reserve	State

[1]Includes Federal, State, county, and private ownership.

Federally Protected Areas: Located south of the proposed project area, the Channel Islands National Marine Sanctuary (CINMS) is a biologically sensitive area, defined and protected by the Federal government. Another important federally protected area is the Monterey Bay National Marine Sanctuary (MBNMS), which is located on the central California coast more than 100 km (60 miles) north of the proposed project area. Although not part of a national program, the Santa Barbara Channel Ecological Preserve (SBCEP) was established by Federal mandate in 1969.

These areas are discussed in some detail in MMS (2001) and are listed in Table 2.12. The recently established California Coastal National Monument (CCNM) and the one local National Natural Landmark, the Nipomo Dunes-Point Sal Coastal Area (ND-PSCA), are discussed below.

California Coastal National Monument: The CCNM was established by Presidential proclamation on January 11, 2000 (BLM, 2002). It extends the length of the California coastline from the Oregon border to Mexico and includes more than 11,500 rocks, islands, exposed reefs, and pinnacles. It does not include the major islands, such as the Channel Islands, the Farallones, or the islands of San Francisco Bay. The Monument protects "all unappropriated or unreserved lands and interest in lands owned or controlled by the United States in the form of islands, rocks, exposed reefs, and pinnacles above mean high tide within 12 nautical miles of the shoreline of the State of California" (BLM, 2002). The primary goal of the CCNM is protection of these rocks and islands, their geologic and biological resources, and related values.

The Bureau of Land Management (BLM) has managed these resources in cooperation with the California Department of Fish and Game (CDFG). The CDFG has regulated the public use of these areas, prohibited the removal of products that may have commercial value, and limited activities during seabird breeding seasons (Arguello Inc., 2003b). In spring 2000, BLM, CDFG, and the California Department of Parks and Recreation signed a Memorandum of Understanding to work jointly to manage the Monument, develop a greater understanding of its resources, and provide information to the public.

In addition to their intertidal resources, the Monument rocks provide nesting and roosting sites for thousands of seabirds, including threatened and endangered species. They also provide hauling areas for a number of pinniped species, including sea lions, harbor seals, and elephant seals.

Nipomo Dunes-Point Sal Coastal Area. National Natural Landmarks (NNLs) are designated by the Secretary of the Interior under the National Natural Landmarks Program (NPS, 2002). The Program was established in 1962 and is managed by the National Park Service (NPS). The goals of the Program are to encourage the preservation of sites illustrating the geological and ecological character of the United States, to enhance the scientific and educational value of sites thus preserved, to strengthen public appreciation of natural history, and to foster a greater concern for the conservation of the nation's natural heritage.

The ND-PSCA was designated in 1974 (NPS, 2002). It extends from Nipomo Dunes in San Luis Obispo County south to Point Sal in Santa Barbara County and encompasses Federal, State, county, and privately owned properties. The ND-PSCA contains the largest, relatively undisturbed coastal dune tract in California and several miles of pristine rocky coastline (NPS, 2002).

Impact Discussion

The impact analysis for the marine resources in this EA adopts significance criteria developed for air quality (Section 2.3), water quality (Section 2.4), and all biological resources, including threatened and endangered species (Section 2.5).

Routine Operations: For details and analyses on possible impacts from routine operations associated with this project on the resources protected within these areas (including air and water quality, marine mammals, marine and coastal birds, intertidal and benthic resources, fish, and wetlands resources), refer to the individual resource discussions in Sections 2.3, 2.4, and 2.5.1 through 2.5.6. Potential impacts from routine activities include temporary disturbance of marine mammals from support vessel traffic (Section 2.5.1) and smothering and turbidity-related effects on benthic organisms within a kilometer (0.6 mile) of platform discharge points (Section 2.5.4). Given the distances of State and Federally protected areas from the Point Arguello platforms, no impacts on marine resources in the areas are expected from routine activities.

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume. The potential impacts of a spill on the resources in these areas are described in the individual resource sections (Sections 2.3, 2.4, and 2.5.1 through 2.5.6).

If an oil spill were to occur from this project and contact one or more of the protected areas listed in Table 2.12, biological resources within that area could be affected. As discussed in Section 2.5.1, a 200-bbl oil spill is not expected to affect the CINMS due to cleanup efforts and the weathering and dispersion of the oil that would occur over the 50-km (30-mile) distance between the Sanctuary and the proposed project area. A spill of this size would be even less likely to contact the MBNMS. If a spill from the proposed project were to make landfall, it would most likely be along the mainland shore between Point Arguello and Point Conception.

Thus, the CCNM is the protected area most likely to be contacted by a 200-bbl spill; contacts to the nearby Vandenberg Ecological Reserve, the ND-PSCA, and the Pismo-Oceano Beach Reserve are somewhat less likely. Such contact could result in minor mortality and temporary displacement of marine mammals (primarily sea otters and harbor seals) and marine and coastal birds, and some loss of intertidal organisms. Fish resources in the area could suffer sublethal effects. None of these impacts would be expected to be significant.

Conclusion: Routine activities associated with the proposed development and production of the eastern half of Lease OCS-P 0451 are expected to have no effects on biological resources in State and Federally protected areas. Accidental oil spills occurring as a result of the proposed project are expected to result in no more than minor mortality and temporary displacement of marine mammals and marine and coastal birds, some mortality of intertidal organisms, and sublethal effects on fish. No significant impacts on biological resources in the protected areas are expected.

Cumulative Analysis: Section 1.4 describes the projects considered in the cumulative analysis for the proposed project. Cumulative impacts on protected area resources could result from on-going and proposed oil and gas activities in Federal and State waters and Alaskan and foreign-import oil tankering. Such a spill is expected to be relatively brief in duration, lasting from days to a few weeks (Section 2.2) and have a minimal impact on protected area resources in the project area. This represents an insignificant incremental increase to the overall cumulative oil spill risk to marine resources in area waters. For information on possible cumulative impacts on the resources protected within these areas, refer to the individual resource discussions in Sections 2.3. 2.4, and 2.5.1 through 2.5.6.

Overall Conclusions: No significant impacts to biological resources in State or Federally protected areas are expected to occur from the proposed project. No cumulative impacts are expected from routing operations, and the potential for an oil spill from the proposed project represents a minor incremental increase to the overall cumulative oil spill risk for marine resources in the protected areas of the region.

2.6 Socioeconomic Resources

2.6.1 Commercial Fishing

Affected Environment

The proposed project is located in the southern Santa Maria Basin. The eastern half of Lease OCS-P 0451 abuts the State seaward boundary, 3 miles from the shoreline between Point

Conception and Point Arguello. The area is productive due to upwelling and favorable habitat for commercially important fish species. However, the area is relatively isolated from ports and weather conditions are often poor, making commercial exploitation difficult and dangerous at times.

The high productivity of the area is conducive to commercial fishing of most gear types including trawl, drift net, purse seine, and trap.

Trawling. Trawlers in the Santa Barbara Channel target Pacific Ocean shrimp, spot and ridgeback prawn, sea cucumbers, some rockfish, and various species of sole. They also fish seasonally in shallow State waters for halibut. Trawling occurs year-round in the Santa Barbara Channel at depths of 55-330 m (180-1,080 ft) (Fusaro et al., 1986).

Drift Gillnetting. Due to drift gillnetting restrictions in State waters, all drift gillnetting occurs in Federal waters. In the SBC, drift gillnetting occurs for some species year round and for others from late summer through the winter. Drift gillnetting will occur within the project area during the summer.

Purse Seining. The numbers of purse seiners and their location within and near the Santa Barbara Channel are highly variable and uncertain. Although the squid fishery contributes almost 95 percent of the total catch for the Santa Barbara area, this fishery is usually located along the nearshore areas of the Channel Islands. Purse seining for mackerel, sardine, and anchovy could be expected throughout the proposed project area.

Trap Fishing. Crab and lobster traps are fished heavily in the State waters off Point Arguello and may occur in rocky habitats of the proposed project area. Shellfish seasons occur year round in the SBC. It is difficult to predict the location of any particular string of trap-gear at a given time. Most full-time fishermen have at least 50-70 traps, and many fishermen have upwards of several hundred arranged in strings of from 5 to 25 individual traps set along particular depth contours.

Impact Discussion

The impact analysis for commercial fishing in this EA adopts significance criteria developed specifically for the resource. The major commercial fishing issues related to the proposed project are the socioeconomic impacts on fishermen from (a) preclusion from fishing grounds, (b) damage and loss of fishing gear, and (c) lost fishing time due to (a) and/or (b).

Impacts to commercial fishing are considered to be significant if one or more of the following criteria are likely to be met:

- Any activity or combination of activities associated with the proposed development and production project that causes a 10 percent or greater loss of, or exclusion, from currently productive fishing grounds for all or most of the fishing season.
- Any activity or combination of activities associated with the proposed development and production project that affects, through preclusion from fishing grounds, 10 percent or more of the fishermen using the assessment area for all or most of a fishing season.
- Any activity or combination of activities associated with the proposed development and production project that causes a one percent long-term (more than 5 years) or 5 percent or greater short-term (1-year) reduction in the productive area available for kelp harvest or mariculture in the assessment area.

Routine Operations: Routine operations were expected to have regionally insignificant adverse impacts on the various commercial fisheries in the area according to the Point Arguello EIR/EIS (ADL, 1984a). No new equipment or facilities would be needed to develop and produce the eastern half of Lease OCS-P 0451 under the proposal. The proposed project would fall within the

approved level of activity scheduled to occur at platforms Hermosa and Hidalgo. The proposed project would not extend the productive life of the Point Arguello facilities. Thus, the proposed project would not add to the impact sources that were scheduled to occur and are covered under permits at platforms Hermosa and Hidalgo, and is not expected to cause further preclusion or space-use conflicts beyond what presently exists.

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume. The Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS (ADL, 1984a) determined that oil spills of less than 1000 bbl would be expected to have regionally insignificant adverse impacts on the various commercial fisheries in the area.

It is unlikely that a 200-bbl oil spill off Point Arguello would have a measurable effect on commercial fishing in south and central California. Although commercial fishing occurs in the area, Point Arguello is isolated from commercial fishing ports. Thus, a 200-bbl oil spill off Point Arguello is not likely to result in port closures that would limit the opportunity for fishermen to harvest alternate areas during the ocean clean-up period. During the Torch pipeline spill of 167 bbl in 1997, the U.S. Coast Guard restricted fishing in the area of the spill during the ocean clean-up and for a few days after ocean clean-up was completed, causing frustration from fishermen wishing to enter the area. A 200-bbl spill associated with the proposed project is likely to result in a closure of the Point Arguello area to fishing for 7-10 days. Based on the criteria established above, a significant impact to commercial fisheries would not be expected after a 200-bbl oil spill.

However, the lost fishing time and lost gear could place a financial hardship on individuals if they are fishing the area at the time of an oil spill. The trap fishery is more likely to be impacted than other fisheries because of the potential for equipment loss and damage. Trap fishing is heavy in the State waters around Point Conception and Point Arguello. Although the responsible company would be accountable for replacing lost or damaged gear after an oil spill, the process to replace the losses can be lengthy.

