fornia will be notified of the use of in-situ burning.

Preliminary laboratory testing has been conducted on the crude oil currently being produced from the Santa Barbara Channel and Santa Maria Basin Areas. The results of these tests indicate that the crude oil has a low percentage of volatile components that would cause difficulty to ignite the oil. Therefore, in-situ burning of discharged oil may not be an appropriate mitigation measure. Information on the equipment needed and the procedures that would be followed in preparation for in-situ burning are contained in appendix 5.3.

Other issues that must be included in any discussion on in-situ burning are efficiency and environmental effects. Burning efficiency is calculated as the difference between the percentage of residue left and the initial amount of oil and is largely a function of oil thickness within the fireproof boom. During the Exxon Valdez spill, a test burn using the 3M fire resistant boom was conducted 2 days following the spill. In this test, an estimated 357 to 714 bbl of North Slope crude oil were burned in approximately 75 minutes with an estimated efficiency of 98 percent. The volume elimination rate for this test using a single 500-foot boom was estimated to be between eight to 16 bbl per minute (Allen, 1990).

The primary objective of oil spill abatement and cleanup is to reduce the effect of spilled oil on the environment. The use of in-situ burning may be considered when the preferred techniques are judged to be inadequate and the environmental benefit of in-situ burning outweighs its adverse effects. Some critics of in-situ burning have raised questions about the effects of air pollution resulting from the process. Tests conducted by MMS, Environment Canada, and the American Petroleum Institute, to better quantify air quality data related to in-situ burn processes indicated that burn products reach safe levels within several kilometers of the burn site and that the eventual concentrations of particulates and associated pollutants are several orders of magnitude below acutely toxic levels. Additional research is needed to fully document these hazards and to develop methods to minimize these hazards.

In August 12, 1993, MMS, USCG, Canadian Coast Guard, and Environment Canada also co-sponsored a large-scale in-situ test burn off the coast of Newfoundland, Canada. Environment Canada published a preliminary report that included the following findings:

- Burning at sea is feasible and practical.
- The fireproof boom stood up throughout the tests, but more work is necessary for it to last longer. Sea motion combined with heat appears to have reduced the life of the boom (48 hours in test tanks). The total burn during the tests lasted 4 hours.
- Some observations from the burns did not correspond to previous test tank data. First, several effects, such as the rapid sea burns noted in test tanks, did not occur at sea. Second, burn rate calculations must more accurately account for the effects of wind. Even a small amount of wind (8-11 km/hr during the second burn) drove the oil far into the apex of the boom and thereby reduced the burning rate to about two-thirds of previous calculations.
- Burning outside of the fire-resistant boom occurred on about three occasions as a result of too much oil in the boom, but did not result in sheening. Either some form of containment occurred naturally, or the overflow was very viscous.

ALTERNATIVE RESPONSE TECHNOLOGIES–ONSHORE

Shoreline cleaning agents, bioremediation and no action are other options for oil spill responders. Each of these involve tradeoffs, have their own strengths and weaknesses, and have their particular roles during the response to an oil spill. Appendix 5.3 contains additional detail on these tools.

5.2 ENVIRONMENTAL IMPACTS OF ALTERNATIVE 1: THE PROPOSED ACTION

5.2.1 IMPACTS ON AIR QUALITY

The following significance criteria levels were used in the impact analysis for air quality to determine whether the proposed delineation projects emissions could result in air quality impacts.

High - Project may cause or contribute to a violation of Federal or State ambient air quality standards, *and* exceed threshold emission levels that have been determined to result in significant impacts to air quality. Impacts deemed to be high are considered to be significant.

Moderate - Project does *not* result in any violations of Federal or State ambient air standards, but does exceed threshold emission levels that have been determined to result in significant impacts to air quality. Impacts deemed to be moderate are considered significant, but are mitigable to an insignificant level.

Low - Project does not result in any violations of Federal or State ambient air standards, *and* does not exceed threshold emission levels that have been determined to result in significant impacts to air quality. Impacts deemed to be low are considered to be insignificant.

The primary impact-producing activities associated with the proposed project include exploratory drilling operations with associated support activities. The major impact agents expected from the proposed activity are emissions from equipment associated with exploratory drilling operations (main and crane engines) and emissions from crew/supply vessels and helicopter support for the drilling operations.

Emissions resulting from the proposed projects may have a potential to increase concentrations of air pollutants onshore. The primary regulated pollutants of concern in Santa Barbara County are oxides of nitrogen (NOx) and reactive organic compounds (ROC). Both NOx and ROC are considered precursors to ozone (O_3) formation, for which Santa Barbara County is presently in nonattainment. The major pollutant of concern associated with projects of this type and duration are NOx emissions due to the extensive use of propulsion and stationary combustion equipment.

Table 5.2.1-1 provides a summation of SBCAPCD threshold requirements as provided in Regulation VIII: New Source Review, relating to the application of Best Available Control Technology (BACT), air quality impact analysis (AQIA), and emission offsets.

The following NEPA documents provide discussions of air quality impacts associated with the Santa Barbara County offshore activities. The references are organized in chronological order and may be referenced for additional information. Various Authority To Construct (ATC) permits and Permits to Operate (PTO) have been issued by the SBCAPCD regarding modifications and operations to OCS projects located adjacent to Santa Barbara County. As these permits are regulatory authorizations and do not contain discussions of air quality impacts, they have not been incorporated in this chronology and may be further referenced by contacting the SBCAPCD offices.

- 1976 - Final Environmental Impact Statement for Oil and Gas Development in the Santa Barbara Channel, Outer Continental Shelf Off California, United States Geological Survey (USGS).

- 1981 - Final EA/EIR for Natural Gas Platform Habitat and Pipeline, Pitas Point Unit, Santa Barbara Channel, Proposed by Texaco, Inc., Chambers Consultants and Planners.

- 1984 - Point Arguello Field and Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS, Arthur D. Little.

- 1984 - Environmental Impact Statement /Report for Santa Ynez Unit/Los Flores Canyon Development and Production Plan, Science Applications, Inc.

- 1985 - Union Oil Project/Exxon project Shamrock and Central Santa Maria Basin Area Study EIS/EIR, Arthur D. Little.

- 1986 - Cities Service Oil and Gas Corporation and Chevron Pipeline Company San Miguel Project and Northern Santa Maria Basin Area Study EIS/EIR, URS Corporation.

- 1988 - OCS Environmental Assessment for the Santa Ynez Unit Development Project modifications, MMS Pacific OCS Region.

- 1991 - OCS Environmental Assessment for the Santa Ynez Unit Pipeline/Power Cable Construction Project, MMS Pacific OCS Region.

- 1994 - OCS Environmental Assessment, OS&T Abandonment Plan, Santa Ynez Unit, Exxon Company U.S.A., MMS Pacific OCS Region.

- 1995 - OCS Environmental Assessment, A proposed 3-Dimensional Seismic Survey, Santa Ynez Unit, Exxon Company, U.S.A., MMS Pacific OCS Region.

- 1997 - OCS Environmental Assessment, Platform Heritage to Platform Harmony Gas Pipeline, Santa Ynez Unit, Exxon Company U.S.A., MMS Pacific OCS Region.

5.2.1.1 IMPACTS OF THE PROPOSED ACTION

IMPACTS COMMON TO ALL UNITS

A single, semi-submersible type, Mobile Offshore Drilling Unit (MODU), has been proposed to drill all the proposed delineation wells for the projects to mini-

Table 5.2.1-1. Santa Barbara County APCD New Source Review requirements.

BACT Requirements	≥ 25 lbs/day for any non-attainment pollutant (except CO) ≥ 150 lbs/day for CO
AQIA Requirements	≥ 120 lbs/day for any non-attainment pollutant (except CO and PM_{10}) ≥ 550 lbs/day for CO; ≥ 80 lbs/day for PM_{10}
Emission Offset Requirements	≥ 55 lbs/day or ≥10 tons/yr for any non-attainment pollutant (except CO and PM_{10}) ≥ 150 lbs/day or ≥25 tons/yr for CO; ≥ 80 lbs/day or ≥10 tons/yr for PM_{10}

mize potential cumulative impacts. Using one dedicated MODU will minimize the short-term cumulative impacts to air quality that would be produced by having multiple drill rigs operating simultaneously in the Santa Barbara Channel. For this analysis, air emissions will be estimated for a typical semi-submersible drilling unit that is representative of the actual drilling unit that is anticipated for the proposed projects. The analog rig to be used for the representative analysis will be the SEDCO 712. This drill rig is similar to rigs used in previously approved Exploration Plans and has been used to drill seven wells in the Pacific OCS Region in the past.

Santa Barbara APCD Rule 202 F.6 (Drill Rig Engine Exemption) provides a permit exemption for drilling equipment provided that emissions from the equipment are less than 25 tons per year. Exceeding the drill rig engine exemption threshold simply requires a permit from the applicant for those pollutant sources and does infer an air quality significance threshold. This exemption would include the MODU's main engines used to power the equipment used during the drilling phase. The remaining equipment that is not part of the drilling phase will be subject to permit including marine vessel emissions and various ROC sources. Thus, all of these projects will require a Permit to Operate from SBCAPCD and will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit.

The operator submitted project descriptions contained equipment, proposed emission control technology and proposed activities information used in this analysis to determine if significant impacts to air quality could occur. Additionally, this information was used to evaluate compliance with emission limitations imposed upon this project pursuant to SBCAPCD Rules and Regulations. Emissions of air pollutants during exploratory and support activities were calculated using the methodology and emission factors contained in the EPA publication AP-42 (EPA, 1990), and recent emissions source tests for the representative semi-submersible drilling vessel (Texaco, 1990). Additional emission factor and emission control measure information were obtained from the results of a study performed by SBCAPCD on crew and supply boats (SBCAPCD, 1987).

Operating equipment/machinery on the SEDCO 712 rig is electrically driven with primary power supplied by diesel-fired engines. Main power is supplied by three EMD 16-645E9 diesels driving three 2400kW generators. Average daily rig fuel usage is estimated at 2,860 gallons per day. The fuel capacity of the SEDCO 712 rig is 277,914 gallons. The fuel used will be approved low sulfur diesel fuel (0.05wt.%S). It is proposed that the fuel will be transported from shore by boat and transferred to the lower hulls and deck tanks of the rig. Table 5.2.1-2 summarizes the estimated fuel usage per well for each of the proposed exploratory projects.

Air emissions expected from the proposed projects result primarily from the main engines and cranes on the MODU, crew and supply boats, and helicopters. The analysis assumes that the MODU will utilize BACT to reduce emission below normal operating levels in compliance with Santa Barbara APCD requirements. Air emission data and assumptions are further documented in Apendix 5.4.

