Larry Seeman Associates, Inc.

ENDANGERED SPECIES ANALYSIS

PLATFORM GAIL

PREPARED FOR
CHEVRON USA INC.

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PREPARED BY
LARRY SEEMAN ASSOCIATES
2606 EIGHTH STREET
BERKELEY, CALIFORNIA 94710
(415) 841-6840

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SUMMARY

This report is an analysis of the expected effects of Platform Gail, an offshore oil platform proposed by Chevron USA Inc., on species listed as endangered or threatened under the federal Endangered Species Act of 1973, including species proposed for listing. The species included are four listed reptiles, five listed bird species, eight listed mammals, one listed plant, and one proposed mammal.

The species considered, their status, the estimated probability of impact, potential impact levels, and most likeley impact levels are summarized in Table 1. The greatest likelihood of impacts to threatened and endangered species from operating Platform Gail would result from potential oil spills. The probability of occurrence of a large spill (> 1,000 bbl.) is quite low (0.07). In general, this low probability results in very low impact probabilities and most likely impact levels for most species. Smaller oil spills are less likely to have significant impacts on the species considered, and the other potential impact producing agents are unlikely to cause significant impacts.

The report includes accounts of the biology of each species. These accounts describe the status, use of the project area, ecology and behavior, range, and population data for each of the species. These accounts are based on previous environmental documents and biological opinions prepared by the US Fish and Wildlife Service and National Marine Fisheries Service.

Potential impact producing agents are described for each species group. These agents are potential oil spills, noise, platform discharges, and crew boat traffic. The descriptions are based on relevant literature, including previous environmental documents and published literature.

To assess the likelihood of impacts, we have assigned contact probabilities to six classes. These probabilities have been quantified for potential oil spills, and have been estimated for other impact producing agents. A very low contact probability is defined as total probability* less than 1%. Total contact probabilities between 1% and 5% are defined as low, those between 5% and 10% are low/moderate, and contact probabilities between 10% and 25% are defined as moderate. Substantial contact probability is defined as total contact probability between 25% and 50%, and likely contact is defined as total contact probability over 50%.

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* Total probability is defined in this report as the probability that a large spill (>1,000 bbl) will occur and contact one of the species considered.

The estimated most likely impacts on each species are discussed and are assigned different levels, using the criteria outlined by MMS (1984b). A high level of impact is defined by 1) a regional or species-wide population decline greater than 5%, 2) persistence of a population decline for more than five years, or persistence of a 3) distributional or 4) ecosystem change for more than 10 years. A moderate level of impact is defined by 1) a regional or species-wide population decline less than 5%, or persistence of 2) a population reduction, 3) distributional change, or 4) ecosystem effects for more than five years. The impact level is low if 1) a regional or species-wide population decline is less than 1%, or if a 2) population reduction or 3) distributional change would be evident for more than one to three years, and 4) no ecosystem effects are evident. The high and moderate levels are considered significant, and the low level is considered significant due to the possible cumulative significance of repeated events. The very low impact level is not considered significant and is defined by 1) limited mortality, distributional change, or reproductive reduction; 2) lack of measurable effects on the population after one breeding cycle; and 3) lack of ecosystem effects. These estimates are based on the biology of the species and the characteristics of the impact producing agents.

As noted above, the most likely impact levels are very low for all species, however, the report also describes potential impacts. Potential impacts are defined as the level of impact that would occur if a an oil spill were to occur and contact the species considered. Potential impacts on the sea turtles, peregrine falcon, bald eagle, gray whale, right whale, blue whale, fin whale, sei whale, humpback whale, sperm whale, southern sea otter, and Guadalupe fur seal would be very low. There is a very low to low/moderate probability of impacts on brown pelicans, and potential impact levels are very low to moderate. The probability of impact and the level of impact would depend on the timing of a potential oil spill and the segment of the population affected. There is a very low probability of impacts on light-footed clapper rails. The potential level of impact would be very low to high, depending on the population segment affected. For the California least tern, the probability of impact is very low to low. The potential impact level is very low to high, depending on the site contacted and the numbers of terns present. The potential impact level on salt marsh bird's beak cannot be quantified due to a lack of population data, but the probability of impact is very low, and impact levels would probably be very low to moderate.

The report concludes with an analysis of cumulative impacts. The project would result in a small incremental increase for each of the impact agents considered.

Table 1

Summary Table

Species	Status[1]	Probability of Impact[2]	Potential Impact Level[3]	Most Likely Impact Level[4]
LISTED SPECIES				
Green Sea Turtle	T/E[5]	VL	VL	VL
Leatherback Sea Turtle	E	VL	VL	VL
Loggerhead Sea Turtle	E	VL	VL	VL
Olive Ridley Sea Turtle	T/E[5]	VL	VL	VL
Brown Pelican	E	VL-L/M[6]	VL-M[7]	VL
Peregrine Falcon	E	VL	VL	VL
Bald Eagle	E	VL	VL	VL
Light-footed Clapper Rail	E	VL	VL-H	VL
California Least Tern	E	VL	VL-H	VL
Southern Sea Otter	T	VL	VL	VL
Gray Whale	E	VL	VL	VL
Right Whale	E	VL	VL	VL
Blue Whale	E	VL	VL	VL
Finback Whale	E	VL	VL	VL
Sei Whale	E	VL	VL	VL
Humpback Whale	E	VL	VL	VL
Sperm Whale	E	VL	VL	VL
Salt Marsh Bird's Beak	E	VL	VL-M?[8]	VL
PROPOSED SPECIES				
Guadalupe Fur Seal	P	VL	VL	VL

1 E = endangered, T = threatened, P = Proposed.
2 Total contact probability or probability of contact with spilled oil (spills > 1,000 bbl) VL = very low, L = low, L/M = low/moderate, M = moderate, S = substantial, Li = likely; as defined in the text.
3 Expected impact levels if a spill were to occur and contact the species. VL = very low, L = low, M = moderate, H = high; as defined in the text.
4 Most likely impact levels, considering the probability of a spill contacting the species. VL = very low, L = low, M = moderate, H = high; as defined in the text.
5 Endangered in parts of its range, threatened in the remainder.
6 Population data are unavailable to quantify expected impact levels for this species.
7 The probability varies by site and/or season.
8 A range of values indicates impacts varying by site and/or season.

INTRODUCTION

PURPOSE

This report has been prepared to evaluate the potential impacts of Chevron USA, Inc.'s proposed Platform Gail on species listed as endangered or threatened, and on species that are proposed for listing under the federal Endangered Species Act of 1973. The report is focused on federally listed species, but the status of a species under the California Endangered Species Act is noted where appropriate. The report is intended to be used in the process of consultation between the Minerals Management Service (MMS) and the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) pursuant to Section 7 of the federal Endangered Species Act.

METHODS AND BACKGROUND

This report was prepared by compiling information from previous biological assessments, biological opinions, environmental documents, and analyses prepared for this project. Where information from different sources conflict, the information from both sources is presented. The species included were specified by the Minerals Management Service (MMS), and include four listed reptiles, five listed bird species, eight listed mammals, one listed mammal, and one mammal proposed for listing. These species, along with their status and the expected most likely impacts, are presented in Table 1. Species are discussed in taxonomic order throughout the report, beginning with listed species and followed by the proposed species. The northern fur seal (Callorhinus ursinus) was a candidate species when preparation of this report began, but it is no longer a candidate and has been deleted from the report.

The greatest likelihood of impacts to threatened and endangered species from operating Platform Gail would result from potential oil spills. Most likely impacts, especially regarding oil spills, are defined as the more likely of two possible events: 1) a large spill will occur and oil will contact the species in operation, or 2) that no large spill will occur or spilled oil will not contact the species in question. The estimated most likely impacts are assigned different levels, using the criteria outlined by MMS (1984b). A high level of impact is defined by 1) a regional or species--wide population decline greater than 5%, 2) persistence of a population decline for more than five years, or persistence of a 3) distributional or 4) ecosystem change for more than 10 years. A moderate level of impact is defined by 1) a regional or species-wide population decline less than 5%, or persistence of 2) a population reduction, 3) distributional change, or 4) ecosystem effects for more than five years. The impact level is low if 1) a regional or species- wide population decline is less than 1%, or if a 2) distributional change would be evident for more than one to three years, and 4) no ecosystem effects are evident. The high and moderate levels are considered significant, and the low level is considered significant due to the possible cumulative significance. The very low impact level is not considered significant and is defined by 1) limited mortality, distributional change, or reproductive reduction; 2) lack of measurable effects on the population after one breeding cycle; and 3) lack of ecosystem effects. The impact levels are also assigned regional and local significance levels. A regionally significant impact would 1) cause or contribute to a measurable population change lasting more than five years, or 2) cause or contribute to key habitat degradation lasting more than five years. A locally significant impact would cause or contribute to changes in species composition or distribution in more than 10% of an area of contiguous habitat for more than five years.

For purposes of this report, we have assigned contact probabilities to six classes. A very low contact probability is defined as total probability less than 1%. Total contact probabilities between 1% and 5% are defined as low, those between 5% and 10% are low/moderate, and contact probabilities between 10% and 25% are defined as moderate. Substantial contact probability is defined as total contact probability between 25% and 50%, and likely contact is defined as total contact probability over 50%.

The analyses of most likely impacts assume that no mitigation would occur, representing a worst case situation. In the case of an oil spill, mitigation would include containment of the spilled oil, clean up of oiled areas, and rehabilitation. Mitigation of oil spill impacts is discussed in detail in the Draft Oil Spill and Emergency Contingency Plan, Platform Grace and Platform Gail (Chevron USA Inc., 1984).

AFFECTED ENVIRONMENT

The affected environment has been described in detail in the Supplement to Santa Clara Unit Environmental Report for Platform Gail and Subsea Pipelines (WESTEC Services, 1984). This document also contains a list of previously prepared environmental documents which also describe the affected environment. The reader should refer to these sources for a complete description of the affected environment.

For purposes of this report, the affected environment consists of all habitats occupied by listed species between the mouth of the Santa Maria River (San Luis Obispo County) and Oceanside (San Diego County). Marine, intertidal, insular, and nearshore mainland habitats are all included.

PROJECT DESCRIPTION

DEVELOPMENT AND PRODUCTION OVERVIEW

Chevron U.S.A. Inc. (hereinafter called Chevron) is to be the operator for development of the Santa Clara Unit crude oil reserves located in OCS Lease P 0205 Lease. Exxon has a 50% interest only in the south half of the south half of the lease and has no ownership interest in Platform Gail.

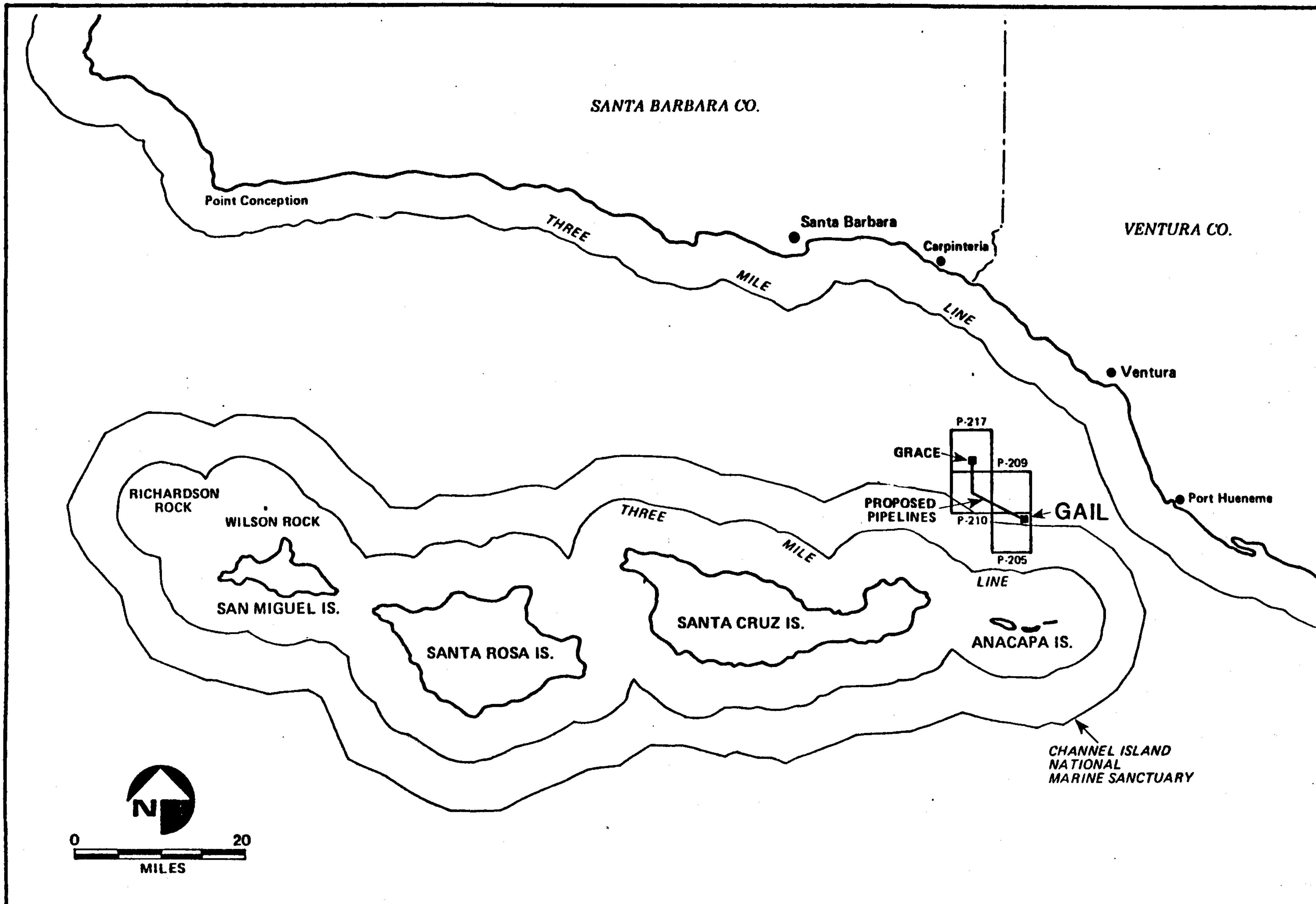
The Santa Clara Unit Plan of Development (Chevron USA, 1979) calls for the installation of three production platforms. Two of these, Chevron's Platform "Grace" on OCS Lease P 0217 and Union's Platform "Gilda" OCS Lease-P 0216 have already been installed. The third platform, Chevron's proposed platform "Gail," is the subject of this Endangered Species Analysis. Platform Gail is expected to be installed in 1986. OCS Leases P 0216, P 0217 and P 0205 are depicted in Figure 1.

A complete schedule for the installation of Platform Gail is shown in Figure 2. The first oil is expected to be produced in the second quarter of 1987. Production from the platform is expected to peak in 1990 at 13,300 barrels per day (BOPD). Gas production is projected to peak in 1998 at 20.2 million standard cubic feet per day (MMSCFD). The project is briefly summarized below.

Platform Gail will be a three deck, eight leg drilling/production facility installed by conventional methods in 739' (225 m) of water. The platform will contain 36 well slots; 25 of these slots will be used for production wells.

The drilling schedule calls for 16 Sespe/Lower Topanga wells to be followed by 9 Monterey/Upper Topanga wells. Developmental drilling will be handled by a single electric rig over an four year period. Initial Sespe/Lower Topanga production is scheduled for 1987, with a planned peak oil production 13,3000 BOPD in 1990 and peak gas production of 20 MMSCF/day in 1997 and 1998.

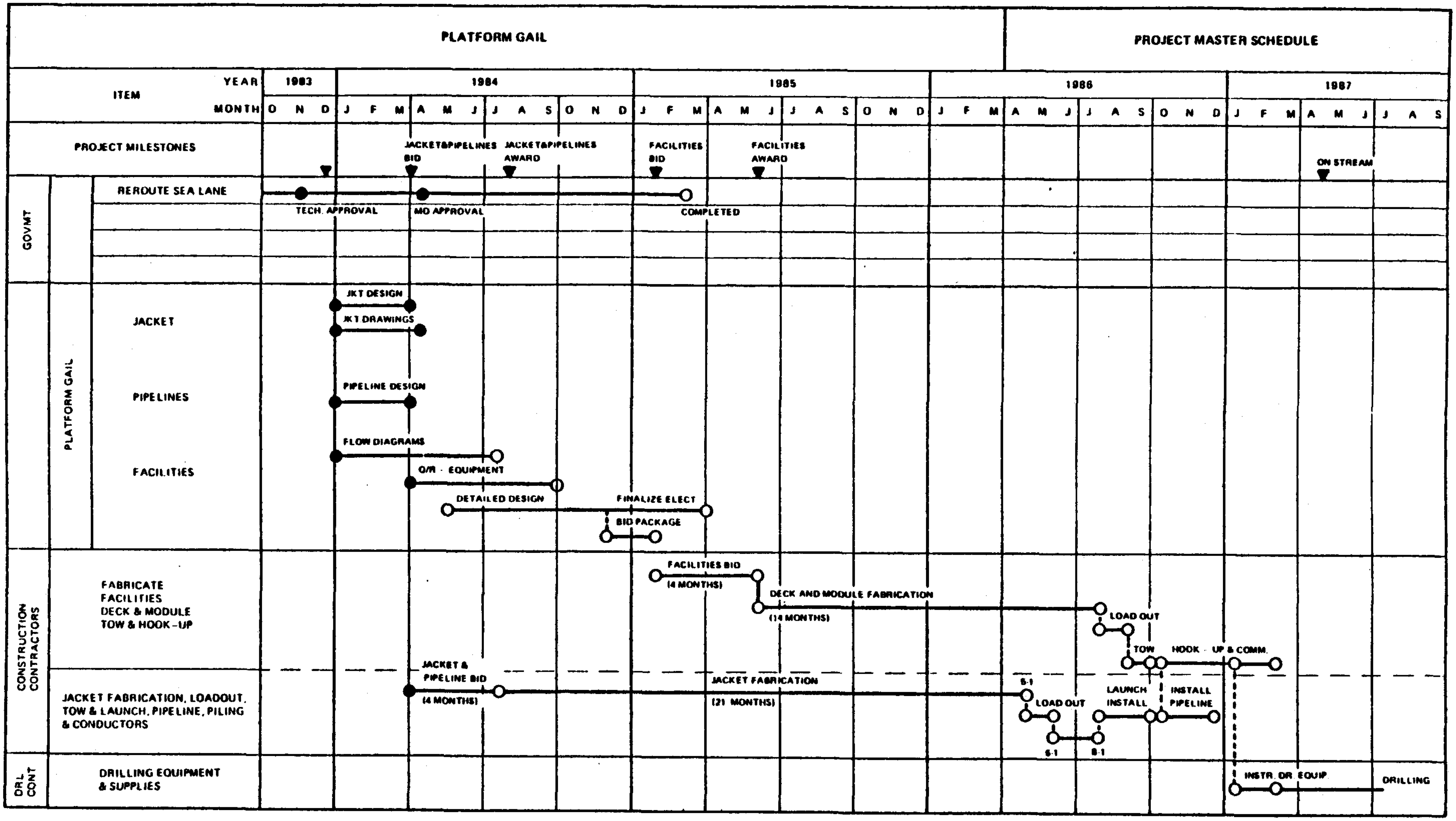
During production, water will be separated from the oil on the platform. Oil with less than 1% water content will be delivered to the oil pipeline after metering. Water will also be removed from the gas before delivery to the pipeline to minimize pipeline deterioration or corrosion and other operational problems. Hydrocarbon condensate separated on the platform will be commingled with the oil and sent to shore.



Project Location

FIGURE 1

SOURCE: WESTEC Services, Inc. 1984



Preliminary Schedule - Platform Gail Project

FIGURE 2

SOURCE: WESTEC Services, Inc. 1984

A circulating heating medium system will be used to provide heat for production processes. Cogeneration will be used on the platform. The heat source for the heating medium will be the exhaust gases from the gas turbine driven electric generators. The gas turbines will be equipped with water injection to reduce NO_x emissions. To further reduce emissions, a fugitive emissions inspection and maintenance program will be instituted.

To minimize disturbance to the marine environment, any drilling mud or cuttings that have become contaminated with oil from a subsurface formation will be transported ashore and disposed of in a government-approved disposal site. Non-oily cuttings will be disposed of at the drill site. All discharges will be in strict compliance with the National Pollution Discharge Elimination System (NPDES) Permit issued by the EPA.

Extensive geophysical, biological, and archaeological surveys have been carried out to assure that the platform and pipelines (discussed below) will result in minimum impact to the environment. Results of the surveys show that all significant ocean features will be avoided, including rocky outcrops and cultural resources.

Pipelines Three submarine pipelines each nominally 8.6 inches (22 cm) in diameter will be installed between Platforms Gail and Grace. One will take oil to Platform Grace, one will transport gas to or from Grace and one will be a spare designed to transport oil or gas. The length of each of these lines from Platform Gail to Platform Grace is approximately six miles. At Grace the oil and gas will enter the pipelines that currently transport the Grace production via Platform Hope to onshore facilities at Carpinteria. The pipeline route from Gail to Grace has been chosen to avoid sub-surface features that might affect the line. It is shown in Figure 1.

The pipelines will be designed to ensure that they can be safely installed and operated in an environmentally acceptable manner and in compliance with MMS OCS Order No. 9. The lines will also be protected from corrosion and will be equipped with high and low pressure shutdowns to prevent any leakage in the event of an emergency.

Environmental and geophysical surveys were carried out in the area of the pipeline routes to establish that the pipelines would not affect sensitive biological habitats or significant cultural resources and would not be affected by any geological hazards or fault zones.

