PXP

Plains Exploration & Production Company

Revisions to the Platform Hidalgo Development and Production Plan to Include Development of the Western Half NW/4 of Lease OCS-P 0450

Accompanying Information Volume
Biological Evaluation of
Threatened and Endangered Species

Submitted to:
The Bureau of Ocean Energy Management
Pacific OCS Region

Submitted by:
Plains Exploration & Production Company

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1.0 Purpose and Overview

This document has been prepared by Plains Exploration and Production (PXP) to assist the Bureau of Ocean Energy Management (BOEM) in fulfilling its requirements under Section 7(c) of the Endangered Species Act (ESA) to solicit a Biological Opinion from both the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). Section 7(c) of the Endangered Species Act (ESA), as amended, requires that a federal agency request from the appropriate authority a list of threatened and/or endangered species present in an area of a proposed major federal action. When such species are believed to be present, and the proposed action is a “major construction activity,” the federal agency prepares a Biological Assessment to evaluate the potential effects and determines whether they are likely to be adversely affected by the proposed action. This biological evaluation describes the proposed project, identifies those threatened and endangered species most likely to be affected by the action, identifies potentially significant impact sources, and analyzes potential effects, including cumulative effects.

2.0 Project Description and Location

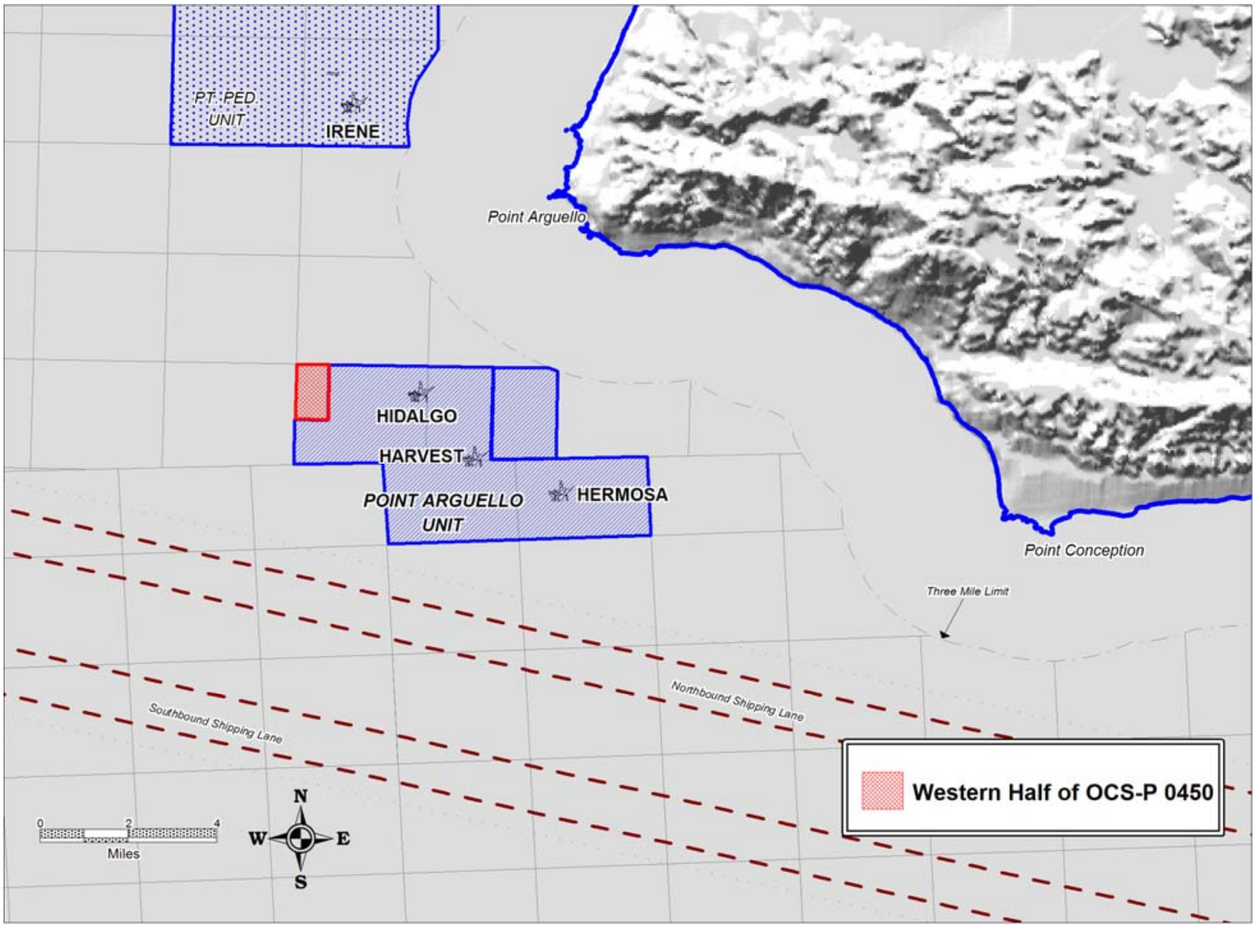
PXP currently operates the Point Arguello Field, which includes the development of all or portions of Federal Outer Continental Shelf (OCS) Leases OCS-P 0315, 0316, 0450, and 0451. Production and development of the unit takes place from three drilling and production platforms located in the southern Santa Maria Basin: Hermosa, Harvest and Hidalgo (ADL 1984). PXP is proposing to revise the Point Arguello Field Development and Production Plans (DPPs) to incorporate the development of hydrocarbon reserves located in the western half of the northwestern quarter (NW/4) of Federal Lease OCS-P 0450 (Electra Field). The subject reserves, known as the Electra Field, lie approximately three miles west of the Point Arguello Field.

The development and production of the Electra Field oil and gas reserves will be accomplished by drilling two extended-reach wells from Platform Hidalgo using existing well slots, pipelines, equipment and facilities. The Electra Field lies due west of Platform Hidalgo, which is located in 131 m (430 ft) of water on the eastern portion of Federal Lease OCS-P450 (34^{o}29'42.06" N, 120^{o}42'08.44" W) (Figure 2-1). The proposed wells (C-16 and C-17) will utilize a combination of electrical submersible pumps and gas-lift technology. No seismic surveys are planned, and no new equipment or facilities will be needed to develop and produce the Field under this proposal.

All production from the Electra Field will be combined with the Point Arguello Field oil and gas production. Oil would be dehydrated and stabilized on the platforms using existing crude stabilizer vessels and reboilers to strip the light hydrocarbons and hydrogen sulfide (H_2S) out of the production stream. The resulting pipeline quality crude would be transported to the Gaviota facility via the existing PAPCO (Hermosa-to-shore) pipeline. At Gaviota, the oil will be metered and heated, stored temporarily in the Gaviota Terminal Company storage tanks, then transported via the All-American Pipeline to various refining destinations.

Gas from the Electra Field will be combined with Point Arguello Unit gas on the production platforms. The combined gas will be sweetened for platform use or sale to shore via the existing Point Arguello Natural Gas Line (PANGL) pipeline. A portion of the gas will also be used for gas lift operations. Gas volumes in excess of platform needs or sales to shore will be injected into the producing reservoir for later recovery and use or sales.

Figure 2.1 Location of Electra Field in Relation to Other OCS Units Off Point Arguello.



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2.1 Proposed Drilling Activities

The two proposed wells (C-16 and C-17) would be drilled from Platform Hidalgo using existing well slots on the platform. The wells will utilize a combination of electrical submersible pumps and gas-lift technology. No seismic surveys are planned, and no new equipment or facilities will be needed to develop and produce the Field under this proposal. Total measured well lengths for the two wells will range in depth from 432,206 m (1,418,000 ft) to approximately 676,656 m (2,220,000 ft), depending on bottom hole displacement from the platform.

The proposed drilling program sequence includes rig installation and necessary platform modifications, drilling and tripping operations, setting the well casing, well logging, and well completion and testing. Total well drilling and completion times are estimated at approximately 70 days to drill, and 20 to 30 days for well completion (i.e., ~100 days total) per well. PXP anticipates that drilling of the first well will begin in July 2013, with production beginning in October 2013. The second well will be drilled immediately following completion of the first well, with production from the second well beginning by January 2014. Overall, drilling activities are projected to take approximately six months.

Overall production from the Electra Field (assuming development begins in 2013) is estimated to peak in 2014, resulting in an annualized rate for the entire Point Arguello Unit of just over 6,300 bbl/d and slightly less than 9.0 mmscfd of gas. Based on PXP's estimates, each of the Electra wells is expected to recover between 2.5 to 3.5 million bbl of oil over lifetime of the project.

2.1.1 Drill Muds and Cuttings

During drilling operations, a mud system is used to control formation pressure, lubricate the drill pipe and bit, and return drill cuttings to the surface. The discharge of drilling muds to be used for the proposed Electra Field drilling program will comply with the National Pollution Discharge Elimination System (NPDES) General Permit (Permit No. CAG280000) currently in effect for the OCS platforms (EPA 2000a,b).

Under this discharge permit, Platform Hidalgo is authorized to discharge up to 6,000 bbl of cuttings, 23,000 bbl of drilling fluids, and 2,000 bbl of excess cement annually per well. Over the anticipated 5-month drilling program for the proposed project, a total of 5,697 bbl of water-based cuttings and 14,036 bbl of drilling fluids are expected to be produced for well C-16. Similarly, 5,512 bbl of water-based cuttings and 13,575 bbl of drilling fluids are expected to be produced for well C-17. Detailed information on the mud system equipment and the estimated mud composition for the Electra Field drilling program is provided in other accompanying information documents.

2.1.2 Produced Water

Produced water generated from the proposed project would also be discharged in accordance with the existing NPDES General Permit. Under the general permit, Platform Hidalgo is authorized to discharge up to 18,250,000 bbl of produced water per year (an average of 50,000 bbl/d). Currently, Platform Hidalgo has a peak produced water discharge of 10,000 bbl/d. The development and production of the Electra Field is anticipated to generate an additional 6,500 bbl/d of produced water. With the addition of the Electra Field, total produced water discharges will still remain well below the permitted levels. Produced water may also be reinjected back into the reservoir.

2.1.3 Support Activities

The drilling rig, heavy drilling equipment, rig supplies, and bulk drilling mud and cement materials for the project will be transported to the Platform Hidalgo by supply boat from Port Hueneme. All support boats will travel along the vessel corridors specified in the Santa Barbara Channel/Santa Maria Basin Oil Service Vessel Traffic Corridor Program (see Section 5.1.1).

Currently, six supply boat trips occur per month. During drilling, vessel traffic to and from the platforms is projected to consist of an additional four round trips per month (an increase of 1 trip per week). During rig installation and removal, supply boats will also make 28 round trips to the platform for rig transport. Manpower requirements and boat schedules can vary depending on the workload. Following the completion of drilling activities, which are anticipated to last for approximately five months, supply vessel traffic is expected to return to current baseline levels (i.e. 6 supply boat trips per month).

Personnel for the Electra Field development will be transported via helicopter from the Santa Maria Airport, the current departure point for personnel working offshore at the Point Arguello Field. No new helicopter trips will be required for the Electra Field development.

3.0 Protected Species

More than 50 federally threatened and endangered species are known to occur or may occur in coastal Ventura, Santa Barbara, and San Luis Obispo counties and the surrounding waters. Of these, PXP has identified 45 species that may occur in the project area and be affected by activities and accidental events associated with the proposed development of the Electra Field. Table 3.1 contains a listing of threatened and endangered species potentially occurring within the project area, their status, agency of oversight, and the expected impact level from the proposed project (see also Section 4.0).

Table 3.1 Special Status Species Occurring Within or Near the Project Area

Common Name	Scientific Name	Listing Status	Oversight Agency	Project Impact Level
Mammals				
Southern sea otter	*Enhydra lutris nereis*	E	USFWS	**Moderate**
Steller sea lion	*Eumetopias jubatus*	T	NMFS	None
Guadalupe fur seal	*Arctocephalus townsendi*	T	NMFS	None
Northern right whale	*Eubaleana glacialis*	E	NMFS	None
Blue whale	*Baleanoptera musculus*	E	NMFS	None
Humpback whale	*Megaptera novaeangliae*	E	NMFS	None
Sei whale	*Balaenoptera borealis*	E	NMFS	None
Fin whale	*Balaenoptera physalus*	E	NMFS	None
Sperm whale	*Physeter macrocephalus*	E	NMFS	None
Morro Kangaroo rat	*Dipodomys ingens*	E	USFWS	None
Santa Cruz Island fox	*Urocyon littoralis santacruzae*	E	USFWS	None
Santa Rosa Island fox	*Urocyon littoralis santarosae*	E	USFWS	None
San Miguel Island fox	*Urocyon littoralis littoralis*	E	USFWS	None
Birds				
California least tern	*Sternula antillarum browni*	T	USFWS	**Low**
Western snowy plover	*Charadrius nivosus nivosus*	T	USFWS	**Moderate**
Light-footed clapper rail	*Rallus longirostrus levipes*	E	USFWS	None
Marbled murrelet	*Brachyramphus marmoratus*	E	USFWS	**Low**
Coastal California gnatcatcher	*Polioptila californica californica*	T	USFWS	None
Short-tailed albatross	*Phoebastria albatrus*	E	USFWS	None
Reptiles				
Leatherback sea turtle	*Dermochelys coriacea*	E	NMFS	None
Green sea turtle	*Chelonia mydas*	E	NMFS	None
Olive Ridley sea turtle	*Lepidochelys olivacea*	E	NMFS	None
Loggerhead sea turtle	*Caretta caretta*	E	NMFS	None
Island night lizard	*Xantusia riversiana*	E	USFWS	None
Amphibians				
California red-legged frog	*Rana draytonii*	E	USFWS	None
Invertebrates				
Black abalone	*Haliotis cracherodii*	E	NMFS	**Low**

Table 3.1 Special Status Species Occurring Within or Near the Project Area

Common Name	Scientific Name	Listing Status	Oversight Agency	Project Impact Level
White abalone	*Haliotis sorenseni*	E	NMFS	None
Morro shoulderband snail	*Helminthoglypta walkeriana*	E	USFWS	None
El Segundo blue butterfly	*Euphilotes battoides allyni)*	E	USFWS	None
Fish				
Steelhead trout	*Oncorhynchus mykiss*	E	USFWS	**Low**
Tidewater goby	*Eucyclogobius newberryi*	E	USFWS	**Low**
Unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	E	USFWS	None
Santa Ana sucker	*Catostomus santaanae*	T	USFWS	None
Green sturgeon	*Acipenser medirostris*	T	NMFS	None
Terrestrial Plants				
Salt marsh bird's-beak	*Cordylanthus maritimus*	E	USFWS	None
California sea-blite	*Suaeda californica*	E	USFWS	None
Beach layia	*Layia carnosa*	E	USFWS	None
Gaviota tarplant	(*Deinandra increscens ssp. villosa*)	E	USFWS	None
La Graciosa thistle	(*Cirsium loncholepis*)	E	USFWS	None
Lompoc yerba santa	(*Eriodictyon capitatum*)	E	USFWS	None
Morro manzanita	(*Arctostaphylos morroensis*)	T	USFWS	None
Marsh sandwort	(*Arenaria paludicola*)	E	USFWS	None
Nipomo Mesa lupine	(*Lupinus nipomensis*)	E	USFWS	None
Pismo Clarkia	(*Clarkia speciosa* ssp. *immaculata*)	E	USFWS	None
Ventura marsh milk-vetch	(*Astragalus pycnostachyus var. lanosissimus*)	E	USFWS	None

Notes: E= Endangered; T= Threatened;

Species Likely to Be Adversely Affected by the Proposed Project

The proposed development of the Electra Field is likely to have adverse impacts on the following seven listed species:

Southern Sea Otter: Oil spills associated with the proposed Electra Field development project are likely to result in moderate impacts to the southern sea otter, including limited mortality. Impacts to otters would be most likely to occur from a rupture in the Hermosa-to-shore pipeline during fall or winter, and could affect otters in the area from Point Purisima to Point Conception. During winter and spring seasonal migration brings large rafts of (predominately male) otters to the southern extent of their current range, off Point Conception. Additionally, as southward range expansion by the southern sea otter continues, increasing numbers of both male and female otters are expected to occur off Point Arguello and Point Conception that could be affected in the event of an oil spill.

California Least Tern: Oil spills associated with the proposed Electra Field development project are likely to result in low impacts to the California least tern. Impacts would be limited to colonies along the mainland coast at Vandenberg Air Force Base (AFB) (between Purisima Point and Point Conception)

Western Snowy Plover: Oil spills associated with the proposed Electra Field development project are likely to result in moderate impacts to the western snowy plover, including limited mortality. Impacts are likely to be limited to the mainland coastal area between Point Purisima and Point Conception, San Miguel and Santa Rosa Islands, and the western portion of Santa Cruz Island. Impacts to the nesting or wintering populations at any of these locations could include loss of adults, disruption of nesting activity, and abandonment of nesting or overwintering beaches. The remoteness of the islands could also impede cleanup and rehabilitation efforts.

Marbled Murrelet: Oil spills associated with the proposed Electra Field development project are likely to result in low impacts to the marbled murrelet. Impacts would be limited to individual birds that occur seasonally along the mainland coast at Point Sal and Vandenberg Air Force Base (AFB).

Black abalone: Oil spills associated with the proposed Electra Field development project are likely to result in low impacts to the black abalone. Impacts would be limited to colonies from Point Sal to Point Conception, as well as the few remaining colonies on San Miguel, Santa Rosa, and Santa Cruz Islands.

Steelhead trout: Oil spills associated with the proposed Electra Field development project are likely to result in low impacts to southern steelhead trout. These impacts would be most likely associated with a nearshore rupture of the Hermosa-to-shore pipeline, rather than a spill originating at Platform Hidalgo. Impacts to steelhead would be most severe if an oil spill occurred during the months of November to April when the anadromous fish are migrating upstream to breed, and juveniles are migrating down to sea. However, impacts to winter steelhead would likely be limited to the area from Point Purisima to Point Conception. Therefore, impacts to this species are likely to be low.

Tidewater Goby: Oil spills associated with the proposed Electra Field development project are likely to result in low impacts to the tidewater goby. These impacts would be most likely associated with a rupture of the Hermosa-to-shore pipeline, rather than a spill originating at Platform Hidalgo. However, tidewater goby are fairly resilient and have shown the ability to disperse and re-colonize areas where they were previously extirpated. Therefore, impacts to this species are likely to be low.

Species Excluded from Further Analysis

A number of the species listed in Table 3.1 are unlikely to be affected by any of the activities associated with the proposed development of the Electra Field. Therefore, after reviewing the relevant literature and consulting with area experts, we have identified the following federally listed species for exclusion from further analysis:

Plants

The following plants are being excluded from this analysis because no onshore facilities are proposed for this project, and their current habitats would not be subject to either direct or indirect effects from a project-related oil spill:

- Beach layia (*Layia carnosa*),
- Gaviota tarplant (*Deinandra increscens ssp. villosa*),
- La Graciosa thistle (*Cirsium loncholepis*),
- Lompoc yerba santa (*Eriodictyon capitatum*),
- Morro manzanita (*Arctostaphylos morroensis*),
- Marsh sandwort (*Arenaria paludicola*),

- Nipomo Mesa lupine (*Lupinus nipomensis*),
- Pismo Clarkia (*Clarkia speciosa* ssp. *immaculata*), and
- Ventura marsh milk-vetch (*Astragalus pycnostachyus var. lanosissimus*).

Similarly, the habitats of the following Channel Islands endemic plants, which were not included in Table 3.1, would not be subject to either direct or indirect effects from a project-related oil spill:

- Hoffmann's rock-cress (*Arabis hoffmannii*),
- Santa Rosa Island manzanita (*Arctostaphylos confertiflora*),
- Island barberry (*Berberis pinnata* ssp. *insularis*),
- Soft-leaved paintbrush (*Castilleja mollis*),
- Santa Cruz Island live-forever (*Dudleya nesiotica*),
- Santa Barbara Island live-forever (*Dudleya traskiae*),
- Sea-cliff bedstraw (*Galium buxifolium*),
- Hoffmann's slender-flowered gilia (*Gilia tenuiflora* ssp. *hoffmannii*),
- Island rush-rose (*Helianthemum greenei*),
- Santa Cruz Island bushmallow (*Malacothamnus fasciculatus* ssp. *nesioticus*),
- Santa Cruz Island chicory (*Malacothrix indecora*),
- Island malacothrix (*Malacothrix squalida*),
- Northern island phacelia (*Phacelia insularis* ssp. *insularis*), and
- Santa Cruz Island fringepod (*Thysanocarpus conchuliferus*).

Wildlife

The following wildlife species are being excluded from further analysis because their current habitats would not be subject to either direct or indirect effects from project-related activities, including an oil spill:

- Morro Bay kangaroo rat (*Dipodomys ingens*)
- San Miguel Island fox (*Urocyon littoralis littoralis*),
- Santa Rosa Island Fox (*Urocyon littoralis santarosae*),
- Santa Cruz Island Fox (*Urocyon littoralis santacruzae*),
- Coastal California gnatcatcher (*Polioptila californica californica*),
- Island night lizard (*Xantusia riversiana*),
- Morro shoulderband snail (*Helminthoglypta walkeriana*),
- El Segundo blue butterfly (*Euphilotes battoides allyni*),
- Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*),
- Santa Ana sucker (*Catostomus santaanae*), and
- North American green sturgeon (*Ambystoma medirostris*).

A brief description of each of these wildlife species follows.

Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*). This species, endemic to the Los Osos-Baywood Park coastal area of San Luis Obispo County, California, was listed as endangered in 1970. Its range is thought to be limited to a small area (<40 acres) of stabilized sand dunes and coastal scrub located south of the community of Los Osos. This species has not been seen in the wild since 1986, however, and the last individual in captivity died in 1993. Nevertheless, no onshore facilities are proposed for this project, and this species' current habitat would not be subject to either direct or indirect effects from a project-related oil spill.

Island Fox (*Urocyon littoralis*). There are six recognized subspecies of island fox, with each subspecies being endemic to one of the Channel Islands off the coast of Southern California. Following sharp population declines in the 1990s, four subspecies of the island fox were listed as endangered in 2004, including the San Miguel Island fox (*Urocyon littoralis littoralis*), Santa Rosa Island Fox (*Urocyon littoralis santarosae*), and Santa Cruz Island Fox (*Urocyon littoralis santacruzae*). The primary cause of decline was predation by golden eagles; extirpation of the bald eagle and the introduction of feral pigs to the islands (providing a prey base for the golden eagle) may have led to colonization of the islands by golden eagles. However, no onshore facilities are proposed for this project, and this species' current habitat would not be subject to either direct or indirect effects from a project-related oil spill.

Coastal California gnatcatcher (*Polioptila californica californica*). This small gray songbird was listed as threatened in 1993. This species range includes coastal sage scrub habitats extending from southern Ventura County to Baja California, Mexico. No onshore facilities are proposed for this project, and this species' current habitat would not be subject to either direct or indirect effects from a project-related oil spill.

Island night lizard (*Xantusia riversiana*). This species is an island endemic found on three of the southern Channel Islands (San Clemente, San Nicolas, and Santa Barbara Islands) where its preferred habitat is coastal scrub made up of dense boxthorn and cacti thickets. It was listed as threatened in 1977. No onshore facilities are proposed for this project, and this species' current habitat would not be subject to either direct or indirect effects from a project-related oil spill.

Morro shoulderband snail (*Helminthoglypta walkeriana*). The Morro shoulderband snail was listed as endangered on January 17, 1995. It is found in the Los Osos area near Morro Bay, usually within or near coastal dune scrub vegetation. However, an oil spill would not impact the habitat of this species, and any clean-up efforts would avoid the established coastal dunes and scrub vegetation that make up its habitat.

El Segundo blue butterfly (*Euphilotes battoides allyni*). The El Segundo blue butterfly was listed as endangered in 1976. Until recently, the El Segundo blue butterfly was only known to exist at three restricted locations on the southeastern shores of the Santa Monica Bay, near El Segundo, California. It typically resides on coastal dune habitats in association with its obligate host plant, the seacliff buckwheat. However, in recent years, the population has expanded and colonized new areas. In 2005 this species was also identified at Vandenberg AFB. Subsequent surveys in 2006 and 2007 confirmed their presence and expanded their known distribution at that site. The El Segundo blue butterflies at Vandenberg AFB are found not only in coastal dune habitats but also on slopes and rocky areas occupied by coast buckwheat. Nevertheless, an oil spill would not impact the habitat of this species, and any clean-up efforts would avoid the established coastal dunes and vegetation that comprise its habitat.

Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*). The unarmored threespine stickleback was listed as endangered under the Endangered Species Act in 1970. It is a small, scaleless, fish that resides in slow water creeks along the California coast. Populations within the project area are located in San Antonio and Cañada Honda Creeks on the Vandenberg AFB, and above Piru Creek in the Santa Clara River system. This species' current range is not in the area of concern for the Electra Field project activities because although most species of stickleback can adapt to salt, brackish, or fresh water, unarmored threespine sticklebacks appear to be limited to fresh water. Therefore, this species' current habitat would not be subject to either direct or indirect effects from a project-related oil spill.

Santa Ana sucker (*Catostomus santaanae*). The Santa Ana sucker was listed as threatened on April 12, 2000. However, the listed portions of this species' population are not in the area of concern for the proposed project activities. Although the Santa Clara River and estuary system in Ventura County supports a population of Santa Ana suckers; this population was not included in the ESA listing because the population is both outside the species' native range and regarded as being introduced. Therefore, the proposed project activities are not likely to affect the listed populations of this species.

North American green sturgeon (*Ambystoma medirostris*). The southern distinct population (SDP) of the North American green sturgeon was listed as threatened in July 2006 (70 FR 17386, NMFS 2004). This population is comprised of sturgeon that spawn in rivers and estuaries south of the Eel River in Mendocino County, California. Green sturgeon are an anadromous fish that ranges from Mexico to Alaska in marine waters, and is observed in bays and estuaries up and down the west coast of North America (Moyle et al. 1995). Although they spend much of their lives in marine waters, green sturgeon return to fresh water (rivers) to spawn. Additionally, young green sturgeon may remain in freshwater rivers and streams for the first few years of their lives before traveling out to sea. Within the southern population segment, the majority of spawning adults are concentrated in the Sacramento River. Although green sturgeon are a highly migratory species and travel widely at sea, they are most commonly encountered north of Point Conception. Additionally, critical areas of their habitat, such as the rivers and estuaries where they spawn and gather, do not occur within the project area. Therefore, the proposed project activities are not likely to affect this species.

The remaining listed species, which could be impacted by the proposed project are described in the following sections.

3.1 Marine Mammals

3.1.1 Southern Sea Otter (Threatened)

<u>**Status**</u>**.** Southern sea otters (*Enhydra lutris nereis)* are among the smallest of the marine mammals. This species was listed as a federal threatened species on January 14, 1977 (42 FR 2968). The original recovery plan was finalized in 1982 (USFWS 1982). A revised recovery plan was finalized in 2003 (USFWS 2003). No critical habitat has been identified for this species. The main reasons for listing the southern sea otter were its small population size and limited distribution, and the threat of oil spills, pollution, and resource competition with humans.

Range and Habitat. Historically, sea otters inhabited coastal waters of the North Pacific in an almost continuous band stretching from central Baja California, Mexico, across the Aleutians to the northern islands of Japan (Kenyon 1969). However, commercial hunting in the late 18th century quickly decimated the otter population, which was heavily targeted for its dense fur. By 1911, when sea otters were afforded protection under the North Pacific Fur Seal Convention, only 13 isolated colonies remained throughout the species' range; most of these eventually became extinct (Kenyon 1969; Estes 1980). At that time, otters were no longer found off the Oregon or Washington coasts, and were assumed have been extirpated from California waters as well.

From that low point, however, the species began slowly to recover. Several surviving Alaskan populations began reoccupying former habitats from Prince William Sound southwest across the Aleutian Islands (Kenyon 1969). Several decades later, in 1938, a small remnant California population of approximately 50 otters was rediscovered at Bixby Creek, near Big Sur (Bryant 1915; Riedman 1987). Over the intervening years, the California sea otter population grew steadily at a rate of about 5 percent annually until the mid-1970s, when it was estimated to contain nearly 1,800 animals (Riedman 1987; Riedman and Estes 1990). Then, the population began declining due to increased mortality from entanglement in set nets (Wendell et al. 1985), reaching an estimated low of fewer than 1,400 animals in 1984. A series of restrictions on nearshore net fisheries culminated in 1991, when the State of California closed waters less than 30 fathoms deep to fishing with nets.

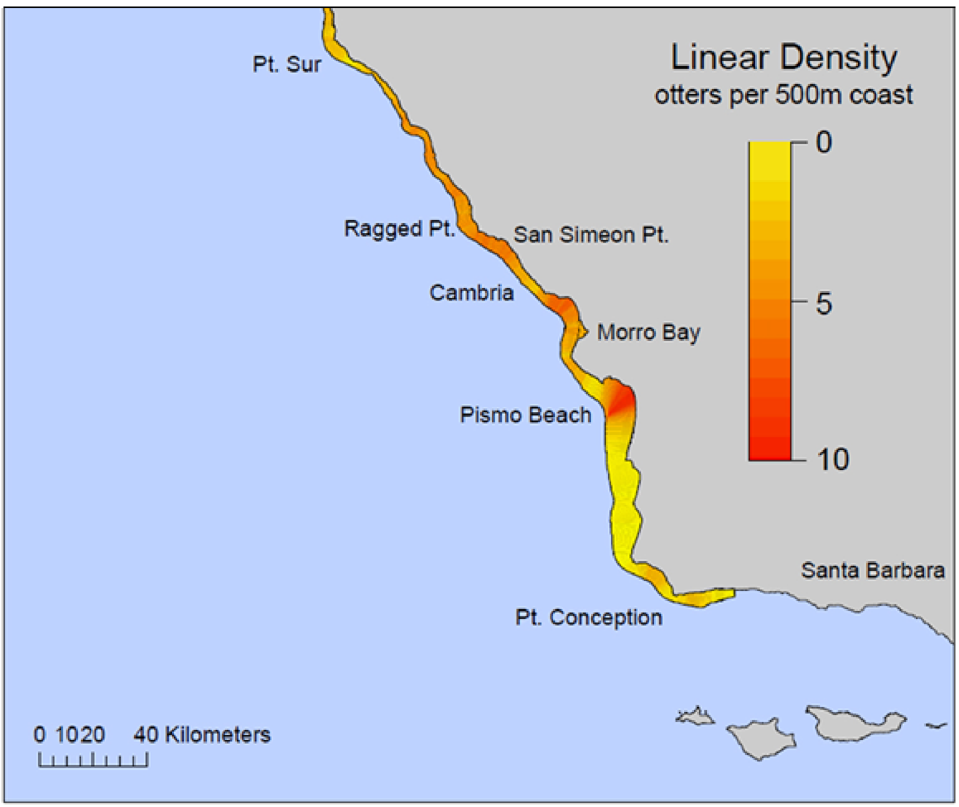
The population fluctuated throughout much of the 1990s, but resumed a slow rate of increase in 1999. However, this growth is primarily attributable to increases in male-dominated portions of the population, particularly near the range peripheries, while female-dominated portions of the population in the center of the range have grown very slowly or remained approximately stable. The southern sea otter's current range spans the central coast of California from Half Moon Bay in the north to approximately Coal Oil Point in the south (Riedman 1987; U.S. Geological Service [USGS] 2010, 2012).

In California, otters typically inhabit shallow (<18 m deep), nearshore (<2 km) waters with rocky or sandy bottoms supporting large populations of benthic invertebrates (Riedman 1987). Observed densities are generally higher over rocky (about 5/km^2) than sandy habitats (about 0.8/km^2) (Riedman and Estes 1990).

Sea otters maintain home ranges that generally consist of several heavily used areas connected by travel corridors (Riedman and Estes, 1990). Female otters are generally more sedentary than males, but are also known to travel long distances (Riedman and Estes, 1990). Males generally have larger home ranges, due in part to regular, seasonal movements they make to either end of the parent range (Bonnell et al. 1983). These migrations coincide with the breeding season (June to November) and the non-breeding season (November to May). During the breeding season mature males maintain territories in core female areas (typically near the center of their range), and excluding juvenile and subordinate males from these areas (Garshelis and Garshelis 1984; Ralls and Siniff 1990; Tinker et al. 2006). In the winter and spring (non-breeding season), however, they generally join male 'bachelor' groups which often range along the population fronts (Riedman and Estes 1990; USFWS 2000). Recent studies also suggest that resource limitations near the center of the otter's range may be influencing these migration movements (Tinker et al. 2006).

Range expansion to the south has brought an increasing number of otters into the proposed project area off of Point Arguello (Figure 3-1). In the spring of 2005, close to 200 otters were observed in the area extending from Point Purisma to Point Conception during the semi-annual census (USGS 2005; As such, otters seen south of Point Purisma comprised approximately 10 percent of the total 2005 population of 2,735 (USGS 2005). Additionally, during this same survey, a large raft of over 88 otters was observed to the east of Point Conception.

Figure 3-1 Sea Otter Range Expansion into Santa Barbara Channel



Source: Adapted from www.werc.usgs.gov/seaottercount.

In addition to the mainland population, there is also a small population of otters that resides in the waters off San Nicolas Island. Between August 1987 and July 1990, the U.S. Fish and Wildlife Service (USFWS) translocated 139 sea otters from the central California range to San Nicolas Island (USFWS 2000). The purpose of the translocation program was to improve recovery of the southern sea otter population. The program sought to establish a colony of southern sea otters outside their then-existing range to protect against the possibility that a natural or human-caused event, such as an oil spill, would devastate the limited mainland population.