Drill Rig Main Engines: Emission estimates for the SEDCO 712 are based on data supplied from a 1990 source test performed for Texaco in 1990 (Texaco, 1990). The SEDCO 712 utilizes three prime mover (GM EMD Model 1 6-645E9) diesel engines. The engines power three 2,200 KW/3, 125 KVA generators to produce the main power to drilling operations. The source test analyzed emissions from the main engines for the air pollutants NOx, CO, and VOC. The main engines tested were equipped with the following emission controls:

- 4 degree injection timing retard
- Turbo-charging
- Enhanced inter-cooling with seawater
- Low sulfur diesel fuel (≤ 0.05 wt.%S)

Results of the source test demonstrates that NOx emissions will be reduced approximately 40% from uncontrolled levels, while CO emissions will increase

approximately the same 40 % due to lower combustion chamber temperatures. VOC emissions source tested approximately 80% lower than those estimated by the manufacturer for the uncontrolled VOC level.

Total main engine emissions for the drilling program are assumed to be approximately proportional to electromotive requirements. Determination of electromotive requirements requires an estimation of engine load during various drilling program phases and the duration of time in each phase. A 1982 study by Radian (Radian, 1982) documented total electromotive requirements and number of days for each of 10 representative activities associated with drilling programs. Engine load (horsepower) requirements were then calculated for each of these phases utilizing the data points. Although engine loads were identical for the various well depths calculated, the length of time in each mode may vary according to well depth.

Drill Rig Crane Engines: The SEDCO 712 has two separate 50 ton cranes, each powered by a Detroit Diesel 8V-171 diesel engine rated at 300hp. Emission control technology proposed for the cranes will be 4-degree injection timing retard.

Crane use was monitored on the SEDCO 712 for the 1989 drilling program by Texaco of the Proteus Prospect off Point Conception. Drilling duration for the program lasted 60 days and crane use and emissions were documented in a report to MMS (Texaco, 1990a). As the cranes that were monitored for this project did not exercise emission control technology, emission estimates will need to be adjusted to reflect the proposed injection timing retard.

Crew and Supply Boats: At a minimum, the following vessels have been proposes to be used directly or in connection with the drilling operations:

- One 110-foot class crew boat
- One standby vessel (most likely a 110-foot class vessel)
- One 180-foot class supply boat to transport supplies, equipment, and materials to the drilling rig and to carry garbage, oil contaminated drill cuttings and formation water back to shore.
- Anchor handling boat
- Tow Vessels

Crew Boats. It is expected that one 110-foot class crew boat will be used to support the delineation drilling operations. It is likely that the boat will be stationed in, and operate out of, Port Hueneme or the Carpinteria Pier and will travel through established corridors. Although crew boats may service other area platforms on the same trip, it is assumed for this analysis that crew boats serve the drilling rig exclusively. Based on a two to three month program, the following mileage assumptions used to calculate crew boat emissions are summarized in Table 5.2.1-3.

Supply Boats. It is expected that one 180-foot class supply boat will be used to support the delineation drilling operations. It is likely that the boat will be stationed in, and operate out of, Port Hueneme and will travel through pre-determined corridors. Based on a two to three month program, the following supply boat mileage assumptions originating from Point Hueneme to each unit are summarized in Table 5.2.1-4.

Standby Boat. A standby boat will be stationed near the delineation rig at all times during operations. It is anticipated that this boat will be a 110-foot class vessel with a two-man crew. The primary purpose of this vessel is emergency response in the unlikely event of an oil spill. This vessel will not normally leave the drill site, except for emergency situations, and only when another vessel can act as standby. No trips for the standby vessel are planned other than initial mobilization and demobilization.

Tow Vessels and Anchor Handling Boats. Tow vessels will be used to tow the MODU to the individual lease locations and position the rig prior to drilling. It is anticipated that there will be (2) - 5000 hp tugboats utilized for towing and positioning the MODU. Vessel usage assumptions are based on the estimated duration projected by the applicant for the movement and positioning phases of the drilling operation. It is anticipated that there will be (2) 3000 hp tugboats utilized for anchor handling. The work boats are required to run the anchor and anchor chain out to the required length, and lower the anchor onto the seafloor using a work wire.

Table 5.2.1-2. Estimated fuel usage by project.

Unit	Total (days)	Estimated Fuel Usage (gal.)
Point Sal	68	194,480
Purisima Point	68	194,480
Bonito/well	88-90	257,400
Gato Canyon	92	260,120

Helicopters: Helicopter trips originating from the Santa Barbara Airport will be used as required (Santa Maria airport for Point Sal and Purisima Point). No modifications are proposed for the helicopters. The Sea King, a two-engine helicopter, is expected to best represent the type of helicopters used for this program. Total flying time assumptions used to determine helicopter emissions for the MODU project is summarized in Table 5.2.1-5 using emission factors from AP-42 (EPA, 1990).

Accidents/Upsets: As discussed in the oil spill Section, no oil spills are expected to occur from the proposed exploratory drilling activities. Thus no impacts to air quality from accidental oil spills are expected from the proposed exploratory drilling activities.

For this analysis, it is assumed that there is no impact to regional air quality expected from a hydrogen sulfide release into the atmosphere as a result of the exploratory activities. If such a release were to occur, it would be localized to the vicinity of the semi-submersible and the MMS approved H_2S Contingency Plan for the exploratory operations would dictate the emergency requirements to be implemented.

AIR QUALITY MODELING ANALYSIS

The MMS studied the impacts of the projected offshore, non-reactive, or inert, emissions from the MODU activities using the Offshore and Coastal Dispersion (OCD) Model. The model was used to predict the ambient concentrations of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and fine particulates (PM_{10}) that could result from the proposed projects. Meteorological inputs to the model consist of source parameters and emissions, along with source and receptor coordinates.

The OCD model computes both short-term (24 hours or less) and annual averaged pollutant concentrations. The OCD model requires separate data sets for characterizing the dispersion meteorology occurring offshore and onshore. Offshore meteorological data utilized for the model runs were compiled for 1990 - 1992 using offshore moored buoys located in the Santa Maria Basin (Buoy 46011) and Point Arguello (Buoy 46023). Onshore meteorological data was obtained from the Santa Maria NWS meteorological site and monthly average morning and afternoon mixing heights were based on 1990 - 1992 averages from the Vandenberg upper air monitoring site. The Gato Canyon Unit model run utilized Buoy 46053 and 1994 onshore meteorological data from the Santa Barbara surface station.

Peak hour emissions were determined for each proposed project and used to determine the onshore impacts to air quality. All the proposed projects have committed to using the same MODU for drilling operations. As the same equipment is proposed for all projects, the peak hour emissions are expected to be the same for each project. The duration of the delineation drilling at each site is the project variable that results in different total emission estimates for each project.

Peak hour emissions were estimated to occur during operational phases utilizing tugboats. Thus, the peak emissions are expected to occur during the movement and site preparation stages of the projects which are the only drilling stages using tugboats. Peak hour emissions were determined to occur during the site preparation phase of the proposed projects. The site preparation stage was used for this analysis as it was determined that this phase had a much greater localized concentration of pollutants that would not

Table 5.2.1-3. Estimated miles traveled for crew boats.

Unit	Number of Trips/ Month	Total Miles
Bonito	8	5,712
Gato Canyon	2	350
Purisima Point	6	2,640
Point Sal	6	3,360

Table 5.2.1-4. Estimated miles traveled for supply boats.

Unit	Number of Trips/ Month	Total Miles
Bonito	12	7,344
Gato Canyon	8	2,500
Purisima Point	9	3,960
Point Sal	9	5,280

Table 5.2.1-5. Estimated helicopter trips.

Unit	Trips/Month	Trips per Drilling Program	Landing-Takeoff Cycles (LTO)[1]	Roundtrip Flying Time (hour)	Total Flying Time (hour)
Bonito*	30	90(180)	180 (360)	1	90 (180)
Point Sal	20	50	100	1	50
Purisima Pt.	20	40	80	1	40
Gato Canyon	28	84	168	.5	21
Total:	**98**	**264 (354)**	**528 (708)**	**3.5**	**201 (291)**

* Bonito Unit numbers are given per 1 well and (2 wells)

[1]LTO cycles during the program. Half are at the rig and half at the airport.

Table 5.2.1-6. Peak hour emissions estimates.

Delineation Peak Hour Emission Estimates (lbs)					
Drilling Phase	**NOx**	**CO**	**VOC**	**SO_2**	**PM_{10}**
Site Preparation	189.45	47.95	13.44	3.92	16.24
Drilling	43.16	9.93	2.35	0.93	2.96

be as readily dispersed over distance as would be the case with the towing of the semi-submersible to the drill site. While the site preparation phase is generally of short duration (1-3 days), the engine load to the main drilling engines, coupled with emissions from the tugs and anchor handling vessels resulted in the maximum hourly emissions.

The proposed delineation projects are all within the modeling domain of the OCD, however individual modeling runs were performed per project location to estimate the potential for incremental emission contributions to onshore receptors from the individual projects. One-hour, 3-hour, 8-hour and 24 hour average concentrations were modeled with expected peak-hour NOx emissions for the Bonito Unit, Purisima Point, and Gato Canyon. A conservative estimate of a 90 day project duration was used for all projects.

Using the peak hour emissions from a small increment of the overall project is expected to result in an overly conservative estimate of ambient air concentrations expected from the project. The OCD model predicts the highest concentrations from the peak hour emissions using an entire year of meteorological data. Therefore, it is highly unlikely that the worst case meteorology will occur during the exact day of the site preparation. Peak hour emissions estimates occurring during the drilling phase of the project are considered to be more indicative of the air quality impacts expected of the project due to the large duration for this phase (21-29 days). Drilling phase peak hour emissions were additionally modeled to demonstrate more representative peak concentrations predicted during drilling operations. The peak hour emissions are provided in Table 5.2.1-6 for the site preparation and drilling phases of the project and were used to model potential impacts to air quality resulting from the proposed projects.

Onshore incremental concentrations from the proposed projects are compared to PSD allowable increments (40 CFR 51.166(c), SBCAPCD Rule 803) to determine the potential for significant impacts. In addition, the incremental concentrations will be added to existing background pollutant levels provided by the SBCAPCD and then compared to applicable Federal and State ambient air quality standards to determine potential violations. Baseline air quality utilized in the analysis reflects the most recent ambient concentration levels and Santa Barbara monitoring stations. When NOx is emitted from a combustion source, the majority of the emissions are in the form of NO and a much smaller percentage is emitted in the form of NO_2. The NO is gradually converted in the atmosphere to NO_2. As the ambient standards apply only to NO_2, a conversion factor of NO to NO_2 must be applied. The EPA screening approach of using the national default of a NO_2/NOx ratio of 0.75 was applied to the predicted concentrations. Results of the individual project contributions to onshore pollutant concentrations are presented under the respective Unit analyses.