OIL AND GAS PROCESSING

Project Description Dehydrated oil and natural gas produced at Platform Gail will be transported to Platform Grace. Any H_2S in the produced gas will be removed on Grace with the existing Stretford plant. This processed gas will then be comingled with Grace's production and transported to shore via platform Hope. The crude oil will not require any additional processing at Carpinteria. The existing facilities at Carpinteria will be used for the final processing of the produced gas.

In order to develop the Sockeye field, Chevron plans to install Platform Gail during 1986. Produced crude will be degassed and dehydrated on the platform before shipment to shore via a new pipeline to Platform Grace. Platform Gail's crude will be comingled with crude from Platform Grace.

Platform Gail production forecasts and economics are based on developing the reserve with sweet gas first. A moderate amount of sour gas reserves can be produced on Platform Gail and sweetened on Platform Grace with the Stretford process. The unit is designed to produce up to 3.2 tons of sulfur per day by removing H_2S for the produced gas.

CRUDE OIL TRANSPORTATION

Chevron intends to transport Platform Gail's crude oil production from the Carpinteria processing facility to Chevron's El Segundo Refinery by means of existing pipelines from Santa Barbara County to the Los Angeles Basin.

SPECIES ACCOUNTS

A total of seventeen species listed as Endangered or Threatened under the Endangered Species Act of 1973 may be found in or near the project area, defined by MMS as shoreline and offshore waters from the Santa Maria River south to Oceanside. These species include four reptiles, five birds, seven mammals, and one plant. Additionally, one proposed species is found in the area. The following accounts of the biology of each species have been summarized from previous environmental documents, biological opinions, and other sources.

LISTED SPECIES

MARINE TURTLES

Four species of marine turtles are found in the Southern California Bight. In 1978 USFWS listed the green sea turtle (Chelonia mydas) as Threatened wherever found except for breeding colony populations in Florida and the Pacific coast of Mexico, where it is endangered (USFWS, 1984c). The leatherback sea turtle (Dermochelys coriacea) was listed as Endangered throughout its range in 1970 (USFWS, 1984c). Loggerhead sea turtles (Caretta caretta) were listed as Threatened throughout their range in 1978 (USFWS, 1984c). The olive, or Pacific, Ridley sea turtle (Lepidochelys olivacea) was listed as threatened wherever found, except breeding colony populations on the Pacific coast of Mexico, where it is Endangered. This species was listed in 1978 (USFWS, 1984c). The National Marine Fisheries Service has recommended that the nesting population in the western North Atlantic Ocean be reclassified to Endangered status (Mager, 1984). Critical habitat has been designated for the leatherback sea turtle, but not for the other three species (USFWS, 1984c).

Use of the Southern California Bight by marine turtles is by transient individuals near the northern edge of their ranges (NMFS, 1979, 1980). The leatherback sea turtle has been recorded as far north as Alaska (Mager, 1984), green sea turtles have been found as far north as British Columbia (Stebbins, 1966, Mager, 1984), and olive Ridleys have been recorded from Humboldt County, California (Stebbins, 1966). A few sightings of leatherback sea turtles have been recorded recently from the Southern California Bight (CCMS, 1981, 1982, cited in MMS, 1984a).

Marine turtles do not breed in the Southern California Bight. The nearest historical breeding beach was at Guerrero Negro, Baja California Sur, Mexico (NMFS, 1979), used by olive Ridleys (Mager, 1984). The nearest active breeding beaches for green, leatherback, and olive Ridley sea turtles are on the Pacific coast of mainland Mexico. The nearest active breeding beach used by loggerhead sea turtles is on the Pacific coast of Panama (Mager, 1984).

BROWN PELICAN

All subspecies of the brown pelican (Pelicanus occidentalis) were listed as Endangered on June 2, 1970, and the California subspecies (P. o. occidentalis) was listed as Endangered on October 13, 1970 (USFWS, 1979b, 1984c). No critical habitat has been designated. The State of California has also listed the brown pelican as Endangered (Anonymous, 1984).

Brown pelicans are resident year-round in the Southern California Bight and the Channel Islands, concentrated between Point Dume, Anacapa Island, and Santa Cruz Island (MMS, 1982, 1984a) and along the mainland coast between Santa Barbara and Point Dume (USFWS, 1983a). Large numbers of non-breeding resident birds roost between Ventura and Point Mugu in late spring (MMS, 1982). Other traditional roosts are located on Anacapa Island and outlying rocks, Santa Cruz Island and nearby Scorpion Rock and Gull Island, and on Santa Barbara and nearby Sutil Island (USFWS, 1983a). The resident population is augmented from late July to November year by migrants from Mexico (MMS, 1982, 1984a; USFWS, 1979b, 1981a). The number of migrants peak in September and October (HMA, 1982), and the migrants are generally gone by early December (USFWS, 1979b, 1981a).

Ecology and Behavior Habitat occupied by brown pelicans is close to salt water and rarely more than 20 to 30 miles offshore (USFWS, 1979b, 1981a). Nesting habitat in California consists of islands with steep, rocky slopes, vegetative cover is variable (USFWS, 1983a). Brown pelicans only nest on islands free from mammalian predators (Gress, cited in MMS, 1982; USFWS, 1983a). Roosting habitat, considered essential to the species, includes offshore rocks and islands, river mouths with sand bars, breakwaters, pilings, jetties, and estuaries (USFWS, 1983a). Waters within 30 to 50 km (18.6 to 31.1 mi) are considered to be essential as feeding habitat (USFWS, 1983a).

Pelicans feed by plunge-diving to near surface, capturing small fishes (USFWS, 1979b, 1981a). Northern anchovies are the primary prey species (USFWS, 1979b, 1981a, 1983a). Estimates of the portion of the pelican's diet consisting of anchovies range from 80% (WESTEC, 1984) to 90 to 95% (USFWS, 1981a); intermediate estimates are 92% (Anderson et al., 1980; Gress, et al. 1980, cited in MMS, 1984b; USFWS, 1983a) and 93% (Gress, cited in MMS, 1982; MMS, 1984a).

A relationship, characterized as strong (USFWS, 1983a) and as highly significant (Southwest Fisheries Team, 1983, cited in MMS, 1984a), between anchovy availablity and abundance and pelican reproductive success has been demonstrated recently. The relationship has been demonstrated between anchovy abundance/availability in the pre-breeding and breeding season and breeding status of pelicans, and between anchovy spawning biomass and the number of fledglings produced per pair of pelicans (Southwest Fisheries Team, 1983, cited in MMS, 1984a). Pelican reproductive and survival rates have been noted to vary with variations in anchovy availability (Anderson et al., 1980, USFWS, 1983a). Pelican mortality rates (MMS, 1981, 1982), particularly nestling mortality and nest abandonment (USFWS, 1983a), are noted to be closely correlated with anchovy abundance.

Low pelican reproduction between 1976 and 1978 has been attributed to a reduced supply of anchovies (Gress, cited in MMS, 1981; USFWS, 1983a). During the 1980 season anchovy abundance was high early in the year, but declined greatly in May, and nest abandonment rates reached 50% in May and 72% in subsequent months (USFWS, 1983a). In 1981, anchovy abundance was high early in the season, and a record number of nest initiations occured on Anacapa Island (Gress, cited in MMS, 1981). A sharp reduction of anchovy abundance occurred in mid-April (Gress, cited in MMS, 1981; USFWS, 1983a), resulting in an overall nest abandonment rate of 53% (USFWS, 1983a), and nest abandonment rates up to 72% in some places (Gress, cited in MMS, 1981). The mortality rate of prefledgling pelicans was particularly high in 1981 due to early nest abandonment (USFWS, 1983a). High nest abandonment and chick mortality rates in 1982 and 1983 are attributed to a low anchovy supply (MMS, 1982). The 1982 season was similar to 1981 with high abandonment rates possibly due to competition for food with pelicans from Los Coronados Islands (MMS, 1982). The 1983 season may have been influenced by the 1983 El Nino, which was one of the strongest in the past 100 years (MMS, 1984b). Anchovy spawning shifted to west of the Channel Islands and north of Point Conception, with little or none in the Santa Barbara Channel due to a cold water plume associated with El Nino (Fiedler, 1984).

The Brown Pelican Recovery Plan (USFWS, 1983a) addresses the need for anchovy management, however, anchovy populations vary almost unpredictably from year to year (USFWS, 1981a; MMS, 1984a). A management plan for northern anchovies (PFMC, 1978) has been prepared, which attempts to reserve 1 million tons of anchovies for fish and wildlife consumption (USFWS, 1981a). The plan is supported by a Department of Fish and Game computer model, but has weaknesses in biomass estimates and knowledge of the needs of fish and wildlife consumers (USFWS, 1981a). The Fish and Wildlife Service (1981a) has stated that the resource appears overfished, based on sex ratios, the increasing mackerel population, and the Mexican anchovy harvest. There is little data on the effects of oil spills on anchovies (USFWS, 1981a).

Adult anchovies are pelagic schooling fish, generally found offshore in fall and winter and moving inshore in spring, and generally found well below surface during the day and nearer the surface at night (Ganssle, 1973). The adults rarely live more than four years (Ganssle, 1973). The eggs are planktonic in the upper water layers, and hatch at two to four days of age (Ganssle, 1973). Most spawning occurs within 60 miles of shore in all seasons, but is heaviest in late winter and spring (Ganssle, 1973). The larvae are planktonic in the upper water layers (Ganssle, 1973).

Inshore southern California is a favored feeding area (MMS, 1984a), and feeding areas used by breeding brown pelicans are usually concentrated near Anacapa Island (CCMS, 1980, cited in MMS, 1984a), and just north of Anacapa Island in the Santa Barbara Channel (USFWS, 1981a). The feeding areas used by the breeding colony birds varies, and is correlated with anchovy movement (Gress, cited in MMS, 1981). In 1978 and 1979 feeding occured almost exclusively in the Santa Barbara Channel (Gress, cited in MMS, 1981) and in 1981 most feeding was in the channel (MMS, 1982). In 1980, most feeding occurred between Anacapa Island and Santa Barbara Island (Gress, cited in MMS, 1981 and 1982). In early 1982 feeding was split almost evenly north and south of Anacapa Island, but was expected to be mostly in the Santa Barbara Channel for the overall year (Gress, cited in MMS, 1982).

Brown pelicans usually begin to nest at three to five years of age (USFWS, 1983a). Clutches are most commonly three eggs, which are incubated by both parents for about 30 days, beginning with the first egg layed (USFWS, 1983a). Renesting after an initial attempt is thought to be uncommon, and apparently has only occurred in significant numbers on Anacapa Island in 1969 (USFWS, 1983a).

Nest timing varies from year to year and from island to island. Between 1970 and 1980, egg laying on Anacapa Island began between January and May, mostly in March; and laying was completed between May and August, mostly in June and July (USFWS, 1983a). Peak nesting activity occurred from February through July, with most in April and May (USFWS, 1983a). Nest timing was unseasonal in 1980 and 1981 (MMS, 1981, 1982), the 6.5-month 1980 season was the longest recorded (USFWS, 1981a, 1983a). In 1982, nesting began in the third week of January (Gress, cited in MMS, 1981), and young were fledged in late September to early October (Gress, cited in MMS, 1982). At Scorpion Rock peak nesting activity between 1970 and 1980 occurred between January and April (USFWS, 1983a). Egg laying began in January and February, and, with the exception of one nest completed in July of 1972, was finished between March and May (USFWS, 1983a). The nesting on Santa Barbara Island during the 1980 season began in December of 1979, peaked in January of 1980, and egg laying was complete by February (USFWS, 1983a).

When hatched, young pelicans are fed and cared for by both parents (USFWS, 1983a). Mortality rates are highest during the first five weeks after hatching, when the nestlings lack a fat reserve (MMS, 1981, 1982). From five weeks to fledging, nestling pelicans have a fat layer that allows fasting for several days (MMS, 1981, 1982). Fledging occurs at about 13 weeks of age, the fledged young continue to be fed by the adults after fledging (USFWS, 1983a). Fledglings do not at first range far from the colony, and often congregate in large numbers on rocks and on the water near the colony (USFWS, 1981a). Mortality rates remain high through the first year (MMS, 1981, 1982).

Food availability is currently the primary reproductive constraint (USFWS, 1983a, MMS, 1984a), which was discussed above. Other limiting factors include pesticide pollution and colony disturbance (USFWS, 1983a).

Chlorinated hydrocarbon pesticides, DDT and its metabolites, were the primary cause of the brown pelican's endangerment, and continue to operate at a chronic low level (USFWS, 1983a). The major reproductive failure between the mid to late 1960s and the early to mid 1970s is attributed to DDT-caused egg shell thinning (USFWS, 1979b, 1981a, 1983a; MMS, 1984a). DDT entered the marine food webs through sewage effluent containing wastes from a DDT manufacturing plant (USFWS, 1981a), and DDT levels in the southern California marine environment were among the highest recorded worldwide (USFWS, 1983a). This dumping was stopped in 1970, with the land disposal of manufacturing plant wastes in a sanitary landfill (USFWS, 1981a, 1983a). DDT levels in the ocean ecosystem have declined since about 1974 (USFWS, 1983a; MMS, 1984a), and are now near background levels (Gress, cited in MMS, 1981, 1982). Brown pelicans began to recover about 1974 (USFWS, 1983a), with higher but still fluctuating reproductive success (USFWS, 1979b, 1981a) and decreased pesticide levels in the birds (USFWS, 1981a). Thin shelled eggs still occur, although at a greatly reduced degree (Gress, cited in MMS, 1981, 1982; USFWS, 1983a).

Colony disturbance has not been a major problem at Anacapa Island, although it has resulted in abandonment of Mexican colonies (USFWS, 1983a). Vulnerability to disturbance is greatest early in the nesting season, when disturbed pelicans easily abandon nests (USFWS, 1983a). Hyperthermia and hypothermia can cause nestling mortality if the parents are away from the nest for an extended period, and young nestlings are subject to predation by western gulls and ravens if the parents are forced off the nest (USFWS, 1983a). Predation, which is not normally a problem, can also occur if food supplies are depleted near the colony (MMS, 1981, 1982). Colony disturbance can result from both direct human disturbance and from low-flying aircraft (USFWS, 1983a).

In addition to factors discussed above, the recovery plan (USFWS, 1983a) lists oil development as a potential threat to the brown pelican's future existence. The USFWS (1984b) indicates that the ability of pelicans to avoid oil is uncertain, or that pelicans do not avoid oil (USFWS, 1981a). No significant effects of oil on pelicans has been documented to date (MMS, 1984a), and no pelican losses due to outer continental shelf petroleum activities have been documented (USFWS, 1979b, 1981a). Although individuals found oiled have responded well to treatment (USFWS, 1979b), there is a lack of specific information on the effects of spilled oil on pelican population dynamics and reproduction (USFWS, 1981a). No pelicans were found oiled after the January, 1969 Santa Barbara spill, but the spill followed a severe storm when most pelicans would have been in sheltered locations, and relatively few pelicans were present because the spill occurred in winter (USFWS, 1979b, 1981a). The USS Manatee spill, which occurred off San Clemente in August, 1973, resulted in light tar washing up on beaches from San Clemente into Mexico (USFWS, 1979, 1981). Twenty to 25 juvenile pelicans were found oiled after this incident, but the population was widely dispersed at the time of the spill (USFWS, 1979b, 1981a).

Range The non-breeding range of the Pacific coast brown pelican subspecies extends from Vancouver Island to Colima, Mexico (USFWS, 1983a, 1984b), and possibly as far south as El Salvador (USFWS, 1983a). The breeding range currently extends from the Channel Islands to islands off Nayarit, Mexico, and may extend to Isla Ixtapa off Acapulco, Mexico (USFWS, 1984b, 1983a).

Current Southern California Bight breeding colonies are found on several islands in US and Mexican waters. West Anacapa Island is the only US site used each year (USFWS, 1983a, 1984b). Between 1970 and 1981, pelicans generally nested on the north side of the island (with the exception of 1978), although the specific nesting area shifts from year to year (USFWS, 1983a). Scorpion Rock, located off Santa Cruz Island and about 10 km (6 mi) west of Anacapa, is the only other regularly used breeding location in US waters. Los Coronados Islands are the only active breeding location in Mexican waters of the Southern California Bight (USFWS, 1983a). The USFWS (1984b) lists Isla Todos Santos and Isla San Martin as breeding colony locations, but the recovery plan (USFWS, 1983a) indicates that these two islands have been abandoned due to excessive disturbance. The Isla San Martin colony has been inactive since 1974 (USFWS, 1983a).

Santa Barbara Island, including the nearby Sutil Island, is characterized by the recovery plan as the second most important site in US waters of the Southern California Bight (USFWS, 1983a). It was used for successful nesting in 1980, probably due to unusual anchovy distribution (Gress, cited in MMS, 1981; USFWS, 1983a). There are some reports of nesting in 1967 and 1971 (USFWS, 1981a; MMS, 1984a), but these are probably erroneous (USFWS, 1983a). Santa Barbara Island was historically used in 1911, 1912, and possibly 1940, but nesting data has not been published (USFWS, 1983a).

Several other islands have historically supported pelican nesting colonies. Prince Island, off San Miguel Island, was used in 1910 and 1939, and possibly sporadically between 1939 and the early 1960s (USFWS, 1983a). This island has not supported a nesting colony since at least the early 1960s (USFWS, 1983a). Santa Cruz Island may have been used for nesting in 1909, but the actual location used is uncertain, and could have been the main island, Gull Island, or Scorpion Rock (USFWS, 1983a). Bird Island, off Point Lobos in Monterey County, is the only other identified historical pelican nesting site (USFWS, 1983a). This island was used in the 1920s and sporadically to 1959, but has not been used since 1959 (USFWS, 1983a). There are no published reports of brown pelicans nesting on the California mainland (Sorenson, cited in MMS, 1984b).

Population The Pacific coast subspecies is thought to include a maximum of 55,000 to 60,000 breeding pairs (USFWS, 1983a, 1984b). The number of breeding pairs ranges from about 28,700 (poor years) to about 58,500 (good years), with 48,500 breeding pairs representing usual years (USFWS, 1983a). Total population data, including non-breeding adults and juveniles, is difficult to obtain and is subject to high variance (USFWS, 1983a). Overall population trends have not been determined, as no survey of all colonies has been completed in a single year and colony size can vary greatly from year to year (USFWS, 1984b).

The resident Channel Islands population consists of approximately 4,000 to 5,000 birds (MMS, 1984b). On Anacapa Island, the breeding population included roughly 1,877 pairs in 1984, and 1,856 pairs in 1983 (Gustafson, cited in MMS, 1984b). Earlier, the breeding population on Anacapa Island has ranged from 2,946 pairs in 1981 to 76 pairs in 1977 (USFWS, 1983a). The breeding population on Scorpion Rock produced 112 nests in 1972, 105 nests in 1974, and 97 nests in 1975 (USFWS, 1983a). On Santa Barbara Island, the 1980 breeding population produced 97 nests (Gress, cited in MMS, 1981, 1982; USFWS, 1983a)

The pelicans migrating into the Southern California Bight from Mexico number 50,000 to 70,000 individuals (MMS, 1982, 1984a). At least some recruitment of Mexican migrants into the southern California population occurs, as 18 birds banded in Mexico have been found nesting on Anacapa Island (Gress, cited in MMS, 1982). This recruitment may occur regularly (USFWS, 1981a).

The reproductive success of the Anacapa Island colony was 1149 fledged young, or 0.62 fledged young per pair in 1983 (Gustafson, cited in MMS, 1984b). Chick mortality was high, 39%, in 1983 (MMS, 1984b). Between 1981 and 1974, reproductive success on Anacapa Island ranged from 0.18 young per pair in 1978 to 0.88 young per pair in 1975; and from 37 fledged young in 1978 to 1805 fledged young in 1981, or 0.61 fledged young per pair (USFWS, 1983a). Between 1969 and 1973, reproductive success at Anacapa Island ranged from 0.002 fledged young per pair in 1970 to 0.22 fledged young per pair in 1972; and from 1 young bird fledged in 1970 to 57 young fledged in 1972 (USFWS, 1983a).

Reproductive success at Scorpion Rock was 0.28 fledged young per pair in 1972, 0.71 fledged young per pair in 1974, and 0.93 fledged young per pair in 1975 (USFWS, 1983a). Respectively, 31, 75, and 74 young were fledged in these years (UFWS, 1983a). At Santa Barbara Island in 1980, 77 young were fledged, with a success rate of 0.79 fledged young per pair (USFWS, 1983a).

In contrast, the brown pelican colonies in the Gulf of California typically fledge 1.4 young per nest (MMS, 1981). Reproductive success rates of 1.0 fledged young per pair (USFWS, 1981a) or 1.0 to 1.5 fledged young per pair (MMS, 1981) are considered stable.

Recovery objectives are based in part on breeding populations and reproductive success rates. Estimates of the necessary population include 2,000 breeding pairs on Anacapa Island (Gress, cited in MMS, 1981), and 3,000 to 4,000 breeding pairs on Anacapa Island and Los Coronados (MMS, 1982). Estimates of the required reproductive success rates are rates greater than or equal to 1.0 fledged young per nesting attempt (Gress, cited in MMS, 1981) and 1.0 ± 0.1 fledged young per pair as a five-year average (MMS, 1982). Two levels of population and reproductive success ojectives appear in the recovery plan. For listing as Threatened, the Southern California Bight Population should include at least 3,000 breeding pairs with a five-year average reproductive success rate of at least 0.7 young fledged per nesting attempt (USFWS, 1983a). For delisting, the Southern California Bight population should include at least 3,000 pairs, with a five-year average productivity of at least 0.9 fledged young per nesting attempt (USFWS, 1983a).