The risk of a hydrogen sulfide (H_2S) release at the Point Arguello offshore facilities would not change as a result of the proposed development. The operations at the Point Arguello platforms do not pose a significant H_2S release risk as defined by the County of Santa Barbara's Significance Criteria Guidelines used for preparing CEQA documents. The maximum H_2S hazard zone is 840 ft downwind from the platforms' water surface base (ADL, 1997). Mitigations and safety requirements associated with the H_2S release risk at the Point Arguello platforms may be found in several documents (ADL, 1998; Chevron, 1998; SBC, 1998a, b).

Conclusion: Routine activities associated with development and production of the eastern half of Lease OCS-P 0451 are expected to cause negligible impacts to commercial fishing in the project area. Based on the criteria established above, a significant impact to commercial fisheries would not be expected after a 200 bbl oil spill. However, the lost fishing time and lost gear could place a financial hardship on fishermen who are fishing the area at the time of an oil spill. Timely reimbursement of claims after a spill for lost catch and damaged or lost fishing gear would mitigate this financial hardship.

Cumulative Analysis: There are currently 23 oil and gas platforms in Federal waters and 4 platforms in State waters offshore Southern California. The cumulative effects of these structures and development activities can be found in numerous reports, and environmental documents (MMS, 1992, 1996a; Bornholdt and Lear, 1995, 1997). The proposed project would add only a

very small increment to the overall oil spill risk associated with ongoing and proposed State and OCS oil and gas activities in the Pacific Region.

Based on routine operations, the proposed project would not add to the impacts the commercial fishing industry experiences from OCS activities. No new facilities would be needed to develop and produce the eastern half of Lease OCS-P 0451 under the proposal. The proposed project would fall within the approved level of activity scheduled to occur at Platforms Hermosa and Hidalgo, and the proposed project would not extend the life of the Point Arguello facilities.

No new space-use or preclusion impacts would result from the routine operations involved with the proposed development and production. The proposed project would fall within the approved level of activity scheduled to occur at Platforms Hermosa and Hidalgo, and the proposed project would not extend the productive life of the Point Arguello facilities.

Accidental oil spills present an ongoing risk to commercial fishermen. Offshore oil and gas facilities in State and Federal waters and tankering are the two main sources of the cumulative oil spill risk in this area. Oil spill response capabilities (Section 2.2.3) and recently implemented or proposed mitigation (such as rerouting tankers farther offshore) temper the risk. The potential for an oil spill occurring from the proposed project represents an insignificant incremental increase to the overall cumulative oil spill risk in the Santa Barbara Channel and Santa Maria Basin.

Overall Conclusions: No significant impacts to commercial fishing from either routine operations or accidental oil spills are expected to occur from the proposed project. No cumulative impacts are expected from routine operations, and the potential for an oil spill from the proposed project represents an insignificant incremental increase to the overall cumulative oil spill risk for commercial fishing in the area.

2.6.2 Recreation and Tourism

Affected Environment

Recreation and tourism are important components of the economy and, in part, define the quality of life and the sense of place for Santa Barbara County residents and visitors (MMS, 1996b, 1998, 2000b). Impacts to coastal and beach recreation and associated tourism from offshore oil and gas development that may result from the following activities:

- Long-term effects from the presence of onshore infrastructure such as processing facilities and offshore oil platforms that may change use patterns.
- Temporary and long-term effects of an oil spill may change use patterns.

Public access between Purisima Point and Point Conception is limited to Ocean Beach County Park, Vandenberg AFB Beach Access, and Jalama Beach County Park (California Coastal Commission, 1991).

Impact Discussion

Significance criteria and mitigation to analyze the impact to recreation have been developed for coastal energy projects in the region (ADL, 1996). For recreation, an impact is considered significant when it causes:

- Permanent or long-term preemption of a recreational use or temporary preemption or conflicts during peak season use, or
- Long-term degradation (extending beyond the construction period) of the recreational value of a major recreational use.

While these criteria are most applicable to routine operations, they have also been applied to analyze the impacts from oil spills (see, for example, Aspen Environmental Group, 1992).

Routine Operations: The potential long-term effects of the presence of infrastructure, significance criteria, and mitigation were examined in Technical Appendix N, Other Uses, of the Point Arguello Field EIR/EIS (ADL, 1984e). Since the drilling project requires no new construction and is not expected to extend the life of the platform beyond that envisioned in the EIR/EIS, the pattern of these long-term effects remain unaltered from those previously analyzed and mitigated. As such, impacts from the proposed project are non-existent.

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume.

The analysis of effects to recreation is based on the likelihood that an approximately 200-bbl spill 3 miles offshore would contact the shoreline between Point Conception and Purisima Point, and that onshore clean up operations over the range of the spill would last less than 10 days.

Oil spills that approach or impact the coast would degrade the recreational values of nearby facilities. However, only a portion of a 200-barrel oil spill would be expected to impinge the coastline. It would also have to come ashore at the two locations that offer public access. Where it did, coastal-dependent activities, such as surfing, kayaking, sail boarding, and swimming, would be most affected. But this impact would be minor, local, and temporary. At the same time, coastal-enhanced activities, such as camping, picnics, and nature walks, also would be affected to a lesser extent, but would be eliminated only if local authorities closed all access to the area during the entire period of clean-up operations.

Conclusion: Impacts from routine operations are non-existent to negligible. A spill of 200 barrels would cause minor, temporary, localized, impact to beach recreation and tourism. These impacts would not be significant.

Cumulative Analysis: Coastal-dependent and coastal-enhanced recreation and tourism can be affected by many circumstances, such as ocean water quality degradation, closing of access to beach areas during nesting of shore birds, and consumer preferences (ADL, 1984e). The impacts of a small oil spill from this project exhibit an incremental, but negligible increase to cumulative impacts on recreation and tourism.

Overall Conclusions: Coastal-dependent and coastal-enhanced recreation and tourism in the area of the proposed project are limited to three widely separated sites. The project would not create any new impacts from in-migration from project employment or the presence of OCS infrastructure. Localized, temporary, minor impacts could result from a project related oil spill, but these would not be significant. Cumulative impacts from such a spill would not be significant. Therefore, no impacts beyond those identified in the 1984 EIR/EIS and the 1988 SEIR are anticipated to occur to recreational resources as a result of the offshore portion of the project.

2.6.3 Transportation/Circulation

Affected Environment

Roadway and Intersection Classification: Transportation/Circulation conditions are often described in terms of levels of service (LOS). Level of service is a means of describing the amount of traffic on a roadway versus the design capacity of the roadways. The design capacity of a roadway is defined as the maximum rate of vehicle travel that can reasonably be expected

along a section of roadway. Capacity is dependent on a number of variables including road classification and number of lanes, weather, and driver characteristics. The LOS rating reflects qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists. These measures include freedom of movement, speed and travel time, traffic interruptions, types of vehicle, comfort, and convenience. Ideal conditions for a roadway would include good lane widths and roadside clearances, the absence of trucks or other heavy vehicles and level terrain. LOS is generally computed as function of the ratio of traffic volume (V) to the capacity (C) of the roadway or intersection, which provides the V/C ratio (see Table 2.13 below).

Table 2.13 Ventura County truck traffic analysis for the development of the eastern half of Lease OCS-P 0451.

Road/ Route	Class	Current ADT	ADT LOS	Design Cap	V/C Ratio	Ref.
Port Hueneme to Ventura/L.A. County Border						
Hueneme Rd.	Major - 2 Lanes	10,500	B	16,000	0.66	1
Las Posas Rd.	Major - 2 Lanes	7,400	A	16,000	0.46	1
101 Southbound at Las Posas Rd.	Freeway 6 - Lanes	143,000	E	195,000	0.73	2
101 Southbound at Kanan Rd.	Freeway - 8 to 10 Lanes	171,000	C	292,500	0.58	2

References:
1. Traffic counts from Ventura County Department of Public Works
2. Traffic counts and average design capacity of 32,500 vehicles per lane per day from Caltrans.

Trucks impact the LOS by occupying more roadway space and by having poorer operating qualities than passenger cars. Because heavy vehicles accelerate slower than passenger cars, gaps form in traffic flow that affects the efficiency of the roadway. Also, intersections present a number of variables that can influence the LOS including curb parking, transit buses, turn lanes, signal spacing, pedestrians, and signal timing.

The Transportation Research Board has developed the Highway Capacity Manual, which details the procedures to be used in predicting LOS for a range of roadways and intersections. The LOS of a roadway is defined with scales ranging from A to F, with A indicating excellent traffic flow quality and F indicating stop-and-go traffic. Level E is normally associated with the maximum design capacity that a roadway can accommodate. The highest quality of traffic service occurs on roadways when motorists are able to drive their desired speed without strict enforcement and are not delayed by slow-moving vehicles more than 30 percent of the time. This condition is representative of LOS A. The classifications of LOS B and C are characterized when average drivers are delayed up to 45 and 60 percent of the time, respectively, by slow moving vehicles. The LOS of A, B, and C are generally considered satisfactory.

The LOS of D is considered tolerable in urban areas, since during peak hours 31 to 70 percent of the signal cycles have one or more vehicles that wait through at least one signal cycle. Current design practices indicate that a LOS of D during peak hours is acceptable due to the cost of improving roadways up to a LOS of C. When an area drops to a LOS of E, the speed of traffic is restricted 71 to 100 percent of the time, and intersection signal cycles have one or more vehicles waiting through more than one signal cycle during peak traffic periods.

Impact Discussion:

Routine Operations: There would be some additional impacts to onshore traffic resulting from the drilling project if synthetic and oil base muds are used. Approximately 16,330 bbl of inert oil-based drill cuttings (solids) and 11,432 bbl of oil base drilling fluid (liquid) would be generated during drilling. If synthetic and oil based muds are used, this would generate 485 roll-off truckloads of cuttings and 121 vacuum truckloads of liquids annually over the projected 28-month drilling period. The 121 truckloads of used drilling muds would be transported back to the manufacturer for recycling. The 485 truckloads of cuttings would be transported to one or more of the following disposal sites: (1) Terrain Technology, McKittrick, CA; (2) Safety Kleen, Button Willow, CA; or (3) Chemical Waste Management, Kern County, CA.

Truck traffic in Ventura County for the drilling project would originate in Port Hueneme. Trucks would exit the port at Hueneme Rd., heading east for several miles. They would turn left at Las Posas Rd. and enter the ramp of southbound Highway 101. The trucks would then take Highway 101 south to Los Angeles County. The project would involve 14 truck trips per workweek, or approximately 3 truck trips per weekday. Table 2.13 provides an analysis of truck traffic impacts for this project.

The project would result in traffic increases of 0.2 percent, 0.2 percent, 0.01 percent, and 0.01 percent at Hueneme Rd., Las Posas Rd., Highway 101 at Las Posas Rd., and Highway 101 at Kanan Rd, respectively. These small increases would not affect the LOS of any of these roadways.

Additionally, these impacts would not be significant due to their temporary nature. There would be no additional need for private or public road maintenance, or need for new roads. There would be no increase in traffic hazards to motor vehicles, bicyclists, or pedestrians, or additional impacts to sight distance, ingress/egress, or emergency access. These impacts would be consistent with those analyzed in the 1984 EIR/EIS (ADL, 1984a), the 1988 SEIR, the 1999 Reconfiguration and Tri-Party Modification EIR Addenda, and the 2001 Gas Disposition EIR Addendum.