CLEAN AIR ACT CONFORMITY

The EPA instituted final rules for determining general conformity of federal actions with federal and state air quality implementation plans (SIP). Section 176(c) of the CAA, the General Conformity Rule, re-

quires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the applicable implementation plan. The provisions for demonstrating conformity of a federal action are that the project does not:

- cause or contribute to any new violation of any standard;
- interfere with provisions in the applicable SIP;
- increase the frequency or severity of any existing violation of any standard; or
- delay timely attainment of any standard, any required interim emission reductions, or other milestones in any area.

The Proposed Actions were evaluated to determine whether the proposed activities are applicable for a general conformity determination and to identify any conformity requirements. General Conformity Rule applicability for a federal action is determined by whether the emissions associated with the action are below de minimus levels for the region in which the action is proposed. Santa Barbara County is presently classified as a serious non-attainment area for ozone. The de minimus level for a serious nonattainment area is 50 tons/year of NOx *or* VOC; or, 10% or more of the emission inventory (regionally significant). Conformity determinations are not required when the federal action:

- requires a permit under New Source Review (NSR);
- the total of direct and indirect emissions is below 50 tons/year for O_3 precursors; and,
- actions where emissions are not reasonably foreseeable (OCS Lease Sales).

A Federal agency must make a determination that a federal action conforms to the applicable implementation plan before the action is taken. A federal action is defined as any activity in which the federal government issues a permit or approval. The proposed projects each require a separate approval decision for the individual Exploration Plan per MMS regulations. Under the definition of a federal action in the General Conformity Rule, the proposed projects constitute four separate federal actions. Santa Barbara County APCD has indicated that per their Rules and Regulations, each of the Proposed Actions will require a separate permit under NSR and those emissions will be considered exempt under general conformity.

Emission estimates were developed for the representative projects to determine whether each of the Proposed Actions were below the 50 ton de minimus levels for NOx and VOC and the emissions are not considered to be regionally significant. Emission estimates for the individual projects demonstrate that the total project emissions for each project are well within the 50 ton de minimus threshold for both NOx and VOC. Accounting for the portion of the total project emissions subject to an NSR permit further reduces the emission potential subject to conformity. A comparison of the regional significance of the federal action demonstrates that each Proposed Action emissions are less than 1% of Santa Barbara County's OCS emission budget and a fraction of the onshore emission inventory. Thus, each of the Proposed Actions are well below the de minimus levels for both the 50 tons/yr of O_3 precursors and 10% of the Santa Barbara's emission budget and would be exempt from a full conformity determination under the General Conformity Rule.

IMPACTS UNIQUE TO EACH UNIT

Bonito Unit. One to two delineation wells are being proposed on the Bonito Unit. The operator has identified 15 potential sites where the well(s) could be drilled. Nine of the 15 proposed sites have been previously approved with the original Exploration Plans. Drilling on the Bonito Unit is anticipated to commence in the second or third quarter of 2002. Air emissions expected from the proposed delineation project result primarily from the main engines and cranes, crew and supply boats, and helicopters.

Drill Rig Emissions. The project description provided by Nuevo estimated the duration for each phase of the estimated 90 day drilling operation. The estimated drilling phase estimates were then combined with the engine loads as determined in the Radian report (Radian, 1982) to determine individual drilling phase electromotive requirements. Based on these calculations, it was estimated that the total electromotive requirements for the main engines were 2,291,236 horsepower hours for drilling 1 well. Emission estimates were then determined by applying the 1990 SEDCO 712 Source Test emission factors to the electromotive requirements. Drilling engine emission estimates per well are provided in the Table 5.2.1-7.

Drill Rig Crane Emissions. Crane emissions were calculated using the crane usage and monitored emissions from the Proteus Prospect report by Texaco (Texaco, 1990a) and then applying a NOx control factor of 20% for the 4 degree injection timing retard. CO estimates were conversely adjusted to reflect the increase in these emissions due to the selective NOx control technology. Drilling rig crane emissions per well are provided in the Table 5.2.1-8.

Crew and Supply Boats. A contracted crew boat will be used to transport personnel to and from the drilling site. Crew boats will originate out of either

Table 5.2.1-7. Bonito drill rig emissions.

Bonito Drilling Engine Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
22.78	3.05	0.13	0.51	0.99

Table 5.2.1-8. Bonito crane engine emissions.

Bonito Drilling Rig Crane Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
0.71	0.28	0.06	0.02	0.08

Port Hueneme or the Carpinteria Pier. It is estimated that the Bonito drilling operations will involve approximately 7 round trips per month. Each round trip is assumed to be 204 miles assuming Port Hueneme as the base port. Approximately 9 round trips of 204 miles for supply boats will be assumed.

The crew and supply boat will utilize the same control measures as are planned for the drilling rig. Additionally, the support vessels will limit their cruising speed to 80 percent of full power. Santa Barbara County APCD performed a study titled *Crew and Supply Boat NOx Control Development Program* (SBCAPCD, 1987) to determine crew and supply boat fuel usage rates and control measures. Assumptions provided in this analysis include an estimated fuel use of 2.97 gal/mi. for crew boats and 8.24 gal/mi. for the supply boats. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990).

Tug and Work Boats. Additional support vessel assumptions used in this analysis include (2) - 5000 hp tugboats utilized for towing and positioning the MODU and (2) 3000 hp tugboats utilized for anchor handling. Vessel usage assumptions are based on the estimated duration projected by the applicant for the movement and positioning phases of the drilling operation. Assumptions provided in this analysis include an estimated fuel use of 140.5 gal/hr (maneuver) and 56.2 gal/hr (idle) for the large tugboats, and 84.3 gal/hr (maneuver) and 33.7 gal/hr (idle) for the smaller tugs. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990). Table 5.2.1-9 provides the crew and supply boat and work boat emissions per well.

Helicopters. Approximately 30 helicopter trips per month will originate from Santa Barbara Airport for a total of 90 trips during the entire drill program. Each round trip required approximately 1 hour of flight time and 2 landing/takeoff cycles. Table 5.2.1-10 provides the helicopter emission estimates per well.

Flare. Well testing is an integral component during delineation activities to determine the quality of the natural gas produced and the formation pressure. This short term duration NOx source occurs upon well completion. Typically, this phase is offset by the reduced power needs for drilling operations as the drilling mode has been completed prior to well testing. Estimated flare emissions have been included in the total emissions summary.

Total Drilling Emissions. Nuevo is proposing to drill 1 to 2 wells on the Bonito Unit. Assuming a conservative case of 2 wells ultimately being drilled, the per-well and total drilling emissions expected by major emissions source are provided in Table 5.2.1-11 below.

An evaluation of the total drilling emissions demonstrate the majority of the NOx emissions are associated with the main drilling engines and the support vessels. Associated support vessels are responsible for the majority of the CO, VOC, and SO2 emissions from the project with PM10 being the least emitted pollutant.

Santa Barbara APCD Rule 202 F.6 (Drill Rig Engine Exemption) provides a permit exemption for drilling equipment provided that emissions from the equipment are less than 25 tons per year. This exemption would include the MODU's main engines used to power the equipment used during the Bonito drilling phase. However, if 2 wells are drilled in the Bonito Unit as has been proposed, the threshold limit of 25 tons per year may be exceeded if the second well occurs within the same 12 month period as the initial well. The remainder of the drilling emissions over the threshold for that 12 month period would be subject to SBCAPCD permit. Other equipment that is not part of the drilling phase will be subject to permit including marine vessel emissions and various ROC sources. Thus, this proposed project will require a Permit to Operate from SBCAPCD and emission sources subject to the permit will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit. Table 5.2.1-12 presents the total project estimated emissions in different configurations used for regulatory overview. A comparison of the New Source Review requirements demonstrates

the Bonito project will be above levels requiring application of BACT and emission offsets to those sources subject to permit. The proposed project is additionally expected to result in a net emissions increase greater than levels which require an air quality impact analysis (modeling) to ensure the project will not cause a violation or interfere with expeditious attainment of any air quality standard.

Air Quality Modeling Analysis. The MMS studied the impacts of the projected offshore emissions from the Bonito Unit using the Offshore and Coastal Dispersion (OCD) Model. Peak hour NOx emissions were determined to occur during the site preparation phase of the drilling operation. Utilizing the site preparation phase allowed for the addition of the crane engines to emissions from the drilling main engines and support vessels. Table 5.2.1-13 lists the highest predicted concentrations to onshore pollutant concentrations from the proposed project for both the site preparation and drilling phases and compares them with the maximum allowable increases over the baseline concentration established by SBCAPCD. The concentrations demonstrate that the proposed Bonito Unit emissions are well within the maximum NO_2, SO_2 and PM_{10} allowable limits for a Class II area. Therefore, it is expected that increases in the onshore average concentrations of NO_2, SO_2 and PM_{10} are estimated to be well within the maximum increases allowed under both the Federal and Santa Barbara APCD standards.

Conclusion: In summary, activities associated with the proposed Bonito Unit delineation activities are expected to result in low impacts to air quality. For a 1 or 2 well scenario, impacts are considered low (insignificant) based on the significance criteria used for this analysis. The project is not expected to result in any violations of Federal and State ambient air standards. The project is below drilling equipment permit exemption emission levels (25 tons/year) for the 1 well scenario as determined by SBCAPCD Rules and Regulations. The 2 well scenario may exceed the permit threshold if it occurs in the same 12 month period as the initial well. NSR thresholds will be exceeded by the project regardless of a 1 or 2 well scenario and will require BACT and emission offsets. Thus, the

Table 5.2.1-9. Bonito support vessel emissions.

Bonito Support Vessel Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Crew Boat	1.43	0.68	0.90	0.04	0.18
Supply Boat	5.07	2.40	3.22	0.13	0.64
Work Boats	4.38	1.31	0.43	0.09	0.42
Total	**10.87**	**4.38**	**4.56**	**0.26**	**1.24**

Table 5.2.1-10. Bonito helicopter emissions.

Bonito Helicopter Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
LTO	0.27	1.22	0.61	0.04	0.04
In-Flight	0.29	0.22	0.02	0.04	0.04
Total	0.56	1.44	0.64	0.08	0.07

Table 5.2.1-11. Bonito total drilling emissions.