BALD EAGLE

Bald eagles found in California are listed as Endangered by the federal government (USFWS, 1984c). The species was first listed in 1967, and the listing was modified in 1978 (USFWS, 1984c). No critical habitat has been designated (USFWS, 1984c). Bald eagles are also listed as Endangered by the State of California (Anonymous, 1984).

Bald eagles last nested on the Channel Islands in the mid 1950s (USFWS, 1979b, 1981a). There is currently no nesting use of the Channel Islands, but reintroduced birds are present on Catalina Island (USFWS, 1981a). The species may forage occassionally in the Santa Barbara Channel during the winter (WESTEC, 1984), and success of the reintroduction efforts will result in increased bald eagle use of coastal areas (USFWS, 1979b).

Ecology and Behavior Most of the bald eagles found in California are wintering individuals (CDFG, 1980). The birds winter nearly statewide (CDFG, 1980), and are usually associated with aquatic habitats such as lakes, reservoirs, large rivers, and estuaries (CDFG, 1980; USFWS, 1979b, 1981a). The diet consists mostly of dead or dying fish and waterfowl, and secondarily of upland carrion and small mammals (CDFG, 1980).

Range The breeding range of bald eagles in California has been restricted to Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties since 1977 (CDFG, 1980). Most of the wintering population is found in inland areas of California (USFWS, 1979b), more than half at the Klamath National Wildlife Refuge (CDFG, 1980).

Bald eagles formerly nested on the Channel Islands, and are being reintroduced to Catalina Island (CDFG, 1980; USFWS, 1981a). Six young birds from Washington (state) were released on Catalina in 1980 by the Institute for Wildlife Studies (CDFG, 1980; USFWS, 1981a). Five of these eagles were still present in 1981 (USFWS, 1981a). The reintroduced birds have been observed to feed mostly on feral goats and pigs, including carrion (USFWS, 1981a).

The Channel Islands have been identified as the highest priority site for further reintroductions by Ron Jurek, the Pacific Bald Eagle Recovery Team Leader (USFWS, 1981a). Release of six additional eagles per year on Catalina Island is planned (USFWS, 1980b), and reintroductions to the northern Channel Islands is also planned (USFWS, 1979b).

Population The Channel Islands historically supported a minimum of 24 nesting pairs (USFWS, 1981a). Extirpation of the population was caused by both direct mortality, as sheepherders and tourists killed eagles annually, and by indirect mortality, such as egg collecting, human disturbance, and sonic booms (USFWS, 1981a). The role of chlorinated hydrocarbon pesticides in the extirpation of bald eagles from the Channel Islands is unclear, as the population was already reduced and confined to the larger islands when DDT was introduced (USFWS, 1981a). These chemicals may have been the final blow to a weakened population (USFWS, 1981a).

The species as a whole has declined primarily due to the effects of habitat loss and chlorinated pesticides (USFWS, 1979b).

PEREGRINE FALCON

In 1984, the federal government listed all wild peregrine falcons in the coterminous United States as Endangered due to similarity of appearence (USFWS, 1984c). The American peregrine falcon (Falco peregrinus anatum) was listed as Endangered by the federal government in 1970 (USFWS, 1984c), and is also listed as Endangered by the State of California (Anonymous, 1984). This subspecies is resident in the project area. The arctic peregrine falcon (P. o. tundrius) is a rare migrant in the project area (USFWS, 1981a). This subspecies was listed as Endangered in 1970, but was reclassified to Threatened in 1984 (USFWS, 1984c). It is not listed by the State of California. No critical habitat has been designated for the species.

Peregrine falcons are found in small numbers in the project area year-round (USFWS, 1984b), particularly near the coast (USFWS, 1980b). The birds are concentrated in the area during winter (USFWS, 1984b) and during migration (USFWS, 1980b), responding to an influx of wintering prey species to coastal wetlands (USFWS, 1980b, 1984b).

There have been one or two sightings of peregrine falcons per year along the coast of Santa Barbara County (Lehman, 1982, cited in MMS, 1984b). Sighting records include several recent records from the Santa Maria River Mouth (MMS, 1984b), one individual seen at Hollister Ranch on March 2, 1975 (WESTEC, 1983, cited in MMS, 1984b), at Refugio State Beach between January 1970 and December 1978 (Collins, 1983, cited in MMS, 1984b), and at the Gaviota Oil Facility in 1982 (Collins, 1983, cited in MMS, 1984b). The Santa Cruz Predatory Bird Group has released a number of young birds at Gaviota Pass, in the Santa Monica Mountains, and on Catalina Island (Walton, personal communication).

Although no active eyries are known to exist south of Morro Bay (Walton, personal communication; USFWS, 1981a; Collins, 1983, cited in MMS, 1984b), USFWS (1979b) indicates that there was one active eyrie west of Santa Barbara. Sightings of peregrines at Point Conception during the breeding season strongly suggest the presence of an active eyrie there, but no adequate survey of the area has been conducted to confirm the eyrie's activity (Harlow, cited in MMS, 1984b).

Ecology and Behavior Peregrine falcons exhibit varying degrees of migratory behavior. Individuals in the northern part of the range are highly migratory (USFWS, 1979b, 1981a). The species is less migratory in the southern part of its range (USFWS, 1979b, 1980b, 1981a; MMS, 1984a), and southern California residents are probably non-migratory.

Peregrines are opportunistic feeders (USFWS, 1981a), preying almost exclusively on birds (USFWS, 1980b), and particularly on coastal birds (USFWS, 1979b, 1981a). Prey items include small mammals (including bats), fish, rock doves, mourning doves, band-tailed pigeons, and shorebirds (USFWS, 1982, cited in MMS, 1984b). Smaller prey, particularly doves and pigeons, are preferred when feeding nestlings (USFWS, 1982, cited in MMS, 1984b). Preferred foraging habitats are found in coastal areas, and include coastal ponds, sloughs, and estuaries (MMS, 1984b).

Nesting habitat is composed of cliffs and steep rocky slopes (USFWS, 1979b, 1981a).

Range The historical range of peregrine falcons included the Channel Islands (USFWS, 1979b, 1980b, 1981a). There were a number of historic eyries along the coast from Point Conception to the Mexican border (USFWS, 1979b, 1984a). These eyries included Jalama Beach, Point Conception, Sacate (USFWS, 1984b), Gaviota Pass (Collins, 1983, cited in MMS, 1984b; HDR, 1983, cited in MMS, 1984b; USFWS, 1984b), San Onofre Canyon, Las Flores Canyon, Santa Monica Canyon, and Upper Mission Canyon (Collins, 1983, cited in MMS, 1984b; HDR, 1983, cited in MMS, 1984b).

Most currently active eyries in California are in the central and northern parts of the state (MMS, 1984a).

Reintroductions of peregrine falcons into the project area has occurred at a number of sites. A release program has been underway on the Los Padres National Forest for two years (Freel, 1984, cited in MMS, 1984b). Four or more individuals have been released from Gaviota Pass to reestablish the historic eyries at Gaviota Pass and San Onofre Canyon (Collins, 1983, cited in MMS, 1984b). Birds have also been released on Catalina Island (Walton, personal communication).

Reintroduction plans for the area include several areas on the Channel Islands (USFWS, 1981a; MMS, 1984a), and reintroduction at San Miguel Island is planned this year or next year (Walton, personal communication). The recovery plan calls for eventual establishment of five pairs on the Channel Islands (USFWS, 1981a, 1984b), eight pairs between Point Arguello and San Francisco, and 15 pairs slightly inland between Point Arguello and San Diego (USFWS, 1984b). The recovery goal for reclassification of the American peregrine falcon is to have 120 nesting pairs in the state (USFWS, 1984b).

Population Estimates of the number of breeding pairs of peregrine falcons in California vary. The USFWS (1984b) indicates that 64 pairs are known, and Harlow (cited in MMS, 1984b) estimates the state breeding population at 50 to 60 pairs. Other recent estimates are about 50 pairs in 1983 (MMS, 1984a), 39 known pairs in 1980 (USFWS, 1981a), less than 50 pairs (USFWS, 1980b), and 31 known pairs in 1979 (USFWS, 1981a).

The primary cause of mortality and nesting failure for peregrine falcons is contamination with chlorinated pesticides (USFWS, 1980b, 1981a; MMS, 1984a). Secondary causes of mortality and nest failure include shooting, predation, egg collecting, disease, illegal collection by falconers, nest disturbance, powerline collisions, and habitat loss (USFWS, 1981a; MMS, 1984a).

LIGHT-FOOTED CLAPPER RAIL

The light-footed clapper rail (Rallus longirostris levipes) was listed by USFWS as an Endangered species in 1970 (USFWS, 1984c). The State of California also lists this subspecies as Endangered (Anonymous, 1984). No critical habitat has been designated (USFWS, 1984c).

Light-footed clapper rails are present year-round in several marshes in the Santa Barbara Channel area, including Goleta Slough, Carpinteria Marsh (El Estero), and Mugu Lagoon (USFWS, 1979a, MMS, 1984a). Carpinteria Marsh is the northernmost recently occupied site, and is the only marsh north of Los Angeles to support clapper rails consistently over the last several years (USFWS, 1984b, MMS, 1984b). In 1983, Carpinteria Marsh had the third highest (USFWS, 1984b) or fifth highest (MMS, 1984b) light-footed clapper rail population in the state, comprising 7% of the state's population and 95% of the population north of Los Angeles (MMS, 1984b).

Ecology and Behavior The light-footed clapper rail is normally found in estuarine habitats, particularly salt marshes (USFWS, 1981; Lewis and Garrison, 1983; MMS, 1984a). Salt marshes with vegetation dominated by cordgrass and pickleweed are preferred, and areas with well-developed tidal channels are preferred (USFWS, 1981; Lewis and Garrison, 1983). Dense cover is preferred for nesting sites (Lewis and Garrison, 1983), and nesting density is highest in cordgrass, suggesting preference for that species (USFWS, 1979a; Lewis and Garrison, 1983). Nesting early in the season is known to occur in gum plant, before cordgrass growth has begun. Later renestings, after tidal nest flooding, often is in pickleweed (Lewis and Garrison, 1983). Although nests are usually built above the high tide mark (Lewis and Garrison, 1983), nest flooding by high tides is known to occur (USFWS, 1979a). Nest sites are normally near the water in tidal sloughs (Lewis and Garrison, 1983).

The rails feed almost entirely on invertebrates, primarily crustacean, mollusks, and annelids (USFWS, 1979b, 1981a) taken from tidal channels, mudflats, and the marshes (Lewis and Garrison, 1983). Staple foods are striped shore crabs, purple shore crabs, fiddler crabs, beach hopper, California hornshell, the gastropod Melampus olivaceus (USFWS, 1979a), and bivalves (USFWS, 1979a; Lewis and Garrison, 1983).

Light-footed clapper rails are most sensitive to disturbance during the breeding season (Zembal, cited in MMS, 1984b). Most nesting occurs between early April and early May, with extremes at mid March and July (USFWS, 1979a).

Individual rails are known to move between marshes. An individual banded at Newport Bay was later found 12 miles away at Anaheim Bay (USFWS file data, cited in MMS, 1984a), and maximum recorded movement is 13.5 miles (Zembal and Massey, 1983, cited in MMS, 1984b). Telemetry and banding work studying this type of work is continuing (MMS, 1984b).

Range The historic range of light-footed clapper rails extended from Santa Barbara County south to Bahia de San Quintin, Baja California (USFWS, 1979a, 1979b, 1981a; MMS, 1984a), Mexico, and possibly the Mexican mainland (USFWS, 1981a, 1979b; MMS, 1984a). The taxonomy of rails south of Bahia de San Quintin is unclear (USFWS, 1979a). Sporadic historical records from as far north as Morro Bay appear in the literature, but the taxonomy of these sightings is also unclear (Zembal, cited in MMS, 1984b).

Historic light-footed clapper rail habitat in California was approximately 26,000 acres in area (Speth, 1971, cited in USFWS, 1979a and MMS, 1984a). Between eight and 16 marshes were suitable habitat and occupied by rails between 1976 and 1980 (USFWS, 1979a, 1979b, 1981a; MMS, 1984b).

At least two marshes in Baja California are occupied by light-footed clapper rails (USFWS, 1979a). El Estero at Ensenada and Bahia de San Quintin are known sites, and two other Baja California sites may be occupied (USFWS, 1979a, 1979b, 1981a; Draft Revised Recovery Plan cited in MMS, 1984a). The Mexican range and population appear to be at or near historic levels (MMS, 1984a).

Present California range extends along 200 miles of coastline (USFWS, 1979b), but distribution is markedly interrupted due to the discontiguous habitat (USFWS, 1981a). Current California habitat for light-footed clapper rails has been estimated at 8500 acres (Speth, 1971, cited in USFWS, 1979a and MMS, 1984a), and at 45% of the original area (USFWS, 1979b, 1981a). Several areas supporting large rail populations have been particularly reduced (USFWS, 1979a, MMS, 1984a). Only portions of the existing coastal wetlands remain suitable, of 36 extant coastal wetlands (MMS, 1984a), 18 are suitable and currently occupied by light-footed clapper rails during the breeding season (MMS, 1984b; USFWS, 1984b). Five of these were publicly owned in 1979, and supported approximately 40% of the population (USFWS, 1979b). Ten of the occupied marshes have estimated populations of less than 10 pairs (MMS, 1984a), and 90% of the population is found in five marshes (Zembal and Massey, 1981, cited in MMS, 1984a). Repopulation of some areas where the rails have been previously extripated is occurring naturally (USFWS file data, cited in MMS, 1984a).

The range of the light-footed clapper rail in Santa Barbara and Ventura counties includes Goleta Slough, Carpinteria Marsh, and Mugu Lagoon (MMS, 1984a). Goleta Slough has a very small population (MMS, 1984b), and the Mugu Lagoon population is small (MMS, 1984a). Carpinteria marsh supports a significant population (MMS, 1984b, USFWS, 1984b). The mouth of the Santa Ynez River appears to be suitable but unoccupied habitat (Bevier, cited in MMS, 1984b).

Essential habitat north of Los Angeles County includes Goleta Slough, Carpinteria Marsh, and Mugu Lagoon. South of Los Angeles County, identified essential habitat includes Anaheim Bay, Upper Newport Bay, Los Penasquitos Lagoon, Mission Bay, the San Diego River mouth, Sweetwater River complex, south San Diego Bay, and the Tijuana River estuary (USFWS, 1979a, 1979b, 1981a). Recovery objectives, which assume natural reintroductions, call for a minimum of 20 occupied marshes comprising at least 10,000 acres and supporting at least 800 breeding pairs (Revised Draft Recovery Plan, cited in USFWS, 1984b).

Population and Reproduction Estimates of the recent California population vary from year to year and between sources. These estimates are summarized in Table 2. These estimates range from 250 individuals (USFWS, 1979a, 1979b, 1981a) to 249 pairs, or 498 individuals (MMS, 1984b, USFWS, 1984b). Recent estimates of the Mexican population total 800 pairs, including 300 pairs at Ensenada and 500 pairs at Bahia de San Quintin (Draft Recovery Plan, cited in MMS, 1984a).

The population at Carpinteria Marsh was estimated at 18 pairs (MMS, 1984b), or 36 breeding individuals (USFWS, 1984b) in 1983. Estimates for previous years range from 10 individuals in 1977 (USFWS, 1979a) to 20 pairs in 1982 (MMS, 1984b). Recent population estimates for the Carpinteria Marsh are

TABLE 2
LIGHT-FOOTED CLAPPER RAIL POPULATION ESTIMATES

California

Year	Population Estimate	Source	Remarks
1976	250 individuals	USFWS, 1979a, 1979b	
1980	203 pairs	MMS, 1984b	Census data
1981	173 pairs 250 individuals 200 breeding pairs	MMS, 1984b USFWS, 1981a Zembal and Massey, 1981, cited in MMS, 1984a	Census data Apparently not entire range.
1982	221 pairs	MMS, 1984b	Census data
1983	249 pairs	MMS, 1984b; USFWS, 1984b	Census data

Carpinteria Marsh

Year	Population Estimate	Source	Remarks
1976	10 individuals	USFWS, 1979a	
1980	16 pairs	MMS, 1984b	Census data
1981	14 pairs	MMS, 1984b	Census data
1982	20 pairs	MMS, 1984b	Census data
1983	18 pairs	MMS, 1984b	Census data

summarized in Table 2. No light-footed clapper rails have been found at Goleta Slough in 1980, 1981, and 1983 (no survey was conducted in 1982) (MMS, 1984b). One pair of rails was detected at Mugu Lagoon in 1983, but none were found in 1981 (MMS, 1984b).

Light-footed clapper rail populations are subject to periodic population crashes. This phenomenon is known to affect individual marshes, and may affect the entire range (MMS, 1984a).

The primary factor responsible for the decline of the light-footed clapper rail is habitat loss (USFWS, 1979a, 1981a). Overharvesting may have contributed to the decline before 1939 (USFWS, 1979b), particularly in Santa Barbara County (USFWS, 1979a).

CALIFORNIA LEAST TERN

The California least tern (Sterna antillarum (=albifrons) browni) was listed as Endangered by USFWS in 1970 (USFWS, 1984c) and as Endangered by the State of California (Anonymous, 1984). No critical habitat has been designated (USFWS, 1984c).

California least terns breed and forage along the California coast, and are normally present from April through August (USFWS, 1980a) or September (USFWS, 1979b, 1981a). Birds have been recorded in California as early as March and as late as November (USFWS, 1980a). A number of breeding locations exist in the Southern California Bight, and several roosting, post-breeding concentration areas, and feeding areas are also found in the bight.

Ecology and Behavior California least terns are migratory, the breeding season is spent between Baja California, Mexico and San Francisco Bay (USFWS, 1979b, 1981a). Migration routes and winter range are poorly understood, some records of wintering birds exist from the Pacific coast of Central America (USFWS, 1980a), and Mexico may be part of the winter range (USFWS, 1979b, 1981a)

Nesting occurs between mid-May and early August, with most nests completed by mid-June (USFWS, 1980a). Not all nesting colonies are ocuppied each year, and the number of nests in each colony is highly variable from year to year (USFWS, 1980a; MMS, 1984b). The fledging rate also varies from year to year at each colony (MMS, 1984b). Nesting habitat is normally close to a lagoon or estuary, or where food is available. Bare sand, dried mud, or bare earth are preferred nesting substrates (USFWS, 1979b, 1981a; MMS, 1984b).

Least terns plunge-dive for food, which is entirely small fishes. Prey species include northern anchovy, deepbody anchovy, jacksmelt, topsmelt, California grunion, shiner surfperch, California killifish, and mosquitofish (USFWS, 1979b, 1980a, 1981a). Most food is obtained from lagoons and estuaries (USFWS, 1980a), but some feeding occurs offshore. Although least terns are seldom seen more than two to three miles offshore (USFWS, 1984b), individuals have been sighted up to 15 miles from shore (Sorenson, cited in MMS, 1982). The significance of offshore feeding areas is not well documented (MMS, 1984b).

Range The California breeding range of the least tern extends from the Mexican border to San Francisco Bay. There were 31 to 48 nesting colonies in California in 1984 (USFWS, 1984b; Gustafson, cited in MMS, 1984b). Most of these colonies were south of Los Angeles, with major colonies located at Venice Beach, Huntington Beach, and the Santa Margarita River (MMS, 1984b). In 1983, eleven nesting colonies were active from San Luis Obispo County south through Los Angeles County, two colonies were inactive, and two other key habitat areas were known. These sites are listed in Table 3, along with breeding population estimates.

Venice Beach supports the largest breeding population, over 300 individuals in 1983. Nesting has occured here since 1977 (USFWS, 1980a). Terminal Island has supported up to 170 breeding individuals. Other breeding colonies in these four counties are small, ranging from a single pair to 50 individuals. The Santa Ynez River mouth, which is more heavily used by non-breeding individuals, supported nesting birds in 1971 (USFWS, 1980a), 1977, and 1983 (MMS, 1984b). The seven nests found in 1983 were the largest recorded for this site, and occured one-half mile upstream from the river mouth (Gustafson, cited in MMS, 1984b). The other breeding locations north of Point Conception supported about 44 pairs total in 1984 (USFWS, 1984b).

Foraging and non-breeding individuals range throughout the southern California coastal zone (WESTEC Services, 1984). Year-old birds are rarely in the breeding areas during the nesting season (USFWS, 1980a), and are presumably more widely distributed than the breeding adults. From 20 to 25 non-nesting birds were observed one-half mile downstream from the Santa Ynez River mouth nesting site during the 1983 breeding season (Gustafson, cited in MMS, 1984b). Significant foraging areas are known to occur at Jalama Beach and Government Point/Cojo Bay (MMS, 1984b), 30 to 40 miles from the breeding site at the Santa Ynez River. Foraging habitat for the San Luis Obispo County and Santa Barbara County colonies is poorly understood, but preliminary studies indicate extensive offshore foraging at these areas (USFWS, 1984b).

TABLE 3

KEY AREAS
CALIFORNIA LEAST TERN

Location	Type of Use	Breeding Population Size and Range[1]	Remarks
Oso Flaco Lake and Dune Lakes	Nesting[2], Foraging, Roosting[3]	2 (?) (1983)[2] 2-4 (1982)[2] Large non-breeding flocks[3]	Observed since 1975[2]
Santa Maria River mouth	Nesting	14 (1983)[2] 50 (1977)[3]	
San Antonio Creek	Nesting	8 (1978)[3] 36 (1983)[2]	Includes both north and south areas.
Purisima Point	Nesting	10 (1978)[3] about 50 (1979)[3]	Both north and south of point.
Santa Ynez River mouth	Nesting Post-breeding[2]	6 (1971)[3] 16 (1983)[2]	Major post-breeding area.[2]
Santa Clara River mouth	Nesting	34-40 (1982)[2] 6 (1983)[2]	Nesting suspected in 1970.
Ormond Beach	Nesting	12-60 (74-79)[3] 8 (1983)[2]	
Mugu Lagoon (Point Mugu)	Nesting Post-breeding[3]	44 (1983)[2] 10 (1977)	Major post-breeding area.[2]

[1]Breeding population size (estimated pairs x 2) from MMS (1984) and USFWS (1980a). Years of high and low populations are given.