There would be approximately 20 round trips for the supply boat necessary to transport drilling muds, the drilling rig, personnel, and supplies to the offshore platforms. This level of boat traffic related to the revised offshore project would be the same or less than previously analyzed in the 1984 EIR/EIS (ADL, 1984a), the 1988 SEIR, the 1999 Reconfiguration and Tri-Party Modification EIR Addenda, and the 2001 Gas Disposition EIR Addendum for the Point Arguello Project and approved as part of Final Development Plan 85-FDP-032 and the Reconfiguration I Project permit (85-FDP-032 (AM01)).

Accidents/Upsets: An oil spill accident or hydrogen sulfide (H_2S) release is not expected to cause a significant impact to transportation/circulation. The impacts to vessel and onshore traffic would be consistent with those analyzed in the 1984 EIR/EIS (ADL, 1984a), the 1988 SEIR, the 1999 Reconfiguration and Tri-Party Modification EIR Addenda, and the 2001 Gas Disposition EIR Addendum for the Point Arguello Project.

Conclusion: Impacts to transportation/circulation resulting from routine operations and accidental oil spills associated with the proposed project are expected to be insignificant.

Cumulative Analysis: Section 1.4 describes the projects considered in the cumulative analysis for the proposed project. The only oil- and gas-related cumulative impact that overlaps impacts to transportation/circulation is from ongoing oil and gas operations. Based on the negligible increase in vessel and onshore traffic resulting from the proposed project, no significant cumulative impacts to traffic are expected.

Overall Conclusions: No significant impacts to transportation are expected from the proposed project. Potential cumulative impacts to transportation/circulation are also expected to be insignificant. No additional transportation/circulation impacts have been identified beyond those previously analyzed in the 1984 EIR/EIS (ADL, 1984a), the 1988 SEIR, the 1999 Reconfiguration and Tri-Party Modification EIR Addenda, and the 2001 Gas Disposition EIR Addendum.

2.6.4 Environmental Justice

Affected Environment

On February 11, 1994, President Clinton issued an executive order to address questions of equity in the environmental and health conditions of impoverished communities. The most effective way of assuring that environmental endangerment is not concentrated in minority or low-income neighborhoods is to locate and identify them from the outset of a proposed project. The proposed project is located offshore the transition zone between "North" and "South" Santa Barbara County.

Impact Discussion

Routine Operations: The proposed project does not anticipate construction of new onshore or offshore facilities and therefore does not adversely affect minority and low-income neighborhoods.

Accidents/Upsets: Oil spills are the primary source of accidental impacts from the proposed project. As discussed in Section 2.2, it was estimated that there is a 15- to 17.5-percent chance that one or more oil spills in the 50- to 999-bbl range would occur over the life of the proposed project, and that such a spill would likely be less than 200 bbl in volume. It is unlikely that a 200-bbl oil spill off Point Arguello would have a measurable effect on minority and low-income neighborhoods.

The risk of a H_2S release at the Point Arguello offshore facilities would not change as a result of the proposed development. The operations at the Point Arguello platforms do not pose a significant H_2S release risk as defined by the County of Santa Barbara's Significance Criteria Guidelines used for preparing CEQA documents. Therefore, no adverse effects are expected to ethnic populations from accidental upsets.

Conclusion: Impacts to minority and low-income neighborhoods resulting from routine operations and accidental upsets associated with the proposed project are expected to be insignificant.

Cumulative Analysis: Offshore oil and gas facilities in State and Federal waters and tankering are the two main sources of the cumulative oil spill risk in this area. Oil spill response capabilities (Section 2.2.3) and recently implemented or proposed mitigation (such as rerouting tankers farther offshore) temper the risk. The potential for an oil spill occurring from the proposed project represents an insignificant incremental increase to the overall cumulative oil spill risk in the Santa Barbara Channel and Santa Maria Basin and would not be expected to adversely affect minority and low-income neighborhoods.

Overall Conclusions: No significant effects are expected of the proposed project to minority and low-income neighborhoods, as the proposed project does not anticipate construction of new onshore or offshore facilities. Potential impacts from offshore accidents and upsets resulting from the proposed project are considered negligible. Potential cumulative impacts to minority and low-income neighborhoods are also expected to be insignificant.

3.0 Alternatives to the Proposed Action

The only alternative to the proposed action that is assessed in this EA is the "No Action" alternative. Three other alternatives were considered but not carried forward in the analysis.

The first alternative involved using extended reach drilling technology to develop the eastern half of Lease OCS-P 0451 from an onshore drilling/production site located near Point Arguello on Vandenberg AFB. This alternative was determined to be technically feasible, but economically impractical due to the drilling distances involved [10-13 km (6-8 mi)] and high drilling costs that would be incurred, relative to drilling from the existing Point Arguello platforms. This alternative would also require the construction and operation of a new drilling and production facility and associated infrastructure, including new pipelines and service roads. The construction activities would result in significant impacts to terrestrial biology, air and water quality, and other onshore resources. The onshore drilling sites would also be located near existing launch facilities located on Vandenberg AFB. Drilling operations would be prohibited or significantly restricted during launch windows. The siting of drilling operations in this area also would pose increased hazards to drilling personnel from missile and target debris. For all of these reasons, this drilling and production alternative was dismissed.

The second alternative considered was the construction of a new platform on the eastern half of Lease OCS-P 0451. This alternative would result in significant impacts to marine biology and water quality, air quality, aesthetics, and commercial and recreational fishing. This alternative was dismissed because it did not offer environmental advantages over the proposed action.

The third alternative considered involved development of the eastern half of Lease OCS-P 0451 from a drill ship by installing subsea completions that would be connected to one or more of the existing Point Arguello platforms by subsea flow lines. This alternative would have environmental impacts similar to the construction of a new platform, except the aesthetic/visual resource impact would only occur during drilling and servicing operations. The mobile offshore drilling units would have to be present to service the wells throughout the life of the project. Currently, there are no mobile offshore drilling units stationed on the West Coast. The stationing of a drilling unit on the West Coast is considered to be economically infeasible given the current level of offshore development occurring in the region. For all of these reasons, this drilling and production alternative was dismissed.

3.1 No Action Alternative

Under the No Action alternative, the proposed action would not be approved and would not be conducted. Adoption of this alternative would avoid all the potential impacts identified for the proposed action in this EA. The purpose and need for the proposed action would not be achieved.

4.0 Consultation and Coordination

4.1 Distribution of Information to the Public

MMS distributed a copy of Arguello Inc.'s DPP Revisions (Arguello Inc., 2003a) and Supporting Information Volume (Arguello Inc., 2003b) to the agencies and organizations listed below on April 17, 2003 (Appendix A). Agencies were requested to provide their comments to MMS by May 21, 2003. The documents were sent to 5 State agencies: California Secretary of Resources, California Coastal Commission, California State Lands Commission, California Division of Oil, Gas, and Geothermal Resources, California Dept. of Fish and Game, (Marine Region; Office of Oil Spill Prevention and Response); 8 Federal agencies: U.S. Environmental Protection Agency, U.S. Coast Guard, Channel Islands National Marine Sanctuary, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Channel Islands National Park, Vandenberg Air Force Base, NOAA Fisheries; 2 local agencies: Santa Barbara County Energy Division and Santa Barbara County Air Pollution Control District (SBCAPCD); and 2 organizations, the Joint Oil/Fisheries Liaison Office and the Environmental Defense Center.

4.2 Communications

Preparers of this EA contacted each agency and organization listed above to determine whether they received the project information and whether or not they would provide MMS with comments. As of May 22, 2003, MMS received written or email comments from the California Coastal Commission, U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, and SBCAPCD. A copy of the comments may be found in Appendix B. Additionally, oral comments were received from several agencies. All comments received have been incorporated, where appropriate, into the text of this EA. Details on communications pertaining to the Endangered Species Act and Essential Fish Habitat are provided below.

Endangered Species Act Communications

On May 1, 2003, MMS staff conducted a telephone conversation with Melissa Neuman, White Abalone Recovery Coordinator for NOAA Fisheries Southwest Regional Office in Long Beach, on potential impacts from the proposed action on the white abalone (*Haliotis sorenseni*), which was recently listed as endangered. Ms. Neuman concurred with MMS's conclusion that the proposed action would be unlikely to negatively affect former or current white abalone habitat. She further recommended that MMS and NOAA Fisheries maintain communication to ensure that there would be minimal interaction between the proposed project and any future outplanting efforts for white abalone in the project area.

Subsequently, on May 14, 2003, MMS sent letters concerning all threatened and endangered species in the project area to NOAA Fisheries Southwest Regional Office in Long Beach and the U.S. Fish and Wildlife Service in Ventura (Appendix B). The letters informed the agencies of MMS's conclusion that the consultations conducted with them under Section 7(a)(2) of the Endangered Species Act (NMFS, 2000; FWS, 2001) on oil and gas activities proposed for the eastern half of Lease OCS-P 0451 as part of the previously proposed Rocky Point Unit (RPU) development project remained valid.

In compliance with the terms and conditions imposed by the Fish and Wildlife Service's biological opinion for the proposed RPU project (FWS, 2001), MMS will 1) provide the Fish and Wildlife Service with an annual report on corrosion deficiencies during each year the project is in operation, 2) require Arguello Inc. to revise their oil spill response plan (OSRP), and 3) ensure that the Ventura Fish and Wildlife Service office is notified when spills of 50 bbl or greater occur in the area. To comply with the second condition, Arguello Inc. sent MMS a letter (Appendix B)

stating that they will revise the Point Arguello Unit OSRP to a) include a description of measures to be taken by platform personnel if oiled wildlife is encountered, and b) provide annual wildlife training for platform operators by a qualified biologist that will include up-to-date information on Federally listed species. The Fish and Wildlife Service has concurred with this approach to compliance (Katherine Drexhage, FWS, pers. comm., June 9, 2003).

Essential Fish Habitat Communications

On May 15, 2003, MMS sent NOAA Fisheries a second letter stating its conclusion that the consultation conducted with them on essential fish habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act on oil and gas activities proposed for the eastern half of Lease OCS-P 0451 as part of the proposed RPU development project also remained valid (Appendix B).

4.3 Determination of the Scope of Analysis

Based on a review of the proposed action by the MMS interdisciplinary team and the consultation and coordination described above, we have determined that the following resources potentially could be impacted: air quality, water quality, marine mammals, marine and coastal birds, intertidal resources, benthic resources, fish resources, wetlands resources, refuges, preserves, and marine sanctuaries, the California Coastal National Monument, commercial fishing, recreation and tourism, transportation/circulation, and environmental justice. An analysis of the potential environmental impacts on all of these resources is in Chapter 2.

Development of the eastern half of Lease OCS-P 0451 would occur within the environmental time-frame and footprint of the existing Point Arguello Unit facilities as actually foreseen and evaluated in the Point Arguello/Southern Santa Maria Basin Area Study EIS/EIR (ADL, 1984a). The total number of wells drilled for the Point Arguello Unit and the eastern half of Lease OCS-P 0451 will be significantly less (about half) than the number of wells originally anticipated and approved for the Point Arguello Unit alone. In addition, drilling and production from the eastern half of Lease OCS-P 0451 will be completed within the remaining productive life of the Point Arguello Unit.