The translocation program specified that there would be a specific area, a "translocation zone" into which sea otters would be moved, as well as a "no-otter" management zone that included all California waters south of Point Conception which would be kept otter-free. In practice, the goals of the translocation program proved difficult to achieve. Thirty-six of the originally translocated otters returned to the parent population range, 10 were captured in the management zone and returned to the parent range, and 15 are known to have died. Over the following years the population at San Nicolas fluctuated, but remained small; in 2002, the translocated colony contained only about 27 individuals, including pups. Additionally, by the turn of the century, the "no otter" management zone had also come into conflict with the natural expansion of the mainland population into its historic range south of Point Conception (Figure 3-1). Subsequently, in 2011 the USFWS proposed an end to the program.

Reproduction. Southern sea otters breed and pup throughout the year in all parts of the range, but there appear to be one or more peaks in most areas (Riedman, 1987; Rotterman and Simon-Jackson, 1988). In California, peak pupping occurs from January through March (Riedman and Estes, 1990). Females typically give birth to a single pup (Jameson and Bodkin, 1986; Riedman, 1987), and births occur both on land and in the water (Kenyon, 1969; Jameson, 1983). Although the time between fertilization and implantation of the embryo may vary substantially, the period between copulation and parturition appears to last about 6 months (Riedman 1987; Rotterman and Simon-Jackson 1988; Jameson and Johnson 1993). Pups remain with their mothers for approximately 6 months, and the normal pupping interval for females that successfully raise pups to independence appears to be a little over a year (Wendell et al. 1984). Sea otters may live for 15 to20 years in the wild.

Diet. Sea otters have high metabolic demands and may consume up to 23 to33 percent of their body weight per day (Riedman and Estes, 1990). Ralls and Siniff (1990) estimated that California otters spend 35 to 50 percent of their time foraging. They found that sea otters in California tend to be crepuscular in activity, resting mainly in the middle of the day..

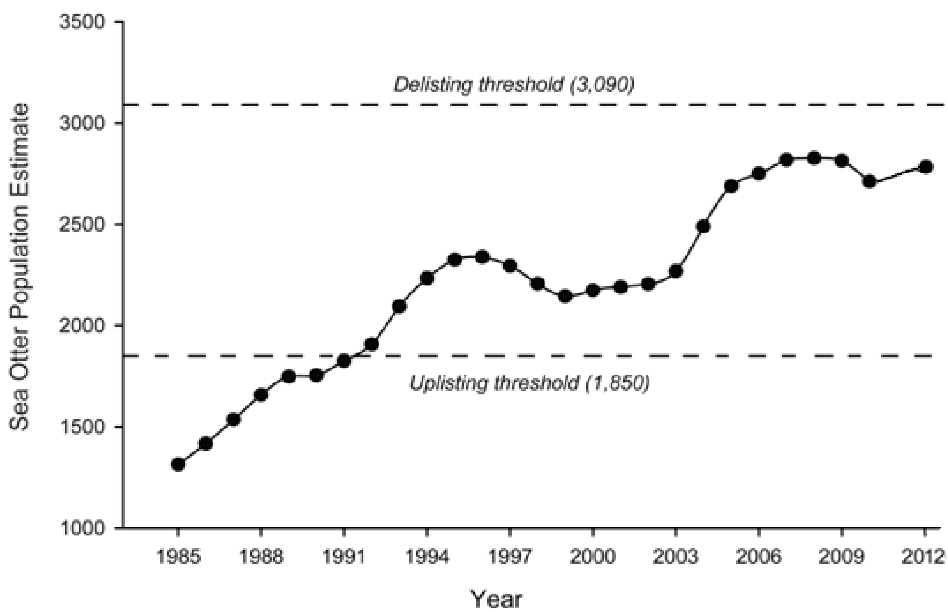
California sea otters feed almost entirely on macroinvertebrates (Ebert, 1968; Wild and Ames, 1974; Estes et al. 1981). In rocky areas along the central California coast, major prey items include abalones (*Haliotis* spp.), rock crabs (*Cancer* spp.), and sea urchins (*Strongylocentrotus* spp.), and, in areas where populations of principal prey species have been reduced, kelp crabs (*Pugettia* spp.), clams (various spp.), turban snails (*Tegula* spp.), mussels (*Mytilus* spp.), octopus (*Octopus* spp.), barnacles (*Balanus* spp.), scallops (*Hinnites* spp.), sea stars (*Pisaster* spp.), chitons (*Cryptochiton* stelleri), and echiuroid worms (*Urechis caupo*) (Boolootian, 1961; Ebert, 1968; Estes, 1980; Estes et. al., 1981; Wendell et al. 1986, USFW 2003, Tinker et al., 2006). These species occur at water depths ranging from the littoral zone to approximately 100 m (328 feet). Not surprisingly, most otters occur between shore and the 20 m (65 feet) water depth (USFWS, 2000).

In sandy areas, sea otters prey primarily on bivalve mollusks, such as Pismo clams (*Tivela stultorum*), which are a principal prey item in sandy areas in Monterey and Morro Bays, gaper clams (*Tresus nuttalii*), and Washington clams (*Saxidomus nuttali*) (Wade, 1975; Stephenson, 1977; Wendell et al. 1986; Riedman and Estes, 1987). Sea otters in California have also occasionally been observed to prey on seabirds (VanWagenen et al. 1981) and fish, although predation on fish is very rare (Hall and Schaller, 1964; Miller, 1974). Diet and foraging strategies apparently differ significantly among individuals; individual females tend to specialize in one to three types of prey (Estes et al. 2003; Lyons, 1989).

Population Status. Before the onset of commercial hunting, the southern sea otter population is estimated to have numbered around 14,000 individuals (USFWS 1995). The most recently completed census, conducted in 2012, indicates that there are currently around 2,792 southern sea otters residing in the waters offshore central California (USGS 2012) (Figure 3-1). In addition, about 42 sea otters reside in the waters off San Nicolas Island (USGS 2008).

Although the population has increased over time (See Figure 3-2), this species' recovery has not been as rapid or robust as expected, and high mortality rates within the population continue to trouble scientists. Challenges to the species' recovery include infections related to coastal pollution, predation by sharks, and depletion of food resources.

Figure 3-2 Sea Otter Population Trends and Recovery Criteria



Note: Population estimates are calculated as three-year running averages of the annual survey counts.

Recent studies suggest that resource limitations near the center of the otter's range may be influencing migration movements (Tinker et al. 2006). These same stressors may also be contributing to high mortality levels within the population as undernourished otters are more susceptible to other stressors in the environment. Competition for, and depletion of, preferred prey items such as sea urchins and abalone, within their home range requires them to spend more time and energy on foraging. Poor nutrition may also be compromising their ability to battle disease, parasites, and other threats.

Finally, predator-prey interactions with other species have increased in recent years. Specifically, white shark attacks on otters have become a leading cause of otter mortality. Although the sharks do not appear to eat the otters, during 2011, nearly 30 percent of stranded otters showed evidence of shark bites, making shark attacks the largest single cause of otter deaths.

3.1.2 Steller Sea Lion (Threatened)

Status. The Steller, or northern sea lion (*Eumetopias jubatus*) was listed as a federal threatened species on December 4, 1990 (55 FR 50006). Critical habitat identified for this species includes the major California rookeries at Año Nuevo and the Farallon Islands. The Steller sea lion recovery plan was finalized in 1992 and revised in 2008 (NMFS 1992, 2008). The main reason for listing was a severe (>75 percent) decline in the Steller sea lion population, particularly in the western (Alaskan) portions of its range (Calkins et al. 1999). Although the reasons for this decline are still unclear, recent research indicates that a major factor may have been nutritional stress (Merrick et al. 1987; Calkins et al. 1998) resulting from a reduction in the abundance or availability of prey and/or a change in prey composition to less nutritious species (Calkins et al. 1998) As this decline continued into the 1990s, NMFS divided the species into two distinct population segments (DPS), eastern and western, and listed the western DPS as endangered in 1997. Meanwhile, the eastern DPS of this species, which includes the portion of the population inhabiting the waters off California, Oregon and Washington, was proposed for delisting in April 2012.

Range and Habitat. The species' range extends along the North American coast from the Bering Strait in Alaska to southern California. At least 90 percent of the species' world population is centered in the Gulf of Alaska, the Bering Sea, and the Sea of Okhotsk (Loughlin et al. 1984). Steller sea lions breed during the summer on rookery islands from the Pribilof Islands, Alaska, south to Año Nuevo Island in central California (Green et al. 1989). Following the breeding season, adult males in California and Oregon move northward into Washington, British Columbia, and Alaska; by the end of October, no adult males are found along the Oregon Coast (Bartholomew and Boolootian, 1960; Gentry, 1970; Mate, 1975; 1981). Female and immature Steller sea lions may not disperse as widely following the breeding season (Green et al. 1989).

Steller sea lions are presently uncommon in southern California waters (Bonnell and Dailey 1993, Pitcher et al. 2007). A few adult or subadult males occasionally may occupy territories on relict rookeries at the west end of San Miguel Island and adjacent rocks in the summer months, but the last reported pups on San Miguel Island were seen in the summer of 1980 (Bonnell and Dailey, 1993; DeLong and Melin, 2000). North of Point Conception, a few animals have been sighted in on offshore rocks at Point Sal, at Diablo Canyon near Point Buchon, and at Point Piedras Blancas (Bonnell et al. 1983). Off California, Steller sea lion sightings at sea have been concentrated in shallow waters over the shelf and upper slope (<400 m) and within 50 km from land (Bonnell et al. 1983).

Reproduction. The timing of the Steller breeding season is uniform throughout the species' range (Gentry 1970; Sandegren 1970; Calkins and Pitcher 1982). Adult males begin arriving on the rookeries first, in mid-May, and establish territories. Pregnant females arrive in late May and give birth to a single pup (Gentry 1970; Higgins et al. 1988). Females and pups begin leaving the rookeries in September (Orr and Poulter 1967), and pups typically remain with their mother through the first year (Le Boeuf 1981).

Diet. Steller sea lions are known to feed on a variety of nearshore, sublittoral prey in estuarine and marine waters. Jones (1981) reported that Steller sea lions feed mainly on bottom-dwelling fishes, and that all the prey items normally eaten by this species inhabit waters less than about 200 m deep. Common prey of the Steller sea lion includes lamprey, rockfishes, herring, anchovy, salmon, smelts, whiting, pollock, tomcod, greenlings, sculpins, sand lance, flatfishes, midshipman, sharks, skates, squid, octopus, shellfish, and shrimp (Wilke and Kenyon 1952; Spalding, 1964; Fiscus and Baines 1966; Jameson and Kenyon 1977; Antonelis and Fiscus 1980; Jones 1981; Roffe and Mate 1984). Stellers are also known to prey upon the pups of several other species of pinnipeds and on sea otters (Gentry and Johnson, 1981; Pitcher, 1981; Pitcher and Fay 1982; Hoover 1988; Byrnes and Hood 1994).

Population Status During the early 1900s, Steller sea lions were the most abundant sea lion found off California, and bred as far south as the Channel Islands (San Miguel Island); however, the Steller sea lion has declined in numbers off California since the 1940s and the overall distribution for this species appears to have shifted northward (Hill et al. 1997; Bonnot 1928; Bartholomew 1967; Le Boeuf and Bonnell 1980; and Bonnell et al. 1981).

Ainley and Lewis (1974) hypothesized that the Steller sea lion decline in California might have been connected with the collapse of the Pacific sardine (*Sardinops sagax*) fishery in California in the 1940s and 1950s. Regardless of its cause, however, Steller sea lions have not been sighted at the Channel Islands since the 1980s. Año Nuevo Island is now the southernmost Steller sea lion rookery in the species' range and the largest rookery in California (Bonnell et al. 1983). Smaller rookeries exist at Cape Mendocino, the Farallon Islands, and the Point St. George Reef (Bonnell et al.1983, NMFS 2008). Total numbers in the eastern DPS have been relatively stable in recent decades, and the population is currently around 44,500-48,000. Between 1990 and 1993, pup counts at Año Nuevo dropped from about 310 to 230 (Westlake et al. 1997), while in 2004 there were 243 pups and 462 non-pups counted at Año Nuevo Island and the Farallon Islands combined.

3.1.3 Guadalupe Fur Seal (Threatened)

Status. The Guadalupe fur seal (*Arctocephalus townsendi*) was listed as a federal threatened species on December 16, 1985 (50 FR 51252). No recovery plan has been prepared for this species. The main reason for listing was the reduction of the population to near extinction by commercial hunting in the nineteenth century.

Range and Habitat. The Guadalupe fur seal is the only representative of the genus *Arctocephalus* in the Northern Hemisphere (Repenning et al. 1971). Historically, the Guadalupe fur seal apparently ranged northward from Islas Revillagigedo off the coast of Mexico to at least Point Conception (Repenning et al. 1971; Fleischer 1978; Walker and Craig 1979). Like the other species of *Arctocephalus*, its numbers were severely reduced by commercial hunting in the nineteenth century, and for many years it was considered extinct (Hubbs 1956). At present, the species breeds only on Isla de Guadalupe off the coast of Baja California, Mexico, although individual animals appear regularly in the California Channel Islands (Stewart et al. 1987b; Bonnell and Dailey 1993). A single pup was born on San Miguel Island in 1997; however no pupping since then has been documented on the Channel Islands (DeLong and Melin 2000).

Little is known about the distribution of Guadalupe fur seals at sea (Gallo 1994), but recent strandings have been reported from as far north on the California coast as Sonoma County (Antonelis and Fiscus 1980; Hanni et al. 1993).

Reproduction. Guadalupe fur seals breed during the summer (Peterson et al. 1968; Pierson, 1987; Figueroa 1994; Gallo 1994). Adult males arrive on Isla de Guadalupe in late May or early June and establish territories, while females begin arriving on the rookery in June, with the major influx occurring during the last two weeks of the month. Pupping apparently peaks in late July. Females alternate from foraging trips to sea with stays on land to nurse their pups; nursing probably continues for at least 8 months. Territorial males leave the rookery by mid-August.

Diet. Limited analysis of Guadalupe fur seal scats and stomach contents indicates that they feed on pelagic squid and schooling fishes such as mackerel and sardine (Hanni et al. 1993; Gallo 1994).

Population Status. The Guadalupe fur seal population remains small, but is increasing; Gallo (1994) calculated the growth rate between 1955 and 1993 at 13.7 percent per year and estimated the 1993 population at approximately 7,400 animals. The current population is approximately 10,000 animals (Wickens and York 1997).

3.1.4 Blue Whale (Endangered)

Status. The blue whale (*Balaenoptera musculus*) was listed as a federal endangered species on June 2, 1970 (35 FR 8495). No critical habitat has been identified for this species. The blue whale recovery plan was finalized in 1998, (Reeves et al. 1998a), and NMFS has noticed its intent to update the plan in 2012. The main reason for listing was a severe worldwide population decline due to intensive commercial whaling.

Range and Habitat. The largest of all animals, blue whales are distributed worldwide in circumpolar and temperate waters and inhabit both coastal and pelagic environments (Leatherwood et al. 1982; Reeves et al. 1998a). Like most baleen whales, they migrate between warmer waters used for breeding and calving in winter and high-latitude feeding grounds where food is plentiful in the summer. In the eastern North Pacific, blue whales are found from the Gulf of Alaska south to at least Costa Rica (Reeves et al. 1998a; Mate et al. 1999). Rice (1992) concluded that the California population is separate from that in the Gulf of Alaska and the eastern Aleutians, and this view is supported by other recent work (Barlow 1995; Calambokidis and Steiger 1995; Calambokidis et al. 1995).

The eastern North Pacific stock of blue whales feeds off California in summer and fall, and migrates to Mexico to breed and calve in winter and spring. Blue whales occur along the west coast of Baja California from March through July (Gendron and Zavala-Hernández 1995). They are first observed in Monterey Bay, around the Channel Islands, and in the Gulf of the Farallones in June-July, and are present on the continental shelf in these areas from August to November (Calambokidis et al. 1990; Calambokidis 1995; Larkman and Veit 1998; Mate et al. 1999). Based on sighting data collected off southern California from 1992 through 1999 by Cascadia Research Collective (Cascadia Research, unpubl. data), blue whales tend to aggregate in the Santa Barbara Channel along the shelf break (seaward of the 200-m line). Sighting frequencies were highest west of San Miguel Island and along the north sides of San Miguel, Santa Rosa, and the western half of Santa Cruz Island.

It is known that some blue whales do migrate south to Mexican waters in the fall, reaching waters off Baja California in October; calving may occur in subtropical waters farther to the south or offshore (Rice, 1974; Reeves et al. 1998a). Some blue whales apparently remain in lower latitudes, such as waters off Central America and in the Gulf of California, year-round (Leatherwood et al. 1987; Bonnell and Dailey, 1993). Data from radio-tracking experiments indicate that blue whales feeding off California in the summer winter in the vicinity of the Costa Rican Dome (Mate et al. 1999; Stafford et al. 1999), supporting the hypothesis of Reilly and Thayer (1990) that blue whales may select winter habitat suitable for feeding. Mate et al. (1999) hypothesize that, given their larger size and higher absolute energy requirements, blues whales may not be able to fast through the winter reproductive season (as gray and humpback whales do).

Reproduction. In the North Pacific, mating occurs on the wintering grounds from October-November through February or March (Mizroch et al. 1984a). Gestation lasts approximately 10-12 months, and calves are weaned at 6-7 months of age (Leatherwood et al. 1982; Reeves et al. 1998a). Females may calve as often as every 2 to 3 years (Mizroch et al. 1984a). Age at sexual maturity is thought to be 5-15 years (Mizroch et al. 1984a; Yochem and Leatherwood 1985).

Diet. Blue whales are filter feeders that feed primarily on a variety of euphausiids. In the North Pacific, predominant prey species include *Euphausia pacifica* and *Thysanoessa spinifera* (Rice, 1986; Schoenherr, 1991). *Thysanoessa inermis*, *T. longipes*, *T. raschii*, and *Nematoscelis megalops* also have been reported as prey in the North Pacific (Kawamura, 1980; Yochem and Leatherwood, 1985; Reeves et al. 1998a). Off Baja California, blue whales have also been observed to eat pelagic red crabs (*Pleuroncodes planipes*) (Leatherwood et al. 1982; Rice 1986). In the Santa Barbara Channel, Croll et al. (1998) recorded blue whales diving to depths where krill concentrations were most dense (mean = 68.1 ± 57.5 m).

Population Status. Blue whales were heavily exploited by commercial whalers following the introduction of modern whaling equipment and techniques in the late19th century. Worldwide, the blue whale population was reduced from a pre-exploitation estimate of 228,000 animals to less than 10,000 (Brownell et al. 1989). The pre-exploitation population of blue whales in the North Pacific has been estimated at 4,500 to 5,000 animals (Braham 1984; Leatherwood et al. 1987).

The current population worldwide remains unknown; however, the eastern pacific population, which frequents the waters off California, is currently estimated at slightly over 2,490 individuals (Reeves et al. 1998a; Caretta et al. 2010). Mate et al. (1999) hypothesized that these animals may constitute the largest remnant blue whale population in the world. Although the population appears to be growing, the observed increase in blue whale abundance off California during the past two decades is considered to have been too large to be explained by population growth alone and may be due to a shift in their distribution (Barlow et al. 1997; Reeves et al. 1998a, Carretta et al. 2005, Calambokidis 2009).

3.1.5 Fin Whale (Endangered)

Status. The fin whale (*Balaenoptera physalus*) was listed as a federal endangered species on June 2, 1970 (35 FR 8495). No critical habitat has been identified for this species. The draft fin and sei whale recovery plan was issued in 1998, (Reeves et al. 1998b). A final recovery plan was issued in July 2010 (NMFS 2010a). The primary reason for listing was due to a severe worldwide population decline resulting from intensive commercial whaling.

Range and Habitat. Second in size only to the blue whale, fin whales are distributed worldwide. NMFS recognizes three stocks in U.S. Pacific waters: Alaska; California, Oregon, and Washington; and Hawaii (Mizroch et al. 1984b; Barlow et al. 1997; Hill et al. 1997; Reeves et al. 1998b). According to Rice (1974), the summer distribution of fin whales includes immediate offshore waters throughout the North Pacific, from central Baja to Japan and north to the Chukchi Sea. Numbers in these areas peak in late May to early July. In recent years, fin whales have occurred year-round off central and southern California, with peak numbers in summer and fall (Dohl et al. 1981, 1983; Barlow, 1995; Forney et al. 1995). In the Southern California Bight, summer distribution is generally offshore and south of the northern Channel Island chain, particularly over the Santa Rosa-San Nicolas Ridge (Leatherwood et al. 1987; Bonnell and Dailey, 1993). Since fin whale abundance decreases in winter and spring off California (Dohl et al. 1981, 1983; Forney et al. 1995) and Oregon (Green et al. 1992), the distribution of this stock probably extends outside these waters seasonally.

Fin whale migratory behavior in the eastern North Pacific appears to be complex, with either inshore-offshore or north to south movements depending on individual's age, reproductive status, or "stock" affinity (Reeves et al. 1998b). Evidence from serological studies (Fujino, 1960) and field observations (Brueggeman et al. 1987; Stewart et al. 1987a) indicates that fin whales migrate back to the same feeding areas each year. Analysis of data from several studies of humpback whale distribution (Nasu, 1974; Dohl et al. 1983; Brueggeman et al. 1987) shows the relationship of fin whales to the continental shelf, particularly near submarine canyons in Alaska and the shelfbreak in California and Alaska. These are areas that presumably feature seasonal convergence zones where upwelling occurs, resulting in high prey concentrations for feeding whales (Green et al. 1989).

Reproduction. Fin whales breed during the winter, from November through March, in lower latitude oceanic waters (generally between 20° and 40°N), although wintering grounds have not been precisely defined (Rice, 1974; Haug, 1981). The gestation period lasts about 11 months, and calves are usually weaned on the feeding grounds at 6 to7 months of age (Leatherwood et al. 1982; Bonnell and Dailey, 1993). Although apparently capable of calving every year, females often rest one or more years between pregnancies (Leatherwood et al. 1982). Sexual maturity apparently occurs at 10 years of age or greater in populations near carrying capacity, and possibly as early as 6 to 7 years of age in exploited populations (Gambell, 1985b; Reeves et al. 1998b).

Diet. In the North Pacific, fin whales feed primarily on euphausiids (including *Euphausia pacifica*, *Thysanoessa longipes*, *T. spinifera*, and *T. inermis*) and large copepods (mainly *Calanus cristatus*). They also feed to a lesser extent on schooling fish such as herring, walleye pollock, capelin, and lanternfish, and occasionally on squid (Nemoto 1970; Kawamura, 1982;

Leatherwood et al. 1982). Several euphausiid species known to be important to North Pacific fin whales occur only in waters less than 300 m deep (Nemoto and Kayusa 1965, cited in Green et al. 1989).

Population Status. The world population of fin whales before exploitation may have been as high as 500,000 animals (Gambell, 1985a). Due to their strength and speed, fin whales were not effectively harvested by early whalers, but came to be intensively hunted with the development of modern whaling equipment and techniques in the late 1800's (Tonnesson and Johnsen 1982; Webb, 1988). By 1976, when fin whales were protected from commercial harvest, the world population had been reduced to approximately 103,000-122,000 animals (Gambell 1985a).

The pre-exploitation population of fin whales in the North Pacific has been estimated at 42,000-50,000 animals (Ohsumi and Wada, 1974; Tillman, 1975; Allen, 1980). Recent estimates range between 7,890 and 20,000 animals (Ohsumi and Wada, 1974; Rice, 1974; Wada, 1976; Allen, 1980), with approximately 60 percent occurring in the eastern half of the North Pacific (Ohsumi and Wada, 1974). Allen (1980) argued that it would take 25 to 30 years for the eastern North Pacific population to recover to 90 percent of its original levels. Current estimates place the California-Oregon-Washington population at about 750 to 930 animals (Barlow and Gerrodette, 1996; Barlow et al. 1997). Shipboard sighting surveys in the summer and autumn of 1991, 1993, 1996, and 2001 produced California population estimates of 1,600 to 3,200 fin whales (Barlow 2003). The most recent estimate for the entire California/Oregon/Washington population is about 2,636 (NMFS 2010a).

3.1.6 Sei Whale (Endangered)

Status. The sei whale (*Balaenoptera borealis*) was listed as a federal endangered species on June 2, 1970 (35 FR 8495). No critical habitat has been identified for this species. The draft fin and sei whale recovery plan was issued in 1998, (Reeves et al. 1998b). A final recovery plan for the sei whale was issued in December 2011 (NMFS 2011). The primary reason for listing was a severe worldwide population decline due to intensive commercial whaling.

Range and Habitat. Sei whales are distributed worldwide and are primarily a pelagic, temperate-water species (Leatherwood et al. 1982; Barlow et al. 1997; Reeves et al. 1998b). There are believed to be three stocks in the North Pacific (Mizroch et al. 1984c). In the eastern North Pacific, sei whales migrate northward from wintering grounds in temperate and subtropical waters to feeding grounds that extend from west of the California Channel Islands as far north as the Gulf of Alaska and the Aleutians in the summer (Leatherwood et al. 1982; Mizroch et al. 1984c). Evidence from tag recoveries indicates movement between central California and Vancouver Island (Rice, 1977; Reeves et al. 1998b). Unlike fin whales, sei whales seldom enter the Bering Sea (Leatherwood et al. 1982). The winter range stretches from about 18°30'N latitude off Baja California to near 35°30'N off the central California coast (Leatherwood et al. 1982), but may be centered between 20° and 23°N (Mizroch et al. 1984c). Some individuals apparently approach the equator (Leatherwood et al. 1982).

Reproduction. Sei whales breed mainly on the wintering grounds, from September through March. Gestation lasts approximately 12 months (Rice, 1977; Leatherwood et al. 1982). Calves are born in wintering areas and are weaned on summer feeding grounds, approximately 6 to 9 months later (Rice, 1977; Mizroch et al. 1984c). Females most often give birth at 3-year intervals (Rice, 1977; Leatherwood et al. 1982). The mean age at sexual maturity is 10 years.

Diet. Sei whales are generally skimming feeders. They are known to prefer copepods, but also take a variety of prey, including euphausiids, small schooling fishes, and squid (Nemoto and Kawamura, 1977; Leatherwood et al. 1982; Bonnell and Dailey, 1993). Off central California, within the California Current, sei whales have been known to consume northern anchovy, Pacific saury, and jack mackerel (Perry et al. 1999, Leatherwood et al. 1982). The dominant food for sei whales off California during June through August is the northern anchovy, while in September and October they eat mainly krill (Horwood 2009; Rice 1977).

Population Status. Sei whales were heavily exploited by commercial whalers in the 1960s, following the decline of the fin whale populations; their numbers were reduced from an estimated pre-exploitation world population of 256,000 to about 50,000 whales (Brownell et al. 1989). Pre-whaling abundance in the North Pacific was estimated at 58,000 to 62,000 by Ohsumi and Wada (1974). Tillman (1977) revised this estimate to 42,000 and further estimated the existing population in 1974 at 7,260 to 12,620 individuals.

Sei whales are now rare in California waters (Dohl et al. 1981, 1983; Bonnell and Dailey 1993; Mangels and Gerodette1994; Barlow 1995; Forney et al. 1995; Barlow et al. 1997). The number of sei whales in the California, Oregon, and Washington waters of the Eastern North Pacific is currently estimated at about 126 individuals (Carretta et al 2010).

3.1.7 Humpback Whale (Endangered)

Status. The humpback whale (*Megaptera novaeangliae*) was listed as a federal endangered species on June 2, 1970 (35 FR 8495). No critical habitat has been identified for this species. The humpback whale recovery plan was finalized in 1991, (NMFS, 1991a), and a status review is currently being conducted for this species. The main reason for listing was a severe worldwide population decline due to intensive commercial whaling.

Range and Habitat. Humpback whales are distributed worldwide and undertake extensive migrations in parts of their range (Leatherwood et al. 1982). They aggregate from late spring through fall to feed in productive waters of temperate and high latitudes and migrate in winter months to lower latitudes for breeding and calving, which often occur near tropical islands and in shallow coastal waters. In the eastern North Pacific, humpbacks range from arctic waters south to central California in the summer. On their feeding grounds, humpback whales are found primarily on the continental shelf near shallow banks and inshore marine waters (Rice, 1974; Wolman, 1986). Humpback whales winter in three areas: waters off Mexico (Rice, 1974); Hawaii (Baker et al. 1986); and the Marianas, Bonin, and Ryukyu Islands and Taiwan (Nishiwaki, 1959). Whales from all three wintering grounds apparently intermingle during the summer months in Alaskan waters (Baker et al. 1986).

Based on photo-identification work, Calambokidis et al. (1996) concluded that humpback whales off California, Oregon, and Washington form a single, intermixing population, with very little interchange with areas farther north. Whales from this population feed off California through summer and fall (Dohl et al. 1983; Calambokidis et al. 1996). Based on sighting data collected off southern California from 1992 through 1999 by Cascadia Research Collective (Cascadia Research, unpubl. data), humpback whales occur throughout the western two-thirds of the Santa Barbara Channel and, to a lesser extent, in the Santa Maria Basin. As was the case for blue whales, there appears to be a tendency for humpback whales to concentrate along the shelfbreak north of the Channel Islands.

Reproduction. Breeding activity occurs year-round, with a strong winter-spring peak (Leatherwood et al. 1982; NMFS, 1991a). Most calves are born on the wintering grounds between January and March, following a 12-month gestation period (Leatherwood et al. 1982; DOC, 1989), and are weaned after approximately 11 months (Johnson and Wolman, 1984). Female humpbacks give birth approximately every other year, although annual and multi-year calving has been reported (Glockner-Ferrari and Ferrari, 1984; Clapham and Mayo, 1987; Baker et al. 1988; NMFS, 1991a).

Diet. Humpback whales exhibit a variety of feeding behaviors and appear to feed whenever and wherever sufficient concentrations of suitable-sized prey are encountered (Winn and Reichley, 1985; NMFS, 1991a). Major humpback whale prey includes a number of species of small schooling fishes and large zooplankton, mainly euphausiids (Tomilin, 1967; Nemoto, 1970; Wolman, 1986). Fish species eaten by humpbacks in the North Pacific include Pacific herring, capelin, walleye pollock, northern anchovy, eulachon, mackerel, sand lance, cod, salmon, and rockfishes (Rice, 1963, 1977; Frost and Lowry, 1981). Important invertebrate prey includes euphausiids (*Euphausia pacifica*, *Thysanoessa raschii*, *T. spinifera*, *T. longipes*), mysids (*Mysis oculata*), pelagic amphipods (*Parathemisto libellula*), shrimps (*Eualus gaimardii*, *Pandalus goniurus*), and copepods (*Calanus* spp.) (Rice 1963; Tomilin 1967; Bryant et al. 1981; Frost and Lowry 1981).

Population Status. The pre-exploitation world population of the humpback whale has been estimated at about 115,000 animals (Brownell et al. 1989). Made vulnerable by their coastal distribution and gregariousness, however, humpback whale populations were greatly depleted at the beginning of this century by both land station and pelagic whaling operations (Rice, 1974, 1978; Tønnessen and Johnsen, 1982; Brownell et al. 1989). Based on whaling statistics, the pre-1905 population of humpback whales in the North Pacific was estimated to be 15,000 (Rice 1978), and was reduced by whaling to approximately 1,200 by 1966 (Johnson and Wolman 1984). A photo-identification study from 2004 to 2006 estimated the abundance of humpback whales in the entire Pacific Basin to be approximately 18,000 to 20,000 individuals (Calambokidis et al. 2008). The best estimate for the population in the waters off California and Oregon is currently 2,043 individuals (Carreta et al 2010).

3.1.8 North Pacific Right Whale (Endangered)

Status. The northern right whale (*Eubalaena glacialis*) was listed as a federal endangered species on June 2, 1970 (35 FR 8495) and a recovery plan was finalized in 1991, (NMFS 1991b). Revised recovery plans were completed in 2001, 2004 and 2005. At the time it was listed, the overall range of the northern right whale extended from about 40ºN to 60ºN. The main reason for listing was a severe worldwide population decline due to intensive commercial whaling. Subsequently, NMFS recognized that there were actually two separate species, the North Pacific right whale (*E. japonica*) and North Atlantic right whale (*E. glacialis*) (73 FR 12024). Critical habitat for the North Pacific right whale, encompassing a total of approximately 36,750 square nautical miles within the Gulf of Alaska and the Bering Sea, became effective on 7 August 2006.

Range and Habitat. North Pacific right whales apparently migrate from high-latitude feeding grounds toward more temperate waters in the fall and winter. The location of calving grounds is unknown; summer feeding grounds may generally stretch across the North Pacific from about 50° to 63°N (Omura, 1958; Omura et al. 1969). In the northeastern Pacific, the major northern right whale whaling ground was the "Kodiak Ground," which encompassed essentially the Gulf of Alaska and was a major summer feeding ground for the species (Leatherwood et al. 1982). Waters off the eastern Aleutian Islands and in the southern Bering Sea were apparently also important areas of concentration (Braham and Rice, 1984; NMFS, 1991b). Catches of right whales on the summer feeding grounds were widespread on the continental margin, generally away from shore (Townsend, 1935; Brueggeman et al. 1985).

The scarcity of sightings along the west coast of North America suggests that right whales migrate to summer grounds from the western or central North Pacific or well offshore in the eastern North Pacific (Braham and Rice, 1984), although the location of seasonal migration routes is unknown (Scarff, 1986). Reeves and Brownell (1982) concluded that the usual wintering ground of northern right whales extended from northern California to Washington, although sightings have been recorded as far south as 23°N off Baja California and near the Hawaiian Islands (Scarff, 1986; NMFS, 1991b; Gendron et al. 1999). However, Scarff (1986) reviewed the literature and whaling records and concluded that right whales overwinter in the western or mid-North Pacific.