	Bonito Total Drilling Emission Estimate (tons)									
	NOx		**CO**		**VOC**		**SO_2**		**PM_{10}**	
	One Well	*Two Wells*	*One Well*	*Two Wells*	*One Well*	*Two Wells*	*One Well*	*Two Wells*	*One Well*	*Two Wells*
Main Engines	22.78	45.56	3.05	6.10	0.13	0.26	0.51	1.02	0.99	1.98
Crane Engines	0.71	1.42	0.28	0.56	0.01	0.01	0.01	0.04	0.08	0.16
Flare	0.14	0.28	0.05	0.10	0.01	0.01	0.01	0.02	0.01	0.02
Vessels	10.87	21.74	4.38	8.76	4.56	9.12	0.26	0.52	1.24	2.48
Helicopters	0.56	1.12	1.44	2.88	0.64	1.28	0.08	0.16	0.07	0.14
Total	**35.07**	**70.14**	**9.20**	**18.40**	**5.34**	**10.68**	**0.87**	**1.74**	**2.39**	**4.78**

Table 5.2.1-12. Bonito Unit total drilling emissions.

	Bonito Total Drilling Emission Estimate									
	NOx		CO		VOC		SO_2		PM_{10}	
	One Well	*Two Wells*	*One Well*	*Two Wells*	*One Well*	*Two Wells*	*One Well*	*Two Wells*	*One Well*	*Two Wells*
Lbs/hr	32.47	32.47	8.52	8.52	4.95	4.95	0.80	0.80	2.21	2.21
Lbs/day	779.3	779.3	204.4	204.4	118.7	118.7	19.3	19.3	53.1	53.1
Tons/qtr.	35.07	35.07	9.20	9.20	5.34	5.34	0.87	0.87	2.39	2.39
Tons/year	35.07	70.14	9.20	18.40	5.34	10.68	0.87	1.74	2.39	4.78

Table 5.2.1-13. Bonito Unit modeling results and corresponding maximum allowable increases.
(micrograms per cubic meter ($\mu g/m^3$))

Pollutant	Averaging Period	Class II Maximum Allowable Increase	National/State Ambient Air Quality Standard	Site Prep Modeled Impact	Drilling Phase Modeled Impact
NO_2	1-hour	100-470[1]	470[2]	61.1	17.7
	Annual Average	25.0	100	0.00	0.00
PM_{10}	24-hour Average	12-30	150	0.44	0.06
	Annual Average	17.0	50	0.00	0.00
SO_2	1-hour	NS	655[3]	1.7	0.51
	3-hour Average	512.0	1300	0.56	0.15
	24-hour Average	91.0	365	0.11	0.03
	Annual Average	20.0	80	0.00	0.00

1. Santa Barbara APCD incremental limit.
2. State of California ambient standard.
3. State Standard. No National Standard.

project will be subject to SBCAPCD permit requirements and New Source Review requirements that emissions be fully offset to ensure a net air quality benefit for the project. Emission control technology proposed with the project descriptions will additionally reduce projected air quality impacts. No impacts are expected from accidents or upsets.

Point Sal Unit. One-delineation well is being proposed on the Point Sal Unit. The operator has identified 3 potential sites where the well could be drilled. All of the proposed sites have been previously approved with the original Exploration Plans. Drilling on the Point Sal Unit is anticipated to commence in the fourth quarter of 2002. Air emissions expected from the proposed delineation project result primarily from the main engines and cranes, crew and supply boats, and helicopters.

Drill Rig Emissions. The project description provided by Aera estimated the duration for each phase of the estimated 74 day drilling operation. The estimated drilling phase estimates were then combined with the engine loads as determined in the Radian report (Radian, 1982) to determine individual phase electromotive requirements. Based on these calculations, it was estimated that the electromotive requirements for the main engines are 2,553,000 horsepower hours. Emission estimates were then determined by applying the 1990 SEDCO 712 Source Test emission factors to the electromotive requirements. Drilling engine emission estimates per well are provided in Table 5.2.1-14.

Drill Rig Crane Emissions. Crane emissions were calculated using the crane usage and monitored emissions from the Proteus Prospect report by Texaco (Texaco, 1990a) and then applying a NOx control factor of 20% for the 4 degree injection timing retard. CO estimates were conversely adjusted to reflect the increase in these emissions due to the selective NOx control technology. Drilling rig crane emissions per well are provided in Table 5.2.1-15.

Crew and Supply Boats. A contracted crew boat will be used to transport personnel to and from the drilling site. Crew boats will originate out of either Port Hueneme or the Carpinteria Pier. It is estimated that the Bonito drilling operations will involve approxi-

Table 5.2.1-14. Point Sal drill rig emissions.

Point Sal Drilling Engine Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
19.98	2.67	0.10	0.45	0.87

Table 5.2.1-15. Point Sal crane emissions.

Point Sal Drilling Rig Crane Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
0.71	0.28	0.01	0.01	0.08

Table 5.2.1-16. Point Sal support vessel emissions.

Point Sal Support Vessel Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Crew Boat	1.34	0.64	0.86	0.04	0.17
Supply Boat	5.82	2.76	3.71	0.15	0.73
Work Boats	2.62	0.79	0.26	0.05	0.25
Total	**9.79**	**4.18**	**4.83**	**0.24**	**1.15**

mately 6 round trips per month. Each round trip is assumed to be 240 miles assuming Port Hueneme as the base port. Total crew boat miles are expected to be approximately 3,360 miles. Approximately 9 round trips of 240 miles for supply boats will be assumed for a total of 5,280 miles.

The crew and supply boat will utilize the same control measures as are planned for the drilling rig. Additionally, the support vessels will limit their cruising speed to 80 percent of full power. Santa Barbara County APCD performed a study titled Crew and Supply Boat NOx Control Development Program (SBCAPCD, 1987) to determine crew and supply boat fuel usage rates and control measures. Assumptions provided in this analysis include an estimated fuel use of 2.97 gal/mi. for crew boats and 8.24 gal/mi. for the supply boats. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990).

Tug and Work Boats. Additional support vessel assumptions used in this analysis include (2) - 5000 hp tugboats utilized for towing and positioning the MODU and (2) 3000 hp tugboats utilized for anchor handling. Vessel usage assumptions are based on the estimated duration projected by the applicant for the movement and positioning phases of the drilling operation. Assumptions provided in this analysis include an estimated fuel use of 140.5 gal/hr (maneuver) and 56.2 gal/hr (idle) for the large tugboats, and 84.3 gal/hr (maneuver) and 33.7 gal/hr (idle) for the smaller tugs. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990). Table 5.2.1-16 provides the crew and supply boat and work boat emissions per well.

Helicopters. Approximately 20 helicopter trips per month will originate from Santa Barbara Airport for a total of 50 trips during the entire drill program. Each round trip required approximately 1 hour of flight time and 2 landing/takeoff cycles. Table 5.2.1-17 provides the helicopter emission estimates per well.

Flare. Well testing is an integral component during delineation activities to determine the quality of the natural gas produced and the formation pressure. This short-term duration NOx source occurs upon well completion. Typically, this phase is offset by the reduced power needs for drilling operations as the drilling mode has been completed prior to well testing. Estimated flare emissions have been included in the total emissions summary.

Total Drilling Emissions. Total drilling emissions expected of the Point Sal drilling operation Samedan are provided in Table 5.2.1-18.

An evaluation of the total drilling emissions demonstrate the majority of the NOx emissions are associated with the main drilling engines and the crew and supply vessels. Associated support vessels are responsible for the majority of the CO, VOC, and SO2 emissions from the project with PM10 being the least emitted pollutant.

Santa Barbara APCD Rule 202 F.6 (Drill Rig Engine Exemption) provides a permit exemption for drilling equipment provided that emissions from the

equipment are less than 25 tons per year. This exemption would include the MODU's main engines used to power the equipment used during the Pt. Sal drilling phase. Other equipment that is not part of the drilling phase will be subject to permit including marine vessel emissions and various ROC sources. Thus, this proposed project will require a Permit to Operate from SBCAPCD and emission sources subject to the permit will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit. Table 5.2.1-19 presents the total project estimated emissions in different configurations used for regulatory overview. A comparison of the New Source Review requirements demonstrates the Point Sal Unit project will be above levels requiring application of BACT and emission offsets to those sources subject to permit. The proposed project is additionally expected to result in a net emissions increase greater than levels which require a an air quality impact analysis (modeling) to ensure the project will not cause a violation or interfere with expeditious attainment of any air quality standard.

Air Quality Modeling Analysis. The MMS studied the impacts of the projected offshore emissions from the Point Sal Unit using the Offshore and Coastal Dispersion (OCD) Model. Peak hour emissions were determined to occur during the site preparation phase of the drilling operation. Utilizing the site preparation phase allowed for the addition of the crane engines to emissions from the drilling main engines and support vessels. Table 5.2.1-20 lists the highest predicted concentrations to onshore pollutant concentrations from the proposed project for both the site preparation and drilling phases and compares them with the maximum allowable increases over the baseline concentration established by SBCAPCD. The concentrations demonstrate that the proposed Pt. Sal Unit emissions are well within the maximum NO_2, SO_2 and PM_{10} allowable limits for a Class II area. Therefore, it is expected that increases in the onshore average concentrations of NO_2, SO_2 and PM_{10} are estimated to be well within the maximum increases allowed under both the Federal and Santa Barbara APCD standards.

Table 5.2.1-17. Point Sal helicopter emissions.

Point Sal Helicopter Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
LTO	0.15	0.68	0.34	0.02	0.02
In-Flight	0.16	0.13	0.02	0.02	0.02
Total	**0.31**	**0.81**	**0.36**	**0.04**	**0.04**

Table 5.2.1-18. Point Sal total drilling emissions.

	Point Sal Total Drilling Emission Estimate (tons)				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Main Engines	19.98	2.67	0.11	0.45	0.87
Crane Engines	0.71	0.27	0.01	0.01	0.07
Flare	0.14	0.05	0.01	0.01	0.01
Vessels	9.79	4.18	4.83	0.24	1.15
Helicopters	0.31	0.81	0.36	0.04	0.04
Total	**30.93**	**7.98**	**5.31**	**0.76**	**2.15**

Table 5.2.1-19. Point Sal Unit total drilling emissions.