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6.0 Literature Cited

Ainley, D.G., D.W. Anderson, and P.R. Kelly. 1981. Feeding ecology of marine cormorants in southwestern North America. Condor 83:120-131.

Ambrose, R. 1995. Coastal Wetland Resources of the Santa Barbara County Mainland. Prepared for the County of Santa Barbara.

Ambrose, R, P. Raimondi, J. Engle, and J. Altstatt. 1994. Shoreline Inventory of Rocky Intertidal resources in Santa Barbara County. MMS OCS Study

American Petroleum Institute (API). 1987. Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms. API Recommended Practice 2A, 17th Edition.

Anderson, C.M., and R.P. LaBelle. 1994. Comparative occurrence rates for offshore oil spills. Spill Science & Technology Bulletin 1(2):131-141.

Anderson, C.M., and R.P. LaBelle. 2000. Update of comparative occurrence rates for offshore oil spills. Spill Science & Technology Bulletin 6(5/6):303-321.

Anderson, J.W., D.J. Reish, R.B. Spies, M.E. Brady, and E.W. Segelhorst. 1993. Human Impacts. Pp. 682-766 *in*: M.D. Dailey, D.J. Reish, and J.W. Anderson (eds.), Ecology of the Southern California Bight: A Synthesis and Interpretation. University of California Press.

Angliss, R.P., D.P. DeMaster, and A. Lopez. 2001. Alaska marine mammal stock assessments, 2001. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-124. 203 pp.

Arguello Inc. 2001b. Revisions to the Point Arguello Field Development and Production Plans to Include the Rocky Point Unit Development, Supporting Information Volume. Submitted to: Minerals Management Service, Pacific OCS Region by Arguello Inc., April 24, 2001.

Arguello Inc. 2002. Oil Spill Response Plan for Nearshore and Onshore Pipelines and Onshore Facilities (Vol. 1), and MMS Supplement for OCS Platforms Harvest, Hermosa, and Hidalgo and Pipelines (Vol. 2).

Arguello Inc. 2003a. Revisions to the Point Arguello Field Development and Production Plans to Include Development of the Eastern Half of OCS-P 0451. Submitted to the Minerals Management Service, Pacific OCS Region, Camarillo, CA, by Arguello Inc., Gaviota, CA. February 12, 2003. 23 pp.

Arguello Inc. 2003b. Supporting Information Volume. Revisions to the Point Arguello Field Development and Production Plans to Include Development of the Eastern Half of OCS-P 0451. Submitted to the Minerals Management Service, Pacific OCS Region, Camarillo, CA, by Arguello Inc., Gaviota, CA. February 12, 2003. 125 pp. plus attachments.

Arthur D. Little (ADL). 1984a. Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS. Prepared for the County of Santa Barbara, Minerals Management Service, California State Lands Commission, California Coastal Commission, and California Secretary of Environmental Affairs. Prepared by Arthur D. Little, Santa Barbara, CA.

Arthur D. Little (ADL). 1984b. Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS. Technical Appendix H – H. Marine Water Resources. Prepared for: County of Santa Barbara, U.S. Minerals Management Service, California State Lands Commission, California Coastal Commission, California Secretary of Environmental Affairs.

Arthur D. Little (ADL). 1984c. Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS. Final Report. Technical Appendix I – Marine Biology. Prepared for: County of Santa Barbara, U.S. Minerals Management Service, California State Lands Commission, California Coastal Commission, California Secretary of Environmental Affairs.

Arthur D. Little (ADL). 1984d. Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS. Final Report. Technical Appendix J –Terrestrial Biology. Prepared for: County of Santa Barbara, U.S. Minerals Management Service, California State Lands Commission, California Coastal Commission, California Secretary of Environmental Affairs.

Arthur D. Little (ADL). 1984e. Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS. Final Report. Technical Appendix N –Other Uses. Prepared for: County of Santa Barbara, U.S. Minerals Management Service, California State Lands Commission, California Coastal Commission, California Secretary of Environmental Affairs.

Arthur D. Little (ADL). 1996. Molino Gas Project. Public Draft. SBC No. 95-EIR-002.

Arthur D. Little (ADL). 1997. Risk assessment for the Chevron Point Arguello Field Gas Injection Feasibility Study. Prepared by Arthur D. Little, Inc. Santa Barbara Ca. 1997.

Arthur D. Little (ADL). 1998. Environmental Impact Assessment for offshore gas injection, oil stabilization and water disposal projects/preservation of Gaviota oil and gas processing facilities, Point Arguello Field project. Prepared by Arthur D. Little, Inc. Santa Barbara CA. April 1998.

Aspen Environmental Group. 1992. Draft Supplemental Environmental Impact Report/Statement. GTC Gaviota Marine Terminal Project. SBC No. 92-EIR-04

Baird, P.H. 1993. Birds. Pp. 541-603 *in*: M.D. Dailey, D.J. Reish, and J.W. Anderson (eds.), Ecology of the Southern California Bight: A Synthesis and Interpretation. Berkeley, CA: University of California Press.

Baker, C.S., and L.M. Herman. 1989. Behavioral responses of summering humpback whales to vessel traffic: Experimental and opportunistic observations. NPS-NR-TRS-89-01. Rep. from Kewalo Basin Mar. Mamm. Lab., Univ. Hawaii, Honolulu, for Natl. Park Serv., Anchorage, AK. 50 pp. NTIS PB90-198409.

Ballachey, B.E., J.L. Bodkin, and A.R. DeGange. 1994. An overview of sea otter studies. Pp. 47-59, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Barabash-Nikiforov, I.I. 1947. The sea otter (*Enhydra lutris* L.)—Biology and economic problems of breeding. Council of Ministers of the RSFSR, Main Administration of Reserves. Published for NSF, Washington, D.C., by Israel Program for Scientific Translations, Jerusalem. 174 pp.

Barlow, J. 1995. The abundance of cetaceans in California waters. Part I: Ship surveys in summer and fall of 1991. Fishery Bulletin 93:1-14.

Barlow, J., and G.A. Cameron. 1999. Field experiments show that acoustic pingers reduce marine mammal bycatch in the California drift gillnet fishery. Report SC/51/SM2 to the Scientific Committee of the International Whaling Commission, May 1999. 20 pp.

Barlow, J., and T. Gerrodette. 1996. Abundance of cetaceans in California waters based on 1991 and 1993 ship surveys. NOAA Tech. Mem. NOAA-TM-NMFS-SWFSC-233.

Barlow, J., K.A. Forney, P.S. Hill, R.L. Brownell, Jr., J.V. Carretta, D.P. DeMaster, F. Julian, M.S. Lowry, T. Ragen, and R.R. Reeves. 1997. U.S. Pacific Marine Mammal Stock Assessments: 1996. NOAA Technical Memorandum NMFS-SWFSC-248.

Barlow, J., R.L. Brownell, Jr., D.P. DeMaster, K.A. Forney, M.S. Lowry, S. Osmek, T.J. Ragen, R.R. Reeves, and R.J. Small. 1995. U.S. Pacific Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWFSC-219. 162 pp.

Battelle, 1991. California OCS Phase II Monitoring Program. Final Report. Report submitted to the U.S. Department of the Interior, Minerals Management Service under contract No. 14-12-0001-30262. MMS OCS Study 91-0083.

Bauer, G.B., and L.M. Herman. 1986. Effects of vessel traffic on the behavior of humpback whales in Hawaii. Rep. from Kewalo Basin Mar. Mamm. Lab., Univ. Hawaii, Honolulu, for Natl. Mar. Fish. Serv., Honolulu, HI. 151 pp.

Behnke, R.J. 1992. Native trout of western North America. Am. Fish. Soc. Monog. 6. American Fisheries Society, Bethesda, MD. 276 pp.

Benech Biological Associates. 1986a. Biological Survey of Bluebottle Prospect.

Benech Biological Associates. 1986b. Biological Survey of Texaco's Tamaro-Ciscero Prospect.

Blake, J.A. 1993. Benthic Soft-Substrate Community Ecology of the Santa Maria Basin and Western Santa Barbara Channel. Submitted with the Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel. Vol. 1, Chap. 3.

Blake, J.A, and A.L. Lissner. 1993. Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel. 14 Volumes. Submitted to the U.S. Department of the Interior, Minerals Management Service under Contract No. 14-35-0001-30484.

Bonnell, M.L., and M.D. Dailey. 1993. Marine mammals. Pp. 604-681 *in*: M.D. Dailey, D.J. Reish, and J.W. Anderson (eds.), Ecology of the Southern California Bight: A Synthesis and Interpretation. Berkeley, CA: University of California Press.

Bonnell, M.L., and R.G. Ford. 2001. Marine mammal and seabird computer database analysis system (CDAS). Prepared by Ecological Consulting, Inc., Portland, OR, for the Pacific OCS Region, Minerals Management Service. Contract No. 1435-01-97-PO-14206.

Bonnell, M.L., B.J. Le Boeuf, M.O. Pierson, D.H. Dettman, G.D. Farrens, and C.B. Heath. 1981. Pinnipeds of the Southern California Bight. Summary Report, 1975-1978, Part I, *In*: Vol. III, Principal Investigator's reports, marine mammal and seabird survey of the Southern California Bight area. NTIS No. PB 81-248-71. 535 pp.

Bonnell, M.L., M.O. Pierson, and G.D. Farrens. 1983. Pinnipeds and sea otters of central and northern California, 1980-1983: status, abundance, and distribution. Final Report to U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region under Contract 14-12-0001-29090. OCS Study MMS 84-0044. 220 pp.

Bornholdt, M.A., and E.M. Lear (comp.). 1995. Outer Continental Shelf Natural Gas and Oil Program: Cumulative Effects 1987-1991. U.S. Department of the Interior, Minerals Management Service, Herndon, VA. OCS Report MMS 95-0007.

Bornholdt, M.A., and E.M. Lear (comp.). 1997. Outer Continental Shelf Oil and Natural Gas Program: Cumulative Effects 1992-1994. U.S. Department of the Interior, Minerals Management Service, Herndon, VA. OCS Report MMS 97-0027.

Brandsma, P.E. 2003. Near-field produced water plumes, Arguello Inc. Platforms Harvest, Hermosa, and Hidalgo. Report to MRS, Ventura, CA.

Briggs, K.T., E.W. Chu, D.B. Lewis, W.B. Tyler, R.L. Pitman, and G.L. Hunt, Jr. 1981. Distribution, numbers, and seasonal status of seabirds of the Southern California Bight. Pp. 1-399, Book I, Part III. Investigators' reports, summary of marine mammal and seabird surveys of the Southern California Bight area, 1975-1978. Publ. #PB-81-248-205, U.S. National Tech. Info Serv., Springfield, VA.

Briggs, K.T., W.B. Tyler, D.B. Lewis, and D.R. Carlson. 1987. Bird communities at sea off California, 1975-1983. Cooper Ornithological Society, Studies in Avian Biology No. 11. 74 pp.

Brody, A.J., K. Ralls, and D.B. Siniff. 1996. Potential impact of oil spills on California sea otters: Implications of the *Exxon Valdez* spill in Alaska. Marine Mammal Science 12(1):38-53.

Bureau of Land Management (BLM). 1980. Final Environmental Impact Statement for Proposed 1981 Outer Continental Shelf Oil and Gas Lease Sale Offshore Central and Northern California, OCS Lease Sale No. 53. Bureau of Land Management, Pacific OCS Region, Los Angeles, CA.