[2]MMS (1984b).

[3]USFWS (1980a).

TABLE 3 (continued)

KEY AREAS
CALIFORNIA LEAST TERN

Location	Type of Use	Breeding Population Size and Range[1]	Remarks
Venice Beach	Nesting	160-190 (1979)[2] 300-378 (1982)[3]	
Playa del Rey	Nesting	0 (76, 82-83)[2,3] 50 (78,79)[3]	Exact size has varied.
Terminal Island	Nesting	48 (73-79?)[3] 170 (73-79)[3] (1983)[2]	
Harbor Lake	Post-breeding foraging	---	Major post-breeding foraging.[3]
San Gabriel River	Nesting	120 (71-79?)[3] 0 (82,83)[2]	Includes Cerritos Lagoon.[2]
Belmont Shores	Roosting	—	Major spring and summer night roost.[3]
Costa del Sol	Nesting	36-48 (1982)[2] 40-50 (1983)[2]	No data for 1969-1979.

[1]Breeding population size (estimated pairs x 2) from MMS (1984) and USFWS (1980a). Years of high and low populations are given.

[2]MMS (1984).

[3]USFWS (1980a).

Post-breeding concentration areas are apparently used by birds from a number of surrounding breeding sites. One of the largest post-breeding concentration areas is at the Santa Ynez River mouth (Gustafson, cited in MMS, 1984b). Birds from Venice Beach have been observed here, and the flocks observed to disappear from Purisima Point may have regrouped at the Santa Ynez River as well (Bevier, cited in MMS, 1984b). Mugu Lagoon is also a large post-breeding concentration area (Gustafson, cited in MMS, 1984b), and Harbor Lake in Los Angeles County is also an important post-breeding foraging area (USFWS, 1980a)

Recovery goals for the least tern include a mimimum of 20 viable colonies, with a minimum total breeding population of 1200 pairs, at 20 secure coastal wetland sites (USFWS, 1980a). Key habitats identified from San Luis Obispo County south through Los Angeles County include Oso Flaco Lake, the Santa Maria River mouth, San Antonio Creek, Purisima Point, the Santa Ynez River mouth, the Santa Clara River mouth, Ormond Beach, Mugu Lagoon, Venice Beach, Playa del Rey, Terminal Island, Harbor Lake, San Gabriel River/Alamitos Bay, and Belmont Shores. In addition, four key habitat areas are identified in Orange County, 15 key areas are identified in San Diego County, and two key areas are in Baja California, Mexico (USFWS, 1980a).

Population and Reproduction Current California breeding population estimates range from 1210 individuals (MMS, 1984b) to 940 breeding pairs, or 1880 individuals (USFWS, 1984b).

Reproductive success varies widely from year to year and between colonies (USFWS, 1980a). In 1983, California least terns fledged 0.76 young per nest overall. The nesting colonies in San Luis Obispo through Los Angeles counties produced about 0.62 fledged young per pair in 1983, ranging from 0 (Oso Flaco Lake) to over 0.90 (Venice Beach and Terminal Island). In 1982, the same colonies produced an average of 0.33 fledged young per pair, ranging from 0 (Oso Flaco Lake, Mugu Lagoon, and Ormond Beach) to 1.7 (Pismo Beach) (MMS, 1984b).

The primary factors responsible for the decline of the species are loss of feeding and nesting habitats and nest disturbance (USFWS, 1979b, 1980a, 1981a). Sixty least tern nests were destroyed by human activity in San Diego County during the 1984 breeding season (USFWS, 1984b). Egg shell thinning has recently been detected in least terns (USFWS, 1984b).

SOUTHERN SEA OTTER

The southern sea otter (*Enhydra lutris nereis*) was listed as a Threatened species by the US Fish and Wildlife Service in 1978. No critical habitat has been designated (USFWS, 1984c). The species was listed due to concerns of oil spill impacts from tanker traffic (USFWS, 1977).

Sea otters are generally found north of Point Conception except for a few nomadic males. A few individuals inhabit the Point Conception/Point Arguello area (MMS, 1984a). These are apparently nomadic males (USFWS, 1984b), and are not considered an integral part of the population nor pioneering individuals (USFWS, 1984a, cited in MMS, 1984a). Recent sightings in this area include 11 otters between a mile north of Point Arguello and two miles south of Point Conception on May 27, 1984; one otter each in Cojo Bay and between Point Conception and Point Arguello on June 6, 1984; and averages of two to three otters between Point Conception and Point Arguello subsequent to June 6, 1984 (Hardy, cited in MMS, 1984b). No sightings have been reported from the vicinity of Platform Gail.

Ecology and Behavior The southern sea otter population is concentrated in two range "fronts" at the north and south ends of the overall range, with the largest concentrations of otters occurring in the fronts (USFWS, 1981a; MMS, 1984a). The number of otters in the fronts vary seasonally, the fronts contain the most otters in winter and early spring and the least otters in the summer and fall (USFWS, 1981b). The southern front currently extends from roughly Shell Beach to the Santa Maria River (MMS, 1984a), or from Avila Beach to Arroyo Grande Creek (USFWS, 1983b). The otters occupying the fronts are males (USFWS, 1981a, 1981b) or males and non-breeding females (MMS, 1984a). The southernmost individuals are thought to be nomadic, subdominant males (USFWS, 1984b; MMS, 1984b).

Southern sea otters are not migratory, but juveniles can wander considerably (USFWS, 1981b; MMS, 1984a). They are normally solitary, but occasionally raft in groups of over 100 (MMS, 1984a).

Although sea otters appear to prefer rocky bottoms and kelp beds, the animals can make use of sandy bottomed areas (Woodhouse et al., 1977). They are known to raft offshore from kelp beds during storms (Woodhouse et al., 1977; USFWS, 1981a), but more commonly seek shelter from storms in coves (USFWS, 1981a; MMS, 1984a). During the winter, sea otters tend to concentrate in kelp beds that survive storms (USFWS, 1981a, MMS, 1984a).

Although the listing notice for the species specified oil spill impacts as a primary concern, the behavior of sea otters in the presence of oil is uncertain. One study indicated they may react to and avoid the odor of oil (Barabash-Nikiforov et al., 1968, cited in USFWS, 1981b). Other experiments with captive otters indicated no avoidance, and the animals repeatedly swam into oil after initial contact with it (Williams, 1978, Siniff et al., 1981, both cited in USFWS, 1981b).

The southern sea otter lacks an insulative blubber layer (USFWS, 1981a). Insulation is provided by air trapped in the pelage, which is groomed constantly to maintain its insulative qualities (USFWS, 1981a). The metabolic rate is high, and the animals consume food equal to 25 to 30% of body weight per day (Kenyon, 1969; USFWS, 1981a). Foraging occurs intermittently through the day (USFWS, 1981a).

Preferred foods of the southern sea otter include sea urchin, abalone, and rock crab (Woodhouse et al., 1977; USFWS, 1981a); pismo clam has also been identified as a preferred food item (USFWS, 1981a). The diet shifts to smaller invertebrates after an area has been occupied for a prolonged period (USFWS, 1981a); these invertebrates include turban snail, kelp crab, mussel, and octopus (Woodhouse et al., 1977). A total of 51 prey species have been identified (Woodhouse et al., 1977). Although these food items are most abundant in rocky bottoms (USFWS, 1981a), southern sea otters also forage in soft-bottom areas (USFWS, 1979b). Foraging is generally limited to water depths of 120 feet (USFWS, 1981a) or 120 to 180 feet (USFWS, 1979b).

Range The historical range of the southern sea otter extended from Morro Hermoso, Baja California, Mexico in the south, and was contiguous with the Alaskan subspecies to the north (USFWS, 1981a). Current range extends from Ano Nuevo to the Santa Maria River (USFWS, 1984a, cited in MMS, 1984b). A few individuals are found south of the range, with isolated observations as far south as Point Loma (Hardy, cited in MMS, 1984b).

Information on range expansion conflicts. Recent information indicates that there is no evidence of continuing range expansion (MMS, 1984a). Other sources indicate that the rate of range expansion is declining (WESTEC Services, 1984). In 1981, continued range expansion at then current rates was expected to result in the range reaching Point Conception between 1993 and 1995 and the Channel Islands Marine Sanctuary by 1995 (USFWS, 1981a). Average range expansion rates have been estimated at 1.8 miles per year southward (USFWS, 1981a; MMS, 1984a) and 1.6 miles per year (MMS, 1984a) or 1.06 miles per year (USFWS, 1981a) northward. The US Fish and Wildlife Service (1981a) indicates that range expansion is faster over rocky bottoms and slower over sand, possibly due to food abundance, but Woodhouse et al. (1977) indicates faster range expansion (14 to 18 miles per year) occurs over sandy bottoms.

Population and Reproduction Estimates indicate that the historical southern sea otter population of the California coast numbered about 16,000 animals (CDFG, 1976; USFWS, 1981a). Between 1940 and 1976, the population increased at an average rate of 5.4% per year, ranging from 4.1% per year to

7% per year (Woodhouse et al., 1977; USFWS, 1981a). The population peaked in 1976, when numbers were estimated at 1,789 (MMS, 1984b) and 1,856 (USFWS, 1979b) animals.

Estimates of the current population vary substantially, due primarily to differing methods of estimating the number of otters. Problems have been identified with the census method used by the California Department of Fish and Game (CDFG), which is a combination of aerial and ground censuses (USFWS, 1981b). Kenyon (1969) indicates that ground censuses are subject to a 15% underestimate and aerial censuses underestimate by 50%, requiring use of correction factors. The correction factors applied to raw count data to respond to these inherent underestimates account for part of the variation in population numbers. Recent population estimates from USFWS are 1,226 animals, including 164 pups (USFWS, 1984a, cited in MMS, 1984b) and 1,304 animals in June, 1984 (USFWS, 1984b). Recent CDFG estimates are 1,521 animals, excluding pups (CDFG news release, cited in MMS, 1984b), and 1,535 animals (USFWS, 1984b).

The current dynamics of the southern sea otter population are unclear. The population no longer appears to be increasing (USFWS, 1983b). Some sources indicate that population numbers have been static since the mid 1970s (USFWS, 1981a, 1983b; USFWS, 1984a, cited in MMS, 1984b; MMS, 1984a, 1984b). Other indications are that population numbers have declined since the mid 1970s (USFWS, 1984a, cited in MMS, 1984b; MMS, 1984a; Estes and Jameson, 1983, cited in USFWS, 1983b), but USFWS (1983b) indicates that evidence is inconclusive.

The southern front has been estimated to contain up to 150 to 200 animals (MMS, 1984a), or a maximum of 160 animals (USFWS, 1981b). Recent aerial counts indicate that about 60 individuals are present in the southern front (Jameson, cited in MMS, 1984a). The nucleus of southern sea otters south of Morro Bay has grown from about six to 20 - 25 individuals in six years (USFWS, 1983b).

Reproduction can occur year-round (MMS, 1984a). Breeding peaks from October through December (Vandevere, 1970, cited in MMS, 1984a), and pupping peaks from December through February (Sandegren et al., 1973, cited in MMS, 1984a). Pups can be produced each year (Vandevere, 1970, cited in MMS, 1984a), but females of the northern subspecies average one pup every other year (Kenyon, 1969). The pups are dependent on the females for six to eight months (Vandevere, 1979, cited in MMS, 1984a).

Several mortality factors have been identified. Shooting accounts for half of the human-caused deaths among carcasses that have been recovered and necropsied (USFWS, 1981b). Mortality due to entanglement in gill and trammel nets is estimated to have been 74 individuals in 1984 (Maxwell, cited in USFWS 1984b; USFWS, 1984b). Gill and trammel net mortality between 1973 and 1983 is estimated at 49 to 168 individuals (USFWS, 1984b). Efforts are underway to curb this mortality factor (USFWS, 1984b). The Interagency Scoping group has postulated gill and trammel net mortality as the cause of the recent population decline and cessation of range expansion. Although not identified as a direct cause of mortality, concern has been expressed over heavy metal buildup in shellfish (USFWS, 1984b), and over the elevated levels of chlorinated hydrocarbons, heavy metals, PCBs, and petroleum detected in some individuals (USFWS, 1981b).

Information on oil as a mortality factor is available from experimental data and observations of an oil spill in the range of the northern subspecies. Over 100 sea otters died as a result of a gasoline/diesel spill at Paramushir Island (USFWS, 1981b). In experimental oiling of sea otters, light oiling of 25% of the fur resulted in a 140% increase in the metabolic rate of otters in water at 15°C (USFWS, 1981b). Removal of oil with detergents aggravated this effect (USFWS, 1984b). Oiling of 30% of a sea otter's pelage is likely to result in death of the animal (USFWS, 1981b).

GRAY WHALE

The gray whale (Eschritius robustus) was listed as an Endangered species in 1970 (USFWS, 1984c). Recently, the National Marine Fisheries Service has recommended reclassification of the eastern North Pacific stock to Threatened status, and retention of the western, or Korean, stock as an Endangered species (NMFS, 1984a).

The Southern California Bight is used by both migratory and non-migratory individuals. The eastern North Pacific gray whale population migrates through or past the Southern California Bight twice each year. Some juveniles have spent extensive periods in kelp beds along the mainland coast and around the Channel Islands (NMFS, 1979), and are thought to winter in the bight (Wellington and Anderson, 1978, cited in MMS, 1984a). These whales have been observed feeding on mysid shrimp in the kelp beds (Wellington and Anderson, 1978, cited in MMS, 1984a). Some stragglers may remain between Point Conception and Oregon during the summer (NMFS, 1980).

One pod of three gray whales was observed northeast of the proposed platform location by McClelland Engineers (McClelland Engineers, 1984, cited WESTEC Services, 1984). A total of 336 gray whales were sighted in the Southern California Bight between Point Conception and the Mexican border in a

BLM-sponsored marine mammal survey (Norris et al, 1975, cited in WESTEC Services, 1984).

Ecology and Behavior Gray whales migrate between high-latitude summer ranges and low latitude winter ranges each year. Two routes are used through the Southern California Bight area, one inshore and one offshore (NMFS, 1984a). Most of the population uses the offshore route during the southbound migration (NMFS, 1984a), Rice and Wolman (1971) indicate that this route is used by 59% of the population. Migrating gray whales commonly cut across bights and other coastal indentations (Rice and Wolman, 1971), but the proportion of the population using the offshore route has increased since the early 1960s (NMFS, 1979). The reasons for this behavioral shift are unclear (NMFS, 1979). The inshore route was used by 90 to 95% of the southbound migrants before the mid 1960s (NMFS, 1979). The northbound migration is entirely coastal (NMFS, 1984a), with the possible exception of females with calves.

The southbound migration begins between October and November, and passes through Unimak Pass, Alaska from November though December (NMFS, 1984a). A number of dates are given for migration off California: late September through December (NMFS, 1979), November to January (NMFS, 1980), and beginning in November with a peak in January (MMS, 1984a). The migration is segregated by sex and age class: pregnant females are first, followed by females that have recently ovulated (Rice and Wolman, 1971; NMFS, 1984a), adult males, immature females (NMFS, 1984a) (or adult males and immature females together (Rice and Wolman, 1971)), with immature males last (Rice and Wolman, 1971; NMFS, 1984b).

Several dates have been given for northbound migration periods: February to June (NMFS, 1979), February to May (NMFS, 1980; MMS, 1984a), and beginning in mid February with arrival in the Bering Sea beginning in April (NMFS, 1984a). The peak of the northbound migration passes Point Piedras Blancas in mid May (NMFS, 1984a). The northbound migration is also segregated by sex and age class: pregnant females are first (Rice and Wolman, 1971; NMFS, 1984a), followed by anestrous females, adult males (NMFS, 1984a) or adult males and anestrous females (Rice and Wolman, 1971), immatures of both sexes (Rice and Wolman, 1971; NMFS, 1984a), and females with calves last (NMFS, 1984a, Poole, 1984). The routes taken by females with calves through the Southern California Bight is unknown, but is thought to be offshore (Rice and Wolman, 1971). In the early 1800s, the route used by females with calves was inshore (Poole, 1984). However, Rice and Wolman (1971) made only one sighting of northbound gray whales with calves: two females with two calves near San Clemente Island. More recently, a radio tagged female with a calf was located near Catalina Island on May 1, 1980 (Mate and Harvey, 1984). North of the Southern California Bight at Point Piedras Blancas, Poole (1984) found that

MMS conditional oil spill probabilities for 3/10/30 days

	Sn.Mig.	Goleta	Carpen.	San.Cl.	Pt.Mugu	Anacapa	S.B.I.
Winter							
Gail	-/-/-	-/-/-	1/3/4	1/5/7	2/7/9	8/20/23	-/-/1
L1	-/-/-	-/-/1	-/1/2	1/4/5	1/5/7	5/16/17	-/-/-
L2	-/-/1	-/-/1	1/4/6	1/5/11	1/4/7	-/6/8	-/-/-
L3	-/-/3	-/1/3	11/18/22	3/12/16	1/2/5	-/2/5	-/-/-
L4	-/1/6	-/3/5	75/79/80	1/5/8	-/-/1	-/-/-	-/-/-
Spring							
Gail	-/-/-	-/-/-	-/1/1	14/39/39	23/66/67	2/3/3	-/-/1
L1	-/-/-	-/-/-	-/3/3	13/44/46	17/56/58	1/3/3	-/-/-
L2	-/-/-	-/-/-	2/7/7	18/67/69	11/46/47	-/1/1	-/-/-
L3	-/-/-	-/-/-	28/38/39	33/64/65	3/9/11	-/-/-	-/-/-
L4	-/-/-	-/-/-	96/98/98	3/7/7	-/-/-	-/-/-	-/-/-
Summer							
Gail	-/-/-	-/-/-	-/6/6	22/59/59	21/63/64	-/-/-	-/-/-
L1	-/-/-	-/-/-	1/9/10	17/70/70	13/46/47	-/-/1	-/-/-
L2	-/-/-	-/-/-	2/14/14	23/83/83	5/17/18	-/-/-	-/-/-
L3	-/-/-	-/-/-	47/62/62	31/51/51	1/2/2	-/-/-	-/-/-
L4	-/-/-	-/-/-	99/99+/99+	1/1/1	-/-/-	-/-/-	-/-/-
Autumn							
Gail	-/-/-	-/-/-	-/-/1	2/20/25	2/24/33	5/20/25	-/-/1
L1	-/-/-	-/-/-	-/1/2	1/19/29	2/25/36	3/14/18	-/-/1
L2	-/-/-	-/-/-	-/4/5	2/33/45	1/19/34	-/5/10	-/-/1
L3	-/-/-	-/-/-	14/31/35	7/40/53	-/6/13	-/1/4	-/-/-
L4	-/-/1	-/-/-	85/92/93	2/13/19	-/1/3	-/-/1	-/-/-

Sn.Mig.= San Miguel Island (incl. land segments 39 & 40)
San.Cl.= Santa Clara River
S.B.I. = Santa Barbara Island

females with calves migrated very close inshore, in contrast to whales without young which migrated farther from shore.

The diet of gray whales consists primarily of benthic amphipods (Rice and Wolman, 1971; NMFS, 1984a). Other benthic species are taken incidentally (NMFS, 1984a). Feeding during migration is rare. In 180 stomach samples from southbound migrants, Rice and Wolman (1971), found no stomachs with food. Only minimal amounts of food were found in a few stomach samples from northbound gray whales (Rice and Wolman, 1971). Few other observations of gray whales feeding in the Southern California Bight have been reported: gray whales have been seen feeding on bait fish off Point Mugu and on Acanthomysis in kelp off Santa Barbara Island, and individuals have been seen mouthing kelp, possibly feeding, off San Miguel Island (Nerini, 1984).

Six types of sounds are produced by migrating gray whales (Dalheim et al., 1984). These sounds are of relatively low frequencies, summarized in Table 4. The mean frequencies produced range from 90 hz to 1940 hz, and mean peak energy ranges from 170 hz to 824 hz (Dalheim et al., 1984). The loudness of a variety of gray whale sounds ranges from 138 to 152 decibels relative to 1 micropascal @ 1 meter (Cummins et al., 1968, cited in Turl, 1982).

Range The summer range of the eastern North Pacific gray whale stock is described by Rice and Wolman (1971) as the northern and western Bering Sea, the Chukchi Sea, and the western Beaufort Sea; and NMFS (1984a) describes it as the northern Bering Sea and the southern Chukchi Sea. There are also isolated summering locations ranging from Vancouver Island to Baja California (NMFS, 1984a), which may be associated with river mouths (Nerini, 1984). Between 35 and 50 individuals summer off Vancouver Island (Darling, 1984), and about 75 individuals summer off Oregon (Mate, cited in Darling, 1984). Some individuals summer off the California coast (Dohl et al., 1981, cited in Nerini, 1984).