	Point Sal Unit Total Drilling Emission Estimate				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Lbs/hr	34.83	8.99	5.98	0.86	2.42
Lbs/day	835.9	215.7	143.5	20.5	58.1
Tons/qtr.	30.93	7.98	5.31	0.76	2.15
Tons/year	30.93	7.98	5.31	0.76	2.15

Conclusion: In summary, activities associated with the proposed Point Sal Unit delineation activities are expected to result in low impacts to regional air quality. For the drilling of the proposed well, impacts are considered low (insignificant) based on the significance criteria used for this analysis. The project is not expected to result in any violations of Federal and State ambient air standards. The project is below drilling equipment permit exemption emission levels (25 tons/year) as determined by SBCAPCD Rules and Regulations. NSR thresholds will be exceeded by the project and will require BACT and emission offsets. Thus, the project will be subject to SBCAPCD permit requirements and will be subject to New Source Review requirements that emissions be fully offset to ensure a net air quality benefit for the project. Emission control technology proposed with the project descriptions will additionally reduce projected air quality impacts. No impacts are expected from accidents or upsets.

Purisima Point Unit. One delineation well is being proposed on the Purisima Point Unit. The operator has identified 4 potential sites where the well could be drilled. All of the proposed sites have been previously approved with the original Exploration Plans. Drilling on the Purisima Point Unit is anticipated to commence in the first quarter of 2003. Air emissions expected from the proposed delineation project result primarily from the main engines and cranes, crew and supply boats, and helicopters.

Drill Rig Emissions. The project description provided by Aera estimated the duration for each phase of the estimated 68 day drilling operation. The estimated drilling phase estimates were then combined with the engine loads as determined in the Radian report (Radian, 1982) to determine individual phase electromotive requirements. Based on these calculations, it was estimated that the electromotive requirements for the main engines are 2,295,960 horsepower hours. Emission estimates were then determined by applying the 1990 SEDCO 712 Source Test emission factors to the electromotive requirements. Drilling engine emission estimates per well are provided in Table 5.2.1-21 below.

Drill Rig Crane Emissions. Crane emissions were calculated using the crane usage and monitored emissions from the Proteus Prospect report by Texaco (Texaco,1990a) and then applying a NOx control factor of 20% for the 4 degree injection timing retard. CO estimates were conversely adjusted to reflect the increase in these emissions due to the selective NOx control technology. Drilling rig crane emissions per well are provided in Table 5.2.1-22 below.

Crew and Supply Boats. A contracted crew boat will be used to transport personnel to and from the drilling site. Crew boats will originate out of either

Table 5.2.1-20. Point Sal Unit modeling results and corresponding maximum allowable increases. (micrograms per cubic meter ($\mu g/m^3$))

Pollutant	Averaging Period	Class II Maximum Allowable Increase	National/State Ambient Air Quality Standard	Site Prep Modeled Impact	Drilling Phase Modeled Impact
NO_2	1-hour	100-470[1]	470[2]	82.1	24.2
	Annual Average	25.0	100	0.03	0.03
PM_{10}	24-hour Average	12-30	150	0.43	0.06
	Annual Average	17.0	50	0.00	0.00
SO_2	1-hour	NS	655[3]	2.3	0.62
	3-hour Average	512.0	1300	0.84	0.21
	24-hour Average	91.0	365	0.11	0.03
	Annual Average	20.0	80	0.00	0.00

1. Santa Barbara APCD incremental limit.
2. State of California ambient standard.
3. State Standard. No National Standard.

Table 5.2.1-21. Purisima Point drill rig emissions.

Purisima Point Drilling Engine Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
17.97	2.41	0.10	0.41	0.78

Port Hueneme or the Carpinteria Pier. It is estimated that the Bonito drilling operations will involve approximately 6 round trips per month. Each round trip is assumed to be 220 miles assuming Port Hueneme as the base port for a total of 2,640 miles. Approximately 9 round trips of 220 miles for supply boats will be assumed for a total of 3,960 miles.

The crew and supply boat will utilize the same control measures as are planned for the drilling rig. Additionally, the support vessels will limit their cruising speed to 80 percent of full power. Santa Barbara County APCD performed a study titled Crew and Supply Boat NOx Control Development Program (SBCAPCD, 1987) to determine crew and supply boat fuel usage rates and control measures. Assumptions provided in this analysis include an estimated fuel use of 2.97 gal/mi. for crew boats and 8.24 gal/mi. for the supply boats. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990).

Tug and Work Boats. Additional support vessel assumptions used in this analysis include (2) - 5000 hp tugboats utilized for towing and positioning the MODU and (2) 3000 hp tugboats utilized for anchor handling. Vessel usage assumptions are based on the estimated duration projected by the applicant for the movement and positioning phases of the drilling operation. Assumptions provided in this analysis include an estimated fuel use of 140.5 gal/hr (maneuver) and 56.2 gal/hr (idle) for the large tugboats, and 84.3 gal/hr (maneuver) and 33.7 gal/hr (idle) for the smaller tugs. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990). Table 5.2.1-23 provides crew and supply boat and work boat emissions per well.

Helicopters. Approximately 20 helicopter trips per month will originate from Santa Barbara Airport for a total of 40 trips during the entire drill program. Each round trip required approximately 1 hour of flight time and 2 landing/takeoff cycles. Table 5.2.1-24 below provides the helicopter emission estimates per well.

Flare. Well testing is an integral component during delineation activities to determine the quality of the natural gas produced and the formation pressure. This short term duration NOx source occurs upon well completion. Typically, this phase is offset by the reduced power needs for drilling operations as the frilling mode has been completed prior to well testing. Estimated flare emissions have been included in the total emissions summary.

Total Drilling Emissions. Total drilling emission expected of the Point Sal drilling operation Samedan are provided in Table 5.2.1-25 below.

An evaluation of the total drilling emissions demonstrate the majority of the NOx emissions are associated with the main drilling engines and the crew and supply vessels. Associated support vessels are responsible for the majority of the CO, VOC, and SO2 emissions from the project with PM10 being the least emitted pollutant.

Table 5.2.1-22. Purisima Point crane emissions.

Purisima Point Drilling Rig Crane Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
0.71	0.28	0.01	0.01	0.08

Table 5.2.1-23. Purisima Point support vessel emissions.

Purisima Point Support Vessel Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Crew Boat	1.06	0.50	0.67	0.03	0.13
Supply Boat	4.38	2.07	2.79	0.12	0.55
Work Boats	2.61	0.79	0.26	0.05	0.25
Total	**8.05**	**3.36**	**3.72**	**0.20**	**0.94**

Table 5.2.1-24. Purisima helicopter emissions.

Purisima Point Helicopter Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
LTO	0.12	0.54	0.27	0.02	0.02
In-Flight	0.13	0.10	0.01	0.02	0.02
Total	**0.25**	**0.64**	**0.28**	**0.03**	**0.03**

Santa Barbara APCD Rule 202 F.6 (Drill Rig Engine Exemption) provides a permit exemption for drilling equipment provided that emissions from the equipment are less than 25 tons per year. This exemption would include the MODU's main engines used to power the equipment used during the Purisima Point Unit drilling phase. Other equipment that is not part of the drilling phase will be subject to permit including marine vessel emissions and various ROC sources. Thus, this proposed project will require a Permit to Operate from SBCAPCD and emission sources subject to the permit will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit. Table 5.2.1-26 presents the total project estimated emissions in different configurations used for regulatory overview. A comparison of the New Source Review requirements demonstrates the Purisima Point Unit project will be above levels requiring application of BACT and emission offsets to those sources subject to permit. The proposed project is additionally expected to result in a net emissions increase greater than levels which require a an air quality impact analysis (modeling) to ensure the project will not cause a violation or interfere with expeditious attainment of any air quality standard.

Air Quality Modeling Analysis. The MMS studied the impacts of the projected offshore emissions from the Point Purisima Unit using the Offshore and Coastal Dispersion (OCD) Model. Peak hour NOx emissions were determined to occur during the site preparation phase of the drilling operation. Utilizing the site preparation phase allowed for the addition of the crane engines to emissions from the drilling main engines and support vessels. Table 5.2.1-27 lists the highest predicted concentrations to onshore pollutant concentrations from the proposed project for both the site preparation and drilling phases and compares them with the maximum allowable increases over the baseline concentration established by SBCAPCD. The concentrations demonstrate that the proposed Point Purisima Unit emissions are well within the maximum NO_2 allowable limits for a Class II area. Therefore, it is expected that increases in the onshore average concentrations of NO_2, SO_2 and PM_{10} are estimated to be well within the maximum increases allowed under both the Federal and Santa Barbara APCD standards.

Conclusion: In summary, activities associated with the proposed Point Purisima Unit delineation activities are expected to result in low impacts to regional air quality. For the drilling of the proposed well, impacts are considered low (insignificant) based on the significance criteria used for this analysis. The project is not expected to result in any violations of Federal and State ambient air standards. The project is below drilling equipment permit exemption emission levels (25 tons/year) as determined by SBCAPCD Rules and Regulations. NSR thresholds will be exceeded by the project and will require BACT and emission offsets. Thus, the project will be subject to SBCAPCD permit requirements and will be subject to NSR requirements that emissions be fully offset to ensure a net air quality benefit for the project. Emission control technology proposed with the project descriptions will additionally reduce projected air quality impacts. No impacts are expected from accidents or upsets.

Gato Canyon Unit. One delineation well is being proposed on the Gato Canyon Unit. The well site identified by the operator is in close proximity to the well site in the original Exploration Plan. Drilling on the Gato Canyon Unit is anticipated to commence in the second quarter of 2002. Air emissions expected from the proposed delineation project result primarily from the main engines and cranes, crew and supply boats, and helicopters.

Drill Rig Emissions. The project description provided by Aera estimated the duration for each phase of the estimated 95 day drilling operation. The estimated drilling phase estimates were then combined with the engine loads as determined in the Radian report (Radian, 1982) to determine individual phase electromotive requirements. Based on these calculations, it was estimated that the electromotive requirements for the main engines are 3,047,628 horsepower hours. Emission estimates were then determined by applying the 1990 SEDCO 712 Source Test emission factors to

Table 5.2.1-25. Purisima Point drill rig emissions.

	Purisima Point Total Drilling Emission Estimate (tons)				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Main Engines	17.97	2.41	0.10	0.41	0.78
Crane Engines	0.71	0.28	0.01	0.01	0.08
Flare	0.14	0.05	0.01	0.01	0.01
Vessels	8.05	3.36	3.72	0.20	0.94
Helicopters	0.25	0.64	0.29	0.03	0.03
Total	**27.12**	**6.73**	**4.12**	**0.66**	**1.84**

the electromotive requirements. Drilling engine emission estimates per well are provided in Table 5.2.1-28 below.

Drill Rig Crane Emissions. Crane emissions were calculated using the crane usage and monitored emissions from the Proteus Prospect report by Texaco (Texaco, 1990a) and then applying a NOx control factor of 20% for the 4 degree injection timing retard. CO estimates were conversely adjusted to reflect the increase in these emissions due to the selective NOx control technology. Drilling rig crane emissions per well are provided in Table 5.2.1-29 below.