Although right whales have, on rare occasions, been recorded off California, there is no evidence that this region was ever an important habitat for right whales (NMFS 2006). Since 1955, only five sightings of right whales have been recorded in waters off southern California. All of the sightings were of individuals, and were recorded between February and May (Scarff, 1991; Carretta et al. 1994).

Reproduction. Little is known about the reproductive biology of right whales in the Pacific, although productivity is obviously very low (Leatherwood et al. 1982). However, the gestation period for North Atlantic right whales is thought to be around 16 months (NMFS, 1991b), and females in that population give birth once every 3 to 5 years (Knowlton and Kraus, 1989). Sexual maturity apparently occurs between ages 5 and 9 (Knowlton and Kraus, 1989).

Diet. Northern right whales are not known to eat fish; their primary prey includes calanoid copepods, particularly *Calanus cristatus* and *C. plumchrus*, and euphausiids (Omura, 1958; 1986; Omura et al. 1969; Nemoto, 1970; Leatherwood et al. 1982).

Population Status. Northern right whales are the rarest of the endangered cetaceans. In the North Pacific, the population is currently believed to number 100-200 animals, which is considerably below the estimated pre-exploitation size of 15,000 animals (Braham, 1984; NMFS, 1991b). Although northern right whales were hunted for centuries in temperate coastal waters, the major cause for their population decline was 19th-century whaling (Rice, 1974; Scarff, 1986; Brownell et al. 1989). These large, slow moving whales have a thick layer of blubber; attributes which made them a particularly attractive target for the whaling industry in the early 1900s.

From 1855 to 1982, only 23 reliable sightings of Northern Pacific right whale were noted (Scarff 1986). Two of these sightings were made in the Santa Barbara Channel. More recently, since 1996, NMFS and other surveys (directed or otherwise) have detected small numbers of right whales in the southeastern Bering Sea, including an estimated 24 animals in the summer of 2004 (NMFS 2006, Carretta 2011). This aggregation included three sets of cows with calves, and nearly doubled the currently known population of this species. The southernmost sighting in recent years was made in 1998 off Cabo San Lucas, Baja California, Mexico (Gendron et al. 1999).

3.1.9 Sperm Whale (Endangered)

Status. The sperm whale (*Physeter macrocephalus*) was listed as a federal endangered species on June 2, 1970 (35 FR 8495). A recovery plan has been prepared and was finalized for this species in December 2010 (NMFS 2010b). The main reason for listing was a severe worldwide population decline due to intensive commercial whaling.

Range and Habitat. The largest of the toothed whales found in the project region, sperm whales are found predominantly in temperate to tropical waters in both hemispheres (Gosho et al. 1984). In the North Pacific, females and juveniles generally remain south of about 45°N latitude year-round, while adult males range northward as far as the Bering Sea in the summer (Gosho et al. 1984). During the winter, most of the population is distributed south of 40°N (Gosho et al. 1984). Off California, sperm whales are present in offshore waters year-round, with peak abundance occurring from April to mid-June and again from late August through November as they pass by during migration (Dohl et al. 1981, 1983; Gosho et al. 1984; Barlow et al. 1997, Carretta et al 2010.).

Sperm whales are primarily a pelagic species and are generally found in waters with depths of greater than 1,000 m (Watkins, 1977), although their distribution does suggest a preference for continental shelf margins and seamounts, areas of upwelling and high productivity (Leatherwood and Reeves, 1986). The majority of sightings by Dohl et al. (1983) in their three-year study off central and northern California were in waters deeper than 1,800 m, but near the continental shelf edge.

Reproduction. Sperm whale groups generally fall into two categories: breeding schools (also called harems), and bachelor schools. One or more mature males may be associated with the breeding schools, which form in early spring (Gosho et al. 1984) and consist of females and juvenile males. Bachelor schools consist almost entirely of younger, but sexually mature, males. Older males are generally solitary and join breeding schools only during the mating season.

The sperm whale mating season lasts from April through August (Rice et al. 1986). Gestation lasts 14 to 15 months, and calves are normally born between June and November (Leatherwood et al. 1982; Rice et al. 1986). Calves are weaned at 1 to 2 years of age, and females give birth at 3- to 5-year intervals (Leatherwood et al. 1982).

Diet. Sperm whales are deep divers and feed primarily on large squid and deepwater fishes (Leatherwood and Reeves, 1986; Rice, 1988). Stomachs of whales taken or stranded off Oregon, Washington, and British Columbia contained predominantly squid and octopus, with some deepwater rockfish and ragfish (Pike and MacAskie, 1969; Mate, 1981).

Population Status. Prized for the high quality of its spermaceti oil, the species was subjected to two major phases of commercial whaling: during the mid-18th to mid-19th centuries; and in the modern whaling era, particularly between 1946 and 1980 (Gosho et al. 1984; Brownell et al. 1989). Between 1958 and 1975, the annual world catch rose to more than 20,000 animals, with a peak of 27,000 in 1966 (Gosho et al. 1984; Brownell et al. 1989). The eastern North Pacific stock was given protective status from commercial whaling in 1980 (Leatherwood and Reeves, 1986; IWC, 1988). The current world population of sperm whales has been estimated at 1,950,000 animals, down from an estimated pre-exploitation population of 2,400,000 (Brownell et al. 1989). The initial population size for the eastern North Pacific (mature animals only) was estimated at 311,000 animals, and the population is currently estimated at 274,000 animals (Braham 1984).

Using acoustic methods, Barlow and Taylor (1998) estimated 39,200 sperm whales in a 7.8 million-km^2 study area encompassing waters between the U.S. west coast and Hawaii. The sperm whale population off California has previously been estimated between about 900 and 1,200 animals (Forney et al. 1995; Barlow and Gerrodette, 1996) and is considered to be relatively stable (Barlow and Taylor, 1998). The best available estimate of the current abundance for the California, Oregon, and Washington stock is 971 individuals (Carretta et al. 2010).

3.2 Birds

3.2.1 California Least Tern (Endangered)

Status. The California least tern (*Sternula antillarum browni*) was listed as endangered on October 13, 1970 (35 FR 16047). The main reasons for listing this species were loss of habitat, human disturbance, and predation. A recovery plan for the species was published in 1980 (USFWS 1980b), but critical habitat has not been designated. On October 2, 2006, the USFWS completed a 5-year review of the status of the California least tern, wherein they recommended it for downlisting from endangered to threatened (USFWS 2006).

Range and Habitat. The breeding range of the California least tern, which the population occupies from about April to September each year, extends from San Francisco Bay south to northern Baja California, Mexico. Least terns usually begin arriving in southern California in April. Early arrival dates include April 8, 1978 for San Diego (Garrett and Dunn 1981) and April 27, 1976 for Santa Barbara (Lehman 1994). The southward migration of least terns may begin as early as August and few, if any, terns remain in California after late September (Garrett and Dunn 1981). The migration route and winter distribution of these birds remains mostly unknown, although they probably winter along the Pacific coast of southern Mexico and Central America.

During the last 20 to 25 years, about 50 sites in California have been occupied by nesting least terns at some time (Fancher 1992; Caffrey 1995). These range from Pittsburg in northern California to the Tijuana River mouth at the south end of the state. However, the number of sites actually used fluctuates from year to year, as potential nesting areas become available naturally or through site preparation efforts, or unavailable due to natural or human disturbance and/or predation. Fewer sites have been used in recent years; for example, only 35 sites were used in 1996 (Caffrey 1998). Furthermore, the number of nesting pairs is concentrated at only a few locations. In 1996, 7 of the 35 sites used that year accounted for 58 percent of the breeding pairs (Caffrey 1998). These seven sites were Naval Air Station (NAS) Alameda, Venice Beach, Huntington Beach, Santa Margarita River/North Beach, Mission Bay/FAA Island and Mariner's Point, and Delta Beach/North.

Nesting colonies are usually located on open expanses of sand, dirt, or dried mud, typically in areas with sparse or no vegetation. Colonies are also usually in close proximity to a lagoon or estuary where they obtain most of the small fish they consume, although they may also forage up to 3 to 5 km (2 to 3 miles) offshore. Least terns are fairly faithful to breeding sites and return year after year regardless of past nesting success.

Reproduction. Nests consist of a shallow scrape in the sand, sometimes surrounded by shell fragments. Eggs (usually two per clutch) are laid from mid-May to early August. Incubation takes 20 to 28 days, and young fledge in about 20 days (USFWS 1980b). Least terns breed after their second year, and first-time breeders are more likely to nest later in the breeding season (Massey and Atwood 1981; Thompson et al. 1997).

Diet. Least terns are opportunistic feeders known to capture more than 50 species of fish. Prey species include the northern anchovy (*Engraulis mordax*), deepbody anchovy (*Anchoa compressa*), jacksmelt *(Atherinopsis californiensis)*, topsmelt *(Atherinopsis affinis)*, California grunion *(Leuresthes tenuis)*, shiner surfperch *(Cymatogaster aggregata),* California killifish *(Fundulus parvipinnis)*, and mosquitofish *(Gambusia affinis)*.

Reasons for Decline. Although loss of habitat and human disturbance were the primary reasons for the decline of least terns in California, predation continues to be an ongoing problem for the species. Least tern chicks are preyed on by several mammalian and avian species, including coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), domestic cats (*Felis domesticus*), American kestrels (*Falco sparverius*), northern harriers (*Circus cyaneus*), red-tailed hawks (*Buteo jamaicensis*), and western gulls (*Larus occidentalis*). One predator, the American crow (*Corvus brachyrynchus*), has become a major problem in recent years. With the increasing urbanization of American crows, this species is now occupying many coastal areas of southern California, and preys on least tern nestlings. During the 1999 breeding season, all the nests at the Venice Beach colony were lost to crows

Population Status. In 1970, when California least terns were listed as endangered by the federal government and California, there were only an estimated 300 pairs distributed among 14 nesting sites in San Diego and Orange Counties, and at a single northern California site at Bair Island in San Mateo County (Craig 1971). Population growth rates have increased, especially since the mid-1980s, when active management for least terns was initiated. Management of California least tern colonies has included intensive monitoring of nesting colonies, site preparation to reduce vegetative cover, protection of sites by means of reduced access to humans, and predator management. Although the increase in the breeding population has not been consistent from year to year (there were only about 2,598 pairs in 1995 compared to 2,792 in 1994; Caffrey 1995, 1997, 1998; Keene 2000), the long-term trends have shown steady population growth. This, despite a decline of more than 10 percent occurred from the 1998 to 1999 when the population dropped from a peak of 4,141 to 4,182 pairs down to only 3,493 to 3,711 pairs. By 2004, however, the population was back up, with an estimated 6354 to 6805 pairs establishing nests (Marschalek 2005). In 2010, a population estimate of 6,568 was recorded (Marshalek 2011). Fluctuations in the least tern population are thought to be attributable to a combination of high levels of predation and low prey availability.

In the general area of concern for the proposed project, from 1994 onward, as many as 12 sites have been used for nesting by least terns, depending to some degree on how some sites have been lumped or split in different years (Caffrey 1995, 1997, 1998; Keane 1998, 2000; Marschalek 2005). Nesting site fidelity among least terns appears to be patchy, and may depend heavily on local prey availability and predation. Only 7 to 9 of these sites were in use in any one year, again depending on how they were tabulated. The general locations of these sites are: Oceano Dunes, Guadalupe Dunes, Mussel Rock Dunes, Vandenberg AFB (Beach 2 and Purisima Point), Santa Clara River mouth, Ormond Beach (3 sites), Point Mugu, and Venice Beach.

The number of pairs at most of these locations has generally been low (<50); however, both Venice Beach and Point Mugu have periodically hosted large numbers of nesting terns. Currently, Mt. Mugu is one of the largest colonies in California, with a total of 640-642 breeding pairs, 708 nests, and at least 98 fledglings produced in 2010. Venice Beach was formerly one of the larger colonies in California, but populations at this site have fluctuated dramatically in response to prey availability and predation. Although it hosted many as 383 pairs in 1998, a food (anchovy) shortage, was believed to account why only 17 pairs attempted nesting at this location in 2004 (Keane 2000, Marschalek 2005). In 2010, 148-164 breeding pairs establish 164 nests at Venice Beach, but predation by crows was extremely high and resulted in 100 percent failure of nesting attempts for a second consecutive year. Low anchovy numbers may result adults spending more time away from nests foraging for food, leaving nests vulnerable to predators.

At the two Vandenberg AFB sites 32-33 breeding pairs established 34 nests and produced 29 fledglings in 2010. This represents the second consecutive year of higher fledgling counts following poorer productivity at Vandenberg AFB sites in 2004-2006. (Marschalek 2005, 2011).

The implementation of protected beach areas for the western snowy plover at Coal Oil Point Reserve in Goleta has had the added benefit of increasing the appeal of this location for least tern nesting. Beginning in 2004, small numbers of terns attempted to nest there. In 2006, five chicks were successfully hatched at this location; however, following two successive years of unsuccessful nesting due to predation, no attempts were recorded in 2009 or 2010 (Marschalek 2011).

3.2.2 Marbled Murrelet (Threatened)

Status. The marbled murrelet (*Brachyramphus marmoratus*) is an unusual member of the auk family, nesting up to 70 km (44 miles) inland in old growth forests and staying close to shore when at sea. This small, secretive seabird was listed as threatened in 1992 (57 FR 45328). The main reasons for listing were population decline resulting from loss and degradation of the old-growth forest habitats that the murrelet uses for nesting (USFWS 2009).

Range and Habitat. The marbled murrelet inhabits the Pacific coast of North America from the Bering Sea south to the Santa Cruz mountains. The southern limit of the species' breeding range is along the coast of northern Santa Cruz and southern San Mateo counties, in the vicinity of Point Año Nuevo (Ainley et al. 1995). The next closest population is located more than 300 kilometers further north, off the Humboldt County coast.

Although the foraging range of breeding marbled murrelets is generally less than 25 km, radio-telemetry studies have tracked several birds nearly 200 km south, to the southern end of the Monterey Bay National Marine Sanctuary near Point Piedras Blancas. These birds were assumed to have traveling such a considerable distance for some predictable food source. At sea, the most birds are observed alone or in pairs and are typically sighted within 1.2 miles of the shoreline (Marshall 1988, Strachan et al. 1995).

Marbled murrelets generally nest in old-growth forests, characterized by large trees, multiple canopy layers, and moderate to high canopy closure. In the non-forested portions of Alaska however, murrelets can also nest on the ground or in rock cavities. It is likely that western hemlock and Sitka spruce constitute the most important nesting trees for this species, with Douglas-fir becoming important south of British Columbia. In California, nests are typically found in coastal redwood and Douglas-fir forests. Nesting forests are located close enough to the marine environment for the birds to fly to and from the nesting sites on a daily basis.

Reproduction. Marbled murrelets do not typically build nests, but instead lay their eggs in small depressions or cups made in moss or other debris on large tree limbs. They typically only nest once per year, and produce only one egg per nesting cycle. Incubation of the egg lasts approximately one month, with both sexes taking turns incubating the egg in alternating 24-hour shifts. After hatching, the chick is fed up to eight times daily, and is usually fed only one fish at a time. The young are semiprecocial, and are capable of walking but not leaving the nest. Fledging occurs approximately 28 days after hatching, and fledglings will fly unaided, directly from the nest to the ocean.

Diet. Marbled murrelets are opportunistic foragers in shallow, nearshore waters as well as at in protected bays and fjords (Strachan et al. 1995). They subsist primarily on small forage fish (e.g., herring, seaperch) and invertebrates (e.g., amphipods, mysids), and seasonally shift between prey based on oceanographic conditions (Burkett 1995, Strachan et al. 1995). For example, the fish portion of the murrelet's diet was most important in the summer and coincided with the nestling and fledgling period.

Reasons for Decline. The primary reasons for the decline in the marbled murrelet population are habitat loss, predation, gill-net fishing operations, oil spills, marine pollution, and disease. Habitat loss has resulted from logging and fragmentation of the old-growth forests that murrelets utilize for nesting. Recent reviews have also concluded that the risk of predation, particularly from crows and gulls, is a larger threat than previously considered (USFWS 2009).

Population Status. Although there are an estimated 270,000 marbled murrelets in Alaska and another 54,000 to 92,000 in British Columbia, within the lower 48 states (Washington, Oregon and California) only 15,000 to 35,000 marbled murrelets exist. Despite ESA protection, this population has continued to shrink and fragment over the last ten years at a rate of up to 7 percent per year. The nearest breeding population of marbled murrelets, located in the Santa Cruz mountains of central California, currently consists of approximately 631 individuals (Peery and Henry 2010).

Small numbers of marbled murrelets are known to occur sporadically along the northern Santa Barbara County coastline where it is considered a very rare late-summer, fall, and winter visitor. (Lehman 2012). Recent sightings (within the last 20 years) have typically occurred near the Santa Maria river mouth, Point Sal, and northern Vandenberg Air Force Base (Lion's Head). However, sightings of marbled murrelets along the Santa Barbara coastline are infrequent, and generally consist of only 2 to 4 birds at a time (Lehman 2012).

3.2.3 Western Snowy Plover (Threatened)

Status. The coastal population of the western snowy plover (*Charadrius nivosus nivosus*) was listed as threatened in the Federal Register on March 5, 1993 (58 FR 12864). The main reasons for listing this population were loss and degradation of habitat from human disturbance. On December 7, 1999, a designation of critical habitat was published in the Federal Register (64 FR 68507). This designation was updated on September 9, 2005 (70 FR 56970) (USFWS 2005b), and revised again on July 16, 2012 (77 FR 36727). A Draft Recovery Plan for this species was published in the Federal Register on August 14, 2001 (66 FR 42676); and finalized in September 2007 (USFWS 2007).

Range and Habitat. Western snowy plovers are found in several western states including Washington, Oregon, California, Nevada, Utah, and Arizona as well as Baja California and mainland Mexico. However the range of the Pacific coast population is much more limited. This population is defined as those individuals that nest adjacent to tidal waters, and includes all nesting birds on the mainland coast, peninsulas, offshore islands, adjacent bays, estuaries, and coastal rivers (58 FR 12864).

The coastal population consists of both resident and migratory birds. Some birds winter in the breeding areas, while others migrate north or south to wintering areas (Page et al. 1986; Warriner et al. 1986). The breeding range of the coastal population extends along Pacific coast of North America from southern Washington to southern Baja California, Mexico. The winter range is somewhat broader and may extend to Central America (Page et al. 1995); however, most plovers winter south of Bodega Bay, California (Page et al. 1986).

The nesting habitat of the coastal population consists mainly of dune-backed beaches, barrier beaches, salt flats, and salt evaporation ponds (Page and Stenzel, 1981; Palacios and Alfaro, 1994). Habitat of wintering birds includes beaches where nesting is not known to occur. In the U.S., over 150 currently used or historical nesting and/or wintering areas have been identified (64 FR 68507), most of which (about 85 percent) are found in California. Additionally, at least four major nesting areas are known to exist in Baja, California. In coastal California, plovers historically nested at 53 locations prior to 1970 (Page and Stenzel, 1981). Currently, 44 of these sites are no longer used by nesting plovers (50 CFR 20607). Declines in the overall number of nesting sites have also occurred in Oregon and Washington (see 35 FR 16047).

The largest number of breeding birds occurs from South San Francisco Bay to southern Baja California. Major breeding areas within the project area include the Callendar-Mussel Rock Dunes area, the Point Sal to Point Conception area, and the Oxnard Lowlands (Ormond Beach and Point Mugu). Most of these areas and many others have been designated as critical habitat for the western snowy plover (77 FR 36727). Designated critical habitat areas in the general area of concern for the proposed project include Devereux Beach (Coal Oil Point in Santa Barbara County), a stretch of beachfront adjacent to downtown Santa Barbara; Santa Rosa Island, San Buenaventura beach in Ventura, Mandalay Beach, the Santa Clara River area, and Ormond Beach (in Ventura County).

Reproduction. Snowy plovers breed in loose colonies of up to 150 pairs. Site fidelity is high, and birds often nest in the exact same location as the previous year (Warriner et al. 1986). The breeding season for western snowy plovers extends from early March to late September, with birds at more southerly locations beginning to nest earlier in the season than birds at more northerly locations (64 FR 68507). In most years, the earliest nests on the California coast occur during the first to third week of March. Peak nesting in California occurs from mid-April to mid-June, while hatching lasts from early April through mid-August.

During courtship, males defend territories and may make multiple scrapes (slight depressions) in flat, open areas with sandy or saline substrates. The male constructs the scrapes by leaning forward on his breast and scratching his feet while rotating his body. Females choose which scrape becomes the nest site by laying eggs in one of them. Plovers lay between 2 to 6 eggs in a nest (Page et al. 1995). The nest is increasingly lined with beach debris (e.g. small pebbles, shell fragments, plant debris, and mud chips) as incubation progresses. Both sexes incubate the eggs, with the female tending to incubate during the day and the male at night. Both nest initiation and egg laying take place from mid-March through mid-July (Wilson, 1980; Warriner et al. 1986).

Snowy plover chicks are precocial, leaving the nest within hours after hatching to search for food. Adult plovers do not feed their chicks, but lead them to suitable feeding areas. Females generally desert both mates and broods by the sixth day after hatching, leaving the males to continue rearing the brood, while the females move on to obtain new mates and initiate new nests. The chicks reach fledging age approximately one month after hatching; however, broods rarely remain in the nesting area throughout this time. Plover broods may travel along the beach as far as 6.4 kilometers (4 miles) from their natal area.

Diet. Snowy plovers are primarily visual foragers whose diet consists primarily of molluscs, worms crabs, sandhoppers, and insects (Soothill and Soothill, 1982; Page et al. 1995). They forage for invertebrates across sandy beaches from the swash zone to the macrophyte wrack line of the dry upper beach. They also forage in dry sandy areas above the high tide, on salt flats, and along the edges of salt marshes and salt ponds (58 FR 12864). Plovers may also sometimes probe for prey in the sand and pick insects from low-growing plants.

Reasons for Decline. The primary reasons for the decline in the coastal population of the western snowy plover are habitat loss, human disturbance, and predation. Habitat loss has resulted from both the urbanization (construction of residential, commercial, and recreation facilities, harbors, roads, campgrounds, etc.) of the Pacific coast, especially in southern California, and the spread of introduced beach grasses (e.g., marram grass) used for the stabilization of coastal sand dunes. Introduced grasses are particularly a problem in the northern portion of the plover's range.

Plovers are highly susceptible to human disturbance, and human activity (walking, jogging, dog walking, off-road vehicle use, beach raking, etc.) has also played an important role in the decline of the coastal population. The breeding season of the western snowy plover (mid-March to mid-September) coincides with the time of greatest beach use by people, and Page et al. (1977) found that snowy plovers were disturbed more than twice as often by human activities than all other natural causes combined. If the level of disturbance is sufficiently high, plovers may abandon their nests, and eggs have been stepped on and run over by vehicles. Chicks that become separated from adults through human disturbance may die of exposure. At one site in coastal California, humans were directly responsible for the loss of at least 14 percent of nests over a 6-year period (Warriner et al. 1986).

Loss of eggs, chicks, and adults to a variety of predators including gulls (*Larus* spp.), American crows (*Corvus brachyrynchus*), common raven (*Corvus corax*), red fox (*Vulpes vulpes*), skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and coyote (*Canis latrans*) is a major concern at a number of nesting sites. Accumulation of trash at beaches attracts these as well as other predators (Stern et al. 1990; Hogan, 1991).

Population Status. The first reliable information on the abundance of snowy plovers along the California coast came from surveys conducted during the 1977 to 1980 breeding seasons by Point Reyes Bird Observatory (PRBO). The surveys suggested that the snowy plover had disappeared from significant parts of its coastal California breeding range by 1980. When these surveys were initially conducted, the breeding population had been estimated at 1,565 birds (Page and Stenzel, 1981). However, based on the number of historical nesting sites that are no longer occupied, the number of plovers nesting along the coast was likely much higher.

The breeding population continued to decline after the 1981 surveys, and subsequent surveys estimated the number of breeding birds at 1,386 in 1989 (Page et al. 1991), 1,180 in 1991, and 967 in 1995 (G. Page, Point Reyes Bird Observatory, Stinson Beach, California, unpublished data). Based on Christmas Bird Counts from 1962 to 1984, the number of wintering birds had also declined, at least in southern California (Page et al. 1986). The current population estimate for the U.S. portion of the Pacific Coast Western Snowy Plover is approximately 2,270 breeding individuals.

Within the project area, the snowy plover populations have fluctuated substantially over the years. Currently, one of the largest active breeding areas is located on Vandenberg AFB in northern Santa Barbara County where the western snowy plover occupies approximately 12.5 miles (20 km) of beach and dune habitat. Vandenberg AFB has previously supported up to 20 percent of the entire Pacific coast population of western snowy plovers. However, during the late 1990s, severe declines in the number of nesting plovers at this location occurred. In 1997, the breeding population on the base was estimated at 240 birds, but by 1999 the count had declined to only 78. at this location resulted in a beach closure was put into effect beginning in spring 2000 for all but about 2 miles of beach. Following the institution of the beach closure, however, the population rebounded significantly, with breeding populations of 259 and 245 birds in 2005 and 2006 respectively. During 2010, a total of 255 nests and 409 chicks were hatched at Vandenberg AFB sites (USFWS 2010a,b).

Declines on the nearby islands of Santa Rosa and San Miguel in the Channel Islands National Park have also occurred in the last decade, although numbers are difficult to assess due to their remoteness. A total of 72 snowy plovers were counted on eastern end of Santa Rosa Island (Skunk Point) during the 1998 breeding season, but only 41 the following year. In 2005, 37 birds were enumerated, however, during the latest breeding season (2010) only eight birds were counted on the island (USFWS 2010b). Although the breeding population has declined, Santa Rosa Island still supports a substantial wintering population of plovers, with over 242 birds counted in January 2010 (USFWS 2010a). A limited breeding population was also known to occur on San Miguel Island in the early 1990s; however, no breeding plovers have been observed at this island in the last decade. In recent years one to two snowy plovers have been documented utilizing the western portions of Santa Cruz Island during winter, but no breeding has taken place here.

In contrast to declines at the northern Channel Islands locations, increases in nesting at two other nearby mainland colonies have occurred in recent years: Coal Oil Point and Ormond Beach. Although plovers historically bred at University of California, Santa Barbara (UCSB)'s Coal Oil Point Reserve, the site produced no snowy plover chicks from the time it opened to the public in 1970 until the summer of 2001. Implementation of an aggressive management plan including predator management, public outreach, and protective fencing resulted in re-establishment of a small, but viable plover breeding population beginning in 2002. Over the last decade, this location has supported a small number of breeding plovers, culminating in 2009 when a total of 65 plover nests were counted and 61 chicks were hatched. Severe storms and predation affected the site in 2010, resulting in only 15 documented nesting attempts. Coal Oil Point also supports a substantial population (100-400) of wintering snowy plovers. In January 2006, 325 wintering plovers were observed at this location. During the annual survey conducted in January 2010, 174 wintering plovers were observed (USFWS 2010a).

Since 2000, the breeding population at Ormond Beach has remained between 10 and 35 birds. In 2005, a total of 22 nesting attempts resulted in 15 hatchings at this location. Numbers have increased slightly since then, with 33 nests and 18 successfully hatchings recorded in 2009. In 2010, 27 nests and 19 successfully hatchings were documented (USFWS 2010b, USFWS 2011).

3.2.4 Short-tailed Albatross (Endangered)

Status. With a wingspan of over 2 meters (>7 feet) the short-tailed albatross (*Phoebastria albatrus*) is the largest of the three albatross species that inhabit the North Pacific Ocean. It is best distinguished from other albatrosses by its large, bubblegum-pink bill. This species was listed as endangered throughout its range in July 2000 (65 FR 46643). A recovery plan was circulated in 2005 and finalized in 2008 (USFWS, 2008), however, critical habitat has not been designated for this species. Overharvesting and habitat loss were the primary reasons for the original listing of the short-tailed albatross; however, habitat loss from volcanism and storms are the current main threats.

Range and Habitat. The short-tailed albatross ranges widely throughout the North Pacific Ocean, including waters off China, Japan, Russia, the Bering Strait, the west coast of Canada and the United States, and Mexico's Baja Peninsula. Short-tailed albatrosses forage widely across the temperate and subarctic North Pacific, traveling to the waters of the California Current and the Gulf of Alaska to take advantage of the nutrient-rich upwellings in these regions. Historically, millions of short-tailed albatrosses bred in the western North Pacific on several islands south of the main islands of Japan. However, following a complete population collapse due to overharvesting, today there are only two active breeding colonies: Torishima Island and Minami-kojima Island, Japan. In addition, a single nest was recently found on Yomejima Island of the Ogasawara Island group in Japan. Single nests have also begun to occur on Midway Island, Hawaii.

Reproduction. Like many seabirds, short-tailed albatrosses are long-lived, with some known to be over 40 years old. However, they are also slow to reproduce. They begin breeding at about 7 or 8 years old, and mate for life, although they have been known to create a new pair bond if their original mate disappears or dies. Short-tailed albatrosses nest almost exclusively on the sloping grassy terraces of the isolated volcanic island of Torishima, Japan and exhibit high nesting site fidelity. Pairs lay a single egg each year in October or November. Eggs hatch in late December through early January. Chicks remain near the nest for about 5 months, fledging in June. After breeding, short-tailed albatrosses move to feeding areas in the North Pacific.

Diet. Prey items for this species include flying fish eggs, shrimp, squid, and crustaceans. Short-tailed albatross feed primarily during daybreak and twilight hours and have been known to forage as far as 3,200 km (1,988 miles) from their breeding grounds. They feed largely on squid and fish on the surface of the ocean, as well as on the offal discharged by fishing boats. Recent telemetry studies indicate that this species seems to prefer foraging areas of ocean that are less than 1,000 meters where deep, fertile waters well up into shallower areas.

Population Status. Prior to the 20th century, the short-tailed albatross was the most abundant of the North Pacific albatross species, with a population numbering more than a million birds. The species was considered "fairly common at sea, irrespective of season" in the waters off California, and was thought to be the most common albatross encountered in inshore waters as indicated by the predominance of its bones in shellmounds at locations such as Point Mugu (Grinnell & Miller 1994).

During the late 1800s and early 1900s, however, the species was nearly driven to extinction by feather hunters and egg collectors who sought their long, white wing and tail feathers to make pen plumes and their downy body feathers to stuff feather beds. Between approximately 1885 and 1903, an estimated five million short-tailed albatrosses were harvested from the main breeding colony on Torishima. Although a ban on the collection of short-tailed albatross feathers was instituted in 1906, it was not very effective and illegal feather collection continued until the 1930's, when the species was no longer economically significant because its numbers had been reduced so drastically. Then in 1939, the last remaining breeding grounds on the island of Torishima were buried under 10-30 meters of lava as a result of a massive volcanic eruption.

In 1949, the species was mistakenly declared extinct, but in the early 1950s, ten pairs were discovered breeding on Torishima. Over the last half century, this remnant population has slowly re-established, and in the last several years has begun to expand rapidly, increasing in size at a rate of 6 to 8 percent annually. The current world population of short-tailed albatross is currently estimated at 2,700 birds,

As its population increases, individuals have slowly started to reappear in California waters, with the first recorded sighting since 1900 observed 40 miles west of San Clemente Island on 28 August 1977. Since that date there have been a total of more than 33 records in California waters, 15 of which have occurred since 2007. As the population continues to rebound, a heightened presence off the California coast is expected, particularly in areas of upwelling.

3.2.5 Light-footed Clapper Rail (Endangered)

Status. The light-footed clapper rail (*Rallus longirostris levipes*) is a coastal marsh dwelling species that was listed as endangered on October 13, 1970 (35 FR 8320). There are currently believed to be only 250-350 pairs left in California, with most found in Upper Newport Bay and the Tijuana Marsh. A recovery plan was approved in 1979 (USFWS, 1979), however, critical habitat has not been designated for this species. Population declines related to habitat loss were the primary reason for listing this species.

Range and Habitat. The current and historic range of the light-footed clapper rail extends from Bahia de San Quintin, Baja California, Mexico to Santa Barbara County, California where they are restricted to coastal salt marshes. Although, historically, most of the salt marshes in this region were probably occupied by rails, no more than 24 marshes have been occupied since about 1980 (Zembal and Hoffman, 1999). Only a portion of these marshes are used each year. For example, from 1997 to 1999, 16, 17, and 14 marshes were occupied, respectively (Zembal and Hoffman, 1999). The vast majority (more than 95 percent) of the remaining rails are in Orange and San Diego counties. For example, of the 222 pairs recorded in 1998, 189 (85 percent) of these occurred at only three sites: Upper Newport Bay and Seal Beach and Tijuana marsh National Wildlife Refuges. In the general area of concern for the proposed development of the Electra Field, there are presently only two marshes that are, or have the potential to be, occupied by rails. These are Carpinteria Marsh in Santa Barbara County and Mugu Lagoon in Ventura County. The next closest location for rails is the Seal Beach National Wildlife Refuge in Orange County.

The light-footed clapper rail is normally found in estuarine habitats, particularly salt marshes with well-developed tidal channels. Dense growths of cordgrass (*Spartina foliosa*) and pickleweed (*Salicornia* sp.) are conspicuous components of rail habitat, and nests are located most frequently in cordgrass. In a radio-telemetry study conducted in Newport Back Bay, radio-tagged rails spent about 90 percent of their time in cordgrass, in the lower marsh (Zembal et al. 1989). At low tides they also hunted along creek banks. When water covered the lower marsh, radio-tagged rails foraged on higher ground in sparser vegetation.

Reproduction. Clapper rails construct loose nests of plant stems, either directly on the ground when in pickleweed or somewhat elevated when in cordgrass (USFWS, 1979). Although nests are usually located in the higher portions of the marsh, they are buoyant and will float up with the tide. Eggs are laid from mid-March to the end of June, but most are laid from early April to early May. Clutch size ranges from 3-11, with clutches of 5-9 most common. The incubation period is about 23 days, and young can swim soon after hatching.