The migration routes between summer and winter ranges are generally narrow (NMFS, 1979). The route passes within a few kilometers of shore at Yankee Point in Monterey County (Rice and Wolman, 1971), and at Point Piedras Blancas (Poole, 1984). In the Southern California Bight the route is much wider because of the inshore and offshore routes, Rice and Wolman (1971) indicate that it is at least 194.5 km wide off Point Loma in San Diego County. The offshore route, used only during southbound migration (NMFS, 1984a) and possibly by northbound females with calves, is seaward of the Channel Islands and as far as 200 km from the mainland (Rice and Wolman, 1971). The inshore route is relatively narrow, usually within a few kilometers of shore (NMFS, 1980), and passes through the Santa Barbara Channel.

TABLE 4

SOUNDS PRODUCED BY MIGRATING GRAY WHALES[1]

Sound Type	Mean Frequency Range (hz)	Mean Peak Energy Range (hz)
Pulses/knocks	90 - 1940	332 - 824
Moans/growls	125 - 1250	170 - 430
Grunt/snort	150 - 1570	225 - 600
Bubble (exhalation)	130 - 840	200 - 500
Blow sounds (exhalation)	250 - 850	250 - 700
Clicks	no data	no data

1 Adapted from Dalheim et al., 1984.

The winter range of the eastern North Pacific stock ranges from Baja California and the southern Gulf of California south to Jalisco, Mexico (Rice and Wolman, 1970). Most of the wintering whales are in Bahia Sebastian Viscaino and Bahia de Ballenas off Baja California, and the calving whales are found in a number of coastal lagoons in Mexico (NMFS, 1984a).

The western North Pacific stock summers in the Okhotsk Sea, and winters in coastal South Korea (Rice and Wolman, 1971; NMFS, 1984a).

Population The western North Pacific stock has been estimated to number 15,000 to 17,000 individuals (Reilly et al., 1980, cited in MMS, 1984a), and 15,000 individuals (NMFS, 1979, 1980). In the gray whale status report, NMFS (1984a) estimates the population at 15,647 with 95% confidence between 13,450 and 19,201.

The historical pre-whaling population of gray whales was probably about 12,000 individuals, reduced from an estimated carrying capacity of 24,000 by aboriginal whaling (NMFS, 1984a). The population was probably reduced to a low of a little more than 2,000 individuals by whaling in the late 1800s (NMFS, 1984a).

The western North Pacific population has probably been reduced to below the minimum viable population, rendering it functionally extinct (NMFS, 1984a).

RIGHT WHALE

The right whale (*Balaena (=Eubalena) glacialis*) is listed as Endangered by the US Fish and Wildlife Service. This whale was listed in 1970, and no critical habitat has been designated (USFWS, 1984c).

Right whales are occassionally present in the Southern California Bight (NMFS, 1980). The bight may be on a migratory route, but migration routes of this species in the eastern North Pacific are poorly known (NMFS, 1980). There are only about 45 sightings of right whales recorded from the eastern North Pacific Ocean south of 50°N latitude (NMFS, 1984b). A right whale was observed in the Santa Barbara Channel in 1981 (Santa Barbara News Press, May 5, 1981, cited in MMS, 1984a). Accounts differ regarding previous sightings: the source above indicates that this sighting was the first in the area since 1956, and NMFS (1979) states that no right whales had been seen for the previous 20 years, but Miller (1975) indicates that there have been occasional sightings in recent years near the Channel Islands. No sightings of right whales were recorded during the recent BLM marine mammal survey (MMS, 1984a).

Ecology and Behavior Right whales are migratory, similar to most other large baleen whales (NMFS, 1979, 1980, 1984b). The species is seasonally coastal, particularly during the calving season. Right whales feed primarily on copepods, and to a lesser degree on krill and "lobster-krill" (NMFS, 1984b).

Range The worldwide range of the right whale includes a minimum of three reproductively isolated populations. The North Pacific population may consist of only a single stock (NMFS, 1980), or may be two stocks. The International Whaling Commission has tentatively divided the North Pacific population into eastern and western stocks (NMFS, 1984b). The North Atlantic population consists of two stocks, and the southern bemisphere population includes at least five stocks (NMFS, 1984b).

The feeding, or summer range of the species, occupied from spring to autumn, is at higher latitudes, usually above 40° latitude. This range is normally well out to sea, particularly in the North Pacific and North Atlantic Oceans (NMFS, 1984b).

The breeding and calving, or winter, range of the right whale is occupied from late autumn to early spring. It is usually above 25° latitude, and the southernmost record of right whales in the eastern North Pacific is at 26°39'N latitude off Baja California, Mexico. Winter range for the eastern North Pacific population is unknown. Two situations are considered possible: the population may winter in pelagic waters of the eastern and central North Pacific, or these whales may be migrants from the western North Pacific. No evidence to date indicates that right whales calved or occupied coastal waters of the eastern North Pacific (NMFS, 1984b).

Population The right whale is the most depleted of the great whale species (NMFS, 1979, 1980, 1984b). The historical population is thought to have been between 100,000 and 300,000, two-thirds were in the southern hemisphere and one-third was in the North Atlantic and North Pacific Oceans. The current North Pacific population has been estimated at 100 to 200 individuals (NMFS, 1980, 1984b; MMS, 1984b) and 220 individuals (NMFS, 1979). A few hundred individuals are thought to be in the North Atlantic, and 3,000 to 4,000 individuals are thought to occur in the southern hemisphere (NMFS, 1984b).

The right whale has not recovered from exploitation in most areas, the only stocks showing evidence of recovery are in the southern hemisphere. Coastal and offshore development, particularly in the northwestern Atlantic Ocean, are the chief concerns regarding future recovery (NMFS, 1984b).

OTHER CETACEANS

Five additional endangered cetaceans are known from the Southern California Bight. The blue whale (Balaenoptera musculus), finback (fin) whale (Balaenoptera physalis), sei whale (Balaenoptera borealis), humpback whale (Megaptera novaeangeliae), and sperm whale (Physeter catadon (=macrocephalis)) were all listed as Endangered by USFWS in 1970 (USFWS, 1984c). No critical habitat has been designated for these species.

These whales use the Southern California Bight primarily as a migration route (NMFS, 1979, 1980). The migratory paths and timing of migration vary by species (MMS, 1984a). Migration corridors and periods for these whales are identified in Table 5.

Several of the whales are found in the area beyond the migration period. The finback whale is present west of the Channel Islands all year (NMFS, 1979), and is the most abundant of the baleen whales off the California coast in spring and summer (NMFS, 1979, 1980). Summer range of the sei whale includes the central California coast (NMFS, 1980). This whale is present west of the Channel Islands in late summer and early fall, and may feed within the Southern California Bight during this period (NMFS, 1979). Part of the North Pacific humpback whale population migrates along the coast from Alaska to Baja California, Mexico (NMFS, 1979), but humpback whales are found in all parts of their range during the summer (NMFS, 1979, 1980). The summer and winter range of this species overlaps in the Southern Californi Bight (NMFS, 1979, 1980), with peak numbers present in summer and fall (CCMS, 1981, 1982, cited in MMS, 1984a).

Information on survey sightings of these species in the general project vicinity is summarized in Table 6, showing the numbers of these whales seen in the area. In addition to sightings from surveys, blue whales have been seen off San Clemente and San Nicholas islands (Miller, 1975). Humpback whales have been observed feeding on northern anchovies over the Santa Rosa Ridge (NMFS, 1979). Sperm whales are frequently seen offshore from the Channel Islands (NMFS, 1979), and have been observed every month of the year except July (CCMS, 1980, 1981, 1982, cited in MMS, 1984a).

Ecology and Behavior These species are generally migratory (NMFS, 1979, 1980), moving from summer feeding grounds in higher latitudes to winter breeding and calving grounds in lower latitudes (MMS, 1984a). Migration in the finback and sei whales is segregated by age and sex class (NMFS, 1984d, 1984e).

Most of the rorquals fast mainly or entirely during migration and winter (NMFS, 1984f). Diet consists of invertebrates and small fishes. Blue whales are nearly monophagous, eating primarily krill (NMFS, 1984e). Finback whales also eat krill primarily, but also eat small fishes (NMFS, 1984d). Sei whales prefer copepods, krill and small fishes are secondary in their diet (NMFS, 1984e)

Range The blue whale is found in the North Atlantic Ocean, northern Indian Ocean, and in the southern hemisphere as well as the North Pacific Ocean (NMFS, 1984e). The number of stocks in the North Pacific is uncertain (NMFS, 1984c), but both eastern and western populations are known to occur (NMFS, 1980). Isolated stocks may occur in the Gulf of California, British Columbia, and the east China Sea (NMFS, 1984e). The individuals wintering off the southern California coast summer from central California to the Gulf of Alaska, but the summer range of the population as a whole is poorly known, individuals are seen across the North Pacific in summer (NMFS, 1984e). The winter range of the North Pacific population is unknown, although there have been numerous sightings off Baja California, Mexico recently (NMFS, 1984e).

The finback whale is found in the North Atlantic Ocean, southern hemisphere, and North Pacific Ocean (NMFS, 1984d). One North Pacific stock is recognized by the International Whaling Commission, although biologically there may be three or four (NMFS, 1984d). Both eastern and western North Pacific populations occur (NMFS, 1980). In the eastern north Pacific the summer range extends from off central California to the Gulf of Alaska (NMFS, 1984d). Winter range of all stocks is unknown (NMFS, 1984d).

The sei whale is found in most oceans (NMFS, 1984e). In the North Pacific Ocean there are biologically three or more stocks (NMFS, 1984e), both western and eastern (NMFS, 1980), although only one stock is recognized by the International Whaling Commission (NMFS, 1984d). The summer range of the North Pacific population extends from 35°N to 40°N, with a few individuals reaching 50°N (NMFS, 1984e). Winter range is unknown (NMFS, 1984e).

Humpback whales are found in all oceans between the Arctic and Antarctic (NMFS, 1984f). There are three stocks in the North Pacific: the Mexican, Hawaiian, and Asian (NMFS, 1984f), forming both eastern and western populations (NMFS, 1980). The whales range across much of the North Pacific in summer, in the eastern North Pacific summer range they extend south to about Point Conception (NMFS, 1984f). Winter range of the Mexican stock extends south of Isla Cedros off the Baja California coast, into the Gulf of California, and as far south as Jalisco and the Islas Revillagigedo (NMFS, 1984f). The Hawaiian stock winters near the main Hawaiian Isslands (NMFS, 1984f).

TABLE 5

OTHER ENDANGERED CETACEANS

Species	Historical North Pacific Population	Current North Pacific Population	Season when present in Southern California Bight	Primary Migration Areas
Blue whale	4,900 individuals (NMFS, 1984c)	1,600 individuals (NMFS, 1984c) 1,700 individuals (NMFS, 1979, 1980)	Southward migration September to February (MMS, 1984a) Northward migration May to June/July (MMS, 1984a; NMFS, 1979)	>15 nautical miles from the mainland (MMS, 1984a), and generally north of Santa Rosa Island along Santa Rosa - Cortez Ridge to Tanner and Cortez Banks (NMFS, 1979)
Finback whale	42,000 to 45,000 individuals (NMFS, 1984d)	14,620 to 18,630 (NMFS, 1984d) 17,000 (NMFS, 1979, 1980)	Spring and summer, peaks May to June (NMFS, 1979, 1980), also August to November (MMS, 1984a)	Poorly defined (MMS, 1984a), but known to be offshore (NMFS, 1984d)
Sei whale	45,000 individuals (NMFS, 1984e)	22,000 to 37,000 in 1967 (NMFS, 1984e) 9,000 individuals (NMFS, 1979, 1980)	Late summer, early fall (NMFS, 1979)	Little known (NMFS, 1979), but known to be offshore (NMFS, 1984e) over the continental slope (MMS, 1984a)

TABLE 5 (continued)

OTHER ENDANGERED CETACEANS

Species	Historical North Pacific Population	Current North Pacific Population	Season when present in Southern California Bight	Primary Migration Areas
Humpback whale	15,000 individuals (NMFS, 1984f)	1,200 individuals (NMFS, 1984f; Rice and Wolman, 1982, cited in MMS, 1984a) 850 individuals (NMFS, 1979, 1980)	All seasons, summer and winter ranges overlap in bight (NMFS, 1979, 1980), peaks in summer and fall (CCMS, 1981, 1982, cited in MMS, 1984a)	Has been observed over Santa Rosa ridge (NMFS, 1979)
Sperm whale	no data	300,000 individuals (NMFS, 1979, 1980)	April to mid June and late August to mid November (NMFS, 1979)	Poorly known broad migration path (NMFS, 1979), normally pelagic and found in water >6,000 feet deep (MMS, 1984)

TABLE 6

CETACEAN SIGHTINGS FROM SURVEYS

Species	Reported Sightings
Blue whale	7 individuals seen in Southern California Bight (Norris et al, 1975, cited in WESTEC Services, 1984)
Finback whale	23 individuals estimated in Southern California Bight (Norris et al, 1975 cited in WESTEC Services, 1984) None seen in Santa Maria Basin survey, attributed to pelagic nature of species (CCMS, 1980, cited in MMS, 1984a)
Sei whale	Two groups totalling 5 individuals seen west of Tanner-Cortez banks in September 1975 (CCMS, 1980, cited in MMS, 1984a) None seen in Southern california Bight (Norris et al, 1975 cited in WESTEC Services, 1984) Some in Santa Maria Basin in 1981 (CCMS, 1981, cited in MMS, 1984a)
Humpback whale	6 individuals estimated in Southern California Bight (Norris et al., 1975, cited in WESTEC Services, 1984)
Sperm whale	None seen in Southern California Bight (Norris et al., 1975, cited in WESTEC Services, 1984)

Both eastern and western populations of sperm whales exist in the North Pacific Ocean (NMFS, 1980).

Populations Current and historical North Pacific populations of the baleen whales are shown in Table 5. Blue whales and humpback whales are the least numerous, and finback and sei whales are more numerous by an order of magnitude. Each of these species is most numerous in the southern hemisphere, and apparently least numerous in the North Atlantic Ocean (NMFS, 1984c, 1984d, 1984e). The humback whale is considered to be among the most depleted of the whales (NMFS, 1979). In contrast, the sperm whale is the most abundant and widespread (NMFS, 1980).

Overharvest is the primary cause of decline and reason for listing of the larger baleen whales (NMFS, 1984c, 1984d, 1984e).

SALT MARSH BIRD'S BEAK

The salt marsh bird's beak (*Cordylanthus maritimus* spp. *maritimus*), an annual herb 15 to 30 cm tall with cream to purple flowers, was listed as Endangered by USFWS in 1978 (USFWS, 1984c). No critical habitat has been designated. The species is also listed as Endangered by the State of California.

Ecology The habitat of the salt marsh bird's beak has been described as high marsh (USFWS, 1979b, 1981a; MMS, 1984a). The Draft Recovery Plan (USFWS, 1984d) provides additional detail: the species is most commonly found in salt marsh above mean lower high water and below extreme high water. It is also known from low areas behind dunes, shell mounds, and depressions flooded by freshwater.

Other plants associated with salt marsh bird's beak are pickleweed, salt grass, fleshy jaumea, alkali heath, sea lavender, and alkali weed (USFWS, 1979b, 1981a, 1984d). Sparsely vegetated areas are preferred (USFWS, 1984d). Salt marsh bird's beak is hemi-parasitic, forming root connections with other species, which include: salt grass, beard grass, pickleweed, fleshy jaumea, common sunflower, alkali bulrush, and cattail (USFWS, 1984d).

Range The historical range of salt marsh bird's beak extended from Carpinteria Marsh in Santa Barbara County south into northern Baja California (USFWS, 1979b, 1981a, 1984d). Herbarium records indicate that it was found in at least ten marshes in California (USFWS, 1984d; MMS, 1984b), and in as many as five marshes in Baja California (MMS, 1984b). Three of these historical sites were in Santa Barbara and Ventura counties (USFWS, 1984d; MMS, 1984b), with the largest and most vigorous historical population at Mugu Lagoon (MMS, 1984b).

The current distribution of salt marsh bird's beak includes six historical sites, one "new" location, and one reintroduction site (USFWS, 1984d; MMS, 1984b). These sites are Carpinteria Marsh, Ormond Beach, the Ventura County Game Preserve (a "new" site, without previous herbarium records), Mugu Lagoon, Anaheim Bay (reintroduction), Upper Newport Bay, Sweetwater Marsh, and the Tijuana River estuary (USFWS, 1984d).

The Carpinteria Marsh is the most northerly known extant location of salt marsh bird's beak (USFWS, 1984d; MMS, 1984b). The species was observed here in 1980, 1982 (USFWS, 1984d; MMS, 1984b) and 1983 (USFWS, 1984d). It was also observed at Ormond Beach in 1980, 1982 (USFWS, 1984d; MMS, 1984b) and 1983 (USFWS, 1984d). According to MMS (1984b), salt marsh bird's beak was first found at the Ventura County Game Preserve in 1981, but USFWS (1984d) indicates that it was found there in 1980. The Mugu Lagoon population is currently the largest and most vigorous in the project area (MMS, 1984b). This population is experiencing wide variations in numbers, due primarily to changes in tidal inundations and freshwater availability (USFWS, 1984d; MMS, 1984b).

A number of possible sites for this plant, where apparently suitable habitat is present but without documented presence of the species, occur in Santa Barbara and Ventura counties. Most of these sites are not likely to support the species because the marshes are highly disturbed (Knudsen, cited in MMS, 1984b), and most of these sites have not been surveyed recently (USFWS, 1984d). Goleta Slough contains favorable habitat, and has been identified as a suitable reintroduction site (MMS, 1984b; USFWS, 1984d). There are no historical records of the species from Goleta Slough, and the slough has not been surveyed recently (USFWS, 1984d). The mouth of the Santa Clara River supported salt marsh bird's beak in 1960 (MMS, 1984b; USFWS, 1984d), but a survey conducted in either 1981 or 1982 produced negative results (USFWS, 1984d). Additional potential sites in Ventura County include McGrath State Beach and the Ventura River Mouth, there are no historical records from these sites and neither has been surveyed recently (USFWS, 1984d).

Population Population data are not available for most of the salt marsh bird's beak sites. The major factor responsible for the decline of the species is the destruction of coastal salt marshes (USFWS, 1979b, 1981a; MMS, 1984a).

PROPOSED SPECIES

GUADALUPE FUR SEAL

The National Marine Fisheries Service is currently proposing the Guadalupe fur seal (*Arctocephalus townsendi*) for listing as a threatened species

(NMFS, 1985). No critical habitat is being proposed because areas that would qualify as critical habitat are located in Mexican territory (NMFS, 1985). The species was formerly listed as threatened under the Endangered Species Protection Act of 1966, but was apparently inadvertently deleted from the list in 1970 (Seagars, 1984; NMFS, 1985). This species is also listed as Rare by the State of California (Anonymous, 1984).

The Guadalupe fur seal is regularly found on San Miguel Island and occasionaly found elsewhere in the Southern California Bight. Sightings have been made at Point Bennet on San Miguel Island each year during the breeding season since 1969 (Seagars, 1984; NMFS, 1985). The number of seals seen in this area has ranged from one individual in 1970, 1979, and 1984 to a maximum of five individuals in 1978 (Seagars, 1984).

The species has been seen recently at San Nicholas, San Clemente, and Santa Barbara Islands (MMS, 1984a, Stewart et al., 1985). San Nicholas Island is apparently most frequently visited, there are nine records from this island (discounting five sightings of a juvenile in June and July, 1982 which are presumed to be one individual) (Stewart et al., 1985). One individual was recorded from San Clemente Island in 1975 (MMS, 1984a; Stewart et al., 1985). Two sightings, probably of the same individual, were recorded from Santa Barbara Island in July 1982 (Stewart et al., 1985).

Three pelagic sightings of Guadalupe fur seals have been recorded in the Southern California Bight since 1967 (Seagars, 1984; Stewart et al., 1985). Records of a male 40 miles south of Santa Rosa Island over the Santa Rosa Cortez Ridge and of a male 40 miles southwest of the Cortez Bank cited by MMS (1984a) appear to be duplicates of these records.

Ecology and Behavior The Guadalupe fur seal relies on its thick fur for insulation, like other fur seals (Seagars, 1984; NMFS, 1985; Stewart, 1985). Feeding habits and feeding range are virtually unknown (Seagars, 1984; NMFS, 1985), but this seal probably feeds on small schooling fishes and deep-water cephalopods (Seagars, 1984). It probably lives pelagically at least part of the year, apparently either in small groups or as solitary individuals (Seagars, 1984f).

The breeding season extends from May through July (Seagars, 1984). Subadult males and juveniles are apparently excluded from the rookery during this period (Seagars, 1984). Females begin to leave the rookery to forage for two to six days at a time following the birth of pups, which peaks in the third week of June (Seagars, 1984). Adult males leave the rookery from late July to early August (Seagars, 1984).

Range The historical non-breeding range of the Guadalupe fur seal extended from 18°N (the Revillagigedo Islands off Mexico) to 37°N (Monterey Bay) (Seagars, 1984; NMFS, 1985). The northern limit of the species is uncertain, CCMS (1982, cited in MMS, 1984a) reports that the Farallon Islands may have been the northern limit, Stewart et al. (1985) indicates that individuals may have seasonally dispersed as far north as the Farallons, but Seagars (1984) and NMFS (1985) states that the evidence reviewed does not support his hypothesis.

The historical breeding range of the species is thought to have extended from the Channel Islands south to Guadalupe Island, the San Benitos Islands, and the Cedros Islands off the coast of Baja California and may have extended as far south as Isla Soccoro in the Revillagiedos (Seagars, 1984; NMFS, 1985). San Miguel Island was probably a former breeding island (Seagars, 1984).

The current breeding range of Guadalupe fur seals is restricted to Guadalupe Island, off the coast of Baja Califronia (Seagars, 1984; NMFS, 1985). The statement in WESTEC Services (1984) that Guadalupe fur seals breed on San Miguel Island appears to be erroneous.