Crew and Supply Boats. A contracted crew boat will be used to transport personnel to and from the drilling site. Crew boats will originate out of either Port Hueneme or the Carpinteria Pier. It is estimated that the Bonito drilling operations will involve approximately 7 round trips per month. Each round trip is assumed to be 204 miles assuming Port Hueneme as the base port. Approximately 9 round trips of 204 miles for supply boats will be assumed.

The crew and supply boat will utilize the same control measures as are planned for the drilling rig. Additionally, the support vessels will limit their cruising speed to 80 percent of full power. Santa Barbara County APCD performed a study titled Crew and Supply Boat NOx Control Development Program (SBCAPCD, 1987) to determine crew and supply boat fuel usage rates and control measures. Assumptions provided in this analysis include an estimated fuel use of 2.97 gal/mi. for crew boats and 8.24 gal/mi. for the supply boats. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990).

Tug and Work Boats. Additional support vessel assumptions used in this analysis include (2) - 5000 hp tugboats utilized for towing and positioning the MODU and (2) - 3000 hp tugboats utilized for anchor handling. Vessel usage assumptions are based on the estimated duration projected by the applicant for the movement and positioning phases of the drilling operation. Assumptions provided in this analysis include an estimated fuel use of 140.5 gal/hr (maneuver) and 56.2 gal/hr (idle) for the large tugboats, and 84.3 gal/hr (maneuver) and 33.7 gal/hr (idle) for the smaller tugs. Emissions were calculated using emission factors contained in AP-42 (EPA, 1990). Table 5.2.1-30 provides the crew and supply boat and work boat emissions per well.

Helicopters. Approximately 28 helicopter trips per month will originate from Santa Barbara Airport for a total of 84 trips during the entire drill program. Each round trip required approximately 25 minutes of flight time and 2 landing/takeoff cycles. Table 5.2.1-31 provides the helicopter emission estimates per well.

Flare. Well testing is an integral component

Table 5.2.1-26. Purisima Point Unit total drilling emissions.

	Purisima Point Total Drilling Emission Estimate (tons)				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Lbs/hr	33.24	8.25	5.05	0.81	2.25
Lbs/day	797.6	197.9	121.2	19.4	54.1
Tons/qtr.	27.12	6.73	4.12	0.66	1.84
Tons/year	27.12	6.73	4.12	0.66	1.84

Table 5.2.1-27. Point Purisima modeling results and corresponding maximum allowable increases. (micrograms per cubic meter ($\mu g/m^3$))

Pollutant	**Averaging Period**	**Class II Maximum Allowable Increase**	**National/State Ambient Air Quality Standard**	**Site Prep Modeled Impact**	**Drilling Phase Modeled Impact**
NO_2	1-hour	100-470[1]	470[2]	75.8	16.6
	Annual Average	25.0	100	0.03	0.03
PM_{10}	24-hour Average	12-30	150	0.62	0.05
	Annual Average	17.0	50	0.00	0.00
SO_2	1-hour	NS	655[3]	2.1	0.62
	3-hour Average	512.0	1300	0.82	0.21
	24-hour Average	91.0	365	0.13	0.03
	Annual Average	20.0	80	0.00	0.00

1. Santa Barbara APCD incremental limit.
2. State of California ambient standard.
3. State Standard. No National Standard.

during delineation activities to determine the quality of the natural gas produced and the formation pressure. This short-term duration NOx source occurs upon well completion. Typically, this phase is offset by the reduced power needs for drilling operations as the frilling mode has been completed prior to well testing. Estimated flare emissions have been included in the total emissions summary.

Total Drilling Emissions. Total drilling emission expected of the Point Sal drilling operation Samedan are provided in Table 5.2.1-32.

An evaluation of the total drilling emissions demonstrate the majority of the NOx emissions are associated with the main drilling engines and the crew and supply vessels. Associated support vessels are responsible for the majority of the CO, VOC, and SO2 emissions from the project with PM10 being the least emitted pollutant.

Santa Barbara APCD Rule 202 F.6 (Drill Rig Engine Exemption) provides a permit exemption for drilling equipment provided that emissions from the equipment are less than 25 tons per year. This exemption would include the MODU's main engines used to power the equipment used during the Gato Canyon Unit drilling phase. Other equipment that is not part of the drilling phase will be subject to permit including marine vessel emissions and various ROC sources. Thus, this proposed project will require a Permit to Operate from SBCAPCD and emission sources subject to the permit will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit. Table 5.2.1-33 presents the total project estimated emissions in different configurations used for regulatory overview. A comparison of the New Source Review requirements demonstrates the Gato Canyon Unit project will be above levels requiring application of BACT and emission offsets to those sources subject to permit. The proposed project is additionally expected to result in a net emissions increase greater than levels which require a an air quality impact analysis (modeling) to ensure the project will not cause a violation or interfere with expeditious attainment of any air quality standard.

Air Quality Modeling Analysis. The MMS studied the impacts of the projected offshore emissions from the Gato Canyon Unit using the Offshore and Coastal Dispersion (OCD) Model. Peak hour emissions were determined to occur during the site preparation phase of the drilling operation. Utilizing the site preparation phase allowed for the addition of the crane engines to emissions from the drilling main engines and support vessels. Table 5.2.1-34 lists the highest predicted concentrations to onshore pollutant concentrations from the proposed project for both the site preparation and drilling phases and compares them with the maximum allowable increases over the baseline concentration established by SBCAPCD. The modeled concentrations demonstrate that the proposed Gato Canyon Unit site preparation NO_2 emissions exceed the lower level of the 1 hour maximum increment range established by the SBCAPCD for NOx allowable limits for a Class II area. The increment range has been established by SBCAPCD to represent consumption of the increment and does not constitute a state or federal standard. The lower level of the increment range represents approximately 20% of the federal standard. Concentrations for SO_2 and PM_{10} were additionally modeled for Gato Canyon to demonstrate

Table 5.2.1-28. Gato Canyon drill rig emissions.

Gato Canyon Drilling Engine Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
23.85	3.19	0.13	0.54	1.04

Table 5.2.1-29. Gato Canyon crane emissions.

Gato Canyon Drilling Rig Crane Emission Estimate (tons)				
NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
0.71	0.28	0.01	0.01	0.08

Table 5.2.1-30. Gato Canyon support vessel emissions.

Gato Canyon Support Vessel Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Crew Boat	0.15	0.07	0.10	0.01	0.02
Supply Boat	2.77	1.31	1.77	0.07	0.35
Work Boats	4.42	1.31	0.43	0.09	0.43
Total	**7.34**	**2.70**	**2.29**	**0.17**	**0.79**

maximum predicted concentrations for those pollutants. Concentrations of SO_2 and PM_{10} are well below allowable increases.

The most recent validated ambient air concentrations were obtained from the SBCAPCD and added to the incremental concentrations predicted by the OCD model for a comparison against Federal and State ambient air quality standards. The comparison indicates that increases in the onshore average concentrations of NO_2, SO_2, and PM_{10} from the proposed projects are estimated to be less than the maximum increases allowed under the Federal, State and Santa Barbara APCD standards.

Conclusion: In summary, activities associated with the proposed Gato Canyon Unit delineation activities are expected to result in low impacts to regional air quality. For the drilling of the proposed well, impacts are considered moderate to low (significant, but mitigable to insignificant) based on the significance criteria used for this analysis. Based on modeling results, the project is not expected to result in any violations of Federal and State ambient air standards, however NO_2 emissions may exceed the lower level of the 1 hour maximum increment range established by the SBCAPCD for NOx allowable limits for a Class II area. The project is below drilling equipment permit exemption emission levels (25 tons/year) as determined by SBCAPCD Rules and Regulations. NSR thresholds will be exceeded by the project and will require BACT and emission offsets. Thus, the project will be subject to SBCAPCD permit requirements and will be subject to NSR requirements that emissions be fully offset to ensure a net air quality benefit for the project. Emission control technology proposed with the project descriptions will additionally reduce projected air quality impacts. No impacts are expected from accidents or upsets.

5.2.1.1.1 SUMMARY AND CONCLUSION

The potential impacts to onshore air quality resulting from the proposed delineation projects are considered low based on the significance criteria levels utilized in this analysis. Increased NOx and SO_2 emissions from exploratory drilling operations on the MODU will be minimized through the application of the following project proposed emission control measures on the main engines, 4 degree injection timing retard, turbo-charging, enhanced inter-cooling with seawater, and low sulfur diesel fuel (≤ 0.05 wt.%S).

Table 5.2.1-31. Gato Canyon helicopter emissions.

Gato Canyon Helicopter Emission Estimate (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
LTO	0.25	1.14	0.57	0.03	0.03
In-Flight	0.07	0.05	0.01	0.01	0.01
Total	**0.32**	**1.19**	**0.58**	**0.04**	**0.04**

Table 5.2.1-32. Gato Canyon total drilling emissions.

	Gato Canyon Total Drilling Emission Estimate (tons)				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Main Engines	23.85	3.19	0.13	0.54	1.04
Crane Engines	0.71	0.28	0.01	0.01	0.08
Flare	0.14	0.05	0.01	0.01	0.01
Vessels	7.34	2.70	2.29	0.17	0.79
Helicopters	0.32	1.19	0.58	0.04	0.04
Total	**32.37**	**7.40**	**3.01**	**0.77**	**1.96**

Table 5.2.1-33. Gato Canyon Unit total drilling emissions.

	Gato Canyon Total Drilling Emission Estimate (tons)				
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Lbs/hr	28.39	6.49	2.64	0.68	1.72
Lbs/day	681.5	155.8	63.37	16.2	41.26
Tons/qtr.	32.37	7.40	3.01	0.77	1.96
Tons/year	32.37	7.40	3.01	0.77	1.96

The crew and supply boats supporting the exploratory drilling activities will utilize the same control measures as are planned for the drilling rig. Additionally, the support vessels will limit their cruising speed to 80 percent of full power.

The potential for a drilling equipment permit exemption threshold level to be exceeded (Rule 202. F.6; 25 tons/yr) has only been determined for the Bonito Unit project, and only if a 2 well scenario is realized over the same 12 month period. All the proposed projects are above NSR threshold emission levels for BACT, emission offsets and air quality impact analysis and will be required to comply with those provisions in SBCAPCD Rules and Regulations. Additional equipment and emissions not related to drilling operations will require a Permit to Operate from SBCAPCD and emission sources subject to the permit will be in accordance with NSR provisions to ensure a net air quality benefit.