Diet. Clapper rails forage mainly by shallow probing of sediment or surface gleaning. Their diet includes small crabs, other crustaceans, slugs, insects, small fish, and eggs (Edelman and Conway, 1998).

Reasons for Decline. Rails may have suffered declines originally in the early 1900s due to overhunting. By far, however, the main reason for the decline has been habitat destruction and degradation. Of the approximate 26,000 acres of historic coastal wetlands, less than 8,500 acres remain (Speth, 1971), and only a fraction of the remaining acreage provides suitable habitat for the light-footed clapper rail. Also, the remaining coastal wetlands often lack important "buffers" where species can retreat during high water and where pollutants and sediments can be filtered before entering the wetland itself, as well as good connections to uplands and to the ocean. Predation has also played a role in the decline of the species. With the implementation of active management, there is hope for improving the health of this species. Ongoing management efforts include habitat restoration through the reestablishment or enhancement of tidal action to historic habitat; predator management, research, and control; nest site enhancement; captive breeding; translocation; and continuing research into the life history of the species.

Population Status. Based on the first statewide survey, the California population was estimated at about 500 birds (Wilbur, 1974), although this estimate is believed to be somewhat high (USFWS, 1979). Since 1980, the California population has ranged from a low of 284 birds in 1985 to a high of 882 in 2011(Zembal and Hoffman 1999; Zembal et al 2006, Zembal et al 2011). The number of marshes occupied has also varied from a low of 8 in 1989 to a high of 21 in 2011. In 2011, a total of 441 pairs of light-footed clapper rails exhibited breeding behavior in 21 marshes in southern California (Zembal et al 2011). This is the second largest statewide breeding population detected since the counts began in 1980. Although surveys have not been conducted in Baja California for several years, the Baja population is thought to consist of at least 400-500 pairs.

Upper Newport Bay currently comprises the largest subpopulation in California, with 137 pairs (31 percent of the state population) in 2011. Together with the subpopulation in the Tijuana Marsh, these two marshes contain a total of 250 pairs, comprising 57 percent of the breeding population in California.

In the general area of concern for the Electra Field project, two marshes have historically been occupied by clapper rails, Carpinteria Marsh and Mugu Lagoon (Zembal et al 2011). These wetlands represent the northernmost habitat for the light-footed clapper rail. Although as many as 26 pairs have been known to occur at Carpinteria Marsh, the rail population of the marsh declined sharply in 1985, and no rails were found during annual surveys from 1989 to about 1994. From 1995 to 2002, there were approximately 1-5 nesting pairs, along with a few apparently unmated birds. However, the last know clapper rail call from Carpinteria Marsh was heard from an unmated female in 2003. In April 2004, two males were released in the marsh in the hope they would find and mate with the previously heard female; however, recent surveys have not detected the presence of rails at this marsh (Zembal et al 2011). The chances for a viable subpopulation of light-footed clapper rail to become re-established in Carpinteria Marsh are currently considered non-existent without improvements in predator and habitat management at this location (Zembal et al 2006).

The rail subpopulation at Mugu Lagoon fluctuated between 3 and 7 pairs for nearly 20 years until recent augmentations fostered its growth. A captive breeding program for the light-footed clapper rail was first established in 1998. Although the first several years of the program were unproductive, since 2000, over 100 rails have been released into the wild, including several at Mugu Lagoon. Additionally, there have been occasional re-sightings of banded rails at Point Mugu, indicating that some of the captive-bred rails remained local after being released into the marsh (Zembal et al 2006). The increased population at this location appears to have led to an expansion of habitat use within the lagoon. For example, in 2004, a pair of rails was observed attempting to breed in the eastern arm of the lagoon for the first time in many years (Zembal et al 2006). Following a population crash in 2008 the clapper rail population at Point Mugu quickly rebounded to 12 pairs in 2010, and more than 16 pairs in 2011 (Zembal et al 2011).

3.3 Reptiles

Historically, four species of sea turtles have been recorded in the eastern North Pacific: the leatherback sea turtle (*Dermochelys coriacea*), the green sea turtle *(Chelonia mydas*), the Olive ridley sea turtle (*Lepidochelys olivacea*), and the loggerhead sea turtle (*Caretta caretta*) (Caldwell, 1962; Márquez, 1969; Hubbs, 1977). Populations of all species have been greatly reduced by overharvesting, incidental bycatch by the fishing industry, and, to a lesser extent, coastal development of nesting beaches in developed countries (Ross, 1982).

3.3.1 Leatherback Sea Turtle (Endangered)

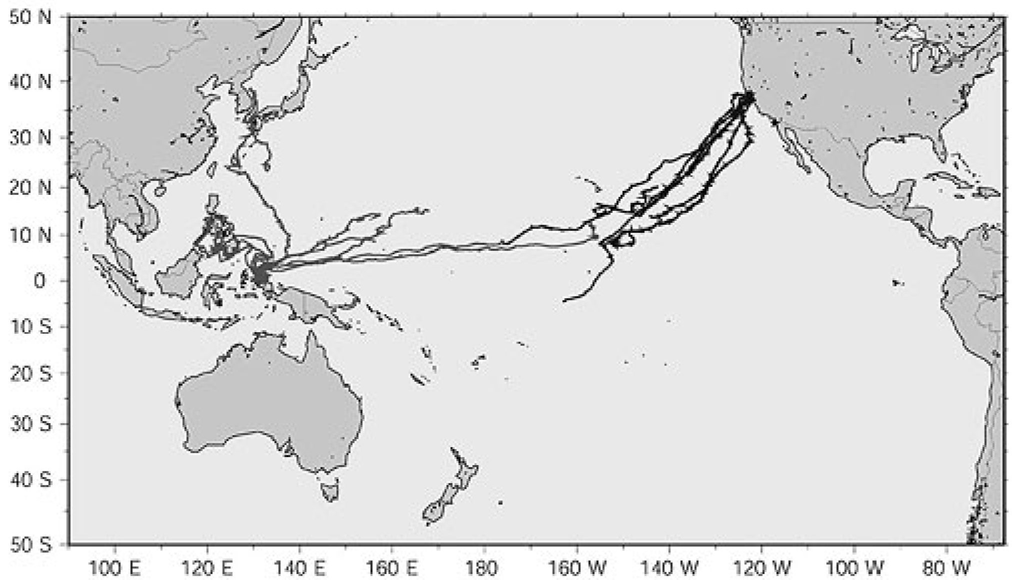
Status. The leatherback sea turtle (*Dermochelys coriacea*), was listed as endangered on June 2, 1970 (35 FR 8495), and a recovery plan was finalized in 1998 (NMFS and USFWS, 1998a-d). Critical habitat was designated for the leatherback turtle along the western U.S coast in January 2012, including 16,910 square miles off California's central coast (77 FR 4170). This area of critical habitat stretches from Point Arena to Point Arguello east of the 3,000-meter depth contour.

Range and Habitat. Leatherback sea turtles, the largest of the sea turtles, occur throughout the Atlantic, Indian, and Pacific Oceans (Mager, 1984). Full-grown specimens reach average lengths of 7 feet, have a span of 8.9 feet from flipper to flipper, and can weigh as much as 650 to 1200 lbs (Eckert, 1997). Leatherbacks commonly range farther north than other sea turtles, probably because of their ability to maintain warmer body temperatures over longer time periods (Frair et al. 1972). They have been sighted in the eastern north Pacific as far north as Alaska (Mager, 1984), and small numbers forage seasonally off the central California coast (Figure 4-1).

Leatherbacks nest at beaches in tropical latitudes, and it was long thought that the local visitors observed off the Pacific coast of the United States originated from the western Mexico, Central America, and northern Peru breeding populations (Mager, 1984). However, genetic analyses of individuals sampled off Monterey, California, and from turtles stranded on California beaches, indicate that the majority of these animals originate from western Pacific nesting stocks, most likely North Papua, Papua New Guinea, or the Solomon Islands (Dutton et al 2001). Satellite telemetry studies, shown in Figure 3-3, support this revised interpretation of the leatherback origins (MBNMS 2002, Paladino 2012). Turtles tagged after nesting in July at Jamursba-Medi arrived in waters off California and Oregon during July-August (Benson et al. 2007a; 2011) coincident with the development of seasonal aggregations of jellyfish (Shenker, 1984; Suchman and Brodeur, 2005; Graham, 2009).

Additional tagging efforts have revealed that leatherbacks in the western Pacific region, although considered a single genetic stock, comprise multiple foraging populations. Turtles that nest during the winter months undertake migrations to the south, while those that nest during summer months move to northern foraging grounds, including the western coast of North America. In contrast, leatherbacks originating from the eastern Pacific nesting grounds off Mexico and Costa Rica tend to migrate south from their nesting beaches to forage areas located off South America and the Galapagos Islands (Morreale et al. 1996, Eckert and Sarti 1997).

Figure 3-3 Satellite-Tracked Leatherback Movements from Nesting Beaches in the Western Pacific and Foraging Areas off the California Coast in 2003-2004.



Source: http://www.montereybay.noaa.gov/reports/2005/eco/openocean.html

In light of the importance of foraging habitats off central and northern California waters to the survival of Pacific leatherbacks, in January 2012 the NMFS designated critical habitat for this species off the U.S. west coast, including 16,910 square miles off California's central coast (77 FR 4170). This area of critical habitat stretches from Point Arena to Point Arguello east of the 3,000-meter depth contour.

Reproduction. Leatherbacks are believed to reach sexual maturity in about 16 years. Female leatherbacks migrate between temperate foraging grounds and subtropical and tropical nesting beaches at 2 to 3-year intervals (NMFS and USFWS, 1998a). Nesting females seem to prefer high energy beaches (beaches immediately adjacent to deep water). Female leatherbacks nest an average of 5 to 7 times within a nesting season. The nests are constructed at night in large clutches harboring an average of 80 to 85 eggs. Typically incubation takes from 55 to 75 days, and emergence of the hatchlings occurs at night. Once hatched, the young instinctively make for the sea.

Diet. Although considered omnivorous (feeding on sea urchins, crustaceans, fish, and floating seaweed), leatherbacks feed principally on soft foods such as jellyfish (scyphomedusae) and tunicates (salps, pyrosomas) (Mager, 1984; NMFS and USFWS, 1998a). Dense swarms of jellyfish can contain nearly 80 percent as much carbon as the densest copepod populations (Shenker 1984), providing a rich food source for predators such as the leatherback. Leatherbacks also may forage nocturnally at depth on siphonophores and salps in the deep scattering layer (Eckert et al. 1989; NMFS and USFWS, 1998a).

Population Status. Pritchard (1971) estimated that there were at least 8,000 nesting females in the eastern Pacific, and later estimated a total world population of 115,000 mature females (Pritchard, 1982). However, by 1995 the worldwide population estimate had dropped to between 26,200 and 42,900 adult females (Spotila et al. 1996, Spotila et al. 2000).

The Pacific portion of the population, in particular, continued to undergo dramatic decline. Between 1996 and 2000, the number of female leatherbacks in the eastern Pacific population dropped from 4,638 to about 1,690. Meanwhile, the western Pacific population also underwent substantial declines. The entire Pacific Ocean is currently thought to contain perhaps as few as 2,300 breeding females.

In the western Pacific, the major nesting beaches occur in Papua New Guinea, Papua-Indonesia, and the Solomon Islands, with lesser nesting reported on Vanuatu; compiled nesting data estimated approximately 5,000 to 9,200 nests annually since 1999, with 75 percent of the nests being laid in Papua-Indonesia.

Inshore waters off California, between Point Conception and Point Arena, are visited annually by approximately 150 to 170 leatherback turtles, with the greatest numbers occurring during summer and early fall when large aggregations of jellyfish form (Bowlby, 1994; Starbird et al. 1993; Benson et al. 2007b; Graham, 2009). Most (83 percent) of the sea turtles sighted off northern and central California by Dohl et al. (1983) during their 3-year survey were leatherbacks, and nearly 90 percent of these sightings were made during the summer and fall. Sightings were widely distributed from 10 to 185 km offshore, and most were recorded in waters over the continental slope.

3.3.2 Green Sea Turtle (Endangered)

Status. The green sea turtle (*Chelonia mydas*) was listed as endangered on July 28, 1978 (43 FR 32808). The recovery plan for the Pacific population of this species was finalized in 1998 (NMFS and USFWS, 1998a-d). No critical habitat has been designated for this species in western U.S. waters.

Range and Habitat. Green turtles (*Chelonia mydas*) occur in temperate and tropical waters worldwide (Seminoff 2004), although the population of this species has declined approximately 90 percent in the last 50 years (Stebbins 2003). Prior to commercial exploitation green turtles were abundant in the eastern Pacific from Baja California south to Peru and west to the Galapagos Islands (NMFS and USFWS, 1998b). Although typically found in waters that remain above 20°C during the coldest months, sightings and strandings have been recorded off the Pacific coast as far north as British Columbia. Most sightings, however, have been reported from northern Baja California and southern California (Mager 1984, NMFS and USFWS 1998b, Smith and Houck 1984, Green et al. 1991).

The green sea turtles that are periodically encountered off the southern California typically originate from nesting sites in the Revillagigedos Islands and the mainland coast of Michoacan, Mexico (NMFS and FWS 2007). Although uncommon north of Mexico, green turtles can be sighted year-round in southern California waters, with the highest concentrations occurring from July through September

Additionally, two small, permanent colonies of green turtles are currently known to exist in southern California, although the only known nesting location for green turtles in the continental U.S. is on the east coast of Florida. One colony of 60 to 100 turtles resides in the southern end of San Diego Bay, while another group of approximately 30 turtles is now recognized as residing where warm water is discharged into the brackish mouth of the San Gabriel River from a Long Beach power plant (the Los Angeles Department of Water and Power's Haynes Generating Station). Green sea turtles are also occasionally seen elsewhere along the California coast, usually in El Niño years when the ocean temperature is higher than normal.

Reproduction. As with other marine turtle species, mating takes place at sea. Adult females migrate from foraging areas to mainland or island nesting beaches and may travel hundreds or thousands of kilometers each way. While nesting season varies from location to location, in the southeastern U.S., females generally nest in the summer between June and September; peak nesting occurs in June and July. During the nesting season, females nest at approximately two-week intervals. They lay an average of five nests, or "clutches." In Florida, green turtle nests contain an average of 135 eggs, which will incubate for approximately 2 months before hatching.

After emerging from the nest, hatchlings swim to offshore areas, where they are believed to live for several years, feeding close to the surface on a variety of pelagic plants and animals. Eventually, they leave the pelagic habitat and travel to nearshore foraging grounds.

Diet. Recent studies have demonstrated that green sea turtles are not the obligate herbivores they were once thought to be. In addition to feeding on algae and sea grasses, their diet also consists of invertebrates such as jellyfish, sponges, sea pens, and pelagic prey (Godley et al. 1998, Heithaus et al. 2002, Seminoff et al 2002b, Hatase et al. 2006).

Population Status. As stated previously, turtles encountered off the California coast typically originate from nesting sites in the Revillagigedos Islands and the mainland coast of Michoacan, Mexico (NMFS and FWS 2007). Approximately 90 turtles nest annually at the Revillagigedos Islands while the mainland coast of Michoacan, Mexico hosts approximately 1,375 nesting female turtles annually (NMFS and FWS 2007).

3.3.3 Olive Ridley Sea Turtle (Threatened)

Status. Olive ridley sea turtles (*Lepidochelys olivacea*) are the smallest of the sea turtles to occur in the Pacific Ocean (Mager, 1984). They were listed as threatened on July 28, 1978 (43 FR 32808). The recovery plan for the Pacific population of this species was finalized in 1998

(NMFS and USFWS, 1998a-d). No critical habitat has been designated for this species in western U.S. waters.

Range and Habitat. Olive ridleys occur worldwide in tropical to warm temperate waters and are considered to be the most abundant sea turtle in the world (NMFS and USFWS, 1998c). In the eastern North Pacific, the species' main foraging areas extend between Colombia and Mexico. Major nesting beaches are, as with many other eastern Pacific sea turtles, on the Pacific coasts of Mexico and Costa Rica, although a few may nest as far north as Baja California (Mager, 1984; NMFS and USFWS, 1998c).

These sea turtles are infrequent visitors to the waters north of Mexico. According to Green et al. (1991) Pacific ridleys have stranded on the Washington and Oregon coasts during the past decade, and strandings have also been recorded from northern California (Houck and Joseph, 1958; Smith and Houck, 1984). According to the California Marine Mammal Stranding Network Database, of the three marine turtle strandings reported on Santa Barbara County beaches over the past eleven years (2001-2011), two were of olive ridley turtles. Hubbs (1977) observed a pair of Pacific ridleys mating in the water off La Jolla, San Diego County, California, in August 1973.

Reproduction. As with other marine turtle species, mating takes place at sea. Adult females migrate from foraging areas to mainland or island nesting beaches and may travel hundreds or thousands of kilometers each way. While nesting season varies from location to location, in the southeastern U.S., females generally nest in the summer between June and September; peak nesting occurs in June and July. In the eastern Pacific, ridleys nest throughout the year, with peaks occurring from September through December (NMFS and USFWS, 1998c). During the nesting season, females nest at approximately two-week intervals. They lay an average of five nests, or "clutches." In Florida, green turtle nests contain an average of 135 eggs, which will incubate for approximately 2 months before hatching.

After emerging from the nest, hatchlings swim to offshore areas, where they are believed to live for several years, feeding close to the surface on a variety of pelagic plants and animals. Eventually, they leave the pelagic habitat and travel to nearshore foraging grounds.

Diet. Olive ridley turtles are considered omnivorous, feeding on a variety of benthic and some pelagic items. USFWS identified prey include fish, crabs, shrimp, snails, oysters, sea urchins, jellyfish, salps, fish eggs, and vegetation (Ernst and Barbour, 1972; NMFS and USFWS, 1998c). Pacific ridleys may also scavenge USFWS.

Population Status. Currently, as many as 200,000 females are estimated to nest in Mexico each year (Márquez, 1990; NMFS and USFWS, 1998c).

3.3.4 Loggerhead Sea Turtle (Endangered)

Status. Loggerhead sea turtles (*Caretta caretta*) are the second largest of the sea turtles after leatherbacks, and are so named for their large heads which support blunt jaws. Loggerhead turtles were listed as endangered on July 28, 1978 (43 FR 32808). The recovery plan for the Pacific population of this species was finalized in 1998 (NMFS and USFWS, 1998a-d).

Although the loggerhead turtle was originally listed as threatened, a status review conducted for this species in 2009 elevated the status of the stock occurring off the western U.S. coast to endangered (Conant et al. 2009). No critical habitat has been designated for this species.

Range and Habitat. Loggerhead sea turtles inhabit subtropical to temperate waters worldwide, and are generally found in waters over the continental shelf (Carr, 1952; Mager, 1984). Following completion of a status review in 2009, the NMFS subsequently published a Final Rule recognizing nine Distinct Population Segments (DPSs) of loggerhead seat turtles under the ESA (76 FR 58868). In this rule, the NMFS recognized The North Pacific population of the loggerhead turtle as distinct from other population segments, and reclassified its status from threatened to endangered.

Stebbins (1966) listed southern California as the northern limit of the loggerhead range; however, these sea turtles are generally infrequent visitors to the waters north of Mexico. The waters off Mexico and southern California appear to support important developmental habitat for juvenile loggerheads and are used as foraging grounds and migratory corridors for a wide range of juvenile size classes. Most sightings of this species in California waters occur during the summer, peaking from July to September (Guess, 1982; NMFS and USFWS, 1998d). However, sightings may occur throughout much of the year during El Niño events when ocean temperatures rise. Although Smith and Houck (1984) reported no sightings of this species for northern California, Green et al. (1991) state that this species has stranded on the Washington and Oregon coasts during the past two decades.

Reproduction. Loggerheads nest on beaches and occasionally on estuarine shorelines in tropical and subtropical areas worldwide. Females instinctively return to their natal beaches to lay eggs. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington 1986, Hailman and Elowson 1992).

Diet. Loggerhead sea turtles are omnivorous, feeding on a variety of benthic prey including shellfish, crabs, barnacles, oysters, jellyfish, squid, sea urchins, and occasionally on fish, algae, and seaweed (Carr, 1952; Mager, 1984; NMFS and USFWS, 1998d). Their powerful jaws also enable them to feed on hard-shelled prey, such as whelks and conch. Sexual maturity ranges between 25 and 35 years.

Population Status. Loggerhead turtles are the most abundant of all the marine turtle species in U.S. waters, with substantial breeding areas occurring on the Atlantic and Gulf Coasts. Loggerheads nest within the U.S. from Texas to Virginia, although the largest nesting concentrations are found in Florida, Georgia, South Carolina, and North Carolina. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting aggregations have greater than 10,000 females nesting per year: South Florida (U.S.) and Masirah (Oman).

Sightings of loggerhead turtles off California generally consist of juveniles that have crossed the Pacific Ocean after hatching on beaches in southern Japan, which contains the only known nesting areas for loggerheads in the North Pacific (Stebbins 2003, Kamezaki et al. 2003), although low level nesting may also occur in areas surrounding the South China Sea (Chan et al.

2007). Nesting aggregations in Japan are small, with perhaps 100 to1,000 females nesting annually.

3.4 Invertebrates

3.4.1 White Abalone (Endangered)

Status. The white abalone (*Haliotis sorenseni*) was listed by NMFS as an endangered species on May 29, 2001, effective June 28, 2001, after a comprehensive status review of the species was completed (NOAA 2001; 66 FR 29054). A draft recovery plan for the species was published on November 2, 2006 (NMFS 2006). This comprehensive document is the primary source of information from which the following subsections were drawn. No critical habitat has been designated for this species due to concerns that identifying critical habitat areas would increase the threat of poaching (66 FR 29048).

Overexploitation leading to a lack of reproductive success was the most significant factor in the listing of this species. White abalone in California were subject to serial depletion by the commercial fishery during the early 1970s. Due to their life history characteristics as long-lived, slow moving bottom dwellers with external fertilization, abalone are particularly susceptible to local and subsequent serial depletion. If male and female abalone are not within a few meters of one another when they both spawn, the sperm will be too diluted by diffusion to fertilize the eggs. As local abalone densities declined with overfishing, the probability of successful fertilization and subsequent recruitment also declined. Regulatory measures instituted at the time also proved inadequate to conserve the species.

Range and Habitat. The historic range of white abalone extended from Point Conception, California, USA to Punta Abreojos, Baja California, Mexico with the historical population center located at the California Channel Islands (NMFS 2006). In the northern part of the California range, white abalone were reported as being more common along the mainland coast, while in the middle portion of the California range, they were noted to occur more frequently at the offshore islands (especially San Clemente and Santa Catalina Islands). At the southern end of the range, in Baja California, Mexico, white abalone were reported to occur more commonly along the mainland coast, but were also found at a number of islands. It remains unknown whether this distribution pattern resulted because of lack of suitable habitat along the mainland coast in the middle portion of the range, or was due to overfishing in the more accessible mainland regions (NMFS 2006).

Since the mid-1990s, extremely low numbers of isolated survivors have been identified along the mainland coast in Santa Barbara County and at some of the offshore islands and banks in the middle portion of the range. This information indicates that the current range of white abalone in California may be similar to what it was historically. No recent information on current range is available for Baja California.

Adult white abalone occur in open, low relief rocky reefs or boulder habitat surrounded by sand. They are usually found between 20-60 m depths, but were most common historically between 25-30m deep. A recent survey found the highest densities of white abalone at 40-50m depth.

Suitable habitat for the white abalone is inherently patchy, thus, the distribution of white abalone is likewise patchy.

Factors controlling the depth distribution of white abalone are poorly known. Biological factors, such as competition and predation, have been implicated as factors controlling the upper limit, while water temperature and food availability have been implicated as factors controlling the lower limit. Speculation has also occurred over whether white abalone may have been restricted to deeper waters (> 25 m) as a result of sea otter predation or competition from pink abalone. There is also some evidence that abalone may shift to increasing depths as they age.

Reproduction. White abalone are dioecious, with separate sexes occurring in approximately a1:1 ratio. They reproduce through broadcast spawning (i.e. directly releasing gametes into the water column for external fertilization). Factors known to affect fecundity in abalone include organism size and food availability.

Synchronization of gonadal maturation and spawning are critical to successful fertilization in abalone. Gonads of white abalone mature on an annual cycle, and the spawning season of white abalone is of limited duration. Spawning in white abalone occurs in winter months, but sometimes extends into the spring. The duration of an individual spawning event is unknown. Experimental evidence suggests that fertilization rates are maximized when substantially more than one sperm contacts an egg, and the probability of this occurring decreases significantly with increasing distance between individuals (Leighton 2000).

Adult abalone of intermediate size are capable of spawning over two million viable eggs. In the laboratory, fertilization success rates of 96-100 percent have been achieved. Fertilized white abalone eggs are about 190-200 microns in diameter and are negatively buoyant.

Diet. The specific dietary preferences of white abalone are not well established. Like other abalone species, white abalone are herbivorous. Small individuals generally scrape bacteria and diatoms from the rocky bottom using their radula, while larger abalone depend on drift algae, especially deteriorating kelp. Laminaria and Macrocystis (brown algae) are believed to make up a large portion of the diet. The reddish brown color of the shell indicates that white abalone also consume some type of red algae throughout their life (NMFS 2006).

Population Status. At least a 99 percent reduction in white abalone density has occurred between the 1970s, when the last successful white abalone recruitment is thought to have occurred, and today. Current information on white abalone population size structure suggests that no evidence of recent recruitment exists, and that any ongoing recruitment is negligible throughout most of its former range. Data on density from areas where they have been located suggest that the remaining abalone are not close enough together to spawn (85 percent of the animals identified in 2002 were separated by linear distances that exceeded 10 m).

During the 1990s the combined estimate for both California and Mexico was approximately 2,600 animals. A 1999 survey of white abalone habitat in U.S. waters found only 157 live white abalone, an average density of only 2.7 per hectare of habitat. However ROV and multi-beam sonar surveys of two shallow banks off of the southern California coast conducted since 2000 have revealed that the white abalone population may be higher (approximately 12,820 for Tanner

Bank and approximately 7,360 for Cortes Bank) than previously thought. Regardless, the viability of animals in the wild remains uncertain because mostly large (>13 cm in shell length) animals were detected on the two offshore banks, and most animals observed were >2 m apart from their nearest neighbor, making successful reproduction unlikely (NMFS 2006).

3.4.2 Black Abalone (Endangered)

Status. Black abalone (*Haliotis cracherodii*) was listed as endangered On January 14, 2009 (74 FR 1937). The NMFS designated critical habitat for black abalone in October 2011 (76 FR 66806). The designated critical habitat encompasses approximately 360 km^2, extending along most of the California coast from the Del Mar Ecological Reserve in Sonoma County south to Point Conception. It also includes the waters around the Channel Islands and the Palos Verdes Peninsula.

Impacts from withering syndrome combined with overexploitation were the most significant factors in the listing of this species. Over-harvesting along the southern California coast decimated black abalone populations until, by the mid-1980s, black abalone were found primarily on offshore islands and inaccessible sections of the coast north of Santa Barbara. At around the same time, however, black abalone on the Channel Islands began to suffered massive local die-offs with losses in excess of 90 percent of the population as a result of 'withering syndrome', a fatal wasting disease where the foot of the abalone shrinks until it can no longer adhere to the substratum. Due to concerns about the species' decline, California's black abalone fishery closed in 1993.

Withering syndrome is caused by a prokaryote that invades the digestive tract of abalone, impairing the production of digestive enzymes and effectively starving the abalone to death. The tell-tale symptom of the disease is atrophy or 'shrinking' of the muscular foot of the abalone. This also impairs the abalone's ability to adhere to substrate, making it far more vulnerable to predation. Withering syndrome spread from the Channel Islands to the mainland coast in 1992, where it proceeded to eradicate most black abalone populations in the waters south of Point Conception and now continues to spread northward along the central coast.

For reasons not fully understood, some abalone can be infected with the bacterium without developing the disease. It is believed, however, that changes in environmental conditions, such as warmer than normal water temperatures, may induce the disease in abalone that already harbor the bacterium, such as during El Nino events, or when the ocean temperature rises above 65° Fahrenheit (18°C).

Range and Habitat. The range of black abalone historically extended from about Point Arena in northern California to Bahia Tortugas and Isla Guadalupe, Mexico. Black abalone are typically rare north of San Francisco and south of Punta Eugenia, although unconfirmed sightings have been reported as far north as Coos Bay, Oregon.

Black abalone reside on rocky relief areas extending from the high intertidal zone out to 6 m depth, though they are most abundant intertidally. They appear to tolerate water temperatures ranging between 7-24°C (45-75°F). Black abalone are often found in a clumped distribution in preferred microhabitats. Smaller individuals (<90 mm) tend to stay within the protective confines of crevices, under rocks, and in boulder fields, while larger individuals may occupy more exposed rocks and surge channels. Black abalone larvae settle into areas characterized by bare rock and crustose coralline red algae. In areas where the density of large adult black abalone (or other grazers) has declined drastically, formerly suitable settlement habitat can become overgrown with encrusting sessile invertebrates (e.g. tube worms and tube snails) and may prevent settlement of black abalone larvae.

Reproduction. Black abalone live for approximately 20 to 30 years. As with other abalone species, black abalone reproduce through broadcast spawning. Spawning occurs in spring and early summer, although, occasionally a second spawning event in the fall. The abalone reach maturity at about 3 years old, or when they reach 1.5 inches (4 cm) length. Black abalone have short larval durations and limited dispersal capability; larvae are free-swimming for approximately 4 to 10 days before they settle onto hard substrate, usually near larger individuals. Analysis of the genetic structure of black abalone populations on the central California coast indicates that these populations are composed predominantly of individuals that were spawned locally (i.e. black abalone larvae do not tend to travel very far along the coast).

Diet. Like other abalone species, black abalone are herbivorous. Small individuals generally scrape bacteria and diatoms from the rocky bottom using their radula, while larger abalone depend on drift algae, especially deteriorating kelp. The primary food species are thought to be giant kelp and feather boa kelp in southern California (i.e., south of Point Conception) habitats, and bull kelp in central and northern California habitats.

Population Status. In most locations south of Point Conception, black abalone have gone locally extinct, while populations along the central coast are now in substantial decline as a result of withering syndrome. This disease has now decimated the populations south of San Simeon, and continues to expand northward. In most areas south of and including Cayucos, adult densities have dropped below the average minimum density where recruitment failure occurs. Recent surveys indicate that there has been no recruitment, and habitats once having abalone have been altered, making re-colonization increasingly less likely. The last extant large and healthy populations of black abalone on the central coast exist in the Monterey Bay National Marine (Bell et al 2009).

Pre-disease, the population between Half Moon Bay and Santa Barbara has been estimated at approximately 1.9 million. Overall, the population has declined by 85 to 99 percent where withering syndrome is present. As of 2008, all known black abalone populations south of Monterey County, California, have experienced major losses, thought largely to be due to withering syndrome. The best estimate of the remaining black abalone population within the study area is approximately 1.3 million (+/-500,000), with 92 percent of those individuals residing within the waters of the Monterey Bay National Marine Sanctuary (Bell et al 2009). However, available evidence indicates that mass mortalities associated with the disease continue to expand northward along the California coast.

Although black abalone populations at select sites on two of the Channel Islands (San Nicolas and Santa Rosa) have shown evidence of successful recruitment, populations in all other areas that have been affected by withering syndrome remain at or near extirpation and have not experienced successful recruitment in recent years. Estimates suggest that with no change, the species could become extinct in 30 years.

3.5 Amphibians

3.5.1 California Red-legged Frog (Threatened)

Status. The California red-legged frog (*Rana draytonii*) was listed as threatened on May 23, 1996 (61 FR 25813). A final recovery plan for the species was published in September 2002, and on April 13, 2006, the U.S. Fish and Wildlife Service issued its final designation of critical habitat for this species (FWS 2002, FWS 2006). This final designation included 450,288 acres in 20 California counties. Critical habitat for this species was subsequently revised and expanded in a final rule issued in March 2010 to encompass approximately 1,636,609 acres in 27 counties. The California red-legged frog has been extirpated from 70 percent of its former range and is threatened in its remaining range by a wide variety of human impacts, including urban encroachment, construction of reservoirs and water diversions, introduction of exotic predators and competitors, livestock grazing, and habitat fragmentation.

Range and Habitat. The historical range of the California red-legged frog extended coastally from the vicinity of Point Reyes National Seashore, Marin County, and inland from the vicinity of Redding, Shasta County, southward to northwestern Baja California, Mexico (Jennings and Hayes, 1985; Hayes and Krempels, 1986).

The following recovery units within the historical range of the California red-legged frog have been established: (1) the western foothills and Sierran foothills to 5,000 feet in elevation in the Central Valley Hydrographic Basin; (2) the central coast ranges from San Mateo and Santa Clara counties south to Ventura and Los Angeles counties; (3) the San Francisco Bay/Suisun Bay hydrologic basin; (4) southern California, south of the Tehachapi Mountains; and (5) the northern coast range in Marin and Sonoma counties. These five units are essential to the survival and recovery of the California red-legged frog. Designation of recovery units assists the USFWS and other agencies in identifying priority areas for conservation planning under the consultation (Section 7) and recovery (Section 4) programs.

The California red-legged frog occupies a fairly distinct habitat, combining both specific aquatic and riparian components (Hayes and Jennings, 1988; Jennings, 1988). Adults require dense, shrubby or emergent riparian vegetation closely associated with deep (>0.7 m) still or slow moving water (Hayes and Jennings, 1988). The largest densities of California red-legged frogs are associated with deep-water pools with dense stands of overhanging willows (*Salix* spp.) and an intermixed fringe of cattails (*Typha latifolia*) (Jennings, 1988). Well-vegetated terrestrial areas within the riparian corridor may provide important sheltering habitat during winter. Adult frogs may be found seasonally in the coastal lagoons of the central California coast. They move upstream to freshwater when sand berms are breached by seawater from storms or high tides.