The current non-breeding range of the species is poorly known (Seagars, 1984, NMFS, 1985). The species has been observed with increasing frequency away from Guadalupe Island (Stewart et al., 1985). To the north, three males were seen at Point Piedras Blancas, San Luis Obispo County, in 1938; one juvenile was seen in Monterey Bay in 1977; and a female was stranded at Pillar Point, San Mateo County, in 1984 (Stewart et al., 1985).

Population The Guadalupe fur seal has been presumed extinct twice since its original discription (NMFS, 1985). The pre-exploitation population has been estimated at 20,000 to 200,000 individuals, 30,000 animals was probably the minimum number present at this time (Seagars, 1984, NMFS, 1985). The species was presumed extinct in 1897 (Seagars, 1984; NMFS, 1985), although there is one record from Santa Cruz Island dating from 1901 (Stewart, 1985). A herd of 35 to 60 seals were rediscovered in 1926, but this population was reported killed in 1928 (Seagars, 1984). The species was again presumed extinct until 1949, when one adult male was found on San Nicholas Island. A herd of 14 seals was dicovered in 1954 on Guadalupe Island (Seagars, 1984; NMFS, 1985).

The current population is believed to be less than 2000 animals (Bonnell et al., 1982, cited in MMS, 1982). A total of 1073 seals was counted on Guadalupe Island in 1977, and 1597 were counted on the island in 1984 (Seagars, 1984; NMFS, 1985). The latter count is considered the most reliable information currently available (Seagars, 1984; NMFS, 1985).

Overexploitation is the primary reason for the decline of the species and is the criterion best supporting listing of the species (Scammon, 1874, Hubbs, 1956, both cited in MMS, 1984a; NMFS, 1985). Three delisting criteria are included with the listing proposal: 1) growth to a population size of 30,000 animals, 2) establishment of one or more additional rookeries within the historic range, and 3) growth to the level at which maximum net productivity of the population occurs (NMFS, 1985).

POTENTIALLY SIGNIFICANT IMPACT PRODUCING AGENTS

The activities which could result in impacts include platform and pipeline installation, drilling and production, and facility abandonment. The potentially significant impact producing agents associated with these activities are potential oil spills, platform discharges, noise, and vessel traffic. Because existing onshore facilities will be used to process and transport the produced hydrocarbons, these activities are not expected to have associated impacts.

POTENTIAL OIL SPILLS

There were a total of 24 oil spills between 1975 and 1981 in the Pacific Outer Continental Shelf (OCS) region (MMS, 1984a). These spills have typically involved less than one barrel of oil, and the total volume of oil spilled was less than 20 barrels.

A number of potential causes of oil spills have been identified, as have factors affecting the degree of impact resulting from a spill. Causes include well blowout, vessel-vessel collisions, vessel-platform collisions, pipeline breaks, and operational errors (MMS, 1984a). The basic factors affecting the degree of impact are the abundance and sensitivity of the affected organisms, the degree of oil weathering and evaporation before contact with sensitive organisms, and the nature of the spill itself (MMS, 1984a). Relevant characteristics of a spill include whether the spill is instantaneous or continuous, the rate of spillage, the volume of oil spilled, the type of oil spilled, and weather and oceanographic conditions during the spill (MMS, 1984a).

Marine Mammals Because of fundamental differences in life history and morphology, the potential effects of contact with spilled oil differ between furred marine mammals (sea otters and fur seals) and those with minimal fur (cetaceans). These two groups are discussed separately below.

The effects of ingested oil on furred marine mammals are variable from species to species (Englehardt, 1983). Oil ingestion usually occurs while grooming the fur (Connell and Miller, 1981; MMS, 1984a). The ingested oil is potentially acutely toxic (Connell and Miller, 1981; USFWS, 1981), and is possibly carcinogenic (USFWS, 1981). Seals are known to have a high ability to metabolize ingested oil (Englehardt, 1983, 1984). Oil ingestion may also occur while juveniles nurse if the mother has been oiled (WESTEC Services, 1984). The effects of ingested oil on elephant seal and sea lion pups on San Miguel Island during the 1969 Santa Barbara Channel spill are uncertain

(Connell and Miller, 1981). No difference was observed in mortality rates of oiled and unoiled gray seal pups in Wales (Connell and Miller, 1981).

Contact with spilled oil can have a number of effects. The insulative qualities of fur are decreased (Connell and Miller, 1981; Englehardt, 1983, 1984; MMS, 1984a; WESTEC Services, 1984). The effects are greatest in species relying on air trapped in the pelage for insulation (Englehardt, 1983). Oiled fur results in an increased metabolic rate, and leads to increased grooming and consequent oil ingestion in some species (Englehardt, 1983). Buoyancy is decreased by oiled fur (WESTEC Services, 1984). Irritation of the eyes and exposed mucous membranes can occur (Connell and Miller, 1981; Englehardt, 1983), but this effect is temporary (Englehardt, 1983). Cutaneous absorption of oil has been demonstrated in seals (Englehardt, 1984). Long-term coating can result from contact with viscous oils (Englehardt, 1983, 1984), depending on the oil viscosity, temperature, pelage type, and the frequency and duration of exposure (Englehardt, 1983). Furred species are most susceptible to oil adherence (Englehardt, 1983). Adhered oil is known to affect the swimming ability of seals (Englehardt, 1983, 1984).

Spilled oil may be inhaled (WESTEC Services, 1984), but Englehardt (1983) indicates that only heavy oils cause this effect. Some deaths of heavily oiled harbor seals were attributed to suffocation by inhaled oil after the Arrow spill (Connell and Miller, 1981), and Englehardt (1983) indicates that inhaled oil has affected both seals and dolphins.

Oil ingestion has been identified as a potential effect on cetaceans (Geraci and St. Aubin, 1982, cited in MMS, 1984a), and has been documented in bottlenosed dolphins (Duguy, 1978, cited in MMS, 1984a). Ingested oil has variable effects from species to species (Englehardt, 1983). The baleen of baleen whales can be fouled by ingested oil (NMFS, 1979, 1980; Englehardt, 1983, 1984; MMS, 1984a), resulting in decreased filtering efficiency and causing food to adhere to the oil if it is persistent (MMS, 1984a). This affect may occur in bowhead whales (Braithwaite, 1980, cited in MMS, 1984a), but has been conclusively shown to have only a temporary adverse effect on the filtering efficiency of gray and fin whales (Geraci and St. Aubin, 1982, cited in MMS, 1984a). Although cetaceans have a high potential to metabolize ingested oil (Englehardt, 1983, 1984), petroleum hydrocarbons have been detected in the blubber of stranded cetaceans (Englehardt, 1983, 1984) and may accumulate in the blubber (Englehardt, 1983).

The effects of contact with spilled oil varies from species to species in cetaceans (Englehardt, 1983), but no documented occurrences of wild cetaceans affected by contact with spilled oil exist (Geraci and St. Aubin, 1979, cited in MMS, 1984a; Englehardt, 1983). Eye damage has been identified as a possible effect of contact with spilled oil (NMFS, 1979, 1980), as has skin damage (NMFS, 1980) The skin of cetaceans is virtually unshielded from the environment (Geraci and St. Aubin, 1982, cited in MMS, 1984a), but no petroleum hydrocarbons were detected in the skin of whales passing through the 1969 Santa Barbara Channel oil spill (Brownell, 1971 cited in MMS, 1984a). The effects of experimental oiling on bottlenosed dolphin skin were temporary, with no gross effects noted (Geraci and St. Aubin, 1982, cited in MMS, 1984a), and Englehardt (1983, 1984) indicates that effects on skin contact were temporary for several cetacean species.

Inhalation of oil has been identified as a possible effect on cetaceans (NMFS, 1979; Geraci and St. Aubin, 1982, cited in MMS, 1984a), possibly disrupting respiration (NMFS, 1980). Volatile constituents of oil may be inhaled (NMFS, 1979; MMS, 1984a), but the effects of inhaled volatile hydrocarbons on whales is unknown (MMS, 1984a). Plugging of the blowhole is very unlikely due to the explosive nature of the blow, followed by rapid inhalation and closing of the blowhole (Geraci and St. Aubin, 1979, cited in MMS, 1984a).

Spilled oil may result in behavioral changes, particularly avoidance (Geraci and St. Aubin, 1982, cited in MMS, 1984a). Evidence regarding the responses of cetaceans to oil conflicts, although studies show that cetaceans should be able to detect and avoid oil, the animals often do not actively avoid oil (Englehardt, 1983). Whales and dolphins have been observed swimming and feeding in oil slicks (Goodale, et al., 1981; Gruber, 1981, both cited in MMS, 1984a). Experiments with bottlenosed dolphins show that this species can detect heavy oil by echolocation and avoid it, and that the species avoids oil when contact is made (Geraci and St. Aubin, 1982, cited in MMS, 1984a). A number of behavioral changes have been noted in gray whales swimming through natural seep areas: swimming speed changed, and individuals spent less time at the surface while blowing less frequently and faster (Geraci and St. Aubin, 1982, cited in MMS, 1984a). Some whales either could not detect the oil or were indifferent to it (Geraci and St. Aubin, 1982, cited in MMS, 1984a).

<u>Birds</u> The effects of spilled oil on birds remains poorly understood. The review by Clark (in press) lists the following caveats regarding current knowledge of the effects of oil on birds. Laboratory studies often cannot be extrapolated to wild birds due to differences in life history and environments. The effects of spilled oil on populations is poorly documented, and it is difficult to separate oil-caused mortality from natural and other causes. There is little relation between the size of the spill and resulting bird mortality.

Many factors influence the vulnerability of birds to an oil spill. The tendency to form large, dense flocks on the water increases vulnerability, as does the amount of time spent on the water surface (Connell and Miller, 1981; MMS, 1984a). Species that forage by diving are more vulnerable to spilled oil (Connell and Miller, 1981; MMS, 1984a), and a tendency to dive when alarmed also increases vulnerability (MMS, 1984a). Species that are attracted to oil slicks are more vulnerable to spills (Connell and Miller, 1981). Cold weather or a cold climate increase vulnerability to oil by exacerbating thermoregulatory effects (Clark, in press).

Spilled oil is often ingested by birds, usually during preening (Nero and Associates, 1982, cited in MMS, 1984a). The short-term effects of ingested oil can include acute toxicity (MMS, 1984a). Longer-term effects can be lethal or sublethal. Numerous histological effects have been noted, including: wasting of muscle and fat (Holmes and Cronshaw, 1977, cited in MMS, 1984a; Clark, in press), liver abnormalities including fatty degeneration, kidney abnormalities including toxic nephrosis, adrenal disorders including adenocortical hyperplasia (Holmes and Cronshaw, 1977, cited in MMS, 1984a; Connell and Miller, 1981; Clark, in press), pituitary inhibition (Holmes and Cronshaw, 1977, cited in MMS, 1984a), spleen enlargement, pancreatic atrophy, lipid pneumonia (Connell and Miller, 1981), abnormalities in the nasal salt gland, gastrointestinal tract abnormalities, and a reduction in the white blood cell count (Clark, in press).

The primary physiological effect associated with ingested oil is severe dehydration. Several mechanisms have been proposed for this effect: salt gland malfunction (Berkner, cited in MMS, 1984a), impairment of intestinal ion absorbtion (Connell and Miller, 1981), and inhibition of intestinal ion absorption resulting in hypertrophy of the nasal salt gland (Clark, in press). Crude oil is apparently the most toxic form of oil in this regard, and weathered crude oil is more toxic than fresh crude oil (Connell and Miller, 1981; Clark, in press). This effect has been observed to result from a dose of 0.5g in young mallards, herring gulls, black guillemots, and in adult Leach's storm-petrel, but was not observed in adult mallards (Clark, in press).

Ingested oil may have physiological effects on reproduction in adult birds, but evidence conflicts on this effect. Egg laying may stop (Connell and Miller, 1981),or be depressed (MMS, 1984a). Clark (in press) indicates that a temporary reduction in laying can be observed in some species following doses of up to 1g of various types of oil. There is no relationship between the supposed toxicity of the oil and egg laying effects (Clark, in press). Reduced hatchability of eggs can also result from oil ingestion (MMS, 1984a; Clark, in press). This effect is due to abnormalities in the yolks, and is dependent on the rate and timing of yolk formation and laying (which varies widely between species), and the timing of the oil ingestion (Clark, in press). The growth rate of offspring may be reduced by ingested oil (MMS, 1984a), but results from different researchers conflict. Clark (in press) provides this summary: Miller et al. (1978a, b) claimed that the growth rate was reduced, Szaro (1977) found no reduction in growth rate except from massive doses, and no reduction in growth rate was measured by Holmes and Cronshaw (1977) and Gorman and Sims (1978).

Dispersants may be ingested if used to control a spill. No effects on weight gain, organ weights, corticosteriod levels, or plasma thyroxine levels were observed in wild herring gulls or Leach's storm-petrels dosed with dispersant (Butler et al., 1979; Miller et al., 1980; Peakall et al., 1981, all cited in Albers, 1984). Young mallards were less affected in regards to weight gain and blood chemistry by dispersant alone or dispersant and oil than by oil alone (Eastin and Rattner, 1982, cited in Albers, 1984).

Contact with spilled oil has been shown to have a number of effects on birds. Increased feather wear, matting, and breakage resulting from oil contact has been documented (USFWS, 1981a). Buoyancy is decreased (Connell and Miller, 1981; WESTEC Services, 1984; Clark, in press), and can result from any surface-active coating, not requiring matting or heavy oiling (Clark, in press). The insulative qualities of the plumage are impaired (Connell and Miller, 1981; WESTEC Services, 1984; Clark, in press), and can also result from any surface-active coating, without matting or heavy oiling (Clark, in press). Decreased insulation results in increased fat and muscle metabolism (Clark, in press). Clark (in press) indicates that the amount of oil contact necessary to produce lethal effects varies from species to species, and that drowning and hypothermia are the primary causes of death in the great majority of cases where birds are oiled.

Contact with oil can affect eggs after laying, in addition to the physiological affects on the reproduction of adults described above. Eggs can be contaminated by oiled adults, resulting in well-documented toxicity (USFWS, 1979, 1981; Albers, 1984; Clark, in press). Egg contamination causes increased egg mortality in mallards, Cassin's auklets, and gulls (Clark, in press). Eggs are most sensitive to oiling when the embryo is less than 10 days old (Szaro, 1977, cited in Clark, in press). Significant effects on mallard eggs were noted at doses as low as 1 microliter; Clark gives the 50% mortality external dose (LD_{50}) for mallard eggs as 5 microliters, and Connell and Miller (1981) report the external LD_{50} for mallard eggs as 20 microliters. Significant egg mortality in common eiders resulted from external doses of 20 microliters (Connell and Miller, 1981).

If dispersants are used for spill control, birds can be affected by contact with dispersant. Plumage contact with dispersants results in dispersal of the feather oils (MMS, 1984a), leading to wetting and feather matting (Albers, 1984). As of 1984, the effects of dispersants on eggs have only been examined for mallards, and microliter quantities of Corexit 9527 were found to delay embryonic development and reduce hatchability (Englehardt, 1984). Mixtures of dispersant and oil and dispersant alone were found to be as toxic to eggs as oil alone (Albers, 1979, cited in Albers, 1984). In another experiment, Albers and Gay (1982, cited in Albers, 1984) found that dispersant applied to water had no effect on mallard egg hatchability, and that dispersant and oil on water had the same effect on hatchability as undispersed oil.

PLATFORM DISCHARGES

Normal operation of Platform Gail will require discharge of solid and liquid wastes to the ocean. These discharges include drilling fluids and cuttings, formation water, and operational water.

Drilling fluids include both drilling muds and completion fluids, normally discharged from the platform after drilling. Drilling muds must be approved by EPA, and the types of muds and mud characteristics are specified for each platform (MMS, 1984a). Chevron does not anticipate using or discharging muds containing chrome lignosulfonate (WESTEC Services, 1984). Muds must be free of oil when discharged (WESTEC Services, 1984). Each well at Platform Gail is expected to produce approximately 900 barrels of excess mud and 600 barrels of completion fluids, totalling 30,600 barrels and 20,400 barrels respectively over the eight-year drilling period. Daily discharges are expected to range from 0 to 420 gallons per day (WESTEC Services, 1984).

The fate of discharged muds has been examined by several researchers. These studies found that muds are rapidly diluted within a relatively short distance (Ray and Shinn, 1975; Zingula, 1975, Ayers et al., 1980a; Ray and Meek, 1980,all cited in MMS, 1984a; WESTEC Services, 1984). A simulation experiment found dilution to 1:1000 within a maximum of 150 feet of the discharge point (Chevron, 1984, cited in WESTEC Services, 1984) The concentration of discharged muds were found to reach background levels within 200m (Ecomar, 1978, cited in WESTEC Services, 1984)or within several hundred meters (Ayers, et al., 1980b, cited in WESTEC Services, 1984).

Discharged muds primarily affect the benthic community within a short distance of the discharge point (MMS, 1984a). Reports conflict on the toxicity of drilling muds, MMS (1981, 1982) indicates that high concentrations are toxic, but Petrazulo (1981, cited in MMS, 1984a) indicates that the acute LC_{50} for benthic invertebrates is >10,000 ppm, indicating very low toxicity.

Cuttings consist of rock particles produced by the drilling operation. These particles are separated from the drilling muds, washed, and discharged from the platform (WESTEC Services, 1984). Each well is expected to produce approximately 2852 barrels of cuttings, and total cutting production from Platform Gail is expected to be 97,000 barrels (WESTEC Services, 1984). Discharges of cuttings will be about 1,330 gallons per day while drilling, and occasional after drilling is completed (WESTEC Services, 1984).

Because of their size and density, cuttings will settle to the ocean floor within a short distance of the platform (WESTEC Services, 1984).

Formation waters consist of water trapped in rock strata, and have historically been discharged to the ocean. Formation water typically contains low concentrations of various minerals such as iron, calcium, and magnesium (MMS, 1984a), and trace elements (MMS, 1981, 1982, 1984a; WESTEC Services, 1984). The ammonia content is often high, the water may be thermally enriched (WESTEC Services, 1984), and the water may be highly saline (UCLA, 1976, cited in MMS, 1981, 1982). Dissolved oxygen is absent (MMS, 1984a), and the biochemical oxygen demand is high (WESTEC Services, 1984). Although formation waters may include entrained oil (MMS, 1984a), the water will be treated so no more than 72 ppm oil remain before discharging (WESTEC Services, 1984).

The effects of discharged formation water are limited to an area within 500m of the discharge point (MMS, 1984a). The potential for impacts is limited by the dilution capacity of the receiving water column and the limited period that most organisms are exposed to discharged formation water (MMS, 1984a).

Operational discharges include sanitary effluent, cooling water, deck drainage, and desalinization brine, which have historically been discharged to the ocean (MMS, 1984a). During drilling, approximately 7,000 gallons per day of sanitary effluent with up to 50 ppm of suspended solids and at least 1.0 ppm of residual chlorine will be discharged; this discharge will decrease to 3,700 to 7,000 gallons per day after drilling is completed (WESTEC Services, 1984). Cooling water accounts for the highest volume of discharges (MMS, 1984a), and is expected to be 160,000 gallons per day at Platform Gail (WESTEC Services, 1984). This water will be up to 12° C warmer than the receiving water (MMS, 1984a). Deck drainage water will be 2,000 to 3,000 gallons per day during drilling and 0 to 250 gallons per day after drilling is completed (WESTEC Services, 1984). Deck drainage water will be treated to remove any oil before discharging (WESTEC Services, 1984). Desalinization brine will be discharged at a daily rate of 72,000 gallons while drilling, and 0 to 67,000 gallons after drilling is completed (WESTEC Services, 1984). The brine will be from 15 to 20% more saline than sea water (WESTEC Services, 1984).

Operational discharges are not expected to cause any effects due to treatment and dilution (WESTEC Services, 1984).

NOISE AND DISTURBANCE

Installation and operation of Platform Gail will produce noise, both above and below the water surface. Noise is not expected to affect birds, largely because sound is attenuated rapidly in air. Noise can be propagated over long distances in water, and is the activity component most likely to affect whales (Fraker et al., 1982, cited in MMS, 1984a).

The potential effects of noise on whales can be divided into two classes, disturbance and displacement, and physical. Disturbance and displacement effects include startle and flight, auditory discomfort (Gales, 1982, cited in MMS, 1984a), and communication masking (Turl, 1982). Physical effects may include hearing loss (Gales, 1982, cited in MMS, 1984a), which can occur if a short-term noise is loud enough (Turl, 1982; MMS, 1984a), or by prolonged exposure to moderate noise (Turl, 1982). Although audiograms indicate that cetaceans and pinnepeds are capable of hearing offshore drilling noises (Turl, 1982), there is no confirmed evidence that gray whales actively avoid platforms, helicopters, or seismic operations (Dohl, cited in MMS, 1984a).

Although no seismic operations are anticipated for Platform Gail, a brief discussion of noise generated by seismic operations is included to allow comparison with other lesser noise sources. The array of air guns normally used for seismic exploration produce one "pop" every 10 seconds, with loudness between 230 and 270 dB relative to one micro Pascal @ 1m (Acoustical Society of America, 1980, cited in MMS, 1984a), frequency between 100 and 300 Hz, and pulses lasting generally less than 1 second (Gales, 1982, cited in MMS, 1984a). There is no evidence of injury to whales from non-explosive seismic exploration noise sources, such as air guns (Task Force on Geophysical Operations, 1982, cited in MMS, 1984a). Responses of gray whales to seismic operation noises were examined in a field experiment, using both a single gun and array of guns, and producing peak noise estimated at 180 dB relative to one micro Pascal @ 1m (MMS, 1984a). With the array of air guns, cow-calf swimming behavior changed at a range of 5km, and confused swimming occurred at a range of 1.6 and 0.84km (MMS, 1984a). The critical distance for noticeable effects was consistently about 2km, and critical loudness was about 160 dB relative to one micro Pascal @ 1m, with normal behavior resuming when whales were 3.6 to 4.5km from the air guns (MMS, 1984a). The effects of a single air gun at 650 to 900m was similar to the effect of the array at 1.6km (MMS, 1984a).