Bureau of Land Management (BLM). 1981. Final Environmental Impact Statement for Proposed 1982 Outer Continental Shelf Oil and Gas Lease Sale Offshore Southern California, OCS Lease Sale No. 68. Bureau of Land Management, Pacific OCS Region, Los Angeles, CA.

Bureau of Land Management (BLM). 2002. California Coastal National Monument. http://www.ca.blm.gov/pa/coastal_monument.

Burgner, R.L., J.T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout (*Oncorhynchus mykiss*) in offshore waters of the North Pacific Ocean. Int. North Pac. Fish. Comm. Bull. 51. 92 pp.

Calambokidis, J. 1995. Blue whales off California. Whalewatcher 29(1):3-7.

Calambokidis, J., G.H. Steiger, J.C. Cubbage, K.C. Balcomb, C. Ewald, S. Kruse, R. Wells, and R. Sears. 1990. Sightings and movements of blue whales off central California 1986-88 from photo-identification of individuals. Rep. Int. Whal. Commn. Spec. Issue 12:343-348.

Calambokidis, J., G.H. Steiger, J.R. Evenson, K.R. Flynn, K.C. Balcomb, D.E. Claridge, P. Bloedel, J.M. Straley, C.S. Baker, O. von Ziegesar, M.E. Dahlheim, J.M. Waite, J.D. Darling, G. Ellis, and G.A. Green. 1996. Interchange and isolation of humpback whales off California and other North Pacific feeding grounds. Marine Mammal Science 12(2):215-226.

Calambokidis, J., G.H. Steiger, J.M. Straley, L.M. Herman, S. Cerchio, D.R. Salden, J. Urbán-Ramirez, J.K. Jacobsen, O. von Ziegesar, K.C. Balcomb, C.M. Gabriele, M.E. Dahlheim, S. Uchida, G. Ellis, Y. Miyamura, P.L. de Guevara P., M. Yamaguchi, F. Sato, S.A. Mizroch, L. Schlender, K. Rasmussen, J. Barlow, and T.J. Quinn, II. 2001. Movements and population structure of humpback whales in the North Pacific. Marine Mammal Science 17(4):769-794.

California Air Resources Board (CARB). 2000. California Air Resources Board, Off-Road Mobile Source Emission Reduction Program – Marine Vessels. http://www.arb.ca.gov/msprog/offroad/marinevess/marinevess.htm

California Coastal Commission. 1991. California Coastal Access Guide. 4th edition. California Coastal Commission. Published by the University of California Press.

California Department of Fish and Game (CDFG). 2003. Office of Spill Prevention and Response, Natural Resource Damage Assessment and Restoration, Torch/Platform Irene Oil Spill. http://www.dfg.ca.gov/Ospr/NRDAirene.htm.

Calkins, D.G., E. Becker, T.R. Spraker, and T.R. Loughlin. 1994. Impacts on Steller sea lions. Pp. 119-139, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Cameron, G.A., and K.A. Forney. 2000. Preliminary estimates of cetacean mortality in California/Oregon gillnet fisheries for 1999. Paper SC/52/024 presented to the International Whaling Commission, 2000 (unpublished). 12 pp. Available from NMFS, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038.

Carter, H.R., G.J. McChesney, D.L. Jaques, C.S. Strong, M.W. Parker, J.E. Takekawa, D.L. Jory, and D.L. Whitworth. 1992. Breeding populations of seabirds in California, 1989-1991. U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Dixon, California, and San Francisco Bay National Wildlife Refuge Complex, Newark, California. Draft final report to Minerals Management Service, Pacific OCS Region, under Inter-agency Agreement No. 14-12-001-30456. Volumes I and II.

Chambers Group, Inc. 1987a. Final Supplemental Environmental Impact Report for the Exxon Santa Ynez Unit Offshore Oil Development Proposal. Prepared for: California State Lands Commission.

Chambers Group, Inc. 1987b. Finalizing Addendum. Final Supplemental Environmental Impact Report of the Exxon Santa Ynez Unit Offshore Oil Development Proposal. Prepared for: California State Lands Commission.

Chambers Group, Inc. 1991. Santa Barbara County shoreline inventory. Prepared for the County of Santa Barbara, California.

Chelton, D.B., R.L. Bernstein, A. Bratkovich, and P.M. Kosro. 1988. Poleward flow off central California during the spring and summer of 1981 and 1984. J. Geophys. Res. 93(C9):10605.

Chevron U.S.A. Production Company (Chevron). 1998. Hydrogen sulfide and sulfur dioxide contingency plan, Platforms Hermosa, Harvest, and Hidalgo. Chevron USA Production Company, June 1998.

Clark, R.B. 1984. Impact of oil pollution on seabirds. Environ. Pollut. Series A.33:1-22.

Clean Seas. 1999. Clean Seas Resource Manual. Prepared for Clean Seas, Carpinteria, CA, by ENSR Consulting and Engineering, Camarillo, CA. ENSR Document No. 1688-001-830, March 1994. Revised November 5, 1999.

Coats, D.A. 1994. Deposition of drilling particulates off Point Conception, CA. Mar. Env. Rev. 37:95-127.

Coats, D.A., M.A. Savoie and D.D. Hardin. 1991. Poleward flow on the Point Conception continental shelf and its relation to the distribution of oil drilling particulates and biological impacts. EOS Trans. SGU 72(44):254.

Dahlheim, M.E., H.D. Fisher, and J.D. Schempp. 1984. Sound production by the gray whale and ambient noise levels in Laguna San Ignacio, Baja California Sur, Mexico. Pp. 511-541 *in*: M.L. Jones, S.L. Swartz, and S. Leatherwood (eds.), The gray whale *Eschrichtius robustus*. Academic Press, Orlando, FL.

Dailey, M.D., D. Reish, and J. Anderson (eds.). 1996. Ecology of the Southern California Bight: A synthesis and interpretation. University of California Press, Berkeley and Los Angeles, CA. 926 pp.

Dames and Moore. 1982. Environmental Report (Production) Santa Ynez Unit Development. Exxon Company U.S.A.

Dames and Moore. 1982. Site-Specific Marine Biological Survey of Chevron Exploration Leases OCS-P 0446, 0447, 0450, 0451, 0452. Prepared for Chevron U.S.A., Inc.

Dames and Moore. 1983. Site Specific Marine Biological Survey of Chevron's Platform Hermosa and pipelines. Prepared for Chevron U.S.A., Inc.

Dames and Moore. 1984. Site Specific Marine Biological Survey of Project Shamrock, OCS-P 0440. Prepared for Exxon U.S.A.

Davis, R.W. 1990. Advances in rehabilitating oiled sea otters: the Valdez experience. *In* symposium, "The Effects of Oil on Wildlife," 13th Annual Conference of the International Wildlife Rehabilitation Council, Herndon, Virginia, October 17-18, 1990.

DeLong, R.L., and S.R. Melin. 2000. Thirty Years of Pinniped Research at San Miguel Island. Pp. 401-406 *in*: D.R. Browne, K.L. Mitchell, and H.W. Chaney (eds.), Proceedings of the Fifth California Islands Symposium, 29 March–1 April 1999, Santa Barbara Museum of Natural History, Santa Barbara, CA. Sponsored by the U.S. Minerals Management Service, Pacific OCS Region, Camarillo, CA. OCS Study No. 99-0038.

DeLong, R.L., B.S. Stewart, and R.D. Hill. 1992. Documenting migrations of northern elephant seals using day length. Marine Mammal Science 8(2):155-159.

Diener, D.R., and A.L. Lissner. 1995. Long-term variability of hard-bottom epifaunal communities: Effects from offshore oil and gas production and development. *In*: SAIC and MEC, Monitoring Assessment of Long-Term Changes in Biological Communities in the Santa Maria Basis: Phase III, Final Report. Report submitted to the U.S. Department of the Interior, Minerals Management Service/National Biological Service, under contract No. 14-35-0001-30584. MMS OCS Study 95-0049.

Dohl, T.P., K.S. Norris, R.C. Guess, J.D. Bryant, and M.W. Honig. 1981. Cetacea of the Southern California Bight. Part II of Investigators' reports: Summary of marine mammal and seabird surveys of the Southern California Bight Area, 1975-1978. Prepared for U.S. Department of the Interior, Bureau of Land Management, Pacific OCS Region. NTIS #PB 81-248-189. 414 pp.

Dohl, T.P., R.C. Guess, M.L. Duman, and R.C. Helm. 1983. Cetaceans of central and northern California, 1980-1983: Status, abundance, and distribution. Prepared for U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region. OCS Study MMS 84-0045. 284 pp.

Dugan, J.E., D.M. Hubbard, D.L. Martin, J.M. Engle, D.M. Richards, G.E. Davis, K.D. Lafferty, and R.F. Ambrose. 2000. Macrofaunal Communities of exposed Sandy Beaches on the southern California mainland and Channel Islands. Pp. 339-346 *in*: D.R. Browne, K.L. Mitchell, and H.W. Chaney (eds.), Proceedings of the Fifth California Islands Symposium, 29 March-1 April 1999, Santa Barbara Museum of Natural History, Santa Barbara, CA. Sponsored by the U.S. Minerals Management Service, Pacific OCS Region, 770 Paseo Camarillo, Camarillo, CA 93010. OCS Study No. 99-0038.

Dugan, J.E., D.M. Hubbard, and A.M. Wenner. 1998a. A catalog of the sandy beaches of San Luis Obispo and Santa Barbara Counties. Report to Minerals Management Service, Pacific OCS Region, Camarillo, CA. Contract # 1435-02-97-PO-26589.

Dugan, J.E., D.M. Hubbard, and A.M. Wenner. 1998b. A physical characterization of the sandy beaches of San Luis Obispo and Santa Barbara Counties. Report to Minerals Management Service, Pacific OCS Region, Camarillo, CA. Contract # 1435-02-97-PO-26589.

Ecomar. 1982. Biological Survey of Mega-Faunal Species. OCS-P 0404, 0405, 0410, 0411. Prepared for Exxon U.S.A.

Engineering Sciences. 1984. Site Specific Marine Biological survey for Chevron's proposed Platform Hidalgo and Pipelines. Prepared for Chevron U.S.A. Production Company, Ventura, CA.

Environmental Protection Agency (EPA). 2000. United States. Environmental Protection Agency. Office of Water. National Health Protection Survey of Beaches Website http://yosemite.epa.gov/water/beach2000.nsf. Ocean Beach, Lompoc, California and Jalama Beach, Lompoc, California.

Erasmus, T., R.M. Randall, and B.M. Randall. 1981. Oil pollution, insulation and body temperatures in the jackass penguin *Spheniscus demerus*. Compendium of Biochemical Physiology 69:169-171.

Estes, J.A., and R.J. Jameson. 1988. A double-survey estimate for sighting probability of sea otters in California. Journal of Wildlife Management 52(1):70-76.

Ferraro, R.C., D.P. DeMaster, P.S. Hill, M.M. Muto and A.L. Lopez. 2000. Draft Alaska marine mammal stock assessments 2000. U.S. Department of Commerce, NOAA Technical Memorandum NOAA-AFSC-119. 195 pp.