California red-legged frogs disperse upstream and downstream of their breeding habitat to forage and seek estivation habitat. Estivation habitat is essential for the survival of California red-legged frogs within a watershed. Estivation habitat and the ability to reach estivation habitat can be limiting factors in California red-legged frog population numbers and survival.

Estivation habitat for the California red-legged frog is potentially all aquatic and riparian areas within the range of the species and includes any landscape features that provide cover and moisture during the dry season within 300 feet of a riparian area. This could include boulders or rocks and organic debris such as downed trees or logs; industrial debris; and agricultural features, such as drains, watering troughs, spring boxes, abandoned sheds, or hay-ricks. Incised stream channels with portions narrower than 18 inches and depths greater than 18 inches may also provide estivation habitat.

Two designated critical habitat units exist in the general project area. At Jalama Creek, about 4.4 miles south of the City of Lompoc, 7,662 acres along the coast were designated, while at Gaviota Creek 11,328 acres were designated (FWS, 2006).

Reproduction. California red-legged frogs breed from November through March, with earlier breeding records occurring in southern localities (Storer, 1925). Egg masses that contain about 2,000-5,000 eggs are typically attached to vertical emergent vegetation, such as bulrushes or cattails. California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto, 1984). Eggs hatch in 6-14 days (Jennings, 1988). Larvae undergo metamorphosis 3.5 to 7 months after hatching (Storer, 1925; Wright and Wright, 1949). Sexual maturity normally is reached at 3-4 years of age (Storer, 1925; Jennings and Hayes, 1985).

Diet. The diet of California red-legged frogs is highly variable. Hayes and Tennant (1985) found invertebrates to be the most common food items of adult frogs. Vertebrates, such as Pacific tree frogs (*Hyla regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs (Hayes and Tennant, 1985). Hayes and Tennant (1985) found juvenile frogs to be active diurnally and nocturnally, whereas adult frogs were largely nocturnal. Feeding activity likely occurs along the shoreline and on the surface of the water (Hayes and Tennant, 1985).

Population Status. The California red-legged frog has sustained a 70-percent reduction in its geographic range in California as a result of several factors acting singly or in combination (Jennings et al. 1993). Habitat loss and alteration, overexploitation, and introduction of exotic predators were significant factors in the California red-legged frog's decline in the early to mid 1900s.

Historically the California red-legged frog was known from 46 counties, but is now extirpated from 24 of those counties. It is estimated that California red-legged frogs were extirpated from the Central Valley floor before 1960. Remaining aggregations (assemblages of one or more individuals, not necessarily a viable population) of California red-legged frogs in the Sierran foothills became fragmented and were later eliminated by reservoir construction, continued expansion of exotic predators, grazing, and prolonged drought. The pattern of disappearance of California red-legged frogs in southern California is similar to that in the Central Valley, except that urbanization and associated roadway, large reservoir (introduction of exotic predators), and stream channelization projects were the primary factors causing population declines. In southern California, California red-legged frogs are known from only five locations south of the Tehachapi Mountains, compared to over 80 historic locality records for this region (a reduction of 94 percent).

California red-legged frogs are known to occur in 243 streams or drainages, primarily in the central coastal region of California. A single occurrence of California red-legged frog is sufficient to designate a drainage as occupied by, or supporting California red-legged frogs. Monterey, San Luis Obispo, and Santa Barbara counties support the greatest number of currently occupied drainages. The most secure aggregations of California red-legged frogs are found in aquatic sites that support substantial riparian and aquatic vegetation and lack exotic predators (e.g., bullfrogs (*Rana catesbeiana*), bass (*Micropterus* spp.), and sunfish (*Lepomis* spp.)). Only three areas within the entire historic range of the California red-legged frog may currently support more than 350 adults, Pescadero Marsh Nature Preserve (San Mateo County), Point Reyes National Seashore (Marin County), and Rancho San Carlos (Monterey County). Threats, such as expansion of exotic predators, proposed residential development, and water storage projects, occur in the majority of drainages known to support California red-legged frogs.

Within the project area, red-legged frogs inhabit the lower drainage basin of San Antonio Creek, the adjacent San Antonio Terrace, and San Antonio Lagoon (Christopher 1996). On Vandenberg AFB, red-legged frogs are often found in association with dune swale ponds. Further south, Jalama Lagoon also supports a relatively large population of frogs (Christopher 1996). Smaller, more patchily distributed populations of red-legged frogs inhabit the lower Santa Ynez River Basin. Additionally, small coastal drainages between Gaviota and Goleta and west to Point Conception also support California red-legged frogs.

3.6 Fish

3.6.1 Tidewater Goby (Endangered)

Status. The tidewater goby (*Eucyclogobius newberryi*) was listed as endangered on February 4, 1994 (59 FR 5498). On June 24, 1999, USFWS published a proposed rule to remove the northern populations of the tidewater goby from the endangered species list; the proposed rule was withdrawn on November 7, 2002. Critical habitat for this species was designated on November 20, 2000 (65 FR 69693), and a final recovery plan was published on December 7, 2005 (USFWS 2005). The tidewater goby is threatened primarily by modification and loss of habitat as a result of coastal development, channelization of habitat, diversions of water flows, groundwater overdrafting, and alteration of water flows.

Range and Habitat. The tidewater goby is a small fish that inhabits coastal areas ranging from Del Norte County (near the Oregon border) south to Agua Hedionda Lagoon in northern San Diego County. Gobies are primarily coastal lagoon fishes that prefer shallow, usually brackish water (Love, 1996).Most are found very close to the coast, though a few have been found as much as 8 km (5 mi) inland.

Primary tidewater goby habitat is found in small, shallow coastal lagoons that are separated from the ocean most of the year by beach barriers. They are typically found in water less than 1 meter (3.3 feet) deep (USFWS 2005). This includes shallow areas of bays and areas near stream mouths in uppermost brackish portions of larger bays. Tidewater gobies are absent from areas where the coastline is steep and streams do not form lagoons or estuaries. Although tidewater gobies can tolerate full seawater, they are most common in waters with salinities of less than 12 parts per thousand. Adults are benthic, and larvae are briefly pelagic (Love, 1996).

Reproduction. Reproduction occurs year-round, although distinct peaks in spawning, often in early spring and late summer, do occur. Tidwater gobies exhibit a female-dominant breeding system that is unusual in vertebrates, whereby female tidewater gobies aggressively spar with each other for access to males with burrows for laying their eggs. Females are oviparous and generally produce between about 300 to 500 eggs per clutch, and between 6 to 12 clutches per year. After the male goby has excavated a vertical burrow in coarse sand, a female will lay the eggs on the roof and sides of the burrow, suspending them one at a time. The males guard the eggs until they hatch in 9-10 days (Love, 1996).

Diet. At all sizes examined, tidewater gobies feed on small invertebrates, usually mysids, amphipods, ostracods, snails, and aquatic insect larvae, particularly dipterans. The food items of the smallest tidewater gobies (4-8 mm) have not been examined, but these gobies, like many other early stage larval fishes, probably feed on unicellular phytoplankton or zooplankton (64 FR 33816).

Population Status. At the time of listing in 1994, tidewater gobies were known to have occurred in at least 87 of California's coastal lagoons, but were considered extirpated in approximately half of these (USFWS 2005). These assessments, however, followed a prolonged period of drought, when conditions in many habitats were at extremely low levels. Subsequent surveys found that populations in several locations had become re-established, or had been overlooked in the initial surveys. Additionally, new populations continue to be discovered. As a result, presently only 23 of the known historic populations are considered extirpated. However, many of the localities are naturally so small, or have been degraded over time, that their long-term persistence is uncertain. Currently, the goby is found in approximately 46 localities within the general project area (San Luis Obispo, Santa Barbara, and Ventura counties).

Tidewater goby populations may fluctuate seasonally. In Aliso Creek Lagoon in Orange County, the winter-early spring population was estimated at 1,000 to 1,500 fish; after the summer-fall spawning, the population rose to 10,000-15,000 individuals. They are found in small groups or in aggregations of hundreds. The tidewater goby is typically an annual species, with few individuals living longer than a year.

3.6.2 Steelhead Trout (Endangered)

Status. A native trout species, "steelhead" is the term used to distinguish anadromous populations of *Oncorhynchus mykiss* from freshwater resident populations, which are known as "rainbow trout". Southern steelhead are one of several related species that exhibit considerable life history plasticity (Boughton et al 2006).

Two distinct populations of west coast steelhead occur in the project area: the southern California population and south-central California coast population. Both populations were listed for protection under the Endangered Species Act on October 17, 1997 (63 FR 32996). The southern population was listed as endangered, while the south-central coast population was listed as threatened. Critical habitat for this species was designated in September 2005 (70 FR-52488). Following a status review in 2005 (Good et al. 2005), a final ESA listing determination for the endangered Southern California Steelhead distinct population segment was issued on January 5, 2006 (71 FR 834). Another status review occurred in 2011, however, no changes to the status of either population occurred.

Range and Habitat. Steelhead, like all salmon, need clean, cool water with plenty of oxygen and low amounts of suspended solids and contaminants. They also need gravel and rocks to spawn. Fine sediment is lethal to steelhead as it clogs the spaces between the rocks and gravel, buries the eggs, and prevents oxygen and flowing water from reaching the eggs. Sediment can also damage the gills of adult steelhead. Steelhead also require large, woody debris and deep pools in the river, which provide refuge from predators and resting places during storms. Deep pools give steelhead cool water when shallow areas warm up in the summer.

Critical habitat has been designated for this species which includes all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Santa Maria River south to Malibu Creek (inclusive). Also included are adjacent riparian zones. Excluded are tribal lands and areas above specific dams or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 3,967 square miles in California. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Los Angeles, San Luis Obispo, Santa Barbara, and Ventura.

Southern California distinct population segment (DPS) – this population segment occupies rivers from the Santa Maria River to the southern extent of the species' range. Historically, steelhead occurred at least as far south as Rio del Presidio, in Mexico (Behnke, 1992; Burgner et al. 1992). At the time of listing, however, the southernmost stream used by steelhead for spawning was generally thought to be Malibu Creek (Behnke, 1992; Burgner et al. 1992), though, in years of substantial rainfall, spawning steelhead were found as far south as the Santa Margarita River in San Diego County (Barnhart, 1986). However, in 1999 and 2000, new information became available which indicated that steelhead were also present in Topanga and San Mateo creeks. This new information included observations of juvenile O. mykiss in Topanga Creek and field and laboratory investigations conducted by the CDFG which demonstrated the presence and spawning of anadromous *O. mykiss* in San Mateo Creek (67 FR 21586). In 2002, NMFS published a notification of this extension of the known range, south to the U.S. - Mexico Border (67 FR 21586).

South-central California Coast DPS – this population segment occupies rivers from the Pajaro River, Santa Cruz County, to, but not including, the Santa Maria River. The southern boundary of this ESU is near Point Conception. Most rivers of this region drain the Santa Lucia Range, the southernmost unit of the California Coast Ranges. The climate is drier and warmer than in the north, which is reflected in the vegetational change from coniferous forest to chaparral and coastal scrub. The mouths of many rivers and streams in this area are seasonally closed by sand berms that form during periods of low flow in the summer.

Migration and life history patterns of southern California steelhead depend strongly on rainfall and streamflow levels (Moore, 1980). Average rainfall is substantially lower and more variable in southern California than in regions to the north, resulting in increased duration of sand berms across the mouths of streams and rivers and, in some cases, complete dewatering of the lower reaches of these streams from late spring through fall.

Reproduction. Stocks of steelhead in southern and south-central California are comprised entirely of winter steelhead. Winter Steelhead are generally in an advanced stage of sexual maturity when they approach the coastline and enter their home streams, which occurs from about November to April. Spawning takes place from March to early May. In contrast, summer steelhead enter rivers between June and November in a relatively immature stage and overwinter in fresh water prior to spawning.

Unlike the other salmonids, steelhead are not pre-determined to die after spawning and may live to spawn multiple times throughout their lives. Females produce 200-12,000 eggs, which hatch in about 50 days (Love, 1996). The fry emerge in summer and may spend the next one to three years in fresh water prior to migrating to the ocean.

Young steelhead remain in fresh water anywhere from less than 1 year to 3 years. Juveniles migrate to sea usually in spring, but throughout their range steelhead are entering the ocean during every month, where they spend 1-4 years before maturing and ascending streams for the first time.

Diet. Fry initially feed on zooplankton and other microorganisms (Barnhart 1991). Juveniles feed on a wide range of items, primarily those associated with the stream bottom such as aquatic insects, amphipods, aquatic worms, fish eggs, and occasionally smaller fish (Wydoski and Whitney 1979). Juveniles may also feed on spiders, mollusks, and fish, including smaller steelhead (Roelofs 1985). Age 0+ steelhead prefer benthic invertebrates (Johnson and Ringler 1980); larger steelhead, having larger mouths, can consume a broader range of foods (Fausch 1991). In the ocean, steelhead feed on juvenile greenling, squids, amphipods, and other organisms (Barnhart 1991).

Population status. In southern California, at the southern limit of the range for anadromous O. mykiss in North America, it is estimated that annual runs have declined dramatically from 32,000-46,000 returning adults historically, to less than 500 returning adults today (Good et al. 2005).

Steelhead from the Southern DPS have been extirpated from much of their historical range. Estimates of historical (pre-1960s) abundance are available for several rivers in the Southern DPS: Santa Ynez River, before 1950, 20,000-30,000; Ventura River, pre-1960, 4,000-6,000; Santa Clara River, pre-1960, 7,000-9,000; Malibu Creek, pre-1960, 1,000. In the mid-1960s, the California Department of Fish and Game (CDFG) estimated steelhead spawning populations for smaller tributaries in San Luis Obispo County to be 20,000, but they provided no estimates for streams farther south.

Recent total run sizes for six streams in this DPS were all were less than 200 adults. Steelhead are still occasionally reported in streams where stocks were identified previously as being extirpated, however. This includes the rediscovery of the presence of *O. mykiss* in Topanga and San Mateo Creeks in 1999 and 2000 (67 FR 21586).

Total abundance of steelhead in the South-Central Coast DPS is also extremely low and declining. Historical estimates of steelhead abundance are available for only a few streams in this region. For example, the California Advisory Committee on Salmon and Steelhead (CACSS,

1988) cited an estimate of 20,000 steelhead in the Carmel River in 1928. In the mid-1960s, CDFG estimated a total of 27,750 steelhead spawning in the rivers of this DPS. However, comparisons with recent estimates for these rivers show a substantial decline during the past 30 years. In contrast to the CDFG estimates, McEwan and Jackson (1996) reported runs ranging from 1,000 to 2,000 in the Pajaro River in the early 1960s, and escapement of about 3,200 steelhead for the Carmel River for the 1964 to 1975 period. Populations have declined from annual runs totaling 25,000 spawning adults to less than 500. Risk factors for this DPS are habitat deterioration due to sedimentation, and flooding related to land management practices and potential genetic interaction with hatchery rainbow trout.

3.7 Plants

3.7.1 Salt Marsh Bird's-Beak (Endangered)

Status. The salt marsh bird's-beak (*Cordylanthus maritimus* ssp.*maritimus*), an annual semiparasitic herb in the figwort family (Scrophulariaceae), was listed as endangered on September 28, 1978 (43 FR 44812). A recovery plan for this species was approved in 1984 (USFWS, 1984b). Critical habitat has not been designated for this species. The main reason for listing this species was due to habitat loss.

Range and Habitat. This plant is generally restricted to coastal salt marshes. Although there has been some confusion in the past over the range of this subspecies and the similar Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*), this plant occurs in salt marshes from Morro Bay in San Luis Obispo County south to San Diego County and Northern Baja California, Mexico. Herbarium records indicate that it was formerly found in at least 10 marshes in California (USFWS, 1984b), and up to five marshes in Baja. The current distribution of this species includes Carpinteria Marsh, Ormond Beach, the Ventura County Game Preserve, Mugu Lagoon, Anaheim Bay, Upper Newport Bay, Sweetwater Marsh, and the Tijuana River estuary (USFWS, 1984b). Within the project area, salt marsh bird's-beak is currently known to occur at Ormond Beach and Mugu Lagoon in Ventura County, at Carpinteria Salt Marsh in Santa Barbara County, and at Morro Bay in San Luis Obispo County (CNDDB 2004).

The primary habitat for this plant is the upper salt marsh that is inundated by tides on a regular basis, but above areas that receive daily salt flooding. Plants may also occur behind barrier dunes, on dunes, mounds, and occasionally in areas with no tidal influence. The plant forms root connections with other plant species such as salt grass (*Distichlis* sp.), pickleweed (*Salicornia* sp.), and cattail (*Typha latifolia*), which may be especially important for plants growing on drier sites (USFWS, 1984b).

Population Status. Population data are not available for most of the salt marsh bird's-beak sites. Destruction and modification of the coastal marshes is the primary reason for this plant's decline. The plants have been directly affected by a host of man-caused activities, including off-road vehicles, construction equipment, cattle grazing, and flood control levees. Even minor alterations of the marsh that result in permanent changes in the natural tidal dynamics can make previously suitable habitat unsuitable. Changes in tidal inundation have affected plants by: smothering them with increased debris deposited by high tide, encouraging other marsh vegetation which shades out plants, or decreasing germination of seeds by lowering or increasing soil salinity (USFWS, 1984b).

3.7.2 California Sea-Blite (Endangered)

Status. The California sea-blite (*Suaeda californica*), a succulent-leaved perennial plant of the goosefoot family (Chenopodiaceae), was listed as endangered on December 15, 1994 (59 FR 64623). A recovery plan is not available for this species, and critical habitat has not been designated. The main reason for listing this species was due to habitat loss.

Range and Habitat. Some confusion has occurred over the historical range of this plant. Munz (1959) described the range as extending from San Francisco Bay south to southern Baja California, Mexico. However, Ferren and Whitmore (1983) separated the plant into two species. The plant they separated out, Estuary seablite (*Suaeda esteroa)*, occurs from Santa Barbara County south to Baja. The historical range of the California sea-blite, therefore, includes the San Francisco Bay area and Morro Bay.

The only remaining, naturally existing population of this species is along the perimeter of Morro Bay in San Luis Obispo County, where it occurs in a very narrow band in the upper intertidal zone (Walgren 2006). The distribution of California sea-blite around Morro Bay was mapped in the early 1990s (see 59 FR 64623). On the east side of the bay, colonies occur adjacent to the communities of Morro Bay, Baywood Park, and Cuesta by-the-Sea, although it apparently is absent from the more interior portion of the marshlands created by Chorro Creek runoff. On the west side of the bay, it is found along most of the spit, excepting the northern flank adjacent to the mouth of the bay.

California Sea-blite occurs in association with other marsh plants including *Salicornia* sp. (pickleweed), *Distichlis spicata* (saltgrass), *Juncus acutus* (rush), *Jaumea carnosa* (Jaumea), and *Frankenia salina* (Frankenia) and the federally endangered *Cordylanthus maritimus* ssp. *maritimus* (salt marsh bird's-beak) (59 FR 64623). Because the California sea-blite occupies such a narrow band in the intertidal zone, it is threatened by any natural processes or human activities that even slightly alter this habitat. Such threats include: increased sedimentation of Morro Bay, the encroachment of sand on the east side of the spit, and dredging projects within the channel of the bay (59 FR 64623).

Population Status. The sea-blite's colonial habits make it difficult to estimate the population. While there is no comprehensive field census estimate for the total number of individual plants along the central coast prior to 1999, the total number of individuals was estimated to be between 200 and 300 individuals in 1999 (P. Baye, Service biologist, unpubl. data 1991-1999).

Additionally, during the spring of 2002, the CDPR initiated a project to restore, enhance, and augment occurrences of sea-blite that included the translocation of individual plants to six State Park sites: Villa Creek, Old Creek, Morro Strand State Beach, and three sites in Morro Bay (Walgren 2006). Current re-introduction projects are also on-going in Golden Gate National Recreation Area, where a small population was successfully re-established in 2003 at the Crissy Field marsh at San Francisco Bay, near Pier 98.

4.0 Potentially Significant Impacts Sources

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, lighting and disturbance; platform discharges; and potential oil spills. The following sections describe the sources and types of these potential impacts.

4.1 Noise, Lighting, and Disturbance

The proposed activities associated with the development of the Electra Field, including drilling and transportation, will marginally increase the amount of nighttime lighting in the project area. Additionally, drilling and marine vessel traffic are among the most common sources of man-made, low frequency noise that could affect protected species. The source level of a sound produced by activities such as these is described as the amount of radiated sound at a particular frequency and distance, usually 1 m from the source, and is commonly expressed in dB re 1 µPa. Much of the following discussion is derived from the detailed review of the sounds produced by offshore activities in Richardson et al. (1995).

4.1.1 Vessel Traffic

Current Levels of Activity. Crew and supply boats are used daily to transport personnel and supplies to platforms offshore southern California. Support vessels for activities in the Santa Maria Basin operate out of bases in the Santa Barbara Channel. During the past decade, support vessels in the Pacific Region, including both crew and supply boats, have averaged approximately 16 trips per week per platform (Bornholdt and Lear, 1995). However, actual vessel traffic in the Region varies among the units. As discussed in Section 3.1, the Point Arguello platforms average as few as six supply trips per month, while crew and supply boat trips in the eastern Santa Barbara Channel are much more frequent.

Currently, an average of six supply boat trips occurs per month. During drilling for the proposed project, vessel traffic to and from the platforms is projected to consist of an additional four round trips per month (1 round trip per week). Rig installation and removal activities (rig transport) will necessitate approximately 28 round trips to Platform Hidalgo by supply boats. Manpower requirements and boat schedules can vary depending on the workload. Following the completion of drilling activities, which are anticipated to last for approximately five months, supply vessel traffic is expected to return to current baseline levels (i.e. 6 supply boat trips per month).

The Santa Barbara Channel/Santa Maria Basin Oil Service Vessel Traffic Corridor Program is intended to minimize interactions between oil industry operations and commercial fishing operations. It was developed cooperatively by the two industries through the Joint Oil/Fisheries Liaison Office. In addition to providing transit corridors in and out of area ports, the program routes support traffic along the Channel seaward of an outer boundary line. East of Gaviota, the outer boundary is defined by the 30-fathom line; west of Gaviota, and north of Point Conception as far as Pedernales Point, it follows the 50-fathom line. In the area west of Gaviota, the 50-fathom line is 4 km (2 nm) or more offshore.

Potential Impact Sources. Vessels are the major contributors to overall background noise in the sea (Richardson et al. 1995). Sound levels and frequency characteristics are roughly related to ship size and speed. The dominant sound source is propeller cavitation, although propeller "singing," propulsion machinery, and other sources (auxiliary, flow noise, wake bubbles) also contribute. Vessel noise is a combination of narrowband tones at specific frequencies and broadband noise. For vessels the approximate size of crew and supply boats, tones dominate up to about 50 Hz. Broadband components may extend up to 100 kHz, but they peak much lower, at 50-150 Hz.

Richardson et al. (1995) give estimated source levels of 156 dB for a 16-m crew boat (with a 90-Hz dominant tone) and 159 dB for a 34-m twin diesel (630 Hz, 1/3 octave). Broadband source levels for small, supply boat-sized ships (55-85 m) are about 170-180 dB. Most of the sound energy produced by vessels of this size is at frequencies below 500 Hz. Many of the larger commercial fishing vessels that operate off southern California fall into this class.

4.1.2 Aircraft Traffic

Current Levels of Activity. Offshore southern California, helicopters are a primary means of crew transport to and from the OCS platforms, and helicopter traffic is a daily occurrence in the Point Conception area. During the past decade, helicopter trips on the Pacific OCS have averaged approximately 3 to 5 trips per week, per platform (Bornholdt and Lear, 1995).

OCS helicopter traffic in the Pacific Region operates primarily out of Santa Maria, Lompoc, and Santa Barbara airports. Helicopter traffic associated with the proposed project will occur between Platform Hidalgo and the Santa Maria airport, however, no increases in helicopter traffic are proposed for this project. Nevertheless, the following information is included to summarize the existing impacts and conditions.

Beginning in the 1980s, a standard Information to Lessees (ITL) issued in conjunction with OCS lease sales off southern California provided offshore operators with guidelines for protecting marine mammals and birds from aircraft impacts (Bornholdt and Lear, 1995). The ITL stated that,

"Aircraft should operate to reduce effects of aircraft disturbances on seabird colonies and marine mammals, including migrating gray whales, consistent with aircraft safety, at distances from the coastline and at altitudes for specific areas identified by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and California Department of Fish and Game (CDFG). A minimum altitude of 1,000 feet is recommended near the Channel Islands Marine Sanctuary to minimize potential disturbances. The CDFG and USFWS recommend minimum altitude restrictions over many of the colonies and rookeries."

More recently, the 1,000-foot minimum altitude restriction was extended to air traffic passing the vicinity of the Santa Maria River mouth, to address concerns over possible disturbance of marine bird nesting habitats there. Although the original ITL is no longer in force, operators in the southern Santa Maria Basin still comply with these restrictions (P. Schroeder, BOEM, pers. comm.).

Potential Impact Sources. Air-to-water transmission of sound is very complex (Richardson et al. 1995). An understanding of underwater sound from any aircraft depends on 1) the receiver depth, and 2) the altitude, aspect, and strength of the source.

The concept of a one-meter sound source means very little when discussing aircraft sound production, and an altitude of 300 m is the usual reference distance (Richardson et al. 1995). The angle of incidence at the water surface is very important—much incident sound is reflected at angles greater than 13 degrees from the vertical. This 26-degree "cone" of sound is defined physically by Snell's Law and influenced by sea conditions. Water depth and bottom conditions also strongly influence the propagation and levels of underwater sound from passing aircraft; propagation is attenuated in shallow water, especially when the bottom is reflective (Richardson et al. 1995).

The rotors are the primary sources of sound from helicopters (Richardson et al. 1995). The rotation rate and the number of blades determine the fundamental frequencies. Fundamental frequencies are usually below 100 Hz, with most dominant tones below 500Hz. These are primarily harmonics of the main and tail rotor blade rates, although other tones associated with engines and other rotating parts may also be present.

Richardson et al. (1995) present an estimated source level for a Bell 212 helicopter of about 150 dB at altitudes of 150-600 m, with the dominant frequency a 22-Hz tone with harmonics. Elsewhere a source level of 165 dB is presented for broadband helicopter noise (frequencies 45-7070 Hz). Source levels of the Sykorski Model 76A helicopters that are used to transport crew on Platform Hidalgo from the Santa Maria airport have been estimated at about 150 dB at altitudes of about 100 m.

Generally, peak received levels occur as the aircraft passes directly overhead and are directly related to altitude and depth. However, when the aircraft is not passing directly overhead, received levels may be stronger at "midwater" depths. Helicopters tend to radiate more sound forward. Duration is variable. For example, a Bell 214 was audible in air for 4 minutes before passing, for 38 seconds at 3-m depth, and for 11 seconds at 18 m.

4.1.3 Offshore Drilling

Current Levels of Activity. As of 2009, more than 1,354 wells had been drilled in the Pacific OCS Region. This number includes 1,026 oil and gas development wells drilled from platforms and 328 exploratory wells drilled from a variety of rigs, including mobile offshore drilling units (MODUs), jack-ups, barges, and drill ships.

Potential Impact Sources. Richardson et al. (1995) cite only a single source of information on the levels of noise produced by platform-based drilling activities. 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 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.

4.1.4 Offshore Production

Current Levels of Activity. There currently are 23 offshore platforms in the Pacific OCS Region. Of these, 4 are in the Santa Maria Basin, 15 are in the Santa Barbara Channel, and 4 are in San Pedro Bay.

Potential Impact Sources. Noise produced by metal production platforms is expected to be relatively weak, because a small surface area is actually in contact with the water and because the machinery is placed on decks well above the water line (Richardson et al. 1995). Gales (1982) measured noise from 11 production platforms off California. Sounds recorded from four platforms were very low in frequency, about 4.5-38 Hz measured 9-61 m. Platforms powered by gas turbines produced more tones than platforms with at least partial shore power. Peak recorded sound spectra were between 50-200 or 100-500 Hz.

4.1.5 Lighting

Current Levels of Activity. All 23 offshore platforms in the Pacific OCS Region have exterior lighting which is required to conform with platform lighting standards required by BOEM, Occupational Safety and Health Administration (OSHA), and the Coast Guard. Platform Hidalgo currently operates approximately 368 exterior lights, with a combined total wattage of approximately 39,520 watts.

Potential Impact Sources. Artificial lighting at oil platforms may have adverse impacts on a variety of marine organisms including localized interference with the light intensity cues of vertically migrating fishes and zooplankton, and attraction of predator species (e.g., marine mammals and large predatory fishes) that use the illumination of the lights to feed on readily available prey sources. However, if impacts from artificial lighting on fishes and zooplankton occur, they would be limited to the approximately 100 meter illuminated area around the platform.

The use of bright lights at the oil platforms or on vessels transiting traveling to the platforms may also negatively impact certain seabird species. Specifically, artificial lighting can result in disruption of the normal breeding and foraging activities of nocturnal seabirds (e.g., certain species of alcids, storm-petrels and shearwaters) (Wolf 2007). The attraction to light by some nocturnal feeding seabirds is thought to result from their use of vertically migrating bioluminescent prey and from a predilection to orient to star patterns (Montevecchi 2006). Regardless of its cause, seabirds have been known to circle oil platforms and flares and to fly directly into lights (Wiese et al. 2001). Continuous circling within the illumination of, or around bright, artificial lights by birds is known as light entrapment.

The holding or trapping effect of bright, artificial lighting can deplete the energy reserves of migrating birds, resulting in diminished survival and reproduction. For example, light entrapment may delay migrating birds from reaching breeding or foraging grounds, or leave them too weak to forage or escape predation. Migrating passerines and seabirds have been observed to continuously circle platforms until exhausted, whereupon they fall to the ocean or land on the platforms (Montevecchi 2006; Wolf 2007). Similarly, light entrapment may impact breeding seabirds by increasing their time away from their nests, leaving the nests vulnerable to predation for longer periods of time. In addition, time and energy spent circling lights may impede a bird's ability to successfully forage for enough food to feed their young.

4.2 Effluent Discharges

Platform discharges with the potential to affect protected species include drilling muds and cuttings, produced waters, and sanitary effluents. All platform effluents are regulated by the requirements of the U.S. EPA's National Pollution Discharge Elimination System (NPDES) General Permit (Permit No. CAG280000; EPA 2000a and b). The biological assessment prepared for the General Permit evaluates 22 types of discharges resulting from normal OCS oil and gas operations (SAIC, 2000a and b). There are specific permit requirements for five of the discharge types: drilling fluids and cuttings; produced water; well treatment, completion, and workover fluids; deck drainage; and domestic and sanitary waste. The requirements for the remaining discharges are combined. Monitoring is conducted in accordance with 40 CFR Part 136, unless other procedures are specified. Monitoring results are summarized monthly on Discharge Monitoring Report (DMR) forms and reported to the EPA quarterly.

4.2.1 Drilling Fluids

The discharge of drilling muds to be used for the proposed Electra Field drilling program will comply with the General Permit requirements. Under the permit, Platform Hidalgo is authorized to discharge up to 6,000 bbl of cuttings and 23,000 bbl of drilling fluids annually per well. Over the anticipated 5-month drilling program for the proposed project, a total of 5,697 bbl of water-based cuttings and 14,036 bbl of drilling fluids are expected to be produced for well C-16. Similarly, 5,512 bbl of water-based cuttings and 13,575 bbl of drilling fluids are expected to be produced for well C-17.

The dispersion of drill muds and cuttings depends on the depth of the discharge (shunt depth), the prevailing flow field, and the physical characteristics of the drill muds and the receiving waters (see Attachment D). On Platform Hidalgo, spent drill muds and cuttings would be discharged approximately 112 ft (34 m) below the sea surface. The temperature and density of drill muds generally increase with increasing drilling depth. Even after dilution with seawater at the shale shaker, the discharged material would be a few degrees warmer than ambient seawater temperatures.

Heavier discharge material tends to settle out, with most of the heavier muds aggregates deposited on the seafloor in the general vicinity of the drilling rig. Similarly, heavier rock cuttings are not expected to be transported more than 200 m beyond the discharge point (de Margerie 1989; MMS 1996). However, in water deeper than about 80 m, settling of some heavier materials may be temporarily delayed when encountering neutral buoyancy conditions within the water column (NAS 1983; MMS 1996). During a study to monitor the environmental effects of drilling discharges from Platform Harvest (Battelle, 1991), heavier particles fell directly below the platform, distributing over an area of about 2.75 km2, while silts were widely and thinly dispersed over a larger area. Approximately 80 percent of the particulates are removed by these near-field depositional processes (CSA 1985).

Lightweight floccules formed from the remaining suspended particulates would be carried upward toward the sea surface by the buoyant plume of warm water associated with the discharge. Lighter particulate- and soluble-discharge components associated with the upper or visible plume are generally dispersed or diluted to ambient levels within approximately 200 to 2,000 m of the discharge (MMS 1996). They can be carried over four miles from the platform before being deposited on the seafloor (Coats 1994; Pickens 1992; Attachment D).

4.2.2 Produced Water

Produced water from the generated by the Electra Field development would also be discharged in accordance with the existing NPDES General Permit. Under the permit, Platform Hidalgo is authorized to discharge up to 18,250,000 bbl of produced water per year, which equates to an average of 50,000 bbl/d. Currently, Platform Hidalgo has a peak produced water discharge of 10,000 bbl/d. The development and production of the Electra Field is anticipated to generate an additional 6,500 bbl/d of produced water. With the addition of the Electra Field, total produced water discharges will still remain well below the permitted levels. Produced water may also be reinjected back into the reservoir.