Pipelaying is a temporary noise source. Pipes will be laid by the conventional barge and stringer method over a period of three months (WESTEC Services, 1984). This installation method produces little noise (MMS, 1984a).

Platform installation and abandonment are also temporary noise-producing activities (MMS, 1984a). The entire installation process typically requires six months, including initial jacket launching and upending, pile installation, and installation of the platform modules (MMS, 1984a). Abandonment is expected to occur in 25 to 35 years, with noise-producing activities including cementing, capping, and cutting wells; removal of the jacket and platform by crane and barge, and cutting of pilings (MMS, 1984a)

Drilling and production are more or less constant sources of noise. Drilling will require about eight years (WESTEC Services, 1984). Production noise begins within a year after drilling begins, and continues through the life of the project. The major noise sources are compressors and diesel engines, which produce noise with loudness of about 90 dBA relative to one micro Pascal @ 1m (MMS, 1984a). Total noise from a semi-submersible drill rig in the Atlantic Ocean was measured at 140 to 150 dB relative to one micro Pascal @ 1m, with a frequency range of 200 to 1,100 Hz (Turl, 1982). The signal to noise ratio produced by drilling activities was as high as 80 to 100 dB above background noise (Turl, 1982). There is little difference between drilling and production noise (Gales, 1982, cited in MMS, 1984a).

Sub-surface drilling and production noise, particularly low-frequency components, can be detected up to 100 miles from the source under ideal conditions (Gales, 1982, cited in MMS, 1984a). Low frequency (20 Hz) drilling and production noise can theoretically be detected by large whales up to 38km from the source, large whales should be able to detect mid-frequency (100 Hz) noise as far as 17.4km from the source, and higher frequencies (100 Hz) can be detected up to 174km from the source (Turl, 1982).

Operational noise above the water surface can be heard up to two miles from the source under ideal conditions, but is inaudible beyond 1/8 mile under rough sea and weather conditions (MMS, 1984a).

Crew boats and helicopters are another source of noise. The primary source of noise from crew boats is propeller cavitation, which occurs during normal, high speed, and maneuvering operations (MMS, 1984a). Noise produced by boats ranges from about 140 to 150 dB relative to one micro Pascal @ 1m in loudness, with a frequency range of 300 to 1,800 Hz (Turl, 1982). Measured noise from crew boats and supply boats in the Beaufort Sea was 20 to 40 dB above background levels (Fraker et al., 1981). Helicopters operate daily, but most of the noise produced is reflected from the water surface (MMS, 1984a).

The amount of sound entering the water and propagation of the noise is affected by the helicopter type, altitude, and flight conditions; sound speed profiles; sound absorption characteristics of the sea bottom (Gales, 1982, cited in MMS, 1984a); and water surface roughness (MMS, 1984a).

No data on the responses of whales to boat noise are available. Gray whales showed no noticeable response to helicopters flying at an altitude greater than 1,000 feet (Leatherwood, cited in MMS, 1984a), but playback of helicopter noise at 250m altitude, and producing an estimated 111 to 118 dB relative to one micro Pascal @ 1m resulted in an annoyance and avoidance response (Malme et al., 1983, cited in MMS, 1984a).

<u>VESSEL TRAFFIC</u>

Installation and operation of Platform Gail will require an increase in vessel traffic. During the installation, pipelaying, and drilling phases of the project, one crewboat will make two round trips per day from Carpinteria, and a supply boat will make one round trip per day from Port Hueneme (WESTEC Services, 1984). During the production phase, the crewboat will make one round trip per day between Carpinteria and the platform (WESTEC Services, 1984).

The chance of collision between boats and endangered species, particularly marine mammals, is negligible.

ESTIMATED MOST LIKELY IMPACTS

This section presents the impacts most likely to affect endangered or threatened species, based on the life histories of the species and the characteristics of the impact producing agents. The impact agents that could potentially affect each species group are identified, as are agents unlikely to affect the species group. The most likely impacts are estimated for each species.

The greatest likelihood of impacts to threatened and endangered species from operating Platform Gail would result from potential oil spills; and this section is focused on potential oil spills for that reason. The probability of occurrence of a large spill (>1,000 bbl) is quite low (0.07). This low probability results in very low most likely impacts for all species and very low impact probabilities for most species. Other potential impact producing agents and smaller oil spills are unlikely to significantly affect the species under consideration.

The greatest likelihood of impacts to threatened and endangered species from operating Platform Gail would result from potential oil spills. Most likely impacts, especially regarding oil spills, are defined as the more likely of two possible events: 1) a large spill will occur and oil will contact the species in operation, or 2) that no large spill will occur or spilled oil will not contact the species in question. The estimated most likely impacts and potential impacts are assigned different levels, using the criteria outlined by MMS (1984b). A high level of impact is defined by 1) a regional or species-wide population decline greater than 5%, 2) persistence of a population decline for more than five years, or persistence of a 3) distributional or 4) ecosystem change for more than 10 years. A moderate level of impact is defined by 1) a regional or species-wide population decline less than 5%, or persistence of 2) a population reduction, 3) distributional change, or 4) ecosystem effects for more than five years. The impact level is low if 1) a regional or species-wide population decline is less than 1%, or if a 2) population reduction or 3) distributional change would be evident for more than one to three years, and 4) no ecosystem effects are evident. The high and moderate levels are considered significant, and the low level is considered significant due to the possible cumulative significance. The very low impact level is not considered significant and is defined by 1) limited mortality, distributional change, or reproductive reduction; 2) lack of measurable effects on the population after one breeding cycle; and 3) lack of ecosystem effects. The impact levels are also assigned regional and local significance levels. A regionally significant impact would 1) cause or contribute to a measurable population change lasting more than five years, or 2) cause or contribute to key habitat degradation lasting more than five years. A locally significant impact would cause or contribute to changes in species composition or distribution in more than 10% of an area of contiguous habitat for more than five years.

A spill risk analysis was performed by Dames and Moore (1985) to evaluate the likelihood of spills from Platform Gail. The spill risk analysis is based on a number of assumptions, which are described below. The first of the assumptions is that past experience is a reliable indicator of the future, which must be made to allow use of historical data. This assumption is probably conservative, as the rate of spills has apparently been declining (Dames and Moore, 1985). The second assumption, which appears to be reliable, is that the underlying causes (e.g. mechanical failure, human error) of oil spills remain the same (Dames and Moore, 1985). The third assumption is that the intrinsic spill rate is not affected by changes in technology or regulations. This assumption must be made to allow use of historic data, but appears to be conservative because the intrinsic spill rate apparently declined (Dames and Moore, 1985). The final assumption is that the causes of oil spills in the Santa Barbara Channel are similar to the causes of spills at other US offshore oil and gas operations, which must be made to allow predictions. Data from the Gulf of Mexico OCS was used for this analysis, a conservative assumption because the gulf is considered a more risky environment for oil and gas operations (Dames and Moore, 1985). Certain differences, such as hurricanes, were corrected for.

The spill risk analysis considered three types of oil spills: blowouts, non-blowout platform spills, and pipeline spills. The probability of occurrence was calculated for each spill type and for all types combined. The analysis found that small spills (larger than 10 barrels) are most likely, with the probability of one or more spills of this size given as 0.69 (Dames and Moore, 1985). Spills larger than 100 barrels and spills larger than 1,000 barrels in size are less likely, the probability of one or more spills of these sizes is 0.16 and 0.07, respectively (Dames and Moore, 1985). Large spills (over 10,000 barrels) are the least likely, with the probability of one or more occurrences calculated as 0.03 (Dames and Moore, 1985).

To assist in the estimation of likely impacts, a trajectory analysis for potential oil spills from the project was prepared by Dames and Moore (1985). The trajectory analysis considered wind forces, from a 14-year data base, and both tidal and geostrophic current forces. Several factors were not considered: waves, which tend to slow movement of a slick; wind-wave current interactions, which also tend to slow slick movement; and physiochemical changes to the slick itself, such as evaporation and emulsification. The analysis was done by a computerized Monte Carlo technique, combining the forces acting on a slick every 20 minutes throughout the 3-day and 10-day simulation periods. A 3-mile modeling grid was used, and 200 runs were made for each month for both the three-day and ten-day simulations.

The results of the trajectory analysis indicate the most likely paths of the centroid of a two-dimensional slick. These results were then used to calculate contact probabilities. Three probability types are considered in this section: 3-day conditional contact probability, 10-day conditional contact probability, and 10-day total contact probability for spills larger than 1,000 barrels. The conditional probabilities are the probability (reported in percent) that an uncontrolled spill would, within 3 days or 10 days, contact the resource in question if a spill were to occur. The 10-day total probability for spills larger than 1,000 barrels is the percent probability that an uncontrolled spill over 1,000 barrels will occur and contact the resource in question within 10 days.

The total probabilities reflect most likely impacts in the sense that the probabilities of both spill occurrence and contact are considered. These figures show that the probability of an impact is small, and that the probability of no impact is much larger. The actual most likely impact in almost all cases is no impact at all. Conditional probabilities represent potential impact probabilities, as they consider only the probability of contact and not the probability of spill occurrence.

The analysis of potential oil spill impacts is focussed on larger spills (<1,000 bbl). Smaller spills are significantly more likely to occur, but are less likely to affect the species under consideration in almost all cases. The lower likelihood of impact from smaller oil spills is due to lower likelihood of contact, resulting from differences in behavior between large and small spills. Smaller spills are more easily controlled and recovered than larger spills. Many factors affecting spilled oil are influenced by surface to volume ratios, which are generally larger for small spills than large spills. The affecting factors include evaporation, dissolution, dispersion, emulsification, and photo- and autooxidation, and sedimentation. Evaporation can remove up to two thirds of an oil spill mass in hours or a day (Jordan and Payne, 1980, cited in National Research Council, 1985), the other factors account for lesser spill volume losses.

The contact probability analyses in Dames and Moore (1985) consider oil spill events that are essentially instantaneous, however, oil from spill events of longer duration would probably behave differently. An "instantaneous" oil spill would be unlikely to contact more than one sensitive resource site, unless two such sites were no more than one or two 3-mile square modeling grid blocks apart (Hargis, personal communication). In the case of an oil spill of longer duration, the forces acting on the oil spilled at the beginning of the event may differ from those forces acting on oil spilled later in the event. Oil from a long duration release may in effect follow more than one trajectory, making contact with multiple sensitive resource sites possible. Basically, the longer the duration of the spill event, the greater the chance that the spill will contact multiple sensitive sites. The duration of the spill event is a more important factor than the volume of oil spilled because the slick would not spread completely before contacting shore (Hargis, personal communication).

For purposes of this report, we have assigned contact probabilities to six classes. A very low contact probability is defined as total probability less than 1%. Total contact probabilities between 1 and 5% are defined as low, those between 5% and 10% are low/moderate, and contact probabilities between 10% and 25% are defined as moderate. Substantial contact probability is defined as total contact probability between 25% and 50% and likely contact is defined as total contact probability over 50%.

Unless a different assumption is noted, contact by spilled oil is assumed to result in 100% mortality, representing a worst case situation.

REPTILES

Four listed reptiles may be present in the project area: green sea turtle, leatherback sea turtle, loggerhead sea turtle, and olive (Pacific) Ridley's sea turtle. These species are potentially affected by an oil spill, platform discharges, noise, and increased vessel traffic (MMS, 1984a).

The probability of impacts on individuals of these species is very low, primarily because a very small number of turtles are scattered in the project area (MMS, 1984a). Vessel traffic has been identified as the agent most likely to cause impacts on marine turtles, but is likely to result in very low level impacts and no significant impacts (MMS, 1984a). Impacts on the populations of these turtles are also very unlikely due to the very small portion of the populations present in the project area.

In summary, no significant impacts on marine turtles are anticipated.

BIRDS

Five listed bird species may be present in the project area: brown pelican, bald eagle, peregrine falcon, light-footed clapper rail, and California least tern. An oil spill is the impact producing agent most likely to affect these species (USFWS, 1979, 1981, 1984; MMS, 1984a). Platform discharges are not likely to affect birds because of the distance between the platform and bird concentration areas and because of dilution of the discharges (MMS, 1984a). Noise is not an impact producing agent for birds because of the distance between birds and the noise source and because of rapid sound attenuation in air. Crew boats are also not expected to cause significant impacts. Three of the species in question, the bald eagle, peregrine falcon, and light-footed clapper rail are rarely offshore, and all birds are relatively capable of avoiding boats.

Brown Pelican The estimated most likely impacts on brown pelicans is very low due to the low probability of spill occurrence. The estimated potential impacts on brown pelicans can be summarized as follows. A spill could result in low to moderate level impacts at any location within the foraging range, which includes essentially the entire Santa Barbara Channel. The probability of low to moderate level impacts on the mainland concentration area is low/moderate, but very low at other concentration areas. Impacts on breeding or fledgling pelicans are unlikely, but there is a small probability of low to moderate level impacts.

Pelicans have several traits increasing their vulnerability to an oil spill: they forage by diving, they spend a significant amount of time on the water, and they tend to form flocks on the water. Pelicans do not dive when alarmed, so their vulnerability to oil spills is not increased this factor, and the attraction to oil slicks is unknown. Pelicans could be affected by spilled oil either by diving through it when feeding or by landing in a slick.

Pelicans' use of the project area includes year-round feeding, concentration areas, and breeding locations. The following analysis considers each of these uses individually.

Because the foraging range of brown pelicans includes essentially the entire Santa Barbara Channel, total contact probabilities do not adequately show the probability of impact. These probabilities reflect shoreline contact as well as spill occurrence, but any oil spill from Platform Gail would be within the pelicans' feeding range. In this special case, the probability of spill occurrence most accurately shows the probability of oil spilling where pelicans could come into contact with it. Table 7 presents the occurrence probabilities of spills of various sizes within the foraging range.

The more likely to occur small spills (less than 1,000 barrels) would be likely to contact pelicans, given the widespread nature of foraging pelicans. Although pelicans do concentrate in certain areas at various seasons, individuals can be found throughout the range at any time of the year. Considering the most likely size of the spill (between 10 and 100 bbl), direct impacts would probably be at the very low level, due to the relatively small area likely to be affected by a spill of this size. A low level impact would result from oiling eight to ten pelicans in winter or spring and 110 to 150 pelicans in summer or fall. To reach the moderate level of impact, mortality would have to exceed 40 to 50 individuals in winter and spring and exceed 550 to 750 individuals if the spill occurred in summer or fall. Past spills (e.g. Manatee) have resulted in mortality levels lower than these mortality thresholds (the percent mortality lying between different impact levels defined by MMS). Indirect impacts from a small spill would probably be minor.

The large spills that are less likely to occur would also be likely to contact pelicans. Direct impacts would probably be at the low to moderate level, with the same thresholds. The spill risk analysis indicates that the probability of two spills from Platform Gail larger than 1,000 barrels is zero (Dames and Moore, 1985), discounting the probability of cumulative impacts resulting from multiple spills. Indirect impacts are more likely to occur, but are unlikely to be measurable considering the lack of definite knowledge on the subject.

Non-breeding concentration areas are located on the mainland coast between Ventura and Point Mugu, at Santa Cruz Island (including Gull Island and Scorpion Rock), on the Anacapa Islands, and at Sutil and Santa Barbara islands. With the exception of the mainland between Ventura and Point Mugu, pelicans concentrate at these areas year-round. The factors influencing vulnerability and the modes of impact would be the same as described above. Table 7 illustrates the probability of contact at these locations.

An oil spill, if one were to occur, would be likely to contact the mainland concentration area between Ventura and Point Mugu. The relatively high probability of contact is due both to the expected trajectory of a spill and to the relatively large size of this target (Hargis, personal communication). The resulting level of impact is uncertain, as population data for this concentration area is unavailable. The impact level would probably be similar to those expected from a spill in the feeding range. The probability of contact at the Santa Cruz Island complex is very low in winter and fall. Population data to evaluate the level of impact are unavailable, but would also be expected to be similar to a spill in the feeding range. The probability of contact at the other islands and at the Santa Cruz Island complex in spring and summer is very low to zero, making significant impacts very unlikely.

The main pelican breeding area is located at West Anacapa Island, and less frequently used breeding sites are found at Scorpion Rock, Prince Island, and Sutil Island. The breeding season normally begins in early spring and extends through summer, with fledglings remaining in the area through the fall

Table 7
Contact Probability at Brown Pelican Concentration Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
Ventura to Pt. Mugu			
Spring	76.23	87.88	6.15
Santa Cruz Is., Gull Is., and Scorpion Rock			
Winter	0.67	1.33	0.70
Spring	0.34	0.17	0.01
Summer	0	0	0
Fall	0.67	0.67	0.19
Anacapa Islands			
Winter	0.66	0.67	0.08
Spring	0.17	0	0
Summer	0	0	0
Fall	0	0.67	0.05
Santa Barbara and Sutil Islands			
all seasons	0	0	0

Source: Dames and Moore, 1985

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1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.

season. The adult birds would be vulnerable to spilled oil for the reasons discussed above, and fledglings would be vulnerable due to their tendency to land on the water near the breeding islands. The mode of impact for adults and fledglings would include landing in an oil slick, adults may be oiled while diving for food, and eggs or nestlings could be oiled by contaminated adults. Table 8 presents the probabilities of contact at pelican breeding sites.

The probability of contact at any of the pelican breeding locations during the nesting season is zero, so no effects would be expected. The probability of contact during the fledging season at Prince Island and Sutil Island is also zero, and the contact probability at Scorpion Rock and West Anacapa Island is very low during this season. The likelihood of impacts at Scorpion Rock is reduced by the irregular use of this site, no impact on fledglings could occur unless this site were in use when a spill occurred. Although contact with the Anacapa Island site is very unlikely, the mortality threshold between the low and moderate impact levels would be approximately 45 to 75 individuals (1% of pairs + young).

<u>Peregrine Falcon</u> Peregrine falcons may be present in the project area as migrants, released birds, and possibly as nesters.

The probability of a migrant peregrine contacting spilled oil is very low, due to the very small numbers of migrant peregrines present in the area. Their low abundance and the fact that the species does not form flocks, does not spend any appreciable time on the water, and does not dive when foraging or alarmed contributes to low vulnerability. Peregrines may be attracted to oil slicks by easily captured oiled prey. These birds would have to capture and consume oiled prey to be affected. The most likely impact level on migrant peregrines would be very low.

Young peregrines have been released (hacked) at several sites in the project vicinity, including Catalina Island, Gaviota Pass, and a site in the Santa Monica Mountains. The probability of contact at the Catalina Island and Gaviota Pass sites is zero (Dames and Moore, 1985). The 3-day conditional contact probability for shorelines within ten miles of the Santa Monica Mountains site is zero at all seasons, and the 10-day contact probability in this area is 0.17% in winter and zero in other seasons (Dames and Moore, 1985). The total 10-day contact probability at this location for spills larger than 1,000 barrels is 0.01% in winter and zero in other seasons (Dames and Moore, 1985). These birds would be subject to the same factors affecting vulnerability and mode of impact as migrants. Because the contact probability for hacked peregrines is very low to zero, no significant impacts would be expected.

Table 8
Contact Probability at Brown Pelican Breeding Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
West Anacapa Is.			
Spring	0	0	0
Summer	0	0	0
Fall	0	0.67	0.05
Scorpion Rock			
Spring	0	0	0
Summer	0	0	0
Fall	0.17	0.67	0.05
Prince Island			
Spring	0	0	0
Summer	0	0	0
Fall	0	0	0
Sutil Island			
Spring	0	0	0
Summer	0	0	0
Fall	0	0	0

Source: Dames and Moore, 1985

1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.

An active peregrine falcon eyrie may exist in the Point Conception area. The contact probability at Point Conception is zero at all seasons (Dames and Moore, 1985), so no impacts are expected on possible nesters. The factors influencing vulnerability of nesters are the same as those described for migrants, however, nesting peregrines could be affected by oiling of eggs or young by adult birds in addition to capture and consumption of oiled prey.

In summary, no significant impacts on peregrine falcons are expected.

Bald Eagle Bald eagles may be present in the project area as migrants and as released birds.

Migrant bald eagles are present in very small numbers, making the probability of contact very low. In addition to the low numbers present, the vulnerability of bald eagles to spilled oil is reduced by their non-flocking habits, negligible time spent on the water, most commonly a non-diving foraging method, and no tendency to dive when alarmed. Bald eagles may be attracted to oiled prey in or near oil slicks, making capture and consumption of oiled prey the most likely mode of impact. Due to the small probability of contact and relatively low level of vulnerability, no significant impacts on wintering bald eagles are expected.

Bald eagles have been released (hacked) on Catalina Island. The probability of contact at Catalina Island is zero (Dames and Moore, 1985), so no impacts are expected. The factors influencing vulnerability of hacked bald eagles are similar to those discussed above, but the probability of capture of oiled prey is lessened by these birds' diet, consisting mainly of upland carrion.

To summarize, no significant impacts on bald eagles would be expected to occur.