Fish and Wildlife Service (FWS). 2001. Biological Opinion on Proposed Oil and Gas Development Activities in the Rocky Point Unit, Point Conception and Point Arguello, California (7300) (1-8-00-F-76). Memorandum to Regional Director, Pacific OCS Region, Minerals Management Service, Camarillo, CA, from Field Supervisor, Ventura Fish and Wildlife Office, Ventura, CA, December 21, 2001. 30 pp.

Fish and Wildlife Service (FWS). 2003. Final Revised Recovery Plan for the Southern Sea Otter (*Enhydra lutris nereis*). Portland, Oregon. xi + 165 pp.

Ford, R.G. 1985. Oil slick sizes and length of coastline affected: A literature survey and statistical analysis. Final report prepared by Ecological Consulting for U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Los Angeles, CA. Contract No. 14-12-0001-30224. MMS OCS Study 85-0105. 34 pp.

Ford, R.G. 2000. Analysis of the Risk of Oil Spills from the Rocky Point Development to the Southern Sea Otter. Prepared for U.S. Dept. of Interior, Minerals Management Service, Pacific OCS Region, Camarillo, CA. R.G. Ford Consulting, Inc., Portland, OR. 3 pp.

Ford, R.G., and M.L. Bonnell. 1995. Potential impacts of oil spills on the southern sea otter population. Final Report to U.S. Fish and Wildlife Service prepared by Ecological Consulting, Inc., Portland, OR. 42 pp.

Forney, K.A., J. Barlow, M.M. Muto, M. Lowry, J. Baker, G. Cameron, J. Mobley, C. Stinchcomb, and J.V. Carretta. 2000. U.S. Pacific marine mammal stock assessments: 2000. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-300. 276 pp.

Forney, K.A., S.R. Benson, and G.A. Cameron. 2001. Central California gillnet effort and bycatch of sensitive species, 1990-98. *In*: E.F. Melvin and J.K. Parrish (eds.), Seabird bycatch: Trends, roadblocks, and solutions. Univ. Alaska Sea Grant, Fairbanks, AK.

Frost, K.J., L.F. Lowry, E.H. Sinclair, J. Ver Hoef, and D.C. McAllister. 1994. Impacts on distribution, abundance, and productivity of harbor seals. Pp. 97-118, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Fusaro, C., D. Gregorio, and M. Bell (eds.). 1986. A manual for geophysical operations in fishing areas of south/central California. Joint Oil/Fisheries Liaison Office, Santa Barbara, CA. 129 pp.

Gales, R.S. 1982. Effects of noise of offshore oil and gas operations on marine mammals: An introductory assessment. Vols. I and II. Technical Report 844. Prepared for USDOI/MMS. Naval Ocean Systems Center, San Diego, CA.

Garrett, K., and J. Dunn. 1981. Birds of Southern California: Status and distribution. Los Angeles Audubon Society, Los Angeles, CA. 408 pp.

Geraci, J.R. 1990. Physiologic and toxic effects on cetaceans. Pp. 167-197, *in*: J.R. Geraci and D.J. St. Aubin (eds.), Sea mammals and oil: Confronting the risks. Academic Press, San Diego.

Geraci, J.R., and D.J. St. Aubin. 1980. Offshore petroleum resource development and marine mammals: a review and research recommendations. Marine Fisheries Review 42:1-12.

Geraci, J.R., and D.J. St. Aubin (eds.). 1990. Sea mammals and oil: confronting the risks. Academic Press, San Diego. 282 pp.

Geraci, J.R., and T.D. Williams. 1990. Physiological and toxicological effects on sea otters. Pp. 211-221 *in*: J.R. Geraci, and D.J. St. Aubin (eds.), Sea mammals and oil: Confronting the risks. Academic Press, Inc., San Diego.

Gosho, M.E., D.W. Rice, and J.M. Breiwick. 1984. The sperm whale, *Physeter macrocephalus*. In, J.M. Breiwick and H.W. Braham (eds.), The status of endangered whales. Mar. Fish. Rev. 46:54-64.

Hanan, D.A., L.M. Jones, and M.J. Beeson. 1992. Harbor seal, *Phoca vitulina richardsi*, census in California, May-June 1991. Final Report submitted to NOAA Fisheries/National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, California. Administrative Report LJ-92-03. 67 pp.

Hardin, D.D., E. Imamura, D.A. Coats, and J.F. Campbell. 1997. A survey of prominent anchor scars and the level of disturbance to hard-substrate communities in the Point Arguello Region. Prepared for Chevron U.S.A. Production Company, Ventura, CA.

Hardin, D.D., J. Toal, T. Parr, P. Wilde, and K. Dorsey. 1994. Spatial variation in hard-bottom epifauna in the Santa Maria Basin, California: The importance of physical factors. Mar. Env. Res. 37:165-193.

Hartung, R., and G.S. Hunt. 1966. Toxicity of some oils to waterfowl. J. Wildl. Man. 30:564-570.

Harvey, J.T., and M.E. Dahlheim. 1994. Cetaceans in oil. Pp. 257-264, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Hawkes, A.L. 1961. A review of the nature and extent of damage caused by oil pollution at sea. Trans. No. Amer. Wildl. and Nat. Res. Conf. 26:343-355.

Heyning, J.E., and T.D. Lewis. 1990. Fisheries interactions involving baleen whales off southern California. Rep. Intl. Whal. Commn. 40:427-431.

Hickey, B.M. 2000. River discharge plumes in the Santa Barbara Channel. Pp. 71-75 *in*: D.R. Browne, K.L. Mitchell, and H.W. Chaney (eds.), Proceedings of the Fifth California Islands Symposium, 29 March–1 April 1999, Santa Barbara Museum of Natural History, Santa Barbara, CA. Sponsored by the U.S. Minerals Management Service, Pacific OCS Region, Camarillo, CA. OCS Study No. 99-0038.

Holmes, W.N. 1984. Petroleum pollutants in the marine environment and their possible effects on seabirds. Pp. 251-317 *in*: I.E. Hodgson (ed.), Reviews in environmental toxicology. Elsevier Science Publishers, Elsevier, NY.

Hoover-Miller, A.A., K.R. Parker, and J.J. Burns. 2001. A reassessment of the impact of the *Exxon Valdez* oil spill on harbor seals (*Phoca vitulina richardsi*) in Prince William Sound, Alaska. Marine Mammal Science 17(1):111-135.

Horn, M.H., and L. Allen. 1978. A distributional analysis of California coastal marine fishes. Journal of Biogeography 5:23-42.

Hunt, G.L., Jr., R.L. Pitman, M. Naughton, K. Winnett, A Newman, P.R. Kelly, and K.T. Briggs. 1981. Distribution, status, reproductive ecology, and foraging habits of breeding seabirds. Summary of marine mammal and seabird surveys of the Southern California Bight area, 1975-1978. Publ. #PB-81-248-205, U.S. National Tech. Info Serv., Springfield, VA.

Hyland, J., E. Baptiste, J. Kennedy, J. Campbell, R. Kropp, C. Robinson, and S. Williams. 1990a. Chapter 7. Macroinfaunal assemblages in the Santa Maria Basin off the coast of Southern California. *In*: M. Steinhauer and E. Imamura (eds.), California OCS Phase II Monitoring Program, Year-three Annual Report. U.S. Department of the Interior, Minerals Management Service. Contract No. 14-12-0001-30262. OCS Study MMS 90-0055.

Hyland, J., D. Hardin, E. Crecelius, D. Drake, P. Montagna, and M. Steinhauer. 1990b. Monitoring long-term effects of offshore oil and gas development along the Southern California outer continental shelf and slope: Background environmental conditions in the Santa Maria Basin. Oil and Chem. Pollut. 6:195-240.

Johnson, W.R., C.F. Marshall, and E.M. Lear (ed.) 2000. Oil Spill Risk Analysis: Pacific Outer Continental Shelf Program. U.S. Department of Interior, MMS, Environmental Division, Herndon, VA. OCS Report MMS 2000-057. 111 pp. + app.

Jones, M.L., and S.L. Swartz. 1984. Demography and phenology of gray whales and evaluation of whale-watching activities at Laguna San Ignacio, Baja California Sur, Mexico. Pp. 309-374, *in*, M.L. Jones, S.L. Swartz, and S. Leatherwood (eds.), The gray whale, *Eschrichtius robustus*. Academic Press, Inc., Orlando, Florida.

Keane, K. 2000. Draft Report to the California Department of Fish and Game. California least tern breeding survey, 1998 season.

Kenyon, K.W. 1969. The sea otter in the eastern Pacific Ocean. North American Fauna. No. 68. Bureau of Sport Fisheries and Wildlife. Washington, D.C.: U.S. Government Printing Office. 352 pp.

King, J.G., and G.A. Sanger. 1979. Oil vulnerability index for marine oriented birds. *In*: Conservation of marine birds in northern North America, J.C. Bartoneck and D. Nettleship, (eds.). FWS Wildlife Research Report No. 11. 319 pp.

Kinnetic Laboratories, Inc. (KLI). 1992. Study of the rocky intertidal communities of central and northern California, Final report, Volumes I-III. Prepared in association with the University of California, Santa Cruz, Moss Landing Marine Laboratories, and TENERA Corporation for the U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region. Contract No. 14-12-0001-30057. CS Study MMS 91-0089.

Kooyman, G.L., and D.P. Costa. 1979. Effects of oiling on temperature regulation in sea otters. Yearly Progress Report. Outer Continental Shelf Energy Assessment Program.

Kooyman, G.L., R.W. Davis, and M.A. Castellini. 1977. Thermal conductance of immersed pinniped and sea otter pelts before and after oiling with Prudhoe Bay crude. Chapter 14 (pp. 151-157) *in*: D.A. Wolfe (ed.), Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. Pergamon Press, New York.

Koski, W.R., J.W. Lawson, D.H. Thomson, and W.J. Richardson. 1998. Point Mugu Sea Range marine mammal technical report. LGL Limited, environmental research associates, King City, Ontario, Canada, in association with Ogden Environmental and Energy Services, Santa Barbara, CA, for Naval Air Warfare Center, Weapons Division, Point Mugu, CA, and Southwest Division, Naval Facilities Engineering Command, San Diego, CA. 281 pp. + app.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1):35-75.

Le Boeuf, B.J., Y. Naito , A.C. Huntley, and T. Asaga. 1989. Prolonged, continuous, deep diving by northern elephant seals. Canadian Journal of Zoology 67:2514-2519.

Leatherwood, S. 1974. Aerial observations of migrating gray whales, Eschrichtius robustus, off Southern California, 1969-1972. Marine Fisheries Review 36:45-49.

Leatherwood, S., B.S. Stewart, and P.A. Folkins. 1987. Cetaceans of the Channel Islands National Marine Sanctuary. NOAA, Channel Islands National Marine Sanctuary and NMFS. 66 pp.

Lees, D.C., W.B. Driskell, J.P. Houghton, R.H. Gilmour, and A.J. Mearns. 1999. Recovery of Prince William Sound Intertidal Infauna from *Exxon Valdez* Oiling and Shoreline Treatments 1989-1996; Part II – Species Composition. Paper presented at the Legacy of and Oil Spill – 10 years after the Exxon Valdez Conference.

Lehman, P.E. 1994. The birds of Santa Barbara County, California. UCSB Vertebrate Museum, Santa Barbara, California. 338 pp.