The potential for violations of the ambient air standards are considered negligible due to the short duration of the projects and the implementation of project proposed emission control measures to minimize impacts from the drilling equipment and support vessels. Table 5.2.1-35 displays the OCD model results of the maximum predicted onshore pollutant concentrations expected for both the site preparation and drilling phases of all the proposed projects. The maximum 1-hour NO_2 concentrations are projected to occur during the positioning phase of the Gato Canyon Unit proposed project, with the other proposed projects' onshore concentrations estimated to be below the Gato Canyon Unit levels. The modeled concentrations demonstrate that only the proposed Gato Canyon Unit NO_2 emissions may exceed the lower level of the 1 hour maximum increment range established by the SBCAPCD for NOx allowable limits for a Class II area. The increment range has been established by SBCAPCD to represent consumption of the increment and does not constitute a state or federal standard. According to SBCAPCD regulations, the applicant may consume the full increment range given they provide for an alternative fee based mitigation to the District. Concentrations of SO_2 and PM_{10} are additionally well below the allowable increases for those pollutants.

The table further demonstrates that based on the modeled emission estimates, the onshore impacts on air quality from the projects are estimated to be well below federally allowable increases in NO_2, SO_2, and PM_{10} emissions as regulated by 40 CFR 51.166(c) and further reflected in SBCAPCD Rule 803. Any project eventually determined to be subject to SBCAPCD permit requirements will be subject to BACT and be fully offset at a greater than a 1:1 ratio to result in a net air quality benefit to Santa Barbara County in accordance with SBCAPCD Rules and Regulations.

5.2.1.2 CUMULATIVE AIR QUALITY IMPACTS (2002-2006)

CUMULATIVE IMPACTS WITHOUT THE PROPOSED ACTION

Proposed Federal and State Oil and Gas Activities. Proposed Federal and State oil and gas activities considered in this analysis include Arguello Inc.'s Rocky Point Unit, Samedan's Sword Unit, and Nuevo's Tranquillon Ridge Unit.

Rocky Point Unit: Arguello, Inc. is proposing to develop the Rocky Point Unit by drilling up to 20 extended reach wells from three existing platforms, Harvest, Hidalgo and Hermosa, in the adjacent Point Arguello Unit. Based on the project description submitted to date, drilling is expected to commence dur-

Table 5.2.1-34. Gato Canyon modeling results and corresponding maximum allowable increases. (micrograms per cubic meter ($\mu g/m^3$))

Pollutant	Averaging Period	Class II Maximum Allowable Increase	National/State Ambient Air Quality Standard	Site Prep Modeled Impact	Drilling Phase Modeled Impact
NO_2	1-hour	100-470[1]	470[2]	200	32.8
	Annual Average	25.0	100	0.03	0.03
PM_{10}	24-hour Average	12-30	150	0.89	0.08
	Annual Average	17.0	50	0.00	0.00
SO_2	1-hour	NS	655[3]	5.4	0.94
	3-hour Average	512.0	1300	1.8	0.28
	24-hour Average	91.0	365	0.2	0.04
	Annual Average	20.0	80	0.00	0.00

1. Santa Barbara APCD incremental limit.
2. State of California ambient standard.
3. State Standard. No National Standard.

ing the fourth quarter of 2001. No new production equipment other than measurement and allocation equipment will be required on the platforms. The produced oil will be transported in existing pipelines to the Gaviota onshore facility. The oil will be heated using existing equipment at Gaviota and transported by pipeline to refineries. All of the wells will be directionally drilled using existing well slots on the platforms. The drilling program is projected to take 4 years to complete. Production is projected to last 10 years. Based on these projections, production from the Rocky Point Unit will take place within the remaining productive life (2015) of the Point Arguello platforms.

As the Rocky Point Unit is projected to be drilled from the adjacent Point Arguello Unit platforms, projected emission increases must be compared to permitted emission limits for the Point Arguello Project. The preliminary emission increases projected in the project description for the Rocky Point Unit are expected to be within existing allowable permitted emission limits for the Point Arguello Project and those emissions have been fully offset per SBCAPCD Rules and Regulations. Any additional equipment or emissions not contained within the Point Arguello Project emission limits will be subject to SBCAPCD permit and shall be in full compliance prior to commencement of the project.

Sword Unit: Samedan Oil Corporation (Samedan), is proposing to develop the Sword Unit by drilling an extended reach well from Platform Hermosa located on the adjacent Pt. Arguello Unit. The new well will be tested for productivity and the oil properties analyzed to make a final determination of the capability to commingle the Sword oil with the Point Arguello oil in the Platform Hermosa facilities. Depending upon the success of the test well, the Sword Unit will be developed from additional extended reach wells from Platform Hermosa. The milestone date for drilling the initial Sword well is August 1, 2003. The feasibility of this project is still being investigated by Samedan and emission estimates are not available at this time.

Tranquillon Ridge Project: Nuevo Energy Company (Nuevo), is seeking approval to develop the Tranquillon Ridge area offshore Point Pedernales in the southern Santa Maria Basin from an existing OCS platform, Platform Irene. The Tranquillon Ridge Unit is located in State waters and is estimated to begin drilling in late 2001. State and local agencies are preparing an Environmental Impact Report (EIR) on the proposed project.

The proposed Tranquillon Ridge Project would involve the drilling of up to 30 extended reach wells (22 development wells and 8 utility and re-drills) from

Table 5.2.1-35. Maximum predicted onshore pollutant concentrations.

Maximum Predicted Onshore Pollutant Concentrations From Proposed Actions (micrograms per cubic meter (► g/m^3)								
Pollutant	**Averaging Period**	**Class II Maximum Allowable Increase**	**Ambient Air Quality Standard**	**Santa Barbara Maximum Background Concentration[3]**	**Site Prep. Phase**	**Drill Phase[5]**	**Total Site Prep.**	**Total Drill Phase**
NO_2	1-hour	100-470[1]	470[2]	58	200	32.8	258	90.8
	Annual Average	25.0	100	26	0.03	0.03	26.03	26.03
PM_{10}	24-hour Average	12-30	150	45.2	0.89	0.08	46.09	45.28
	Annual Average	17.0	50	30.9	0.00	0.00	30.9	30.9
SO_2	1-hour	NS	655[4]	10.4	5.4	0.94	15.8	11.34
	3-hour Average	512.0	1300	7.8	1.8	0.28	8.6	8.08
	24-hour Average	91.0	365	2.6	0.2	0.04	2.8	2.64
	Annual Average	20.0	80	5	0.00	0.00	5.00	5.00

1. Santa Barbara APCD incremental limit.
2. State of California ambient standard.
3. Vandenberg (south) 1999 ambient data (Provided by SBCAPCD)
4. State Standard. No National Standard.
5. Maximum predicted concentration for longest project phase.

Platform Irene into State Tidelands. Total well drilling and completion times are anticipated to range between 60 and 120 days per well. Oil and gas produced by the proposed project would be transported to shore via the existing pipeline system to the Lompoc processing facility. The Tranquillon Ridge project would take approximately 15 years.

The proposed project will be subject to SBCAPCD permitting requirements and NSR provisions ensuring that the project will result in no net increase in emissions and be fully offset to have an air quality benefit. Emission estimates for the Tranquillon Ridge project have not been developed at this time.

On-going Oil and Gas Activities. There are presently a total of 19 platforms located in the South Central Coast Air Basin with 15 platforms located in the OCS offshore of Santa Barbara County and 4 Platforms in federal waters offshore of Ventura County. The existing platforms are within the jurisdiction of the adjacent onshore air agencies and all have current Permits to Operate. The emission sources from those facilities have been controlled and fully offset and are in full compliance with SBCAPCD and VCAPCD Rules and Regulations. The platforms located in Ventura County waters are considered outside of the geographical scope of this analysis and are not considered to cumulatively interact with the proposed projects.

The 1996 annual emission inventory for the OCS contained in the 1998 Santa Barbara Clean Air Plan (SBCAPCD, 1998) estimates that fuel combustion and petroleum production NOx emissions from OCS oil and gas production facilities contribute less than 4% of the total NOx emissions. Emissions attributable to offshore oil production crew and supply boats represent approximately 2.7% of the total marine vessel emissions in the OCS. Therefore, total NOx emissions attributable to OCS oil and gas activities represent approximately 6.4% of the annual OCS emission inventory.

Oil and gas activities represent approximately 24% of the reactive organic gas (ROG) inventory with natural petroleum seeps accounting for the largest contribution to the ROG inventory at 45%. Thus, natural sources of hydrocarbon emissions contribute approximately 40% more emissions than all OCS oil and gas activities combined. Marine vessels contribute the remaining 31% of ROG emissions.

The approximate emission contributions from ongoing oil and gas activities in the OCS are conservatively expected to remain at present levels and are considered to be indicative of the proportional contribution to cumulative air quality during the period 2002 - 2006. Table 5.2.1-36 lists the major source groupings for the 1996 OCS annual emission inventory.

Marine Shipping and Tankering. Other offshore emission sources considered in this analysis are marine shipping and tankering operations. Emissions from marine vessels traversing the Santa Barbara Channel are not regulated by federal, state or local air authorities and are the major offshore contributor to regional air quality. Approximately 80 percent of the vessels calling on the Ports of Los Angeles and Long Beach are of foreign registry and most use engines produced outside the United States (ARB, 2000).

The 1996 OCS emission inventory for Santa Barbara County estimates that emissions from ships and commercial boats account for approximately 1 ton per day of ROG, or about 24 percent of the total OCS ROG inventory. The most recent Santa Barbara CAP estimates that approximately 96% of the OCS NOx emissions inventory is attributable to shipping and commercial vessels and 97% of the particulate matter emissions. Therefore, it is expected that the cumulative air quality impact of marine shipping and tankering will continue to be the most significant contributor to cumulative air quality in the OCS. Table 5.2.1-37 lists the major source groupings for the 1996 OCS annual emission inventory.

INCREMENTAL IMPACTS OF THE PROPOSED ACTIONS

For this analysis, each of the proposed projects has been analyzed as to their incremental contribution to cumulative air quality. Potential sources of cumulative air quality impacts in the project area which overlap both spatially and temporally include emissions from on-going and proposed oil and gas activities in Federal and State waters, natural petroleum seeps, and marine shipping and tankering operations and have been discussed above. See Section 5.2.1 for the discussion of the impacts associated with the proposed delineation activities for the period 2002-2006.