Light-footed Clapper Rail The estimated potential impacts to light-footed clapper rails can be summarized as follows. Significant impacts at Goleta Slough are unlikely, and no impacts are expected at the locations south of Los Angeles. The probability of contact at Carpinteria Marsh is very low; and if contact were to occur, the potential impacts on a US-wide basis would probably be low, with moderate to high impact levels progressively less likely. Impacts at Carpinteria Marsh would be regionally significant if any mortality were to occur. The potential impacts at Mugu Lagoon would be less than at Carpinteria Marsh.

Light-footed clapper rails may be year-round residents at Goleta Slough, Carpinteria Marsh, Mugu Lagoon, Anaheim Bay, and Upper Newport Bay. Table 9 shows the probability of contact at these sites for each season of the year.

Light-footed clapper rails could be affected by direct oiling if a spill entered an occupied marsh, by indirect oiling from contaminated vegetation or prey, and by subsequent oiling of eggs or young. The vulnerability of light-footed clapper rails is influenced both by the life history of the species and by related oil spill control technology. The species does not form flocks, spends little time on the water, does not dive to forage, does not normally dive when alarmed, and probably has no attraction to oil or oiled prey, each of which reduces vulnerability to spilled oil. The rails inhabit tidal marshes with small openings to the ocean, which are relatively easily protected from spilled oil. The results of the spill trajectory analysis indicate that oil would be unlikely to reach light-footed clapper rail sites within three days, allowing time to transport and install oil protection devices and further reducing the vulnerability of light-footed clapper rails to spilled oil.

The probability of contact at Goleta Slough is very low to zero. Considering the relatively low vulnerability resulting from the species life history and spill control technology, significant impacts are unlikely at this site. The probability of impact is reduced further by the fact that this site may be unoccupied, no impacts to rails at this site could occur if none are present.

At Carpinteria Marsh, the contact probability ranges from zero to very low, depending on the season. The contact probability is very low in fall, spring, and winter; and zero in summer. Again, the life history of the rails and spill control technology reduce the vulnerability of rails at Carpinteria Marsh. If oil were to enter the marsh, the level of impact would depend on the degree of mortality and persistence of the effects. A 100% mortality rate is unlikely considering the vulnerability factors, however, 100% mortality at this site would reduce the U.S. population by 7% and the regional (north of Los Angeles) population by 97%. These effects are high levels of impact. Lesser mortality rates are more likely to occur: a mortality rate of 69% represents the threshold between moderate and high impact levels on a US-wide level, and a 14% mortality rate is the threshold between moderate and low impact levels on the same basis. Because the population of rails north of Los Angeles is small, loss of one pair of rails in Carpinteria Marsh would be regionally significant.

The probability of contact at Mugu Lagoon is very low in all seasons. Potential mortality would be affected by the factors described above, and would probably be less than 100%. The rail population at Mugu Lagoon is very

Table 9
Contact Probability at Light-footed Clapper Rail Breeding Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
Goleta Slough			
Winter	0	0.33	0.02
Spring	0	0	0
Summer	0	0	0
Fall	0	0.67	0.05
Carpinteria Marsh			
Winter	0.17	0.83	0.06
Spring	0.33	1.17	0.08
Summer	0	0	0
Fall	0	10.67	0.75
Mugu Lagoon			
Winter	0.67	1.50	0.11
Spring	0	4.50	0.32
Summer	0.67	0.83	0.06
Fall	0.67	0.83	0.06
Anaheim Bay			
all seasons	0	0	0
Upper Newport Bay			
all seasons	0	0	0

Source: Dames and Moore, 1985

[1] Percent conditional probability for a spill of unspecified size.
[2] Percent conditional probability for a spill of unspecified size.
[3] Percent total probability for a spill >1,000 bbl.

small, so 100% mortality would be at a very low impact level at the US-wide, basis and a moderate level impact at the regional basis.

No impacts at the Anaheim Bay or Upper Newport Bay sites are expected because the probability of contact at these locations is zero.

California Least Tern The estimated potential impacts on non-breeding least terns would be low to very low, and the post-breeding concentration areas are unlikely to be affected. Three breeding locations have very low to low probabilities of contact: the Santa Clara River mouth (low in spring and summer), Ormond Beach (low in spring and very low in summer) and Mugu Lagoon/ Point Mugu (very low in spring and summer). The level of impacts would depend on the numbers of terns present, which varies from year to year. If spilled oil reached these sites, impact levels would range from very low to high, depending on the numbers of terns.

Least terns are present in the project area as non-breeding birds, breeding birds, and as post-breeding birds.

Non-breeding birds are widespread along the coast, and are present during the spring and summer. The 3-day trajectory simulation indicates that 79.7% of spring trajectories and 65.7% of the summer trajectories reach shore (Dames and Moore, 1985), where they would be within the foraging range of these birds. In the 10-day trajectory simulation, 79.3% of the spring trajectories reach shore and all of the summer trajectories reach shore (Dames and Moore, 1985). The vulnerability of least terns to oil is increased by their diving foraging method, but the birds do not form large flocks, spend little time on the water, and do not dive when alarmed. Their attraction to oil slicks is unknown. The most likely mode of impact would be oiling while diving for food.

Population data are not available to evaluate the significance of potential impacts. Because of the widespread nature of these birds, a small spill would be unlikely to result in mortality exceeding the low impact level threshold and would probably be at the very low level. Larger spills, which are less likely to occur, could result in mortality exceeding the low impact level on a regional basis.

Post-breeding concentration areas are located at Oso Flaco and Dune Lakes, the Santa Ynez river mouth, Point Mugu and Mugu Lagoon, Harbor Lake, and at Belmont Shores. Terns are present in these areas during the summer. Factors influencing the vulnerability of these birds are the same as described above, and the mode of impact would be the same. Table 10 presents the probability of contact at the post-breeding concentration areas.

Table 10
Contact Probability at California Least Tern Post-breeding Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
Oso Flaco Lakes and Dune Lake	0	0	0
Santa Ynez River	0	0	0
Mugu Lagoon/Point Mugu 0.67 0.83	0.06	0.83	0.06
Harbor Lake	0	0	0
Belmont Shores	0	0	0

Source: Dames and Moore, 1985

1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.

The contact probabilities for all post-breeding concentration areas except Mugu Lagoon and Point Mugu are zero, so no impacts are expected at these sites. At Mugu Lagoon and Point Mugu, the contact probability is very low, indicating that significant impacts are unlikely.

Least tern nesting locations are found north of Point Conception (Santa Ynez River, Purisima Point, San Antonio Creek, Santa Maria River, and Oso Flaco and Dune Lakes), at the Santa Clara River, Ormond Beach, Mugu Lagoon, and in Los Angeles County (Venice Beach, Playa del Rey, Terminal Island, San Gabriel River, and Costa del Sol). The nesting season begins in spring and is completed by summer. Breeding birds could be oiled while diving for food and eggs or young could be oiled by adults, factors influencing vulnerability are the same as described above. Contact probabilities for the breeding locations are shown in Table 11.

Contact probabilities for the Santa Clara River, Ormond Beach, and Point Mugu and Mugu Lagoon range from very low to low. The Santa Clara River site contact probability is low in both summer and spring. At Ormond Beach, contact probabilities are low in spring and very low in summer. The contact probabilities at Mugu Lagoon/Point Mugu are very low in spring and summer. Because least terns forage offshore in addition to protected estuaries, oiling and mortality are relatively likely to occur if a spill reaches these areas. Although mortality rates would probably be lower, a 100% rate was used in the following analysis. The significance of these effects would be highly variable from year to year due to the high variability in the population size at breeding sites.

On a regional basis (San Luis Obispo to Los Angeles counties), a 100% mortality rate at the different sites would have the following significance. The Santa Clara River location had much less than 1% of the regional population in 1983, which is the lowest recorded, but the highest recorded population would have been 12% of the 1983 regional population. Impact levels would range from very low to high at this site, depending on the actual population if a spill contacted the area. Ormond Beach is also at the lowest population recorded, 1% of the regional population, and the highest recorded population would have accounted for 18% of the 1983 regional population. Impact levels would be low to high at this site. Mugu Lagoon/Point Mugu is at the highest recorded level, representing 7% of the 1983 regional population, and would have contained 3% of the 1983 regional population at its lowest level. Impact levels here would range from high to moderate.

On a species-wide basis, 100% mortality at the breeding locations would have these effects: The Santa Clara River had much less than 1% of the 1983

Table 11
Contact Probability at California Least Tern Breeding Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
North of Point Conception[4]			
all seasons	0	0	0
Santa Clara River			
Spring	20.83	33.67	2.36
Summer	25.20	51.17	3.58
Ormond Beach			
Spring	17.50	17.67	1.24
Summer	10.80	9.67	0.68
Mugu Lagoon/ Point Mugu			
Spring	5.83	4.50	0.32
Summer	0.67	0.83	0.06
LA County and south[5] all seasons	0	0	0

Source: Dames and Moore, 1985

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1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.
4 Includes Santa Ynez River, Purisima Point, San Antonio Creek, Santa Maria River, and Oso Flaco Lakes and Dune Lake.
5 Includes Venice Beach, Playa del Rey, Terminal Island, San Gabriel River, and Costa del Sol.

population, and would have 3% of the population if it were at the highest recorded population. Impact levels would be very low to moderate. Ormond Beach supported less than 1% of the population in 1983, and would account for 5% of the population if at the highest recorded levels. Impact levels here would be very low to moderate. The 1983 population at Mugu Lagoon/Point Mugu was 2% of the total, and would be much less than 1% if at the lowest recorded levels, representing moderate and very low impact levels.

No impacts on colonies north of Point Conception and in Los Angeles counties are expected because contact probabilities at these locations are zero.

MAMMALS

Four listed mammal species or species groups may be present in the vicinity of Platform Gail: southern sea otter, gray whale, right whale, and other endangered whales. An oil spill could potentially affect any of these species, and noise and crew boats could potentially affect the cetaceans. Noise and crew boats are unlikely to affect southern sea otters due to the distance between the otter range and the project site. Platform discharges are unlikely to affect listed mammals due to rapid dilution and the low probability of prolonged contact (MMS, 1984a).

Southern Sea Otter The main range of the sea otter is north of the Santa Maria River, and the range of the nomadic males extends south to Point Conception. The probability of an oil spill contacting either of these areas is zero (Dames and Moore, 1985). No impacts on southern sea otters is expected for this reason.

Gray Whale Gray whales migrate past the project area twice each year, on both southbound and northbound migrations. A few individuals winter in the project area, particularly around the islands.

The offshore migration route is used by most of the gray whale population during the southbound migration. The probability of spilled oil reaching the offshore migration route is zero (Dames and Moore, 1985), so no impacts from spilled oil would affect whales using this route. Noise generated by project activities would probably be detectable at parts of the offshore route, but the route is much farther from the platform than the distance at which behavioral changes result from much louder seismic operation noise, so no behavioral or physical impacts would be expected. This migration route is well offshore from project vessel routes, so no impacts would result from vessel traffic.

The inshore migration route is used by less than half of the southbound gray whales. The 3-day trajectory simulation indicates that 80.7% of fall trajectories and 76.5% of winter trajectories remain at sea, and the 10-day simulation indicates that 9.8% of fall trajectories remain at sea and 20.7% of winter trajectories remain at sea (Dames and Moore, 1985). Spills remaining at sea would probably not cross the migration route, which closely follows the coastline. The total shoreline contact probability for the 10-day simulation the total probability of shoreline contact by spills larger than 1,000 barrels is 6.37% in fall and 5.63% in winter. Based on these figures, the probability of contact is low/moderate, but relatively few individuals would be affected due to the small numbers of whales that might cross a slick during the time the slick would be in the migration route. The effects on contacted whales would probably be temporary, and may include temporary physical and behavioral impacts. Mortality and lasting ecological effects are unlikely, so impacts would be at the very low level.

The entire population, with the possible exception of cows with calves, uses the inshore route on the northbound migration. The contact probability during the winter would be the same as noted above, and both the 3-day and 10-day trajectory simulation showed that 20.7% of the trajectories remain at sea during the spring (Dames and Moore, 1985). The total shoreline contact probability for spills larger than 1,000 barrels in spring is 5.59%. The contact probability would be low/moderate, but again would be likely to affect a limited number of individuals, with temporary effects at the very low impact level.

Project generated noise would be within detectable range of the inshore migration route. Again, the route is much farther from the platform than the range at which behavioral effects result from louder seismic operation noise, so no mortality or short-term behavioral effects are expected. The impact level for noise on the inshore migration route would be very low.

Vessel traffic from Platform Gail will cross the inshore migration route. The probability of a collision between a whale and boat is very low, and is not expected to result in significant mortality.

Individual gray whales have been observed wintering near San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Catalina islands. The wintering season includes the latter part of fall, winter, and early spring. Table 12 presents the contact probability at these locations. Contact probability ranges from very low at Santa Cruz Island, San Miguel Island, and the Anacapa Islands to zero at other islands. Only a few whales would be present, and the effects of contact would probably be temporary. Impact levels would be very low.

Table 12
Contact Probability at Gray Whale Offshore Island Wintering Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
San Miguel Island			
Fall	0	0	0
Winter	0	0.17	0.02
Spring	0	0	0
Santa Rosa Island			
Fall	0	0	0
Winter	0	0.34	0
Spring	0	0	0
Santa Cruz Island			
Fall	0.67	2.67	0.19
Winter	0.67	1.33	0.70
Spring	0.34	0.17	0.01
Anacapa Islands			
Fall	0	0.67	0.05
Winter	0.66	0.67	0.08
Spring	0.17	0	0
Catalina Island			
all seasons	0	0	0

Source: Dames and Moore, 1985

1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.

The effects of noise on gray whales wintering near the islands would be similar to those described above for the migration routes. Project crew boats would not operate near the islands, and would have no effects.

Right Whale Right whales are present in the project area on a sporadic basis in very small numbers. Impacts from any of the potential agents are unlikely to affect the population as a whole for this reason. Impacts on individuals, which are unlikely to occur, would probably be similar to those discussed above for gray whales, and would be at a very low level.

Other Cetaceans The other listed cetaceans potentially present in the project area include blue whale, fin whale, sea whale, humpback whale, and sperm whale.

Most of these species are very unlikely to be effected by an oil spill because they inhabit offshore areas that spills would not reach. The only exception is the blue whale, which migrates north of Santa Rosa Island to the Santa Rosa - Cortez Ridge. The probability of contact at Santa Rosa Island is very low to zero (Dames and Moore, 1985), and contact would probably result in temporary impacts. Overall, impact levels would be very low.

Project-generated noise may be detectable within the range of these whales, but is not expected to result in noticeable behavioral or physical changes. Impact levels would be very low. Crew boats from the project would not be present in the ranges of these whales.

PLANTS

Salt marsh bird's beak is the only listed plant present within the area that could be affected by the project. Oil spills are the only impact agent that could potentially affect this species. Noise has no effect on plants, platform discharges would not reach the plant's habitat, and crew boats would not operate in the habitat.

In summary, there is a small probability of locally significant impacts on known populations of salt marsh bird's beak, and a somewhat higher probability of locally significant impacts at possible sites. The probabilities of low to moderate level impacts on a regional and species-wide basis are similar.

Salt marsh bird's beak is known to occur at Carpinteria Marsh, Ormond Beach, the Ventura County Game Preserve, Mugu Lagoon, Anaheim Bay, and Upper Newport Bay. It may also occur at Goleta Slough, the Ventura River, and McGrath State Beach. The plant is most vulnerable to oiling during a high tide, particularly in winter when tides are highest. Salt marsh bird's beak grows in estuaries and marshes with small openings to the ocean, reducing vulnerability by being well-suited to spill-control technology. Some populations may not be vulnerable if they are located behind sand dunes or in similar location where there is no tidal influence. The vulnerability of the plant at other seasons is minimal. The probability of contact at known sites is shown on Table 13, and the contact probability at possible sites is presented in Table 14.

Population data are unavailable to evaluate the levels of impacts on salt marsh bird's beak. At the known sites, winter contact probabilities range from zero at Anaheim Bay and Upper Newport Bay to very low at Ormond Beach, the Ventura County Game Preserve, and Mugu Lagoon. To reach a population, spilled oil would have to enter the marsh or estuary past oil control devices and would have to coincide with a seasonally high tide, an unlikely combination of events. If oil were to reach one of these sites, the effects would probably be locally significant. High mortality rates at a vigorous population site could result in regional or species-wide impacts at low to moderate levels.

Impact levels at the possible sites would be dependent on the presence of the species, no impact could occur if the species were not present. Winter contact probabilities are very low at Goleta Slough, the Ventura River, and McGrath State Beach. If the plant is present at these sites, the likely impacts would be similar to those described above.

PROPOSED MAMMALS

One species currently proposed for listing, the Guadalupe fur seal, is present in the project area. This species could potentially be affected by an oil spill, noise, or vessel traffic. Platform discharges are not likely to affect this species due to dilution and the low probability of prolonged contact (MMS, 1984a).

Guadalupe Fur Seal Guadalupe fur seals are regularly present in small numbers at San Miguel Island, and individuals are occasionally present on San Nicholas, San Clemente, and Santa Barbara islands. The seals are present in spring and summer.

Guadalupe fur seals could be affected by spilled oil if they were to swim through or feed in a slick. The contact probability at each of the Guadalupe fur seal sites is zero, so no impacts from oil spills are expected.

Table 13
Contact Probability at Salt Marsh Bird's Beak Known Population Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
Carpinteria Marsh			
Winter	0.17	0.83	0.06
Spring	0.33	1.17	0.08
Summer	0	0	0
Fall	0	10.67	0.75
Ormond Beach			
Winter	7.00	7.00	0.49
Spring	17.50	17.67	1.24
Summer	10.80	9.67	0.68
Fall	4.20	3.33	0.23
Ventura County Game Preserve			
Winter	0.67	1.50	0.11
Spring	5.83	4.50	0.32
Summer	0.67	0.83	0.06
Fall	0.67	0.83	0.06
Mugu Lagoon			
Winter	0.67	1.50	0.11
Spring	5.83	4.50	0.32
Summer	0.67	0.83	0.06
Fall	0.67	0.83	0.06
Anaheim Bay			
all seasons	0	0	0
Upper Newport Bay			
all seasons	0	0	0

Source: Dames and Moore, 1985

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1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.

Table 14
Contact Probability at Salt Marsh Bird's Beak
Possible Population Areas

Location and Season	Conditional 3-day[1]	Conditional 10-day[2]	10-day Total >1,000 bbl[3]
Goleta Slough			
Winter	0	0.33	0.02
Spring	0	0	0
Summer	0	0	0
Fall	0	0.67	0.05
Ventura River			
Winter	0.50	11.33	0.79
Spring	20.80	33.67	2.36
Summer	25.20	51.17	3.58
Fall	0	28.00	1.96
McGrath State Beach			
Winter	4.00	8.30	0.58
Spring	11.50	14.00	0.98
Summer	14.80	16.17	1.13
Fall	6.00	7.00	0.49

Source: Dames and Moore, 1985

1 Percent conditional probability for a spill of unspecified size.
2 Percent conditional probability for a spill of unspecified size.
3 Percent total probability for a spill >1,000 bbl.

Noise from project operations may be audible to Guadalupe fur seals, but would be at low levels due to the seals' distance from the source, and impact levels would be very low. Crew boats would not operate in the vicinity of the seals, so no impacts would be expected.

CUMULATIVE IMPACTS

Platform Gail is one of a number of oil and gas facilities that are either proposed or existing in the Southern California Bight. These operations are expected to have impacts comparable to those associates with Platform Gail. In addition to oil and gas operations, other activities, such as shipping and recreational boating, contribute to background levels of potential impact producing agents.

Existing oil and gas operations located in the Santa Barbara Channel and the Santa Maria Basin yield a probability of an oil spill from platforms and pipelines larger than 1,000 barrels of 97.7%, and the probability of a spill larger than 10,000 barrels is 80.2% (Dames and Moore, 1985). The probability of a spill larger than 1,000 barrels from a pipeline or platform is currently 90.3% and 76.8% respectively, and the probability of a pipeline or platform spill larger than 10,000 barrels is 62.4% and 47.4% respectively (Dames and Moore, 1985).

Construction and operation of Platform Gail would result in an incremental increase in the probability of an oil spill in the Santa Barbara Channel and Santa Maria Basin. With Platform Gail, the probability of a spill from platforms or pipelines greater than 1,000 barrels increases 0.3% to 98.0%, and the probability of spills greater than 10,000 barrels increases 1.0% to 81.0% (Dames and Moore, 1985). For pipeline spills greater than 1,000 barrels, the spill probability increases 0.7% to 90.9%, and the probability of a spill over 10,000 barrels increases 1.4% to 63.3% (Dames and Moore, 1985). The probability of platform spills over 1,000 barrels increases 0.3% to 77.6%, and the spill probability for spills over 10,000 barrels increases 1.9% to 48.3% (Dames and Moore, 1985).

Platform Gail would result in an incremental increase in subsea noise in the Santa Barbara Channel. Project-generated noise would add to noise from other oil and gas operations in the area and to noise from other activities in the channel. No data are available to compare existing and projected noise.

Platform discharges would also increase incrementally, but data are not available to compare existing and projected discharge volumes. Some types of discharges, particularly thermal discharges, desalinization brine, and sanitary effluent, dissipate completely and are not cumulative. Other discharges, such as drilling muds and cuttings, which are diluted or settle to the bottom are not expected to cumulatively effect listed species. In the Gulf of Mexico, very fine barite particles have been found to form a "haze" of very slow settling particles in areas with many drilling platforms (Trocine and Trefry, 1983, cited in WESTEC Services, 1984), but this effect is not expected to occur in the Santa Barbara Channel due to the much lower density of platforms.

Platform Gail would result in a small incremental increase in vessel traffic. This increase would not be significant relative to exiting vessel traffic in the Santa Barbara Channel.

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