Initial mixing and dispersion govern the fate of produced water discharged into the marine environment. Initial mixing occurs immediately after discharge. It is driven by the turbulence caused by the momentum of the discharge jet and instability of the buoyant effluent plume as it rises through the water column. EPA's allowed mixing zone for produced-water discharges (not applied to oil and grease) is the larger of 100 m measured laterally around the discharge point from the sea surface to the sea floor, or to the boundary of the zone of initial dilution as calculated by a plume model.

Produced water discharged off the California coast is generally less saline and warmer than ambient seawater. This results in a buoyant discharge plume that aids in the initial mixing of the effluent. Modeling suggests that initial mixing occurs rapidly and results in dilutions of 30- to 100-fold within a few tens of meters from the outfall (Neff 1997). Slower-paced dispersion further reduces the concentration of contaminants as the oceanic flow field transports the produced-water plume.

As part of the General Permit requirements, permittees generated a detailed quantitative assessment of potential impacts from produced-water discharges on federally managed fish species from each of the California OCS dischargers, including Platform Hidalgo (MRS 2005). The study focused on the toxicity and bioaccumulation potential of produced-water discharges to the fish populations that reside within the 100-m mixing zone beneath the platforms. These fish populations consist mostly of rockfish that utilize the platforms as habitat, rarely venturing far from the protection of the structure. Consequently, contaminant concentrations at locations 100-m from the platform have little bearing on the potential impacts experienced by these fish.

Nevertheless, the quantitative exposure assessment found a general absence of impacts from most of the major produced-water constituents. Many of the produced-water constituents that are normally of concern for the protection of marine organisms were below biological effects levels prior to discharge. Four constituents (benzene, cyanide, silver, and ammonia) had end-of-pipe concentrations that were slightly elevated in produced water compared to thresholds of potential effects in finfish. However, the produced-water discharges achieve high dilution almost immediately upon discharge. As a result, the plume volumes containing concentrations of potential biological significance were exceedingly small compared to the volume of habitat contained within the mixing zones.

In September 2005, EPA concurred with the overall conclusions of the study and forwarded them to NMFS as part of the EFH consultation required by the General Permit. In October 2005, NMFS notified EPA that the study met the intent of the conservation recommendations incorporated in the General Permit and that the EFH consultation was complete. Revisions to the NPDES General Permit, which included new compliance criteria for several of the platforms and a revision to the undissociated sulfide criterion, were approved in November 2009 (EPA 2009).

4.3 Oil Spills

4.3.1 Oil Spill Risk Assessment

A major environmental concern with offshore oil and gas activities is the potential for oil spills and the resulting effects on biological resources, such as listed species. The largest oil spill in the Pacific OCS Region occurred in 1969, when a well blowout on Platform A off Santa Barbara spilled an estimated 80,000 bbl into the Santa Barbara Channel (Van Horn et al. 1988). As discussed in Section 5.3.2, a number of preventive measures have been initiated since that time, including stringent regulations covering OCS operational and environmental safety, a rigorous inspection program in the Pacific Region, continuous evaluation and improvement in OCS facilities' oil spill response, and the development of a highly organized oil spill response structure (Bornholdt and Lear 1997). Following the 2010 *Deepwater Horizon* well blowout and oil spill in the Gulf of Mexico, additional extensive reforms to offshore oil and gas regulation and oversight were enacted which strengthened requirements for everything from well design and workplace safety to corporate accountability.

Table 4.1 lists the hydrocarbon spills that occurred in the Pacific OCS Region from 1969 through 1999. During that period, a total of 843 oil spills were recorded. The total volume of oil spilled in the region is dominated by the 1969 Santa Barbara spill—since then, these spills have ranged in size from less than 1 bbl to 163 bbl, for a total of slightly less than 830 bbl. For comparison, natural oil seeps at Coal Oil Point in the Santa Barbara Channel are estimated to discharge approximately 100-170 bbl of oil per day (Hornafius et al. 1999).

Table 4.1 Hydrocarbon Spills Recorded in the Pacific OCS Region, 1969-1999 (volumes in barrels)

Year	Spill Size						Total	
	≤1 bbl		>1 bbl to ≤50 bbl		≥50 bbl			
	No.	Volume	No.	Volume	No.	Volume	No.	Volume
1969	0		0		2	80,900	2	80,900.0
1970	0		0		0		0	
1971	0		0		0		0	
1972	0		0		0		0	
1973	0		0		0		0	
1974	0		0		0		0	

Table 4.1 Hydrocarbon Spills Recorded in the Pacific OCS Region, 1969-1999 (volumes in barrels)

Year	Spill Size						Total	
	≤1 bbl		>1 bbl to ≤50 bbl		≥50 bbl			
	No.	Volume	No.	Volume	No.	Volume	No.	Volume
1975	1	0.1	0		0		1	0.1
1976	3	1.1	1	2	0		4	3.1
1977	11	2.2	1	4	0		12	6.2
1978	4	1.2	0		0		4	1.2
1979	5	1.7	1	2	0		6	3.7
1980	11	4.9	2	7	0		13	11.9
1981	21	6.0	10	75	0		31	81.0
1982	24	3.2	1	3	0		25	6.2
1983	56	7.7	3	6	0		59	13.7
1984	65	4.7	3	36	0		68	40.7
1985	55	9.3	3	9	0		58	18.3
1986	39	5.5	3	12	0		42	17.5
1987	67	7.5	2	11	0		69	18.5
1988	47	3.7	1	2	0		48	5.7
1989	69	4.1	3	8	0		72	12.1
1990	43	3.6	0		1	100	44	103.6
1991	51	5.8	1	10	1	50	53	65.8
1992	39	1.2	0		0		39	1.2
1993	32	0.7	0		0		32	0.7
1994	18	0.4	2	33	1	50	21	83.4
1995	25	0.9	1	1.4	0		26	2.3
1996	39	0.9	1	5	1	150	41	155.9
1997	20	2.5	0		1	163	21	165.5
1998	29	1.0	0		0		29	1.0
1999	22	0.5	1	10	0		23	10.5
Total	**796**	**80.4**	**40**	**236.4**	**7**	**81,413.0**	**843**	**81,729.8**

In the course of normal, day-to-day platform operations, occasional accidental discharges of hydrocarbons may occur. Such accidents are typically limited to discharges of quantities of less than 1 bbl of crude oil. As shown in Table 4.1, 836 spills of less than 50 bbl (99 percent of the total) occurred on the Pacific OCS between 1969 and 1999, resulting in slightly less than 320 bbl of oil being discharged into the ocean. Due to the infrequency and small volumes of these accidental discharges, and their location (generally away from sensitive species), spills of less than 50 bbl are not considered an impact-producing agent for the protected species discussed in this biological evaluation.

Larger oil spills may occur from loss of well control (if wells are free flowing), pipeline breaks, operational errors, or vessel-platform collisions. However, only 5 of the 45 spills of greater than 1 bbl measured 50 bbl or more in volume (Table 4.1); the largest of these was the 163-bbl Platform Irene (Torch) pipeline spill in September 1997. Additionally, since 1999, no spills greater than 50 bbl have occurred in the region.

For the purposes of this biological evaluation, BOEM has estimated that one oil spill of 50 to 1,000 bbl could occur as a result of the proposed action over the approximately year life of the proposed project. 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. The estimated probability that one or more spills of this size will occur is 4.4 percent.

An effort also was made to estimate the likely size of such a spill. The BOEM U.S. Oil Spill Database includes Pacific and Gulf of Mexico OCS spills of greater than 1.5 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, and 75 percent (79) are of less than 200 bbl. More than 95 percent (101) are of less than 500 bbl. Given these data and the experience in the Pacific Region over the last 40 years, the most likely spill volume from the Electra Field development would probably be less than 200 bbl in volume.

BOEM also has estimated the number of major oil spills (i.e. spills of equal to or greater than 1,000 bbl) that could occur as a result of the proposed action. The major spill estimate is based on the estimated production of oil over the life of the proposed project, including the subsea pipeline transport of hydrocarbons to shore. Based on the BOEM Accident Spill Rates from all U.S. platforms and pipelines (Anderson and LaBelle, 1994; Anderson, 2000, unpubl.), the estimated probability that one or more large spills (≥1,000 bbl) will occur in association with the proposed project is 0.3 percent.

Finally, federal regulations concerning oil spill response plans 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. Since these are worst-case estimates, intended to insure that an operator has the capacity to respond to the largest imaginable spills, they are based on unlikely events.

This is particularly true of the estimates for the first and third spill types described above. A catastrophic event would be required to empty all storage tanks and flow lines on the production platform. Similarly, with the implementation of modern blowout prevention equipment, operating procedures, and the current inspection program, blowouts have become rare. As discussed above, no blowout resulting in the release of substantial quantities (>1,000 bbl) of oil has occurred on the Pacific OCS since the 1969 Santa Barbara spill. Nevertheless, as was evident in the case of the 2010 *Deepwater Horizon* event, accidents can and do occur.

In the wake of the 2010 *Deepwater Horizon* well blowout and oil spill in the Gulf of Mexico, the BOEM substantially revised and increased the requirements for worst case discharge scenario calculations. Among the changes included was the incorporation of the time to drill a relief well and an added level of conservatism in assumptions regarding the operational ability of blow out preventer equipment following a catastrophic event.

The BOEM estimates that the most likely maximum size of a major oil spill from the Electra Field development is the maximum volume of oil calculated to be spilled from a well blow out that occurs at well C-16 (which has the higher estimated flow rate of the two proposed wells), "after the well reaches total depth with the drill pipe out of the well, before installing the 7 inch liner". Under these conditions, the scenario results in an estimated spill rate of 1,190 bbl/d.

However, as in the case of the *Deepwater Horizon* event, the worst-case scenario also assumes that there is no functioning blow out prevention equipment in place, requiring the drilling of a relief well to stem the flow of oil into the environment. For the Electra Field and Platform Hidalgo, it has been conservatively estimated that it will require 80 to 111 days to drill a relief well, bringing the total worst-case spill size to 95,200 to 132,090 bbl of oil. This blowout spill size is similar in size to what was addressed in the 1984 EIR/EIS for the Point Arguello Field that use a 100,000 barrel spill for a severe blowout.

The most likely scenario, however, as discussed above, is that one oil spill in the 50-1,000 bbl range would occur over the life of the proposed project (with approximately a 4.4 percent chance of occurrence), and that such a spill would be less than 200 bbl in volume.

The level of impacts from such a spill will depend on many 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.

Oil Spill Risk Assessment (OSRA) Model

The analyses described below provide possibilities of oil spill trajectory and landfall or resource impact based on an Oil Spill Risk Assessment (OSRA) model calculation. The OSRA model analysis is the traditional BOEM method of determining probabilities of oil spill landfall and impacts to resources. It calculates numerous trajectories from a pre-designated launch point by varying the wind over a static, seasonally-averaged ocean current field and applying the deep ocean 3.5-percent wind rule to project the assumed movement of oil over the surface layer of the water. Shoreline segments are partitioned into their USGS Quad maps, and probabilities of oil spill landfall for each shoreline segment are calculated.

These analyses provide important insights that help present a more complete picture of what may occur when oil is spilled and represent the best available information the BOEM currently has to offer on possible oil spill trajectories in the Santa Barbara Channel-Santa Maria Basin area.

In order to determine the areas that might be contacted by proposal-generated oil spills, BOEM has generated conditional oil spill probability data. Conditional oil spill probabilities are independent of both the accident spill rates and resource estimates; they are based solely on the OSRA model simulation trajectories and assume that a spill has occurred. Attachment F describes the OSRA model and provides graphical depictions of the results of the conditional model runs for southern California. Four launch points were included in the analysis for the proposed Electra Field project: Platform Hidalgo, Platform Harvest, Platform Hermosa, and the Hermosa-to-shore pipeline.

The following paragraphs present seasonal synopses of the conditional OSRA model runs conducted for the proposed development of the Electra Field. For each season, the OSRA model calculated probabilities of contact to shoreline segments for spills from each of the four launch points over 10-, and 30-day periods. The results of each of these conditional model runs are included in Attachment F. The effects of weathering on oil make the first 10 days of the oil spill trajectory the most important in a risk analysis assessment, and have been focused on here. Additionally, containment measures are generally in place well before 30 days have elapsed.

Spring (March-May). Based on the spring OSRA model runs, the probabilities that oil spilled from the Electra Field development would contact San Miguel and Santa Rosa Islands range up to 24.2 percent by day 10, but do not change over the 30-day period. No contact with the mainland is predicted.

The spring conditional runs show predominantly south and southeastward movement of an oil spill during this season, with the highest probabilities of contact occurring on the western portions of San Miguel and Santa Rosa Islands from a spill along the Hermosa-to-shore pipeline.

Summer (June-August). The OSRA model runs for summer indicate an even smaller probability of contact to the northern Channel Islands than in spring. Contact would be limited to San Miguel Island, with probabilities of contact ranging from 0.3 to 16.7 percent by day 10. As was the case for spring, the model runs predict no mainland contacts, north or south, from a spill during this season.

The summer conditional runs show predominantly southward movement of an oil spill, with the highest probabilities of contact confined to the western half of San Miguel Island. As in spring, the highest probabilities of contact were associated with a spill from the Hermosa-to-shore pipeline.

Fall (September-November). The fall OSRA model runs indicate relatively low probabilities of contact, up to 6.3 percent, to the western portions of San Miguel and Santa Rosa Islands after 10 days. The contact probabilities do not increase over the 30-day period. Additionally, a slight (0.3 percent) probability of a spill reaching the western portion of Santa Cruz Island by day 30 exists in the event of a spill originating at Platform Hermosa.

The fall model runs also indicate a low probability (≤3.3 percent) that an oil spill from the Electra Field would contact the mainland shore at, and just north of, Point Arguello within 10 days. Additionally, low shoreline contact probabilities (≤0.3 percent) are recorded along the northern coast until just below Point Sal. These probabilities do not change over the 30-day period.

The fall runs indicate movement to both north and south and considerable spreading throughout the 10-day model period. Relatively greater movement to the south results in low contact probabilities to the southern and eastern portions of Santa Rosa Island. As before, the highest probabilities of contact were associated with a spill from the Hermosa-to-shore pipeline.

Winter (December-February). The conditional OSRA model runs for winter give probabilities of up to 19.7 percent that an oil spill from the proposed project would contact San Miguel Island within 10 days. By the end of the 30-day period, these probabilities increase only slightly, to

21.1 percent. Chances of contact to Santa Rosa Island are much slighter, reaching only 2.8 percent by day 30. Additionally, a slight (≤0.3 percent) probability of a spill reaching the northern and western portions of Santa Cruz Island by day 10 exists in the event of a spill originating from the Hermosa-to-shore pipeline. These probabilities do not change over the 30-day period.

North of Point Conception, the model runs show low probabilities of up to 3.3 percent that the Point Arguello area would be contacted by a spill within 10 days. These probabilities do not change over the 30-day period.

The winter runs indicate some spreading to the north and northwest. Movement to the south appears comparable to that of the fall season. The highest probabilities of contact were again associated with a spill from the Hermosa-to-shore pipeline.

4.3.2 Oil Spill Prevention and Response

Platform Inspections and Drills. The Bureau of Safety and Environmental Enforcement (BSEE) is the new federal agency that oversees the safe and environmentally sound exploration and production of oil and gas on the OCS. On October 1, 2011, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly the Minerals Management Service (MMS), was replaced by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) as part of a major reorganization effort aimed at addressing the inherently conflicted missions of MMS, which was charged with resource management, safety and environmental protection, and revenue collection.

In the Pacific OCS Region, BSEE inspectors and engineers visit the offshore platforms 365 days a year to ensure that safety, maintenance, and operational standards are being maintained and to prevent oil spills from occurring. Unannounced, partial production and drilling inspections of every offshore facility in the Region are conducted at least once per month, in addition to thorough annual inspections of each facility. Three or four times a year, the BSEE also conducts intensive, multi-day inspections, known as focused facility inspections (FFIs), rotating among the offshore facilities.

In order to test offshore operators' states of readiness and response capabilities, as well as their knowledge and understanding of their individual oil spill response plans (OSRPs), the BSEE also conducts frequent oil spill response exercises at OCS facilities. Appropriate federal, state, and local agencies are notified of, and frequently take part in, these exercises. Two types of exercises are conducted: 1) equipment deployment exercises (EDEs), and 2) table-top exercises (TTEs).

EDEs can be minor or major, and the exercises conducted in the Pacific OCS Region are unannounced. A minor EDE requires the successful deployment and operation of primary response equipment at the platform. A major EDE requires the establishment of an onshore incident command center, as well as the successful deployment and operation of primary and, to some degree, secondary response equipment. Minor EDEs are conducted at least once per year per offshore facility. The BSEE also schedules one major drill every year, rotating among the facilities.

A TTE is an exercise of an operator's spill management team response while simulating deployment of response equipment. An intended EDE may become a TTE if for some reason (e.g., weather or damage to equipment) response equipment cannot be deployed without unacceptable risk to personnel and the EDE cannot be rescheduled.

When BSEE inspectors conduct drills at the OCS facilities, the operators are judged, in part, by their ability to show containment of the simulated spill within 1 hour and skimming operations within 2 hours. If these guidelines are not met, the BSEE inspector can issue an Incident of Non-Compliance (INC) that will indicate how the operator failed in the drill and give them some time to remedy the failure. A retest will be conducted at some later time to ensure that the operator has corrected the fault. During a drill, various records, including training certifications and equipment inspections, are also checked. INCs may also be issued for failure in these areas.

Pipeline Inspection. The Pacific OCS Region also has a rigorous offshore pipeline inspection policy. The policy specifies several types of regular inspections. The operator is required to conduct weekly inspections by boat or aircraft of the ocean surface along the pipeline route for leakage. The records of these inspections must be submitted annually to the BSEE.

External and internal inspections of all oil and gas pipelines by a third party are also required in alternating years. Plans for these inspections must be submitted to the BSEE at least 30 days before the survey; inspection results must be submitted within 60 days of survey completion. The external inspections, which must be conducted using ROV or side-scan sonar, are intended to identify burial and spanning conditions, protrusions, structural integrity, damage, and corrosion to the pipeline. The internal inspections involve the use of internal survey tools to identify corrosion and/or damage.

If an inspection reveals a potential problem with a pipeline, the BSEE requires the operator to develop a remediation plan to address the problem. The plan is submitted to the BSEE for review and approval. If the BSEE is unsatisfied with the plan, or if an inspection has identified a problem requiring immediate action, the BSEE has the authority to shut down the pipeline. This is accomplished by de-rating the pipeline to a lower maximum volume and pressure, by shutting in the pipeline directly, or by suspending the operator's approval to transport OCS oil through the pipeline until the problem is resolved.

BSEE regulations state that operators may be required to equip oil pipelines with a metering system to provide a continuous volumetric comparison between the input to the line at the structure(s) and the deliveries onshore. Such a system must include an alarm system and be sensitive enough to detect variations between input and discharge volumes. Alternately, an operator may, with approval from the BSEE, install a system capable of detecting leaks in the pipeline. The majority of the oil pipelines in the Pacific OCS Region have continuous volumetric comparison-type leak detection systems. All oil pipeline leak detection systems must be installed and tested to demonstrate indicated design performance levels.

The Platform Hermosa-to-shore pipeline, which would transport production from the Electra Field development, went into operation in June 1991. The pipeline is equipped with a continuous volumetric comparison-type leak detection system (Chevron 1997).

Oil Spill Response. As discussed above, BSEE regulations require that each OCS facility have a comprehensive OSRP. Federal regulations (30 CFR Part 254) specify oil-spill response requirements for offshore oil and gas facilities. Operators of oil handling, storage, or transportation facilities must submit a spill-response plan to the BSEE to demonstrate their ability to respond quickly and effectively whenever oil is discharged from their facility. Response plans consist of an emergency response action plan, and supporting information that includes an equipment inventory, contractual agreements with subcontractors, a worst-case discharge scenario, a dispersant use plan, an in-situ burning plan, and details on training and drills (Chevron 1997). Each response plan must be reviewed by the operator at least every 2 years and submitted with modifications to the BSEE for review and approval.

Since 1970, oil companies operating in the Santa Barbara Channel and Santa Maria Basin have funded and operated a non-profit oil spill response cooperative called Clean Seas (Clean Seas, 2000). 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 (Chevron 1997).

Clean Seas' area of responsibility stretches from Point Dume north to approximately Cape San Martin, and includes the northern Channel Islands. To provide spill response coverage in the area, Clean Seas maintains two large Oil Spill Response Vessels (OSRVs), several smaller response vessels, and pre-positioned equipment at strategic locations.

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 booms, assisted logistics, and served as wildlife rescue platforms.

The primary oil spill response for the Point Arguello Unit facilities is provided by Clean Seas' OSRV *Mr. Clean III*. *Mr. Clean III* normally is moored adjacent to Platform Harvest or in Cojo Anchorage near Point Conception. Response time from Cojo Anchorage to the Point Arguello facilities is estimated to be approximately one hour. *Mr. Clean III* is equipped with two Lori Five Brush advancing skimmer units, one stationary skimmer, and one DOP 250 Skimmer, plus accessory equipment; 1500 feet of 70-inch Expandi Boom on a hydraulic reel and 1500 feet of 43-inch containment boom; a fast response boom boat, a dispersant application system, an 18-ton crane, 10 bags each of absorbent boom and pads, and an onboard oil storage capacity of 1400 bbl.

Secondary oil spill response from an OSRV would come from *Mr. Clean*, moored outside Santa Barbara harbor along with Clean Seas' oil-recovery barge. *Mr. Clean* could arrive at the Point Conception area in about 5 to 6 hours. This vessel would be used in the case of a spill that was larger than the primary OSRV could handle.

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 Clean Seas cascadable agreements, additional levels of oil spill response to the Point Arguello facilities are provided by Marine Spill Response Corporation (MSRC), and Advanced Cleanup Technology, Inc**.**

The Marine Spill Response Corporation (MSRC) is a nation-wide spill response cooperative, established by the oil industry in the wake of the *Exxon Valdez* spill. Founded in 1990, it is the largest dedicated standby oil spill response organization in the United States. MSRC operates four OSRVs in Southern California and two in the San Francisco Bay. The OSRVs are approximately 210 feet long, have temporary storage for 4,000 barrels of recovered oil, and have the ability to separate oil and water aboard ship using two oil-water separation systems.

To enable the OSRV to sustain cleanup operations, recovered oil is transferred into other vessels or barges. The MSRC's southern California response vessel is the OSRV *California Responder*, which is currently based in Port Hueneme, approximately 8 to 10 hours response time from the Point Arguello facilities. MRSC also maintains a 32,000 bbl capacity barge at Port Hueneme. Originally, it was intended that the *California Responder* only be deployed in response to oil spills of 1,200 bbl or greater. However, due to the superior operating record and lack of large spills in this region, the *Responder* now responds to smaller spills on an on-call basis.

Advanced Cleanup Technologies, Inc. (ACTI) is a primary contractor for onshore and shoreline cleanup. ACTI 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 under a few hours.

The BSEE also routinely inspects and can write INCs to the oil spill cooperatives and ACTI.

5.0 Impacts to Threatened and Endangered Species

5.1 Marine Mammals

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on marine mammals. The following sections analyze the potential impacts of activities and accidental events associated with the proposed project on threatened and endangered marine mammal species in the project area.

Noise, Lighting, and Disturbance

Aircraft Traffic. No increases in helicopter traffic are proposed for the Electra Field development project. Therefore, no impacts to marine mammals are expected from aircraft operations. Nevertheless, the following information has been included herein for reference.

There have been few systematic studies on the reactions of pinnipeds to aircraft (Richardson et al. 1995). Most documented observations of the reactions of pinnipeds to aircraft noise related to animals hauled out on land. Under these circumstances, recorded reactions range from increased alertness to headlong rushes into the water. In open water, pinnipeds sometimes respond to low-flying aircraft by diving (Richardson et al. 1995; M.O. Pierson, pers. obs.).

There are no data on the received levels at which toothed whales, or odontocetes, react to aircraft (Richardson et al. 1995). Observed reactions include diving, slapping the water with flukes or flippers, and swimming away. Information on the reactions of sperm whales to aircraft has been mixed. Sperm whales have not been observed to exhibit obvious reactions to low-flying helicopters (Richardson et al. 1995). However, sperm whales have been observed to dive immediately in response to a Twin Otter passing 150-230 m overhead (Mullin et al. 1991).

Baleen whales vary in their responses to the approach of aircraft. Richardson et al. (1995; pp. 249-252) review the recorded behavior of several baleen whale species, including bowhead, right, gray, humpback, and minke whales. They conclude that response depends on the whales' activities and situations, with foraging or socializing groups less likely to react to the approach of aircraft than individual animals. Observed responses include hasty dives, turns, and other changes in behavior. To date, there is no evidence that aircraft disturbance has resulted in long-term displacement of baleen whales.

Marine Vessel Traffic. Off California, collisions between vessels and whales have occurred frequently. Between 1975 and 1980, twelve collisions occurred off southern California, resulting in the deaths of six gray whales (Patten et al. 1980). However, fin and blue whales are also highly susceptible to ship strikes.

During the fall of 2007 there were five confirmed blue whale fatalities within the SCB within a two month period. At least two of these fatalities were attributed to ship strikes: a 15-foot (4.6-m) long bruise was found on the side of a juvenile whale that washed up in Ventura County in September 2007 after initially being sighted from a plane near San Miguel Island; and a second whale thought to have been hit by a freighter was found floating in Long Beach Harbor a week earlier. This spate of fatalities was designated as an "unusual mortality event" by NOAA.

Four additional fatalities have occurred to fin and blue whales in the region as a result of ship strikes since then. The most recent event, in April 2009, involved a 60-foot (18.3-m) fin whale that was struck and impaled upon the bow of a 900-foot container ship transiting between the Santa Barbara Channel and San Pedro Bay; it was the third fin whale mortality within the SCB from a known ship strike in less than one year.

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, 1987), 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. For example, right whales are often approachable by a slowly moving boat, but will move away from a rapidly moving vessel (Watkins, 1986). Observed reactions can 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).

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

Amongst the pinnipeds, 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).

Offshore Drilling and Production. As discussed in Section 5.1.3, 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) predict that the radii of audibility for baleen whales for production platform noise would be about 2.5 km in nearshore waters and 2 km 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 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 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. Richardson et al. (1995) predicted similar radii of response for odontocetes and pinnipeds.

Lighting. Lighting associated with this project is not expected to have measurable effects on any of the subject marine mammal species. Although artificial lighting may act as an attractant for certain marine mammals (e.g., sea lions) that use the illumination to feed on readily available prey sources that are either themselves attracted by the light (forage fish, squid), or are merely better illuminated (e.g., salmon at fish ladders), impacts from artificial lighting would be limited to the approximately 100 meter illuminated area around the platforms.

Effluent Discharges

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 1996). Additionally, significant impacts from routine OCS discharges have not been associated with marine mammals, because they are highly mobile and capable of avoiding such discharges, and their ranges far exceed the extent of the discharge plumes.

The EPA's 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. Potential impacts to listed marine mammals would most likely occur through the bioaccumulation of toxins in prey, or through the displacement or reduction of prey species (MMS 1996; SAIC 2000a, b). The potential impacts of OCS effluents on individual listed species are discussed below.

Oil Spills

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. 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.

The critical factors involved in sea otter mortality in Alaska, as identified by Williams (1990), were: 1) hypothermia, directly due to the decrease in insulation resulting from fouling of the pelage; 2) pulmonary emphysema, which was thought to be due to the inhalation of toxic fumes and was more or less limited to the first 2 weeks; 3) hypoglycemia, which was possibly due to poor gastrointestinal function; and 4) lesions in other organs (liver, heart, spleen, kidney, brain), which were probably due to ingestion of oil, as well as to stress. Williams felt that stress due to the effects of captivity contributed to tissue damage in otters brought into the treatment centers for cleaning, and that pulmonary emphysema was probably the most serious problem, since it was untreatable.

Potential indirect effects on sea otters resulting from an oil spill include a reduction in available food resources due to mortality or unpalatability of prey organisms and the loss of appropriate habitat available to sea otters as kelp forest communities become contaminated (Riedman 1987).

Impacts of Past and Present OCS Activities

OCS oil and gas activities began off southern California in the late 1960s (Galloway 1997). Section 4.0 provides information on current offshore infrastructure and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear, 1995, 1997; MMS 1996).

Noise and disturbance associated with OCS activities in the Pacific Region have resulted in few documented impacts to marine mammals. Van Horn et al. (1988) concluded that seismic surveys and support vessel traffic had resulted in temporary, localized disturbances to some marine mammals, primarily gray whales. However, despite hypothesizing that increased vessel traffic off southern California might be causing greater numbers of gray whales to migrate farther offshore (Wolman and Rice, 1979; MBC Applied Environmental Services, 1989), the gray whale population does not appear to have been unduly affected by such activity as no alterations have been observed in their migration routes.

Based on experiences in southern California, and the temporary nature of the slight increase in traffic associated with the proposed project, the BOEM believes that accidental collisions between endangered whales and support vessel traffic are highly unlikely. Although large cetaceans are occasionally struck by freighters or tankers, and sometimes by small recreational boats, no such incidents have been reported with crew or supply boats off California (BOEM, unpubl. data). The same is true for southern sea otters.

Pinnipeds and otters are very nimble and are also considered very unlikely to be struck by vessels. However, the single documented instance of a collision between a marine mammal and a support vessel on the Pacific OCS involved a pinniped—an adult male elephant seal was struck and presumably killed by a supply vessel in the Santa Barbara Channel in June 1999.

The only OCS-related spill in the Pacific Region known to have contacted marine mammals was the 1969 Santa Barbara Channel spill. Although the entire northward migration of California gray whales passed through the Santa Barbara Channel while it was contaminated, Brownell (1971) found no evidence that any cetacean mortality had occurred due to the spill. Similarly, studies of elephant seals and California sea lions contacted by the 1969 spill reported no evidence of pinniped mortality from this event (Brownell and Le Boeuf, 1971; Le Boeuf, 1971). Although, the 1997 Torch oil spill off Point Pedernales contacted the shoreline at the southern end of the sea otter range, no otters are known to have been oiled as a result (M.D. McCrary, BOEM, pers. comm.).

5.1.1 Southern Sea Otter (Threatened)

Although no direct information is available on the potential impacts of exploratory and development drilling operations on sea otters, Riedman (1983; 1984) did observe 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. Most of the otters observed by Riedman (1983) were at least 400 m from the projector; all observed by Riedman (1984) were at least 1.2 km away. Although sea otters at the surface were probably receiving little or no underwater noise, some otters continued to dive and feed below the surface during the playbacks. At 1.2 km, the received sound levels of the strongest sounds were 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, except for juvenile males, rarely move more than 2 km offshore (Riedman, 1987; Ralls et al. 1988), and thus could be expected to be at least 9 km away from the nearest drilling activity. Because of this distance and the evidence from the playback experiments described above, no effects on sea otters from these activities are expected.

No systematic studies have been made of the reaction of sea otters to aircraft and helicopters (Richardson et al. 1995). During aerial surveys of the California sea otter range conducted at an altitude of about 90 m (Bonnell et al. 1983), no reactions to the two-engine survey aircraft were - observed. . Helicopter traffic is not expected to affect sea otters.

Although sea otters will often allow close approaches by boats, they will sometimes avoid heavily disturbed areas (Richardson et al. 1995). Garshelis and Garshelis (1984) reported that sea otters in southern Alaska tend to avoid areas with frequent boat traffic, but will reoccupy those areas in seasons with less traffic. The vessel traffic corridors between Port Hueneme, the support base, and Platform Hidalgo pass 4 km (2.5 miles) or more offshore while most sea otters remain within 1.6 km (1 mile) of shore. Therefore, no effects on sea otters from service vessel traffic are expected.

As discussed previously, the most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. Further, based on the distribution of past spill sizes, it is estimated that such a spill would probably be less than 200 bbl in volume. The probability that an oil spill of equal to or greater than 1,000 bbl would occur also exists but is extremely low (0.3 percent).

The conditional OSRA model runs indicate that a spill from the Point Arguello Unit (Platforms Hidalgo, Harvest, Hermosa, and the Hermosa-to-shore pipeline) during fall or winter has up to a 3.3-percent chance of contacting the Point Arguello area within 10 days. Slight (<1 percent) chances of contact to mainland areas north of Point Arguello, along Vandenberg AFB, also appear over the 10-day model run period.

Thus, there is a slight possibility that a spill of 50-1,000 bbl would contact the shoreline at the southern end of the southern sea otter's current range. However, 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.

Ford and Bonnell (1995), in their analysis of the potential impacts of an *Exxon Valdez*-sized spill 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. However, since 1995, southern sea otter range expansion to the south has continued, and seasonal densities at the southern end of their range have increased. During both semiannual surveys (spring and fall) conducted in 2005, close to 200 otters were observed between Point Sal and Point Conception, comprising 5 percent and 7 percent of the total population at that time respectively.

If a spill were to occur, the magnitude of expected sea otter mortality would vary with a number of factors, including the time of year, volume of oil spilled, wind speed and direction, current speed and direction, distance of the spill from shore, volume of oil contacting the shoreline, condition of the oil contacting the shoreline, the success of containment operations, number of animals contacted, and the effectiveness of otter cleaning and rehabilitation.

In its Final Revised Recovery Plan for the Southern Sea Otter (USFWS 2003), the USFWS makes the assumption that, lacking reliable data on the survivability of oiled sea otters in the wild, all sea otters coming into contact with oil within 21 days of a spill will die. However, the USFWS recognizes that activation of the California Department of Fish and Game's wildlife care facilities and oil spill response protocols would mitigate these impacts to some extent, and that this assumption is probably conservative. Rapid and effective oil spill cleanup response (as discussed in Section 5.3.2) would also lessen impacts on otters in the spill area.