Lipscomb, T.P., R.K. Harris, A.H. Rebar, B.E. Ballachey, and R.J. Haebler. 1994. Pathology of sea otters. Pp. 265-279, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Lissner, A.L., G.L. Taghon, D.R Diener, and S.C. Schroeter. 1987. Review of Recovery and Recolonization of Hard Substrate Communities of the Outer Continental Shelf. MMS OCS Study 88-0034.

Littler, M.M. (ed.). 1978. Year II. Intertidal study of the Southern California Bight. Rocky intertidal community studies. Prepared for U.S. Department of the Interior, Bureau of Land Management, Pacific OCS Region, Los Angeles, CA. Science Applications, Inc., La Jolla, CA. Contract No.CT6-40.

Loughlin, T.R. (ed.). 1994a. Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA. 395 pp.

Loughlin, T.R. 1994b. Tissue hydrocarbon levels and the number of cetaceans found dead after the spill. Pp. 359-370, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Loughlin, T.R., B.E. Ballachey, and B.A. Wright. 1996. Overview of studies to determine injury caused by the *Exxon Valdez* oil spill to marine mammals. Pp. 798-808 *in*: S.D. Rice, R.B. Spies, D.A. Wolfe, and B.A. Wright (eds.), Proceedings of the Exxon Valdez oil spill symposium. American Fisheries Society, Symposium 18.

Love, M.S., M. Nishimoto, D. Schroeder, and J. Caselle. 1999. The ecological role of natural reefs and oil and gas production platforms on rocky reef fishes in Southern California: Final interim report. U.S. Department of the Interior, U.S. Geological Survey, Biological Resources Division, USGS/BRD/CR-1999-007. 208pp.

Love, M.S., J. Stephens, Jr., P. Morris, M. Singer, M. Sandhu, and T. Sciarrotta. 1986. Inshore soft substrata fishes in the Southern California Bight: An overview. California Cooperative Oceanic Fisheries Investigations Report 27:84-106.

Love, M.S., W. Westphal, and R. Collins. 1985. Distributional patterns of fishes captured aboard commercial passenger fishing vessels along the northern Channel Islands, California. Fishery Bulletin 83:243-251.

Lowry, L.F., K.J. Frost, and K.W. Pitcher. 1994. Observations of oiling of harbor seals in Prince William Sound. Pp. 209-225, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Malme, C.I., P.R. Miles, C.W. Clark, P. Tyack, and J.E. Bird. 1983. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior. BBN Rep. No. 5366. Rep. from Bolt, Beranek, and Newman, Inc., Cambridge, Massachusetts, for U.S. Minerals Management Service, Anchorage, Alaska. NTIS PB86-174174.

Malme, C.I., P.R. Miles, C.W. Clark, P. Tyack, and J.E. Bird. 1984. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior. Phase II: January 1984 migration. BBN Rep. No. 5586. Rep. from Bolt, Beranek, and Newman, Inc., Cambridge, Massachusetts, for U.S. Minerals Management Service, Anchorage, Alaska. NTIS PB86-218377.

Mate, B.R., B.A. Lagerquist, and J. Calambokidis. 1999. Movements of North Pacific blue whales during the feeding season off Southern California and their southern fall migration. Marine Mammal Science 15(4):1246-1257.

Matkin, C.O., G.M. Ellis, M.E. Dahlheim, and J. Zeh. 1994. Status of killer whales in Prince William Sound, 1985-1992. Pp. 141-162, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Mazzuca, L., S. Atkinson, and E. Nitta. 1998. Deaths and entanglements of humpback whales in the main Hawaiian Islands, 1972-1996. Pacific Science 52(1):1-13.

MBC Applied Environmental Sciences. 1986. Ecology of important fisheries species offshore California. U.S. Department of the Interior, Minerals Management Service. MMS 86-0093.

McArdle, D.A. 1997. California marine protected areas. California Sea Grant College System, La Jolla, CA. 268 pp.

McClelland Engineers. 1984. Site Specific Marine Biological Survey for Unocal's Platform Irene and associated pipelines. Prepared for Unocal.

McClelland Engineers. 1987. Site Specific Marine Biological Survey for Chevron's proposed Platform Hacienda and pipelines. Prepared for Chevron U.S.A. Production Company, Ventura, CA.

McCrary, M.D., and M.O. Pierson. 2002. Shorebird abundance and distribution on beaches of Ventura County, California. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region. OCS Study MMS 2000-010. 73 pp.

Miller, C.D., S.R. Signorini, L.E. Borgman, D.W. Denbo, and C.E. Dorman. 1991. An initial statistical characterization of the variability of coastal winds and currents. Prepared for: U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0091.

Miller, D. J., and R. Lea. 1972. Guide to the coastal marine fishes of California. California Department of Fish and Game Fish Bulletin, No. 157. 249pp.

Minerals Management Service (MMS). 1992. Final Environmental Impact Statement, Proposed comprehensive Outer Continental Shelf natural gas and oil resource management program for 1992-1997. MMS 92-0004.

Minerals Management Service (MMS). 1996a. Final Environmental Impact Statement, Outer Continental Shelf Oil & Gas Leasing Program: 1997-2002. U.S. Department of the Interior, Minerals Management Service, Herndon, VA.

Minerals Management Service (MMS). 1996b. Minerals Management Service, 1996. Santa Barbara County, Two Paths. OCS Study MMS 96-0036. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Camarillo, CA

Minerals Management Service (MMS). 1998. Petroleum Extraction in Santa Barbara County, California: An Industrial History. OCS Study MMS 98-0048. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Camarillo, CA

Minerals Management Service (MMS). 2000a. Biological evaluation of threatened and endangered species: Proposed oil and gas development activities in the Rocky Point Unit off Point Conception, California. Prepared for the National Marine Fisheries Service and U.S. Fish and Wildlife Service in accordance with Section 7(c) of the Endangered Species Act of 1973, as amended. Minerals Management Service, Pacific OCS Region, Camarillo, CA. 115 pp. + app.

Minerals Management Service (MMS). 2000b. Report on the 1999 Minerals Management Service Social and Economic Studies Conference. OCS Study 2000-0016. U.S. Department of the Interior, Minerals Management Service, Environmental Studies Program, Herndon, VA

Minerals Management Service (MMS). 2001. Draft Environmental Impact Statement for Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Camarillo, CA. OCS EIS/EA MMS 2001-046.

Minerals Management Service (MMS). 2002. Final Environmental Impact Statement, Outer Continental Shelf Oil & Gas Leasing Program: 2002-2007. U.S. Department of the Interior, Minerals Management Service, Herndon, VA. OCS EIS/EA MMS 2002-006.

Minerals Management Service (MMS) and Kinnetic Laboratories, Inc. (KLI). 1996. Mussel recovery and species dynamics at four California rocky intertidal sites. 1992 data report. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region. OCS Study MMS 96-0009. 151 pp.

Moser, H.G. (ed.). 1996. California Cooperative Oceanic Fisheries Investigations, Atlas No. 33. The Early Stages of Fishes in the California Current Region. 1505 pp.

Murray, S.N., T. Gibson Denis, J.S. Kido, and J.R. Smith. 1999. Human visitation and the frequency and potential effects of collecting on rocky intertidal populations in southern California marine reserves. CalCOFI Reports 40:100-106.

Murray, S., and M. Littler. 1979. Southern California Baseline Study Intertidal, Year III, Final Report Volume II. Published by Science Applications, Inc.

National Marine Fisheries Service (NMFS). 1998a. Essential Fish Habitat, West Coast Groundfish. http://swr.ucsd.edu/hcd/grndfish.pdf. 45pp.

National Marine Fisheries Service (NMFS) 1998b. Essential Fish Habitat, Coastal Pelagic Species. http://swr.ucsd.edu/hcd/cpsefh.pdf. 39pp.

National Marine Fisheries Service (NMFS). 2000. Letter of Concurrence on Proposed Oil and Gas Development Activities on the Rocky Point Unit off Point Conception, California, Letter to Regional Director, Pacific OCS Region, Minerals Management Service, Camarillo, CA, from Regional Administrator, NMFS Southwest Region, Long Beach, CA, November 14, 2000. 6 pp.

National Oceanic and Atmospheric Administration (NOAA). 1998. Chemical Contaminants in Oysters and Mussels. NOAA's State of the Coast Report. Silver Spring, MD: NOAA. URL: http://state-of-coast.noaa.gov/bulletins/html/ccom05/ccom.html

National Park Service (NPS). 2002. National Natural Landmark Program. http://www.nature.nps.gov/nnl.

Natural Resources Defense Council. 2000. Clean Water and Oceans: In Depth: Report: Testing the Waters 2000; A Guide to Water Quality at Vacation Beaches. From NRDC website: http://www.nrdc.org/water/oceans/ttw/titinx.asp

Neff, J.M. 1987. Biological Effects of Drilling Fluids, drill cuttings and produced waters. *In*: D.F. Boesch and N.N. Rabalais (eds.), Long-term environmental effects of offshore oil and gas development. Elsevier Applied Science Publishing, New York.

Neff, J.M. 1997. Potential for bioaccumulation of metals and organic chemicals from produced water discharged offshore in the Santa Barbara Channel, California: A review. Report to Western States Petroleum Association, Santa Barbara, CA. 201 pp.

Nekton. 1981. Biological Survey of a Hardbottom Feature—Exploration of Leases in the Santa Maria Basin. Prepared for Arco, Inc.

Nekton. 1983. Biological Survey of Texaco's Proposed Platform Harvest and Pipelines. Prepared for Texaco, Inc.

Nero and Associates. 1987. Seabird oil toxicity study. Final report to MMS, Pacific OCS Region, Los Angeles, CA.

Noble Consultants. 1995. Nearshore Hydrodynamic Factors and Wave Study of the Orange County Coast. Draft report prepared for U.S. Army Corps of Engineers, Los Angeles District.

Oiled Wildlife Care Network (OWCN). 1998. Six months-eight spills: Leaky pipe fouls coastal waters. OWCN Network News, Winter 1998.

Patten, S.M., Jr., and L.R. Patten. 1977. Effects of petroleum exposure on hatchling success and incubation behavior of Gulf of Alaska herring gull group. NOAA, Outer Continental Shelf Environmental Assessment Program.

Payne, R.S., O. Brazier, E.M. Dorsey, J.S. Perkins, V.J. Rowntree, and A. Titus. 1983. External features in southern right whales (Eubalaena australis) and their use in identifying individuals. Pp. 371-445 *in*: R.S. Payne (ed.), Communication and behavior of whales. AAAS Sel. Symposium 76. Westview Press, Boulder, CO.

Raimondi, P. 1998. Part II, Section 4.0: 1997 Torch Oil Spill section from: Monitoring of Rocky Intertidal Resources along the Central and Southern California Mainland. Prepared for the Trustees of the Torch Oil spill.

Raimondi, P., R. Ambrose, J. Engle, S. Murray, and M. Wilson. 1999. Monitoring of Rocky Intertidal Resources along the Central and Southern California Mainland – 3 year report for San Luis Obispo, Santa Barbara, and Orange Counties (Fall 1995- Spring 1998). OCS Study MMS 99-0032.

Ralls, K., T. Eagle, and D.B. Siniff. 1988. Movement patterns and spatial use of California sea otters. Pp. 33-63 *in*: D.B. Siniff and K. Ralls (eds.), Population status of California sea otters. OCS Study MMS 88-0021. Pacific OCS Region, Minerals Management Service, U.S. Department of the Interior. Contract No. 14-12-001-30033.

Reeves, R.R. 1992. Whale responses to anthropogenic sounds: A literature review. Sci. & Res. Ser. 47, New Zealand Dept. Conserv., Wellington. 47 pp.

Reeves, R.R., P.J. Clapham, R.L. Brownell, Jr., and G.K. Silber. 1998. Recovery plan for the blue whale (*Balaenoptera musculus*). Office of Protected Resources, National Marine Fisheries Service, NOAA, Silver Spring, MD. 42 pp.

Richardson, W.J., C.R. Greene, Jr., C.I. Malme, and D.H. Thompson. 1995. Marine mammals and noise. Academic Press, Inc., San Diego, CA. 576 pp.

Ricketts, E.F., J. Calvin, and J.W. Hedgpeth (revised by D.W. Phillips). 1985. Between Pacific Tides, 5th Edition. Stanford University Press. Stanford, CA.

Riedman, M.L. 1983. Studies of the effects of experimentally noise associated with oil and gas exploration and development on sea otters in California. Report by Center for Coastal Marine Studies, University of California, Santa Cruz, for U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska. NTIS B86-218575.

Riedman, M.L. 1984. Effects of sounds associated with petroleum industry activities on the behavior of sea otters in California. Pp. D-1 to D-12 in, C.I. Malme et al., Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior/Phase II: January 1984 migration. BBN Report 5586 from Bolt, Beranek, & Newman, Inc., Cambridge, Massachusetts, for U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska. NTIS PB86-218377.

Riedman, M.L. 1987. Summary of information on the biology of the southern sea otter. Technical Support Document 1. Vol. II, Final environmental impact statement: Translocation of southern sea otters. Sacramento, CA: U.S. Fish and Wildlife Service. 69 pp.

Riedman, M.L., and J.A. Estes. 1990. The sea otter (*Enhydra lutris*): behavior, ecology, and natural history. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service. Biological Report 90(14). 126 pp.

Robinson, N.H. 1979. Recent records of southern right whales in New South Wales. Victorian Nat. 96:168-169.

Rugh, D.J., M.M. Muto, S.E. Moore, and D.P. DeMaster. 1999. Status review of the eastern North Pacific stock of gray whales. NOAA/National Marine Fisheries Service, Alaska Fisheries Science Center, National Marine Mammal Laboratory, Seattle, WA. 96 pp.

Santa Barbara County, California (SBC). 1998a. Addendum to the Final Environmental Impact Report, EIR/EIS #84-EIR-16. Planning and Development Department, Santa Barbara County, August 1998.

Santa Barbara County, California (SBC). 1998b. Report to Santa Barbara County Board of Supervisors on hydrogen sulfide gas release at the Chevron Point Arguello Facility. Planning and Development Department, Santa Barbara County, September 1998.

Santa Barbara County Air Pollution Control District (SBCAPCD). 2001. Santa Barbara County 2001 Clean Air Plan.

Savoie, M.A., D.A. Coats, P. Wilde, and P. Kinney. 1991. Low Frequency Flow Variability on the Continental Shelf Offshore Point Conception. *In*: Minerals Management Service. 1991. California OCS Phase II Monitoring Program Final Report. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Camarillo, California. OCS Study MMS 91-0083. 41 pp.

Science Applications, Inc. (SAI). 1984. Final Environmental Impact Statement/Report. Technical Attachment 12: Marine Water Quality for the Santa Ynez Unit/Las Flores Canyon Development and Production Plan.

Science Applications, Inc. (SAI). 1986. Assessment of long-term changes in biological communities in the Santa Maria Basin and western Santa Barbara Channel. Final Report to the U.S. Department of the Interior, Minerals Management Service under Contract No. 14-12-0001-30032.

Science Applications International Corporation (SAIC). 2000a. Biological assessment for endangered species in outer continental shelf waters of south and central California for consultation with the National Marine Fisheries Service. Submitted to U.S. Environmental Protection Agency Headquarters, Washington, D.C., and Region 9, San Francisco, CA. Reston, VA, and Santa Barbara, CA. EPA Contract No. 68-C4-0034, WA No. IM-5-30. 35 pp.

Science Applications International Corporation (SAIC). 2000b. Biological assessment for endangered species in outer continental shelf waters of south and central California for consultation with the United States Fish and Wildlife Service. Submitted to U.S. Environmental Protection Agency Headquarters, Washington, D.C., and Region 9, San Francisco, CA. Reston, VA, and Santa Barbara, CA. EPA Contract No. 68-C4-0034, WA No. IM-5-30. 29 pp.

Science Applications International Corporation (SAIC). 2000c. Essential Fish Habitat assessment for re-issuance of NPDES general permit for oil and gas production platforms off the California coast. Submitted to U.S. Environmental Protection Agency, Region 9, San Francisco, CA. EPA Contract No. 68-C4-0034, WA No. IM-5-30(P).

Science Applications International Corporation (SAIC) and MEC. 1995. Monitoring Assessment of Long-Term Changes in Biological Communities in the Santa Maria Basis: Phase III, Final Report. Report submitted to the U.S. Department of the Interior, Minerals Management Service/National Biological Service, under contract No. 14-35-0001-30584. MMS OCS Study 95-0049.

Southern California Coastal Water Research Project (SCCWRP). 1997. Annual Report, 1996.

Southern California Coastal Water Research Project (SCCWRP). 1998. Southern California Bight 1994 Pilot Project. Executive Summary. SCCWRP, Westminster, CA. URL: http://www.sccwrp.org/regional/94scbpp/94docs.htm

Sowls, A.L., A.R. Degange, J.W. Nelson, and G.S. Lester. 1980. Catalog of California seabird colonies. Fish and Wildl. Serv. FWS/OBS-80/37, U.S. Dept. of Interior.

Spraker, T.R., L.F. Lowry, and K.J. Frost. 1994. Gross necropsy and histopathological lesions found in harbor seals. Pp. 281-311, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Stewart, B.S., P.H. Thorson, and J.K. Francine. 1996. Behavioral responses of pinnipeds and selected avifauna at Vandenberg Air Force Base and the Northern Channel Islands to rocket noise and sonic boom during launch of a Titan IV K-22 rocket from SLC-4E, Vandenberg Air Force Base, on May 12, 1996. Hubbs Sea World Research Institute Technical Report 96-254. 67 pp.

Stewart, B.S., and P.K. Yochem. 2000. Community ecology of California Channel Islands pinnipeds. Pp. 413-420 *in*: D.R. Browne, K.L. Mitchell, and H.W. Chaney (eds.), Proceedings of the Fifth California Islands Symposium, 29 March–1 April 1999, Santa Barbara Museum of Natural History, Santa Barbara, CA. Sponsored by the U.S. Minerals Management Service, Pacific OCS Region, Camarillo, CA. OCS Study No. 99-0038.

Stewart, B.S., P.K. Yochem, R.L. DeLong, and G.A. Antonelis, Jr. 1987. Interactions between Guadalupe fur seals and California sea lions at San Nicolas and San Miguel Islands, California. Pp. 103-106 *in*: J.P. Croxall and R.L. Gentry (eds.), Status, biology, and ecology of fur seals. Proceedings of an International Symposium and Workshop, Cambridge, England, 23-27 April 1984. NOAA Technical Report NMFS 51.

Stickel, L.F., and M.P. Dieter. 1979. Ecological and physiological/toxicological effects of petroleum on aquatic birds. FWS Biological Services Program. FWS/OBS-70-23.

Thorson, P.H., J.K. Francine, and D.A. Eidson. 1998. Acoustic measurement of the Titan IV A-18 launch and quantitative analysis of harbor seal (*Phoca vitulina richardsi*) behavioral and auditory responses. Prepared for Space and Missile Systems Center, Air Force Materiel Command, Los Angeles Air Force Base, Los Angeles, CA. SRS Technologies, System Development Division, Manhattan Beach, CA. 44 pp.

Trivelpiece, W.Z., R.G. Bulter, D.S. Miller, and D.R. Peakall. 1984. Reduced survival of chicks of oil-dosed adult leaches storm petrels. Condor 86:81-82.

U.S. Geological Survey, USGS). 2003. California Sea Otter Surveys, Spring Surveys, 1983-2003. U.S. Geological Survey, Western Ecological Research Center. http://www.werc.usgs.gov/otters/ca-surveys.html.

U.S. Navy. 2002. Final Environmental Impact Statement/Overseas Environmental Impact Statement, Point Mugu Sea Range. U.S. Department of Defense, Department of the Navy, Naval Air Systems Command, Naval Air Warfare Center Weapons Division, Point Mugu, CA.

von Ziegesar, O., E. Miller, and M.E. Dahlheim. 1994. Impacts on humpback whales in Prince William Sound. Pp. 173-191, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.

Watkins, W.A. 1977. Acoustic behavior of sperm whales. Oceanus 20:50-58.

Watkins, W.A. 1986. Whale reactions to human activities in Cape Cod waters. Marine Mammal Science 2(4):251-262.

Weinrich, M.T. 1999. Behavior of a humpback whale (*Megaptera novaeangliae*) upon entanglement in a gill net. Marine Mammal Science 15(2):559-563.

Whitehead, H., J. Gordon, E.A. Mathews, and K.R. Richard. 1990. Obtaining skin samples from living sperm whales. Marine Mammal Science 6(4):316-326.

Williams, T.D. 1978. Chemical immobilization, baseline hematological parameters, and oil contamination in the sea otter. U.S. Marine Mammal Commission Report No. MMC-77/06. NTIS, Springfield, Virginia.

Williams, T.M. 1990. Evaluating the long term effects of crude oil exposure in sea otters: laboratory and field observations. *In* symposium, "The Effects of Oil on Wildlife," 13th Annual Conference of the International Wildlife Rehabilitation Council, Herndon, Virginia, October 17-18, 1990.

Williams, T.M., and R.W. Davis (eds.). 1995. Emergency care and rehabilitation of oiled sea otters: A guide for oil spills involving fur-bearing marine mammals. University of Alaska Press, Fairbanks, Alaska. 279 pp.

Woodward-Clyde Consultants. 1982. Central and Northern California Coastal Marine Habitats: Oil Residence and Biological Sensitivity Indices. Prepared for Minerals Management Service, Los Angeles, CA. Woodward-Clyde Consultants, San Francisco, CA. Technical paper 83-5. MMS Contract No. AA851-CTO-73. 226 pp.

Wyrick, R.F. 1954. Observations on the movements of the Pacific gray whale *Eschrichtius glaucus* (cope.). Journal of Mammalogy 35:596-598.

Zengel, S., and J. Michel. 1996. Vegetation cutting as a clean-up method for salt and brackish marshes impacted by oil spills: A review and case history of the effects on plant recovery. Marine Pollution Bulletin 32(12):876-885.

Zimmerman, S.T, C.S. Gorbics, and L.F. Lowry. 1994. Response activities. Pp. 23-45, *in*, T.R. Loughlin (ed.), Marine mammals and the *Exxon Valdez*. Academic Press, Inc.: San Diego, CA.