Nevertheless, it is expected that one 50-1000 bbl spill will occur over the lifetime of the project, and it is estimated that this spill will likely be 200 bbl in size. Given the likelihood of such a spill making landfall along the mainland coast, there is a reasonable probability for sea otter contacts between Purisima Point and Point Conception as a result of a spill occurring during the fall or winter. Although the seasonal nature of the otter migration and the oil spill prevention and response capabilities in place, may act to reduce the number of affected otters, due to the increasing number of otters expanding into the project area, moderate impacts to the southern sea otter from the proposed Electra Field development project are expected, including mortality in the tens of animals.

5.1.2 Steller Sea Lion (Threatened)

As discussed in Section 3.2.2, Steller sea lions are now uncommon in southern California waters; their southernmost active rookery, Año Nuevo Island, is approximately 400 km north of the project area. They would not be affected by routine activities or discharges associated with the proposed action, and it is very unlikely that any Steller sea lions would come in contact with the one spill of about 200 bbl that could occur during the life of the Electra Field development. Therefore, no impacts on Steller sea lions from the proposed project are expected.

5.1.3 Guadalupe Fur Seal (Threatened)

Although a few Guadalupe fur seals appear on the Channel Islands each year (Bonnell and Dailey, 1993; DeLong and Melin, 2000), the Mexico-based population is still quite small (Gallo, 1994). They are almost never sighted at sea off California (Bonnell and Dailey, 1993). As is the case with the Steller sea lion, it is extremely unlikely that any routine activities or accidental oil spills associated with proposed Electra Field development would affect more than one or two individuals of this species. As such, no impacts on Guadalupe fur seals are expected from the proposed project.

5.1.4 Blue Whale (Endangered)

The proposed Electra Field drilling operations and rig installation and removal, would result in slight but temporary increases in supply boat traffic. However, following the completion of drilling activities, which are anticipated to last for approximately five months, supply vessel traffic is expected to return to current baseline levels (six supply boat trips per month). Vessel traffic would be relatively close to shore and would remain in the established traffic corridors. Additionally, as no new helicopter trips will be required for the Electra Field development, beyond the 3 to 5 trips per week per platform currently estimated to occur in the Pacific Region, no impacts from aircraft noise and disturbance are expected.

There have been few detailed studies of the reactions to vessels by rorqual species other than humpback whales (Richardson et al. 1995). Blue and fin whales summering in the St. Lawrence Estuary have been observed to react most strongly to rapid or erratic approaches by vessels (Edds and McFarlane, 1987). As discussed in Section 5.1 above, blue whales would be likely to react to the close approach of crew or supply boats, and some temporary displacement could occur under these circumstances. However, the temporary increase in surface traffic to and from Platform Hidalgo associated with the proposed project is unlikely to have a detectable effect on blue whales during their summer and fall presence in southern California waters.

Similarly, neither the minor and temporary increases in sound levels produced during the drilling activities on Platform Hidalgo, nor the continuing noises produced by production activities, are likely to affect blue whale movements through the project area waters. Blue whales are frequently sighted from Platform Hidalgo, during the summer and fall months.

Although blue whales pass Platform Hidalgo on their way to and from foraging areas in the Santa Barbara Channel, they are unlikely to swim near enough to pass through the platform's effluent mixing zones. In addition, the zooplankton that form the blue whale's primary prey would be unlikely to remain in the vicinity of the platform long enough to bioaccumulate any toxins. Based on limited data, the impacts of effluents, particularly muds, cuttings, and produced water, on plankton generally appear to be limited to the several hundred to several thousand meters extent of the discharge plume for the brief period (perhaps several hours) that the organisms are in the plume (Raimondi and Schmitt 1992; MMS 1996). This could result in some mortality in the immediate vicinity (tens of meters) of the discharge and perhaps some reduced productivity farther away, to the extent of the plume. However, given their short generation time, on the order of hours or days, populations of plankton over broader areas should remain unaffected. For these reasons, the EPA's biological assessment for Section 7 consultation on the reissuance of their general NPDES permit for OCS facilities (SAIC 2000a) concluded that whales off southern California would not be impacted by OCS platform discharges. Thus, no impacts on blue whales are expected from the effluent discharges associated with the proposed action.

The most likely oil spill scenario for the development of the Electra Field reserves is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. Further, based on the distribution of past spill sizes, it is estimated that such a spill probably would be less than 200 bbl in volume. This level of spillage would be unlikely to have a detectable effect on the California blue whale population.

The probability that an oil spill of equal to or greater than 1,000 bbl would occur as a result of the proposed project is very low, about 0.3 percent. However, if an oil spill of this size did occur, it would be very likely to contact the waters at the western end of the Santa Barbara Channel. Therefore, if a spill were to occur during summer or fall, when blue whales were in southern California waters to feed, at least part of their local foraging area could be affected.

Based on experiences from past spills, it is unlikely that any direct blue whale mortality would result from such a spill, and there is no evidence that blue whales would avoid oiled areas. However, blue whales could be temporarily displaced from a portion of their foraging area by the cleanup activities associated with the response to a spill of this size. Such displacement could be a source of physical stress for whales in the affected area and might also increase population congestion in areas unaffected by the spill. Nevertheless, these effects would not, in themselves, represent a serious threat to the portion of the California blue whale stock that feeds seasonally in the Southern California Bight.

In conclusion, considering all impact sources, only oil spills are likely to have an effect on blue whales in the project area. However, given the likelihood that a spill occurring as a result of the proposed project would likely be less than 200 bbl in volume, and with the current the oil spill prevention and response capabilities in place, no impacts on blue whales are expected from the proposed development of the Electra Field reserves.

5.1.5 Fin Whale (Endangered)

As discussed in Section 4.2.2, fin whales are present in greatest numbers off southern California in summer and fall (Dohl et al. 1981, 1983; Barlow, 1995; Forney et al. 1995). Fin whales are sighted in the Santa Barbara Channel, although they generally occur farther offshore and in waters south of the northern Channel Island chain (Leatherwood et al. 1987; Bonnell and Dailey, 1993). They are less common than blue or humpback whales in the project area and, therefore, unlikely to be affected by any of the routine activities associated with the proposed development of the Electra Field.

Similarly, fin whales are unlikely to be affected by an accidental oil spill from Point Arguello facilities, were one to occur. Therefore, no impacts to fin whales are expected from the proposed project.

5.1.6 Sei Whale (Endangered)

Due to the low numbers of sei whales estimated to frequent California waters, routine activities associated with the proposed development of the Electra Field reserves are not expected to affect this species. Similarly, sei whales are unlikely to be affected by an accidental oil spill from Point Arguello facilities, were one to occur. Therefore, no impacts to sei whales are expected from the proposed project.

5.1.7 Humpback Whale (Endangered)

Like blue whales, humpbacks are frequently sighted from area platforms during the summer and fall, and the sound levels produced by the drilling and production activities associated with the development of the Electra Field reserves are not expected to affect humpback whales in the project area.

The reactions of humpback whales to vessels vary considerably. Humpbacks often move away when vessels are within several kilometers, (Baker and Herman, 1989; Baker et al. 1992), but may show little or no reaction when much closer (Richardson et al. 1995). They appear less likely to react overtly when feeding. As discussed for blue whales, humpbacks would be likely to react to the close approach of crew or supply boats, resulting in some temporary displacement and, possibly, disruption of feeding activity. However, given the short duration of the anticipated, modest increases in surface traffic to and from Platform Hidalgo associated with the proposed project, it is unlikely to have a detectable effect on humpback whales during their summer and fall presence in southern California waters.

Additionally, although humpback whales do occur near Platform Hidalgo, they are unlikely to swim near enough to pass through platform effluent mixing zones. In addition, as was discussed for blue whales, the zooplankton and small schooling fishes that form their primary prey would be unlikely to remain in the vicinity of the platforms long enough to bioaccumulate toxins. For these reasons, the EPA's biological assessment for Section 7 consultation on the reissuance of their general NPDES permit for OCS facilities (SAIC, 2000a) concluded that humpback whales off southern California would not be impacted by OCS platform discharges. Thus, no impacts on humpback whales are expected from the effluent discharges associated with the proposed action.

However, in Prince William Sound following the 1989 *Exxon Valdez* oil spill, humpbacks were observed feeding in areas that had been heavily oiled, although none were observed feeding in oil (von Ziegesar et al. 1994). The whales did not appear to preferentially favor areas that had not been oiled. No humpback whale deaths or strandings were observed in Prince William Sound in 1989-1990 (Loughlin et al. 1996).

It is estimated that one oil spill of approximately 200 bbl in size could occur during the life of the proposed project. If a spill of this size were to occur from the Point Arguello offshore facilities during the summer or fall, it would be likely to contact part of the area used for feeding by humpback whales in the Santa Barbara Channel and, to a lesser extent, in the southern Santa Maria Basin. Such an event would be unlikely to result in any humpback whale mortality, but could result in the temporary displacement of some animals from local foraging areas, primarily as the result of clean-up activities.

In conclusion, considering all impact sources, only oil spills are likely to have an effect on humpback whales in the project area. However, given the likelihood that a spill occurring as a result of the proposed project would be less than 200 bbl in volume, and the oil spill prevention and response capabilities in place, no impacts on humpback whales are expected from the proposed development of the Electra Field reserves.

5.1.8 North Pacific Right Whale (Endangered)

Due to the low numbers of North Pacific right whales estimated to frequent California waters, neither routine activities nor accidental events associated with the proposed project are expected to affect this species.

In waters off the Atlantic coast, ship strikes are a major source of mortality for these slow-moving whales (Kenney and Kraus, 1993). However, the right whale population in the North Pacific is very small, and right whales are very rarely seen off southern California (Carretta et al. 1994). Therefore, the probability that a right whale would be affected by vessel traffic or noise and disturbance associated with the proposed project is extremely low. It is also highly unlikely that effluent discharges or oil spills from the Point Arguello facilities would impact right whales. Therefore, no impacts on the North Pacific right whale from the proposed action are expected.

5.1.9 Sperm Whale (Endangered)

Although they are occasionally sighted in the Southern California Bight, sperm whales are a pelagic species with a preference for deep waters (Watkins, 1977; Gosho et al. 1984), and are generally found farther offshore (Dohl et al. 1981, 1983; Bonnell and Dailey, 1993). In addition, the squid that comprise their primary prey are deep-water species not known to be abundant near OCS platforms. Thus, sperm whales are unlikely to be present near enough to Platform Hidalgo or traffic corridors to be disturbed by routine activities or accidental discharges associated with the proposed project. Therefore, no impacts on sperm whales are expected from the proposed project.

5.2 Birds

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on coastal and marine birds. The following sections analyze the potential impacts of activities and accidental events associated with the proposed project on threatened and endangered bird species in the project area.

Threatened or endangered bird species occurring in the general area of concern for the Point Arguello Unit that were considered in this analysis include: the California least tern, marbled murrelet, western snowy plover, light-footed clapper rail, and the short-tailed albatross.

Noise, Lighting, and Disturbance
Aircraft Traffic. . No increases in helicopter traffic are proposed for the Electra Field development project. Therefore, no impacts to listed bird species are expected from aircraft operations.

Marine Vessel Traffic. No adverse impacts to listed bird species are expected from the temporary increase in vessel traffic associated with the proposed project.

Offshore Drilling and Production. Because all drilling activities would occur about 11 km (6 mi) from the nearest land, noise and disturbance associated with this project are not expected to have measurable effects on any of the subject bird species.

Lighting. Artificial lighting is not expected to have a measurable effect on any of the five listed bird species. Although marbled murrelets may actively forage at night, they occur in very low numbers in the project area, and are typically found only in nearshore waters (<1.2 miles from shore) where they would not be expected to be impacted by night lighting at the offshore platform or along the vessel transport routes. Sightings of murrelets in the project area have also generally occurred well north of the platform and vessel transport routes.

Effluent Discharges
Platform discharges are also not expected to have a measurable effect on threatened or endangered bird species due to the platform's distance to shore and the high degree of dilution that would occur upon discharge (SAIC 2000b; Weston Solutions Inc. and MRS 2006).

Oil spills
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.

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. 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.

Oil-related mortality is therefore highly dependent on the life histories of the bird species involved. For example, birds that spend much of their time feeding or resting on the surface of the water are typically more vulnerable to oil spills (King and Sanger 1979, Carter and Kuletz 1995). Direct contact with even small amounts of oil can be fatal, depending on the species involved. Studies by Dr. Michael Fry (Nero and Associates 1987) have found that exposure to as little as 3 ml of oil (which amounts to just less than a teaspoon) spread evenly on the wings and breast of Cassin's auklets caused severely matted plumage and was a lethal dose. Acute (short-term) mortality, as well as sublethal effects, can also result from toxicity after birds ingest or inhale oil. Chronic (long-term) effects of oiling likely include reduced reproduction and survivability.

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 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 go 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.

Impacts of Past and Present OCS Activities

Section 4.0 provides information on current offshore infrastructure and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear 1995, 1997; MMS 1996).

The level of OCS-related helicopter traffic in the Pacific Region is described in Section 4.1. Although helicopter traffic can cause disturbances to birds, especially in largely unpopulated areas (e.g., Alaska), there is no evidence that OCS-related helicopter traffic has affected endangered birds in the Pacific Region (Bornholdt and Lear, 1995). No new helicopter trips are proposed in conjunction with the Electra Field development, beyond the 3 to 5 trips per week per platform currently estimated to occur in the Pacific Region (Bornholdt and Lear, 1995). Several international and numerous smaller airports occur along the southern California coast along with several military airports, and air traffic is a constant daily and even hourly occurrence. Additionally, BOEM provides OCS lessees with guidelines for protecting birds from aircraft.

The largest OCS-related oil spill in the Pacific Region was the 1969 Santa Barbara spill, which resulted in the loss of thousands of birds (Straughn 1971). Between 1971, when formal tracking of all OCS spills was initiated, and 1999, 843 OCS-related oil spills have occurred in the Pacific Region. However, almost all of these (99 percent) have been very small (less than 50 bbl). No impacts to endangered birds or birds in general have been reported from these very small spills. Five OCS-related spills equal to or larger than 50 bbl have also occurred in the Pacific Region since 1971 (less than 1 percent of the total 841 spills). These spills ranged in size from 50-163 bbl. Four of these spills did not contact shore, and no impacts to endangered birds or any birds were reported from them. One spill, however, did contact the shoreline and resulted in the mortality of an estimated 635 to 815 birds (Torch/Platform Irene Trustee Council 2007)

On September 28, 1997, a rupture in the Torch pipeline from Platform Irene to the shoreline occurred releasing an estimated 162 to over 1,242 bbl of crude oil (Santa Barbara County 2001). The rupture resulted in the oiling of approximately 64 km (40 miles) of coastline, stretching from the northern end of Minuteman Beach to Boat House in Santa Barbara County. Approximately 100 acres (40 hectares) of sandy beach were disturbed by oiling and cleanup operations. The cleanup of these beaches required the use of heavy equipment which resulted in extensive physical disturbance of the sandy beach habitat, as well as the removal of marine plants and other matter constituting the "wrack line," an important source of food and cover for numerous shore species. In addition, another 263 acres (106 hectares) of sandy beach were very lightly oiled (less than or equal to 10 percent oiling by area), but were relatively undisturbed by heavy equipment during cleaning operations (OSPR 1999).

Surveys for dead or live oiled seabirds that were beached were conducted from September 29 to October 5, 1997. Of the 140 birds that were collected during the surveys, 122 were either dead or died after sampling. The primary affected species were coots, cormorants and gulls. However, the survey numbers did not include birds that may have been missed by the surveyors, dead or oiled birds were outside the survey area or did not reach the shoreline, and birds that reached the shoreline in the survey area but were removed by scavengers or predators, such as vultures and coyotes. In total, Ford Consulting (1998) estimated that approximately 353 birds died from oiling that were not recovered during the surveys, bringing the total number of impacted birds to nearly 500. Additionally, although no deaths from oiling were reported for the brown pelican or western snowy plover, Ford Consulting (1998) estimated that 14 California brown pelicans and 13 western snowy plovers were fouled by oil from the pipeline rupture.

A subsequent revision to these numbers occurred in 2007, when the Final Restoration Plan and Environmental Assessment for this spill was published. This analysis determined that a total of between 635 and 815 seabirds and shorebirds were adversely impacted by the Torch spill (Torch/Platform Irene Trustee Council 2007).

The OSRA model provides information on where an oil spill associated with the proposed project might be expected to travel during different seasons. Based on OSRA results, an oil spill from this project would most likely move toward the south or west, potentially impacting San Miguel and Santa Rosa Islands in the spring and summer, but there is a slight probability (up to 3.3 percent) that a spill could contact portions of the mainland shore from Purisima Point to Point Conception if a spill occurred during fall or winter.

5.2.1 California Least Tern (Endangered)

Least terns are at risk from an oil spill because they dive into the water to catch their fish prey. They also nest and roost on beaches and mud flats that may be contacted by an oil spill or are in close proximity to the ocean or an estuary. Additionally, any cleanup processes, if not conducted with respect to Federal and State regulations, could exacerbate the effects of an oil spill on least terns.

The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. Further, based on the distribution of past spill sizes, it is estimated that such a spill would probably be less than 200 bbl in size.

If a spill of 200 bbl were to occur during the spring or summer, when terns are present in California, and move north, contacting the shoreline along Vandenberg AFB, impacts to tern colonies could occur, including some mortality. The severity of these impacts would depend on the size of the spill, the length of shoreline contacted, and the number of terns present in the area. Over the last several years, tern usage at sites on Vandenberg AFB has fluctuated; however, 32-33 breeding pairs established 34 nests and produced 29 fledglings in 2010. This represents the second consecutive year of higher fledgling counts following poorer productivity in 2004-2006 (Marschalek 2005, 2011). The colonies are generally widely spaced, so impacts from a spill would probably be limited to a single colony.

Nevertheless, based on the OSRA model results, a spill from the proposed project would not impact the mainland shoreline during spring or summer when terns are expected to be present in California (See Appendix E). The possibility of contact along the mainland shore from an oil spill is only anticipated with spills during the fall and winter months, when terns are not expected to be present in the region. Additionally, during the remainder of the year, the probability of contact with the mainland shore is very low (≤3.3 percent). Nevertheless, if a spill occurred at any time which reached the shoreline, temporary, sublethal impacts to least terns from degraded nesting and foraging areas or resulting from disturbance from cleanup activities could still occur.

Given that a spill occurring as a result of the proposed project would probably be less than 200 bbl in size, and that that any impacts would be temporary and sublethal, restricted to the small colonies north of Point Conception and south of Point Sal, and the comprehensive oil spill prevention and response capabilities in place, impacts to least terns are expected to be low.

5.2.2 Marbled Murrelet (Threatened)

Marbled murrelets are typically at high risk from oil spill impacts due to their utilization of nearshore areas and surface waters, and general habit of ranging a short distance from nesting areas (Carter and Kuletz 1995, Marshall 1988). This, combined with their limited population along the central California coast, makes them extremely vulnerable to impacts from an oil spill from the proposed project.

Although murrelets are not known to breed in the project area, they occur in very low numbers along the northern coast of Santa Barbara county, particularly during the late summer and early fall (Peery and Henry 2010, Lehman 1994). They have also been documented in small numbers in the region during winter. Sightings in recent years, however, have typically been of less than 5 individuals, and have been concentrated near the Santa Maria river mouth and at Point Sal (Lehman 1994). Recent winter sightings have taken place as far south as northern Vandenberg AFB (Lion's Head). If a spill were to occur and move north, contacting the shoreline near or north of Point Sal, impacts to murrelets could potentially occur. The severity of these impacts would depend on the size of the spill, the length of shoreline contacted, and the number of murrelets present in the area at the time.

The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. However, based on the distribution of past spill sizes, it is estimated that such a spill would probably be less than 200 bbl in size.

Based on the OSRA model results, the possibility of contact occurring anywhere along the mainland shore from a 200 bbl oil spill from the proposed project is very low (≤3.3 percent), and is only anticipated with spills that occur during the fall or winter season. The probability of a spill from the proposed project impacting the mainland shoreline north of Point Arguello, where most recent (within the last 20 years) sightings of murrelets in the region have been recorded, is an even lower (≤0.3 percent) and would only occur in the fall (See Appendix E).

Nevertheless, if a spill occurred at any time which reached the shoreline where murrelets were present, temporary, but potentially lethal impacts to marbled murrelets could occur. Additionally, temporary, sublethal impacts resulting from disturbance from cleanup activities could also occur.

Given the low numbers of marbled murrelets estimated to frequent south-central California waters, and their nearshore distribution when at sea (within 1.2 miles of the shoreline), routine activities associated with the proposed development of the Electra Field reserves are not expected to affect this species. Additionally, given the extremely low probability of a spill from the proposed project reaching the mainland shore, that such a spill would probably be less than 200 bbl in size, that any impacts from such a spill would be restricted to areas south of Point Sal, the comprehensive oil spill prevention and response capabilities in place, and the limited occurrence and seasonality of murrelets in the region, impacts to marbled murrelets from accidental events (i.e., oil spills) associated with the proposed development of the Electra Field reserves are expected to are expected to be low.

5.2.3 Western Snowy Plover (Threatened)

Western snowy plovers are highly vulnerable to oil spills because of their small population size and dependence on sandy beach habitats, which can be contacted by spills. Additionally, oil spill cleanup operations could exacerbate the effects of an oil spill on snowy plovers.

The most likely oil spill scenario for the Electra Field development project, is that one spill of approximately 200 bbl in size could occur during the life of the project. If such an oil spill were to occur from this project, the probability of oil contacting important snowy plover areas, including critical nesting and wintering habitats, is shown in Table 5.1.

Based on the OSRA results, there is a moderate probability (>16 percent) during most seasons of the year that snowy plover areas on San Miguel and western Santa Rosa Island could be contacted in the event of a spill (Appendix E). There is a much smaller probability (≤3.3 percent) that areas of the mainland coast, including Vandenberg AFB would be contacted. Vandenberg AFB currently acts as a breeding area for more than 10 percent of the plover population while both Vandenberg AFB and the Channel Islands host several hundred wintering plovers.

Table 5.1 Conditional Probability of Oil Spill Contact with Important Western Snowy Plover Use Areas

Location and Season	Conditional Probabilities[1]	
	10-Day	30-Day
Point Purisima to Point Conception		
Winter	0-3.3	0-3.3
Spring	0-0	0-0
Summer	0-0	0-0
Fall	0-3.3	0-3.3
San Miguel Island		
Winter	0.8-21.1	0.3-21.1
Spring	0-24.2	0-24.2
Summer	0-16.3	0-16.7
Fall	0.3-6.3	0.3-6.1
Santa Rosa Island		
Winter	0-2.2	0-2.8
Spring	0-22.2	0-22.2
Summer	0	0
Fall	0-0.6	0-1.1
Santa Cruz Island		
Winter	0-0.3	0-0.3
Spring	0	0
Summer	0	0
Fall	0	0-0.3

[1]Percent range based on four launch points for the Point Arguello Unit.

The highest probabilities for landfall (>20 percent) occur at the Channel Islands (San Miguel Island and western Santa Rosa Island) during winter and spring and are associated with a spill from the Hermosa-to-shore pipeline. Critical habitat on the southwestern portion of Santa Rosa Island could potentially be impacted at these times. In contrast, there is no likelihood of contact with the mainland coast during the spring breeding season, and only limited potential for contact (<3.3 percent) between Point Sal and Point Conception (including Vandenberg AFB) during the fall and winter.

If a spill were to occur, the magnitude of plover impacts would vary with a number of factors, including the time of year, volume of oil spilled, wind speed and direction, current speed and direction, distance of the spill from shore, volume of oil contacting the shoreline, length of shoreline contacted, condition of the oil contacting the shoreline, the success of containment operations, number of animals contacted, and the effectiveness of plover cleaning and rehabilitation. Although the outcome of containment efforts cannot be predicted, response at the site of a potential spill should be rapid. Impacts to snowy plovers could, however, be exacerbated by beach cleanup efforts.

Given that a spill occurring as a result of the proposed project would probably be less than 200 bbl in volume, the likelihood of oil contacting various nesting and wintering areas, and the oil spill prevention and response capabilities in place, impacts on snowy plovers would probably be limited to San Miguel and Santa Rosa Islands, and to the mainland coast between Point Sal and Point Conception. Impacts to the wintering or nesting populations at all of these locations could include mortality of adults, disruption of nesting activity, abandonment of nesting or overwintering beaches.

While spills affecting the area between Point Sal and Point Conception, could potentially impact larger numbers of plovers, cleanup operations and rehabilitation efforts at the Channel Islands could be impeded by weather or sea conditions and the remoteness of the locations. Overall, although the seasonal nature of the plover's presence in the region, combined with the oil spill prevention and response capabilities in place, may act to reduce the number of affected plovers, moderate impacts to the southern western snowy plover from the proposed Electra Field development project are expected, including mortality in the tens of animals.

5.2.4 Light-footed Clapper Rail (Endangered)

The range of light-footed clapper rails is limited to only a very few salt marshes along the California coast, and this, combined with their already low numbers, makes them extremely vulnerable to impacts from an oil spill. Additionally, oil spill cleanup processes, if not conducted in accordance with federal and state regulations, could exacerbate the effects of an oil spill on the rail's habitat.

The nearest marsh to the project area known to be inhabited by light-footed clapper rails is Mugu Lagoon. Although rails have previously inhabited Carpinteria salt marsh, they are not anticipated to re-establish in this location in the near future.

There is a 4.4 percent chance that a 50-1,000-bbl spill would occur from the Electra Field. Based on the distribution of past spill sizes, it is estimated that such a spill probably would be less than

200 bbl in volume. Further, based on OSRA model results, no contact from such a spill would occur along the southern Santa Barbara and Ventura County coastlines, where Carpinteria salt marsh and Mugu Lagoon are located. In the highly unlikely event that a large (>1,000-bbl) oil spill were to occur from this project and approach a salt marsh occupied by rails, the mouths of marshes are more easily protected than the open coast, which affords the rails a greater degree of safety.

Given that a spill occurring as a result of the proposed project would probably be less than 200 bbl in volume, the likelihood that no contact to an occupied salt marsh will occur, and the oil spill prevention and response capabilities in place, no impacts to light-footed clapper rails are expected from the proposed project.

5.2.5 Short-tailed Albatross (Endangered)

Due to the low numbers of short-tailed albatross estimated to frequent California waters, neither routine activities nor accidental events associated with the proposed development of the Electra Field reserves are expected to affect this species. Therefore, no impacts to this species are expected from the proposed project.

5.3 Reptiles

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on sea turtles. The following sections analyze the potential impacts of activities and accidental events associated with the proposed project on threatened and endangered sea turtle species in the project area.

Noise, Lighting, and Disturbance
Aircraft Traffic. . No impacts to marine turtles are expected from aircraft operations associated with the proposed project.

Marine Vessel Traffic. In the Gulf of Mexico, sea turtles are known to be attracted to and feed around offshore platforms (MMS 1996). Although no systematic studies have been conducted on the effects of manmade noise on sea turtles (MMS 1996), noise from service-vessel traffic may elicit a startle reaction from marine turtles and produce a temporary sublethal stress. Service vessels could also collide with and injure marine turtles at the sea surface. However, sea turtles are estimated to be at the sea surface less than 4 percent of the time (Byles, 1989; Lohoefener et al. 1990) and are generally infrequent visitors to the project area. Therefore, collisions with vessel traffic are unlikely.

Additionally, although vessel-related injuries have been reported in the Gulf of Mexico, only one has been known to occur in project waters. In 2004, an olive ridley was found stranded on Ellwood Beach near Santa Barbara with a cracked carapace that was consistent with injury from a boat collision (NMFS 2012). Comparatively, in the Gulf of Mexico, 9 percent of stranded turtles examined showed signs of vessel injuries.

Although marine turtles could be harmed or killed by project-related vessels, due to the limited and temporary increase in vessel traffic associated with the project, the probability of an encounter is low and collision impacts are considered to be adverse but not significant.

Offshore Drilling and Production. No impacts to marine turtles are expected from drilling and production operations associated with the proposed project.

Lighting. No impacts to marine turtles from artificial lighting are expected from the proposed project.

Effluent Discharges

The potential effects of OCS platform discharges on sea turtles 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 sea turtles. Comprehensive reviews by the National Academy of Sciences (1983), the U.S. Environmental Protection Agency (1985a), and Neff (1987) do not address the potential effects of routine OCS discharges on this group of animals (MMS 1996).

No significant impacts have been associated with these animals, in part, because they are highly mobile and their range far exceeds the extent of a platform discharge plume. An indirect effect related to the displacement or reduction of food/prey species is more likely (MMS 1996).

Oil Spills

If a sea turtle comes into direct contact with oil, a number of physiological effects may occur (MMS 1996). Oil exposure has been observed to adversely affect sea turtle skin tissues, respiration, blood chemistry, and salt gland function. However, test animals exposed to sublethal doses have been observed to recover from oil contact within a month (Lutz 1985; MMS 1996).

Oil spills can adversely affect sea turtles by toxic external contact, toxic ingestion or blockage of the digestive tract, disruption of salt gland function, asphyxiation, and displacement from preferred habitats (Lutz and Lutcavage, 1989; Vargo et al. 1986). Sea turtles are known to ingest oil (Gramanetz, 1988); this may occur during feeding (tar balls may be confused with food) or while attempting to clean oil from flippers. Oil ingestion frequently results in blockage of the respiratory system or digestive tract (Vargo et al. 1986). Some fractions of ingested oil may also be retained in the animal's tissues, as was detected in turtles collected after the *Ixtoc* spill in the Gulf of Mexico (Hall et al. 1983).

It is unclear whether adult sea turtles actively avoid spilled oil (MMS 1996). In some instances, turtles have appeared to avoid oil by increasing dive times and swimming away (Maxwell, 1979; Vargo et al. 1986). Other observers have suggested that sea turtles actually may be attracted to some of the components found in crude oil (Kleerekoper and Bennett, 1976).

Impacts of Past and Present OCS Activities

Section 4.0 provides information on current offshore infrastructure and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear, 1995, 1997; MMS 1996).

No impacts on sea turtles from past and present OCS oil and gas activities in the Pacific Region have been identified.

5.3.1 Leatherback Sea Turtle (Endangered)

Although leatherbacks are the most commonly observed sea turtles off the west coast of the U.S. (Dohl et al. 1983; Green et al., 1989; NMFS and USFWS, 1998a), their presence is seasonal, peaking during late summer and fall. Additionally, the project area is at the southern end of their expected range, which is centered around foraging grounds offshore Monterey Bay. Given their limited, seasonal presence, in the project area, it is unlikely that routine activities or accidental oil spills associated with the Electra Field development would have a detectable effect on this species. Therefore, no impacts on leatherback sea turtles from the proposed project are expected.

5.3.2 Green Sea Turtle (Endangered)

Off California, green sea turtles are uncommon in waters north of the San Diego area (NMFS and USFWS, 1998b) and are rarely seen in the vicinity of the project area (Dohl et al. 1983). Given their limited, presence in the project area, it is unlikely that routine activities or accidental oil spills associated with the Electra Field development would have a detectable effect on this species. Therefore, no impacts on green sea turtles from the proposed project are expected.

5.3.3 Pacific Ridley Sea Turtle (Endangered)

Pacific ridley sea turtles are infrequent visitors to waters north of Mexico and are unlikely to occur in the vicinity of the project area. Therefore, no impacts on Pacific ridleys from the proposed project are expected.

5.3.4 Loggerhead Sea Turtle (Threatened)

Like Pacific ridley turtles, loggerhead sea turtles are near the northern limit of their range off southern California and are likely to be infrequent visitors to the project area (Stebbins, 1966; NMFS and USFWS, 1998d). Given their limited, presence in the project area, it is unlikely that routine activities or accidental oil spills associated with the Electra Field development would have a detectable effect on this species. Therefore, no impacts on loggerhead sea turtles from the proposed project are expected.

5.4 Marine Invertebrates

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on marine invertebrates. The following section analyzes the potential impacts of activities and accidental events associated with the proposed project on endangered white and black abalone in the project area.

Noise, Lighting, and Disturbance
Aircraft Traffic. . No impacts to invertebrate species are expected from the proposed project.

Marine Vessel Traffic. No impacts to invertebrate species are expected from vessel traffic associated with the proposed project.

Offshore Drilling and Production. No impacts to invertebrate species are expected from drilling and production operations associated with the proposed project.

Lighting. No impacts to invertebrate species are expected from artificial lighting associated with the proposed project. Effluent Discharges
The drilling muds and cuttings and produced waters of OCS oil and gas facilities could potentially affect abalone through direct toxicity by exposure in the water. The EPA biological assessment for the proposed reissuance of its general NPDES permit for offshore OCS facilities in southern California waters concludes that direct toxicity to listed fish species, or their food base, should be minimal (EPA, 2000a, b). All such discharges are required to meet NPDES water quality criteria, which were established to protect biological resources outside the mixing zone. Significant impacts from routine OCS discharges generally have not been associated with fish or marine invertebrates. For example, a successful mariculture operation previously sold mussels collected from OCS platform legs to local restaurants for over a decade. The mussels consistently passed all FDA criteria for marketing shellfish.

Oil Spills
Oil may affect marine invertebrates through various pathways, including direct contact (e.g. smothering), ingestion of petroleum contaminated water, and lingering sublethal impacts due to oil becoming sequestered in sediments and persisting in some cases for years in low energy environments (NRC 1985). The level of impacts and the persistence of the oil in the environment will depend on the volume of oil that reaches the habitat and the amount of mixing and weathering the oil has undergone before reaching the habitat. An at-sea oil spill would likely disperse sufficiently prior to any deposition at depth, that it would not impact white abalone habitat. However if an oil spill made landfall on the mainland or Channel Islands, impacts to black abalone (e.g. smothering) could occur.

Impacts of Past and Present OCS Activities
Section 4.0 provides information on current offshore infrastructure and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear, 1995; MMS 1996).

Following the 1997 Torch spill (163 bbl) at Point Arguello, large amounts of fresh oil and tar were observed on rocks throughout the middle to lower intertidal zone just north of the Boat House. Tar was observed on sea stars and obscuring the respiratory holes of black abalone, leading observers to conclude that some mortality may have occurred (Raimondi et al. 1999, OSPR, 1998).

5.4.1 White Abalone (Endangered)

Due to NPDES discharge permit requirements and the rapid dilution of the discharges, contaminants from effluent discharges associated with OCS activities should not be measurable in the coastal waters and sediments known to harbor white abalone. Thus, no impacts on white abalone are expected from effluent discharges associated with the proposed project.

Although it is unlikely that white abalone exist within the project area since it is north of Point Conception, areas where white abalone or suitable white abalone habitat exist could be affected by a spill from the project area that exhibits a southward trajectory.

The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. Based on the distribution of past spill sizes, it is estimated that such a spill probably would be less than 200 bbl in volume. Given the oil spill prevention and response capabilities in place, however, an oil spill of this size would likely weather, mix, and break up to the point where no impacts would occur to white abalone or their habitat. Therefore, no impacts to white abalone or its habitat would be expected from an oil spill associated with the proposed project.

5.4.2 Black Abalone (Endangered)

Due to NPDES discharge permit requirements and the rapid dilution of the discharges, contaminants from effluent discharges associated with OCS activities should not be measurable in the coastal waters and sediments known to harbor black abalone. Thus, no impacts on black abalone are expected from effluent discharges associated with the proposed project.

Oil spill impacts to black abalone are not well known, but smothering and ingestion of toxic compounds are both likely. The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. Based on the distribution of past spill sizes, it is estimated that such a spill probably would be less than 200 bbl in volume. The most probably points of impact for a spill from the project facilities are along the mainland coast between Point Sal and Point Conception, and on the offshore islands of San Miguel, and Santa Rosa.

Black abalone populations south of San Simeon have been decimated by withering syndrome, experiencing losses of up to 99 percent of the population. Most areas no longer support the densities of adults thought adequate for successful recruitment to occur. Impacts from an oil spill to these already struggling populations could further reduce the chances of recovery for this species. However, the level of impacts to black abalone and the persistence of the oil in the environment will depend on the volume of oil that reaches the habitat and the amount of mixing and weathering the oil has undergone before reaching the habitat.

An oil spill of 200 bbl would probably result in light to heavy tarring of the intertidal zone if oceanographic conditions carried the oil to shore. However, due to the openness of the south-central coast and the high-energy environment of the area, a spill of about 200 bbl originating at Platform Hermosa or along the Hermosa-to-shore pipeline would likely break into smaller slicks, and some of the oil would disperse into the water column before reaching the nearshore waters where black abalone reside. Thus, concentrated oiling of black abalone habitat would not be expected.

Given the low probability of a spill from the Electra Field development project contacting the mainland, and the oil spill prevention and response plans in place, adverse impacts to the remaining black abalone on the mainland are likely to be low. Similarly, although there is a moderate probability of an oil spill reaching San Miguel, Santa Rosa and Santa Cruz islands in the event of a spill exhibiting a southward trajectory, impacts to the black abalone on the islands are likely to be low.

5.5 Amphibians

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on amphibians. The following section analyzes the potential impacts of activities and accidental events associated with the proposed project on the threatened California red-legged frog in the project area.

Noise, Lighting and Disturbance
Aircraft Traffic. .Loud noises such as those produced by a low-flying helicopter would be expected to cause a startle response in some species. Depending on the frequency of the flights and the altitude of the helicopter, disruption of feeding or breeding behaviors can occur.

Marine Vessel Traffic. No impacts to amphibians are expected from the marine vessel traffic associated with the proposed project.

Offshore Drilling and Production. No impacts to amphibians are expected from drilling and production operations associated with the proposed project.

Lighting. No impacts to amphibians are expected from artificial lighting associated with the proposed project. Effluent Discharges
No impacts to amphibians are expected from marine discharges associated with the proposed project.

Oil Spills
Oil may affect amphibians through various pathways, including direct contact, ingestion of contaminated prey, and lingering sublethal impacts due to oil becoming sequestered in sediments and persisting in some cases for years in low energy environments (NRC 1985). The level of impacts and the persistence of the oil in the environment will depend on the volume of oil that reaches the habitat and the amount of mixing and weathering the oil has undergone before reaching the habitat. An at-sea oil spill would not be expected to impact breeding or estivation habitat of red-legged frogs, which occur well upstream of the coast.

Impacts of Past and Present OCS Activities
Section 4.0 provides information on current offshore infrastructure, and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear, 1995; MMS 1996).

No impacts on threatened or endangered amphibians from past and present OCS-related oil and gas activities in the Pacific Region have been reported.

5.5.1 California Red-legged Frog (Threatened)

No new helicopter trips will be required for the Electra Field development, beyond the 3 to 5 trips per week per platform currently estimated to occur in the Pacific Region (Bornholdt and Lear, 1995). Regardless, aircraft noise is temporary in nature and altitude restrictions placed on OCS helicopter flights make it unlikely that the helicopter flights would result in an adverse behavioral effect on red-legged frogs. Thus, no impacts on red-legged frogs are expected from helicopter traffic.

The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl could occur during the life of the project. Based on the distribution of past spill sizes, it is estimated that such a spill would be less than 200 bbl in volume. An oil spill of this size would weather, mix, and break up to the point where only limited tarring would be expected to occur to coastal lagoons in the Point Arguello area. Such a level of spillage would be unlikely to have a detectable effect on the California red-legged frog or the coastal lagoons it uses as seasonal habitat.

If a spill were to occur during the fall or winter season, the OSRA model runs predict up to a 3.3 percent probability that the Point Arguello area would be contacted by oil within 10 days. The coastal rivers and streams in the Point Arguello area support populations of red-legged frogs. Tadpoles have been reported in Jalama and Cañada Honda creeks, and adult frogs can be found seasonally in the coastal lagoons of the central California coast. Eggs and tadpoles are not found in the coastal lagoons.

Adult red-legged frogs move down to the brackish coastal lagoons formed seasonally behind sand berms that close the mouths of rivers and streams along the south central coast. Red-legged frogs cannot tolerate salinities in excess of 9 ppm and leave the coastal lagoons for fresher waters when storms or tides breach these natural berms. There is some risk that an oil spill might reach the coastal lagoons during a high tide or storm when the sand berms have been breached. Although no direct oil contact with frogs is expected from such an event, oil can become sequestered in the sediments and persist until rains flush the sediments from the lagoon. If the sand berms reform and conditions become favorable, some red-legged frogs may return to the lagoons before the contaminated sediments are flushed into the ocean. The level of toxicity of these sediments would be dependent on the weathering of the oil and the volume of oil that reaches the lagoon. However, oil spill of about 200 bbl that contacted the mainland along this section of the California coast would be unlikely to result in red-legged frog mortality or sub-lethal effects. Although habitat destruction could result from clean-up efforts, proper preparation and execution of the oil spill contingency plan should protect these areas during an oil spill response.

In conclusion, given the low probability (≤3.3 percent) that an oil spill of about 200 bbl would contact seasonal red-legged frog habitats in the coastal lagoons between Point Sal and Point Conception, and the oil spill prevention and response capabilities in place, no impacts to the California red-legged frog or its habitat would be expected from an oil spill associated with the proposed project.

5.6 Fish

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on fish. The following sections analyze the potential impacts of activities and accidental events associated with the proposed project on endangered fish species in the project area.

Noise, Lighting, and Disturbance

Aircraft Traffic. No adverse impacts to fish are expected from daily helicopter flights associated with the proposed project.

Marine Vessel Traffic. No adverse impacts to fish are expected from vessel traffic associated with the proposed project.

Offshore Drilling and Production. No adverse impacts to fish are expected from offshore drilling and production noise associated with the proposed project.

Lighting. Artificial lighting at oil platforms may result in localized interference with the light intensity cues of vertically migrating fishes and zooplankton, and attraction of predator species (e.g., marine mammals and large predatory fishes) that use the illumination of the lights to feed on readily available prey sources. However, if impacts from artificial lighting on fishes and zooplankton occur, they would be limited to the approximately 100 meter illuminated area around the platform. These impacts are considered to be adverse but not significant.

Effluent Discharges

The drilling muds and cuttings and produced waters of OCS oil and gas facilities could potentially affect fish species through direct toxicity by exposure in the water or ingestion of prey that have bioaccumulated toxins from the discharges. The EPA biological assessment for the proposed reissuance of its general NPDES permit for offshore OCS facilities in southern California waters concludes that direct toxicity to listed fish species, or their food base, should be minimal (EPA, 2000a, b). All such discharges are required to meet NPDES water quality criteria, which were established to protect biological resources outside the mixing zone. Significant impacts from routine OCS discharges generally have not been associated with fish. In fact, offshore platforms may provide nursery grounds for some species of rockfish (Love et al. 1999a,b, 2000, 2001).

Currently there are eight generic water-based muds that have been approved for use by EPA. The EPA does not authorize discharge of oil-based drilling fluids into marine waters. The major toxic constituents of drilling muds are trace metals including arsenic, cadmium, chromium, lead, mercury, and zinc. The toxicity of water-based drilling mud to juvenile lobster and flounder was investigated by Neff et al. (1989). They found that both species accumulated small amounts of barium, but no detectable chromium during 99 days of exposure to sandy sediment heavily contaminated with the settleable fraction of a used water-based lignosulfonate drilling mud. There was some physiological and biochemical evidence of stress in both species, but growth was not significantly affected. The authors concluded that, for the species and life stages tested, there is little evidence for toxicity of water-based drilling mud.

Cuttings are generally not highly toxic, but depending on the subsurface formations being penetrated, they may contain toxic metals, naturally occurring radioactive elements, or petroleum. Cuttings generally do not disperse far from the discharge point, and instead accumulate on the seafloor below the platform. Several thresholds (contaminant concentrations at which ecological and toxicological effects rise to a level of concern) have been proposed for marine sediments. The most widely used thresholds for sediments are the “Effects Range-Low” and “Effects Range-Median” guidelines developed by NOAA (Long and Morgan, 1990; Long, 1992; Long et al. 1995). Effects thresholds were ranked, using laboratory and field tests, and the 90^{th} and 50^{th} percentiles were determined. The 90^{th} percentile (i.e., the contaminant concentration at which 90 percent of the studies found no effect) is referred to as ERL and is considered to be a concentration below which adverse impacts are unlikely. The 50^{th} percentile is referred to as ERM and is interpreted as the concentration at which effects are frequently observed. Neff and Sauer (1996) examined PAH concentrations near four petroleum production platforms in the Gulf of Mexico with large produced water discharges. Although PAH concentrations were 2- to 10-fold above background in sediments at 20 m from discharge points, and were at background by 200 m, the PAH concentrations in sediments were generally below the ERL levels determined by Long et al. (1995).

"Produced water" is the water present in the source petroleum. The major constituents are carboxylic acids and phenols, single-ring aromatics, and polycyclic aromatic hydrocarbons. Acute toxicity correlates strongly with the phenol concentration. The contaminants from produced water are rapidly diluted and removed by volatilization and biodegradation (SAIC, 2000a, b). These findings are consistent with the assessment of essential fish habitat that was prepared for the re-issuance of a NPDES General Permit for offshore oil and gas facilities in southern California (SAIC, 2000c). The overall conclusions of the assessment were that the continued discharge from the 22 platforms offshore California will not adversely affect fish outside the mixing zones. Within the 100-m radius mixing zone, discharges from oil and gas exploration, development, and production may have localized effects on water quality and resident marine organisms, including fish. The assessment further concluded that while there may be effects on fish from certain discharges such as drilling fluids and produced water within the mixing zone near an outfall, these effects should be minor and localized.

As a result of NMFS consultation, the NPDES General Permit required a study of the direct lethal, sublethal, and bioaccumulative effects of produced water on federally managed fish species that occupy the mixing zone of produced-water discharges (MRS 2005). That study included site-specific modeling of the dispersion plumes from each platform covered by the permit, including Platform Hidalgo. The study found that fish populations around Platform Hidalgo consist mostly of rockfish that utilize the platform as habitat, rarely venturing far from the protection of the structure. A quantitative exposure assessment found a general absence of impacts from most of the major produced-water constituents. Many of the produced-water constituents that are normally of concern for the protection of marine organisms were below biological effects levels prior to discharge. Four constituents (benzene, cyanide, silver, and ammonia) had end-of-pipe concentrations that were slightly elevated in produced water compared to thresholds of potential effects in finfish. However, because the produced-water discharge achieves high dilution almost immediately upon discharge, the plume volume containing concentrations of potential biological significance were exceedingly small compared to the volume of habitat contained within the mixing zone.

In September 2005, EPA concurred with the overall conclusions of the study and forwarded them to NMFS as part of the EFH consultation required by the General Permit. In October 2005, NMFS notified EPA that the study met the intent of the conservation recommendations incorporated in the General Permit and that the EFH consultation was complete. Revisions to the NPDES General Permit, which included new compliance criteria for several of the platforms and a revision to the undissociated sulfide criterion, were approved in November 2009 (EPA 2009). Thus, potential impacts to finfish within the 100-m mixing zone around Platform Hidalgo are not likely to be significant.

Oil Spills

Research shows that hydrocarbons and other constituents of petroleum spills can, in sufficient concentrations, cause adverse impacts to fish (NRC, 1985; GESAMP, 1993). The effects can range from mortality to sublethal effects that inhibit growth, longevity, and reproduction. Benthic macrofaunal communities can be heavily impacted, as well as intertidal communities that provide food and cover for fishes.

Although fish can accumulate hydrocarbons from contaminated food, there is no evidence of food web magnification in fish. Fish have the capability to metabolize hydrocarbons and can excrete both metabolites and parent hydrocarbons from the gills and the liver. Nevertheless, oil effects in fish can occur in many ways: histological damage, physiological and metabolic perturbations, and altered reproductive potential (NRC, 1985). Many of these sublethal effects are symptomatic of stress and may be transient and only slightly debilitating. However, all repair or recovery requires energy, and this may ultimately lead to increased vulnerability to disease or to decreased growth and reproductive success.

The egg, early embryonic, and larval-to-juvenile stages of fish seem to be the most sensitive to oil. Damage may not be realized until the fish fails to hatch, dies upon hatching, or exhibits some abnormality as a larva, such as an inability to swim (Malins and Hodgins, 1981). There are several reasons for this vulnerability of early life stages. First, embryos and larvae lack the organs found in adults that can detoxify hydrocarbons. Second, most do not have sufficient mobility to avoid or escape spilled oil. Finally, the egg and larval stages of many species are concentrated at the surface of the water, where they are more likely to be exposed to the most toxic components of an oil slick.

Impacts of Past and Present OCS Activities

Section 4.0 provides information on current offshore infrastructure and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear, 1995, 1997; MMS 1996).

No impacts on threatened or endangered fish from past and present OCS-related oil and gas activities in the Pacific Region have been reported.

5.6.1 Tidewater Goby (Endangered)

Tidewater gobies, which are found in shallow coastal lagoons, stream mouths, and shallow areas of bays are not expected to impacted by offshore platform noise and vessel traffic.

Likewise, would not be impacted by effluent discharges. Over the distance from Platform Hidalgo to the shore, any pollutants discharged would be diluted to background levels.

There is some risk that an oil spill might reach the coastal lagoons during a high tide or storm when the sand berms blocking the stream mouths from the ocean have been breached. However, breaches usually occur during the winter and spring months, and tidewater gobies often move upstream out of the lagoons during this time.

Although direct oil contact with gobies would be unlikely, oil can become sequestered in the sediments and persist until rains flush the sediments from the lagoon. When the gobies returned, short-term sublethal effects would also be expected, since gobies burrow into and feed in the sediment and rely on macrofaunal and intertidal communities for food and shelter from predators. The level of impacts, however, would be dependent on the volume of oil that reached their habitat and the amount of weathering and mixing the oil had undergone before reaching the habitat.

The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl would occur during the life of the project. Based on the distribution of past spill sizes, it is estimated that such a spill would probably be less than 200 bbl. An oil spill of this size would weather, mix, and break up to the point where only limited tarring would be expected to coastal lagoons in the Point Arguello area. Such a level of spillage would be unlikely to have a detectable effect on tidewater gobies.

Additionally, oil spill response teams would be expected to boom the mouths of creeks and rivers or enhance the existing berms in the event of a spill, thus minimizing the chance of oil reaching the lagoons.

Based on OSRA model runs, the greatest threat is to goby populations north of Point Conception from a spill occurring during fall or winter. The modes show that during these months there is a low (≤3.3percent) probability that an oil spill from Platform Hermosa or the Hermosa-to-shore pipeline would contact the Point Arguello area within 10 days. The probability of contact with Point Arguello drops to zero slightly during spring and summer.

Most goby habitat during fall will be separated from the ocean by sand berms and thus would be protected to some degree. However, tides, heavy surf, or early seasonal rains could breach these barriers. Oil spill response teams would be expected to protect these habitats further with booms and enhancement of the natural berms. During winter months, after rains and storms have breached the natural sand barriers, protection of goby habitat that is within the contact zone of a spill would rely on the speed and effectiveness of the oil spill response team. A spill of about 200 bbl that hit the mainland coast in the Point Arguello area would in all likelihood contact and impact one or two tidewater goby habitats, possibly resulting in some mortality and likely short-term sub-lethal effects. This would depend on the amount spilled and the weathering of the oil.

However, tidewater gobies along the south-central California coast are quite resilient and have a great ability to disperse and re-colonize areas from which they were previously eliminated (USFWS, 1999a). Given the moderate probability that an oil spill would contact the mainland, the oil spill prevention and response capabilities in place, and the ability of tidewater gobies to re-colonize their habitat, expected impacts to tidewater gobies from the proposed Electra Field project are low.

5.6.2 Steelhead Trout (Endangered)

Winter steelhead occur along the south-central coast, entering their home streams from November to April to spawn, while juveniles usually migrate to sea in the spring.

Platform noise and vessel traffic are not expected to impact steelhead trout.

Direct toxicity to this species from effluent discharges associated with the Electra Field development project is unlikely due to discharge requirements and rapid dilution of the discharges. Additionally, heavy metals and hydrocarbons are not expected to be accumulated by their prey to toxic levels due to cellular mechanisms for removal of these substances. Thus, no impacts on steelhead trout are expected from effluent discharges.

The most likely oil spill scenario for the Electra Field development project, based on OCS spill data for California, is that one spill of a volume ranging between 50 and 1,000 bbl would occur during the life of the project. Based on the distribution of past spill sizes, it is estimated that such a spill would probably be less than 200 bbl in volume.

Based on OSRA model runs, the greatest threat is to steelhead populations north of Point Conception during fall and winter. If a spill from the Hermosa-to-shore pipeline were to occur during this time, the OSRA model runs predict a slight (up to a 3.3-percent) probability of contact with the Point Arguello area within 10 days.

During winter months, after rains and storms have breached the natural sand barriers, protection of steelhead habitat that is within the contact zone of a spill would rely on the speed and effectiveness of the oil spill response team. A spill of about 200 bbl that hit the mainland coast in the Point Arguello area would in all likelihood contact and impact one or two steelhead critical habitats. Specifically, a spill originating from Platform Hermosa or the Hermosa-to-shore pipeline during the fall season could potentially enter the Santa Ynez River, San Antonio Creek, and Jalama and Cañada Honda Creeks which are all designated critical habitat for steelhead. Historically, the Santa Ynez system supported the largest steelhead run in southern California.

Impacts to steelhead would be greatest if the spill occurred during adult or juvenile migration to or from spawning and rearing areas upstream of the project. Although little mortality would be expected from a spill of 200 bbl, short-term sublethal effects causing stress might lead to increased vulnerability to disease and perhaps reduced reproduction of impacted individuals. Migration could also be disrupted.

Oil avoidance reactions are well documented in salmon. Adults and juveniles can detect sublethal levels of hydrocarbons (Rice, 1973; Weber et al. 1981) and have been observed actively avoiding contaminated areas (Patten, 1977; Weber et al. 1981). However, these effects are expected to be short-term due to the weathering and mixing that would occur to the oil before it reached the shore. The high-energy environment of the south-central California coast would further minimize the toxicity and persistence of the oil in the environment. Also, in the event of a spill, oil spill response teams would identify river and stream mouths at risk of oil contact and would immediately boom or build protective berms at the river and stream mouths, which could further disrupt migration. Cleanup efforts could also adversely affect steelhead present through direct mortality or stress from harassment or capture and relocation.

In conclusion, oil spills associated with the Electra Field development project would be expected to have minor impacts on steelhead trout if a spill were to contact critical habitat (such as the Santa Ynez River) during a period when steelhead are migrating. Due to the openness of the south-central coast and the high-energy environment of the area, a spill of about 200 bbl originating at Platform Hermosa or along the Hermosa-to-shore pipeline would likely break into smaller slicks, and some of the oil would disperse into the water column. Thus, concentrated oiling of steelhead habitat would not be expected.

Given the low probability of a spill from the Electra Field development project contacting the mainland, and the oil spill prevention and response plans in place, adverse impacts to southern steelhead from the proposed project are likely to be low.

5.7 Terrestrial Plants

This section provides a general discussion of the potential effects of the identified impact factors, including noise and disturbance, effluent discharges, and oil spills, on terrestrial plants. The following sections analyze the potential impacts of activities and accidental events associated with the proposed project on endangered plant species in the project area.

There are two threatened or endangered species of plants in the general area of concern for the Electra Field development project: salt marsh bird's-beak and California sea-blite. Of the potential impact sources identified for this project, only an oil spill could adversely affect these species.

Noise, Lighting, and Disturbance
Aircraft Traffic. No impacts are expected to onshore species.

Marine Vessel Traffic. No impacts are expected to onshore species

Offshore Drilling and Production. No impacts are expected to onshore species.

Lighting. No impacts are expected to onshore species.

Effluent Discharges. No impacts are expected to onshore species.

Oil Spills
Plant mortality from oil spills can be caused by smothering and toxic reactions to hydrocarbon exposure, especially if oil reaches shore before much of the spill's lighter fractions have evaporated or dissolved. Generally, oiled marsh vegetation dies, but roots and rhizomes survive when oiling is not too severe (Burns and Teal, 1971). Research has shown that recovery to pre-oiling conditions usually occurs within a few growing seasons, depending on the magnitude of exposure (Holt et al. 1975; Lytle, 1975; Delaune, et al. 1979; Alexander and Webb, 1987).

Impacts of Past and Present OCS Activities
Section 4.0 provides information on current offshore infrastructure and levels and types of activities. Several reviews have been made of the possible cumulative impacts of these activities on biological resources in the region (Van Horn et al. 1988; Bornholdt and Lear, 1995, 1997; MMS 1996; MMS, 2001).

No impacts on threatened or endangered plants from past and present OCS-related oil and gas activities in the Pacific Region have been reported.

5.7.1 Salt Marsh Bird's-Beak (Endangered)

Salt marsh bird's-beak grows in the higher reaches of coastal salt marshes to intertidal and brackish areas influenced by freshwater input. However, the range of salt marsh bird's-beak is currently limited to a very few (<10) salt marshes along the coast of California and Baja California, Mexico, making this species highly vulnerable to impacts from an oil spill. Within the project area, marshes where this species occurs include Ormond Beach and Mugu Lagoon in Ventura County, Carpinteria Salt Marsh in Santa Barbara County, and Morro Bay in San Luis Obispo County.

Although, a large (>1,000-bbl) oil spill from the proposed project is highly unlikely, one 50-1,000-bbl spill might be expected to occur over the project lifetime. Based on the distribution of past spill sizes, it is estimated that such a spill probably would be less than 200 bbl in volume. However, the OSRA model results (Attachment F) indicate that a spill from the Point Arguello Unit will remain south of Purisima Point, and will not contact the mainland near Morro Bay. Likewise, the OSRA model results indicate that an oil spill from the proposed project will not make landfall anywhere on the mainland south of Point Conception. Therefore, no impacts to salt marsh bird's-beak from the development of the Electra Field are expected.

5.7.2 California Sea-Blite (Endangered)

This plant is highly vulnerable to an oil spill, because its range in the project area is presently limited to a single coastal salt marsh (Morro Bay).

Although, a large (>1,000-bbl) oil spill from the proposed project is highly unlikely, one 50-1,000-bbl spill might be expected to occur over the project lifetime. Based on the distribution of past spill sizes, it is estimated that such a spill probably would be less than 200 bbl in volume. Based on the OSRA model results (Attachment F), however, an oil spill from the Point Arguello Unit will remain south of Purisima Point, and will not contact the mainland near Morro Bay. Therefore, no impacts to California sea-blite from the development of the Electra Field are expected.

6.0 Cumulative Effects

6.1 Introduction

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act. Cumulative effects are usually viewed as those effects that impact the existing environment and remain to become part of the environment. These effects differ from those that may be attributed to past and ongoing actions within the area since they are considered part of the environmental baseline. The primary difference between project specific effects and cumulative effects is the definition of geographical and temporal boundaries.

Section 7.2 describes actions that are reasonably likely to occur and will be considered in the cumulative effects analysis. These actions include activities that could produce impacts on listed species in the project area during the expected life of the Tranquillon Ridge Unit development project (approximately 30 years).

Section 7.3 describes reasonably foreseeable future federal actions that will not be included in the analysis of cumulative effects, since these actions will be considered in separate consultations pursuant to Section 7 of the ESA. Descriptions of these activities are provided as baseline information.

Section 7.4 describes the cumulative effects that may occur to threatened and endangered species as a result of the listed activities.

6.2 Actions Reasonably Likely to Occur

Table 6.1 contains a list of projects in the region likely to occur which could contribute to cumulative effects on threatened or endangered species. A total of three proposed oil and gas development projects were evaluated. The three proposed projects were identified in State waters, near Coal Oil Point in the central Santa Barbara Channel, and offshore Carpinteria.

These projects are in various stages of environmental review and typically involve resumption or continuation of oil production, with two of the projects proposing the use of extended-reach drilling from existing platforms and the mainland, to access offshore reserves. Overall, these projects would be expected to contribute some increase in the oil spill risk in the Santa Barbara Channel and Santa Maria Basin. Oil spills originating in the central Santa Barbara Channel would be more likely to contact threatened and endangered species that occur along the mainland coast within the Santa Barbara Channel, including the California least tern, and western snowy plover.

Table 6.1 Relevant Cumulative Projects

	Project Name/Applicant	Description/Status
1	Carpinteria Field Redevelopment Project/Carone Petroleum Corp. and PACOPS	Redevelopment of State Leases PRC-4000, PRC-7911, and PRC 3133/Pending
2	Return to production of State Lease PRC-421/ Venoco	Continuation of offshore oil and gas reserves/Application submitted
3	Ellwood Oil Pipeline Installation and Field Improvements, Venoco	Development of offshore oil and gas reserves/Application submitted

Notes: LNG = liquefied natural gas; NG = natural gas;

Carpinteria Field Redevelopment Project, Carone Petroleum Corporation and Pacific Operators Offshore Inc.: Carone has applied to the CSLC to develop and produce existing State Oil and Gas Leases PRC-4000, PRC-7911, and PRC-3133 within the Carpinteria Field.

Specifically, Carone proposed to drill up to 25 new production or injection wells from Outer Continental Shelf (OCS) Platform Hogan. Oil and gas production from the State Leases would be commingled on Platform Hogan with existing production from the Federal lease and sent via existing pipelines to the La Conchita Facility. After processing, gas and oil are sold to The Gas Company and other third parties at the La Conchita sales meters, and shipped via existing pipelines. A Draft EIR/EIS for this project is currently being prepared.

Paredon Project PRC-3150, Venoco: Venoco applied to the CSLC (application received in February 2005) and to the city of Carpinteria to develop existing State Oil and Gas Lease PRC-3150.1 by conducting extended-reach drilling from an onshore site located within Venoco's existing Carpinteria Oil and Gas Processing Facility (Venoco Carpinteria Facility), in the city of Carpinteria. Venoco estimates that this project could produce up to 10,000 bbl/d of crude oil and 10 mmscfd of gas. After processing, oil would enter an existing 16-inch-diameter (41 cm) pipeline to the Rincon Onshore Separation Facility for connection with the existing pipeline system extending to Los Angeles refineries. Processed gas would be delivered via the existing 6-inch-diameter (15 cm) pipeline connection to Southern California Gas Company's existing regional 12-inch-diameter (30 cm) pipeline that passes near the Venoco Carpinteria Facility. The application was found complete in October 2005.

Return to Production of State Lease 421, Venoco: Venoco is proposing to return State Lease PRC-421 to production. The plan for this project was received in May 2004, and it has been reviewed by the Santa Barbara County Energy Division, in consultation with the city of Goleta, as well as by the CSLC. The project includes the removal of old production equipment from oil piers 421-1 and 421-2 (which are California's last remaining surfzone oil piers); repairs to the access road, rock rip-rap wall, and caisson at the end of pier 421-1; installation of a drilling rig and new oil separation and processing equipment on pier 421-2; and reactivation of the oil well on pier 421-2 with a capacity to produce up to 700 bbl/d. The oil would be pumped to Line 96 through an existing pipeline and then to the EMT. The existing pipeline between Line 96 and the 421-1 pier would be upgraded. The CSLC, Santa Barbara County, and the City of Goleta provided comments on the proposed plan, including local permitting and policy concerns. The schedule of the project is unknown. The public scoping meeting for this project was held on June 23, 2005.

Ellwood Oil Pipeline Installation and Field Improvements, Venoco: In August 2005, Venoco submitted an application to the CSLC, Santa Barbara County, and the city of Goleta with a number of project components. The project would include drilling of up to 40 new wells on both the existing leases and the proposed project area, decommissioning and abandonment of the Ellwood marine terminal (EMT) and Line 96, replacement of the existing 2-inch (5-cm) utility pipeline and subsea power cable between the EOF and Platform Holly, and discontinuation of marine transportation via barge.

The offshore EMT abandonment process, including pipeline flushing and abandonment, and the removal of mooring equipment, will last approximately 9 weeks. Vessel traffic will follow the prescribed traffic corridors currently used by vessels supporting platform operations. A temporary vessel route and minimal construction work zone will be defined for removal of the offshore components of the EMT.

Oil production is expected to peak at 12,600 BPD (2,003 m3/day) and gas production at 20 MMSCFD (566,337 m3/day) after five years. The application was found incomplete and is being revised. Although the schedule for this project is unknown, if the project is implemented, it would result in the decommissioning and abandonment of the EMT since there would be no further need for barging.

Paredon, Development of State Leases 3150 and 3133, Venoco: Venoco has proposed to develop new oil and gas reserves from their existing Carpinteria Oil and Gas Processing Facility (CPF) (Venoco, 2000). The proposed project would consist of drilling up to 35 wells from a drilling pad located within Venoco's CPF to existing offshore State Leases PRC 3150 and 3133, as well as an onshore area east of the City of Carpinteria. Venoco estimates that the proposed project would produce up to 23.5 million bbl of oil and 43 billion cubic feet of gas over the life of the project. The project proposes to use existing pipelines to transport the oil and gas obtained from the leases.

Venoco proposes to drill an exploration well and test production through temporary facilities. If the exploratory well proves the development is commercially viable, then installation of permanent drilling facilities and modifications to the existing CPF would follow to allow for the processing of the new oil and gas production.

6.3 Foreseeable Future Federal Actions

Carpinteria Field Redevelopment Project, Carone Petroleum Corporation and Pacific Operators Offshore Inc.: This project proposes the development of State leases (Carpinteria Offshore Field) from within Federal waters (Platform Hogan). A Draft EIR/EIS for this project is currently being prepared jointly by CSLC and BOEM.

6.4 Cumulative Impacts

Given the relative distance between of the Platform Hogan project (Carone) and Platform Hidalgo and the limited drilling activities proposed at both locations, some potential cumulative impacts might be expected. These are discussed below.

Noise, Lighting, and Disturbance
The proposed Electra Field production is not expected to increase activity levels much above that of current operations. Vessel traffic and lighting are both expected to increase slightly during drilling operations, but will return to baseline conditions within about 5 months, following the completion of drilling.

The construction and operation activities associated with the Carone project are expected to be similar to current levels, except for during drilling operations. During drilling operations, temporary, localized increases in lighting, vessel traffic, and noise are anticipated with this project; however, Platform Hogan is located approximately 80 km (50 mi) to the east of Platform Hidalgo, and any impacts from this project or the other proposed projects in State waters are unlikely to contribute perceptibly to noise, lighting, and disturbance impacts on listed species in the project area.

Effluent Discharges
Localized increases in effluents associated with drilling and production would be expected from Platform Hogan if the proposed Carone project were approved.

Oil Spills
Production from PRC-421, Paredon, and increased production at Platform Hogan would increase the overall oil spill risk in the Santa Barbara Channel by some unknown amount, which cannot yet be quantified.

Thus, the overall effect of these three proposed projects would probably be an increased risk of oil contact to threatened and endangered species distributed south of Point Conception. An accidental oil spill associated with the proposed Pier 421, Paredon, or Carone projects would have impacts on threatened and endangered species similar to those described earlier for the proposed Electra Field development project.

However, an oil spill from Platform Hidalgo or its associated pipeline would be most likely to contact those species that occur along the coast of Vandenberg AFB or the northern Channel Islands of San Miguel and Santa Rosa, while spills associated with the three other projects would likely impact portions of the mainland and islands within the central and eastern portions of the Santa Barbara Channel. Species that could be impacted from these projects include the southern sea otter, California least tern, western snowy plover, red-legged frog, tidewater goby, black and white abalone, and southern steelhead.

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