Bonito Unit. A single drill rig has been proposed by the applicants to drill all the proposed delineation wells. Section 5.2.1 discusses the expected air quality impacts from each of the Proposed Actions. The OCD model predicted emission concentrations for the projected Bonito Unit to be within the maximum allowable limits for a Class II area. The predicted concentrations were added to existing ambient background levels for NO_2 and demonstrate that the proposed Bonito Unit emissions are estimated to be less than the maximum increases allowed under both the Federal and state ambient air standards (Table 5.2.1-13). Non drilling equipment will require a Permit to Operate from SBCAPCD and will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit.

Proposed Federal and State Oil and Gas Activities. Federal and state oil and gas activities considered in the Bonito Unit cumulative analysis include the Tranquillon Ridge Unit, the proposed Aera projects (Purisima Point Unit, Point Sal Unit), and Samedan's

Sword Unit and Gato Canyon Unit. Air emission impacts would be associated with delineation drilling from the MODU and extended reach drilling from adjacent OCS platforms. The delineation drilling projects will not run concurrently due to utilizing a single drill rig and any short-term emission impacts from the individual activities are not expected to overlap. Emission potentials are unavailable at this time for the Tranquillon Ridge and Sword Unit projects. All of the proposed Federal and state oil and gas projects will be subject to SBCAPCD permit requirements, including NSR provisions which require the implementation of BACT and emissions offsets to result in a net air quality benefit for the projects. Therefore, the proposed projects will be permitted and analyzed by the SBCAPCD to ensure that emissions from the proposed projects will be below levels deemed significant to regional air quality.

On-going Oil and Gas Activities. The existing energy related projects considered in Federal and state waters to cumulatively contribute with the proposed Bonito Unit project include air emissions from Platform Irene, the Point Arguello Unit and the Santa Ynez Unit. The existing platforms identified within the vicinity of the proposed project are within the jurisdiction of the SBCAPCD and have current Permits to Operate. Ambient air monitoring levels from the nearest monitoring station were combined with the predicted OCD modeled concentrations from the Bonito Unit and no violation of the ambient air standards is expected. It is assumed that the monitoring data represents ambient concentrations from the existing OCS oil and gas facilities in the project area. The emission sources from those facilities have been controlled and fully offset and are in full compliance with SBCAPCD Rules and Regulations and ambient air pollutant concentrations from these facilities are reflected in monitored data. Thus, the additional incremental emissions levels expected with the proposed project will have been fully offset and is not expected to have a cumulative air quality impact with existing controlled and fully offset Federal oil and gas activities.

Table 5.2.1-36. 1996 Santa Barbara County OCS emission inventory - (tons/year).

Category	ROG	NOx	CO	SOx	PM
Stationary Sources					
Fuel Combustion	12.46	307.07	177.36	13.72	15.36
Petroleum Production	354.56	9.21	50.14	77.52	2.72
Surface Coatings	15.46	-	-	-	-
Total Stationary	**382.48**	**316.28**	**227.50**	**91.24**	**18.95**
Mobile Sources					
Ships/Comm. Boats	363.31	8,114.75	976.06	5,273.69	641.23
(crew/supply)*	(19.75)	(222.07)	(55.95)	(13.62)	(22.20)
Recreational Boats	97.93	20.42	303.05	2.31	5.50
Aircraft	6.78	6.22	5.40	0.32	0.32
Total Mobile	**468.02**	**8,141.39**	**1,284.51**	**5,276.32**	**647.05**
Petroleum Seeps	684.83	-	-	-	-
Santa Barbara County Total	**1,535.33**	**8,457.67**	**1,512.01**	**5,367.56**	**666.00**

* subset of shipping category

Table 5.2.1-37. Total emission contribution from proposed projects.

Total Emission Contribution to Existing Santa Barbara OCS Emissions (tons)					
	NOx	**CO**	**VOC**	**SO_2**	**PM_{10}**
Bonito	35.07	9.20	5.34	0.87	2.39
Point Sal	30.93	7.98	5.31	0.76	2.15
Purisima Point	27.12	6.73	4.12	0.66	1.84
Gato Canyon	32.37	7.40	3.01	0.77	1.96
Total	**125.49**	**31.31**	**17.78**	**3.06**	**8.34**
1996 OCS Inventory	**8,457.67**	**1,512.01**	**1,535.33**	**5,367.56**	**666.00**

Marine Shipping and Tankering. Other offshore emission sources considered in this analysis are marine shipping and tankering operations. Emissions from marine vessels traversing the Santa Barbara Channel are not regulated by federal, state or local air authorities and may combine with emissions from the proposed project to affect onshore air quality. However, emissions from the proposed project will be permitted and offset per Santa Barbara APCD Rules and Regulations and is not expected to incrementally add to the cumulative air quality impact of marine shipping and tankering.

Onshore Projects. No major onshore projects are pending or approved in the vicinity of the Bonito Unit project which have the potential of cumulatively impacting regional air quality.

Conclusions. The potential for the incremental emissions increase associated with the Bonito Unit delineation project to cumulatively impact regional air quality are considered to be low. Emission increases associated with the proposed project will be fully offset and permitted by SBCAPCD and are not expected to contribute significantly to the potential impact to regional air quality that may be expected from existing offshore oil and gas activities and marine shipping and tankering emissions. Emission modeling of the project demonstrates a negligible short-term impact to overall regional air quality and is not expected result in any violation of Federal or State ambient air quality standards for the period 2002-2006.

Point Sal Unit. A single drill rig has been proposed by the applicants to drill all the proposed delineation wells. Section 5.2.1 discusses the expected air quality impacts from each of the Proposed Actions. Projected emissions from the Point Sal Unit exhibit the highest NO_2 concentrations of all the proposed projects modeled. The modeled concentrations demonstrate that the proposed Point Sal Unit NO_2 emissions marginally exceed the lower level of the 1 hour maximum increment range established by the SBCAPCD for NOx allowable limits for a Class II area. This lower limit has been established by SBCAPCD and does not constitute a state or federal increment and represents approximately 20% of the federal standard. The predicted concentrations were added to existing ambient background levels for NO_2, SO_2, and PM_{10} and demonstrate that the proposed Point Sal Unit emissions are estimated to be less than the maximum increases allowed under both the Federal and state ambient air standards (Table 5.2.1-20). Non drilling equipment will require a Permit to Operate from SBCAPCD and will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit.

Proposed Federal and State Oil and Gas Activities. Federal and state oil and gas activities considered in the Point Sal Unit cumulative analysis include the Tranquillon Ridge Unit, the proposed Aera's Purisima Point Unit, Nuevo's Bonito Unit, and Samedan's Sword Unit and Gato Canyon Unit. Air emission impacts would be associated with delineation drilling from the MODU and extended reach drilling from adjacent OCS platforms. The delineation drilling projects will not run concurrently due to utilizing a single drill rig and any short-term emission impacts from the individual activities are not expected to overlap. Emission potentials are unavailable at this time for the Tranquillon Ridge and Sword Unit projects. All of the proposed Federal and state oil and gas projects will be subject to SBCAPCD permit requirements, including NSR provisions which require the implementation of BACT and emissions offsets to result in a net air quality benefit for the projects. Therefore, the proposed projects will be permitted and analyzed by the SBCAPCD to ensure that emissions from the proposed projects will be below levels deemed significant to regional air quality.

On-going Oil and Gas Activities. The existing energy related projects considered in Federal and State waters to cumulatively contribute with the proposed Point Sal Unit project include air emissions from Platform Irene, the Point Arguello Unit and the Santa Ynez Unit. The existing platforms identified within the vicinity of the proposed project are within the jurisdiction of the SBCAPCD and have current Permits to Operate. Ambient air monitoring levels form the nearest monitoring station were combined with the predicted OCD modeled concentrations from the Point Sal Unit and no violation of the ambient air standards is expected. It is assumed that the monitoring data represents ambient concentrations from the existing OCS oil and gas facilities in the project area. The emission sources from those facilities have been controlled and fully offset and are in full compliance with SBCAPCD Rules and Regulations and ambient air pollutant concentrations from these facilities are reflected in monitored data. Thus, the additional incremental emissions levels expected with the proposed project will have been fully offset and is not expected to have a cumulative air quality impact with existing controlled and fully offset Federal oil and gas activities.

Marine Shipping and Tankering. Other offshore emission sources considered in this analysis are marine shipping and tankering operations. Emissions from marine vessels traversing the Santa Barbara Channel are not regulated by federal, state or local air authorities and may combine with emissions from the proposed project to affect onshore air quality. Emissions from the proposed project will be permitted and offset per Santa Barbara APCD Rules and Regulations and are not expected to incrementally add to the cumulative air quality impact of marine shipping and tankering.

Onshore Projects. No major onshore projects are pending or approved in the vicinity of the Pt. Sal Unit project which have the potential of cumulatively impacting regional air quality.

Conclusions. The potential for the incremental emissions increase associated with the Point Sal Unit delineation project to cumulatively impact regional air quality is considered to be low. Emission increases associated with the proposed project will be fully offset and permitted by SBCAPCD and are not expected to contribute significantly to the potential impact to regional air quality that may be expected from existing offshore oil and gas activities and marine shipping and tankering emissions. Emission modeling of the project demonstrates a negligible short-term impact to overall regional air quality and is not expected result in any violation of Federal or State ambient air quality standards.

Purisima Point Unit. A single drill rig has been proposed by the applicants to drill all the proposed delineation wells. Section 5.2.1 discusses the expected air quality impacts from each of the Proposed Actions. The OCD model predicted emission concentrations for the projected Purisima Point Unit to be within the maximum allowable limits for a Class II area. The predicted concentrations were added to existing ambient background levels for NO_2 and demonstrate that the proposed Purisima Point Unit emissions are estimated to be less than the maximum increases allowed under both the Federal and state ambient air standards (Table 5.2.1-26). Non drilling equipment will require a Permit to Operate from SBCAPCD and will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit.

Proposed Federal and State Oil and Gas Activities. Federal and state oil and gas activities considered in the Purisima Point cumulative analysis include the Tranquillon Ridge Unit, the proposed Aera's Point Sal Unit, Nuevo's Bonito Unit, and Samedan's Sword Unit and Gato Canyon Unit. Air emission impacts would be associated with delineation drilling from the MODU and extended reach drilling from adjacent OCS platforms. The delineation drilling projects will not run concurrently due to utilizing a single drill rig and any short-term emission impacts from the individual activities are not expected to overlap. Emission potentials are unavailable at this time for the Tranquillon Ridge and Sword Unit projects. All of the proposed Federal and state oil and gas projects will be subject to SBCAPCD permit requirements, including NSR provisions which require the implementation of BACT and emissions offsets to result in a net air quality benefit for the projects. Therefore, the proposed projects will be permitted and analyzed by the SBCAPCD to ensure that emissions from the proposed projects will be below levels deemed significant to regional air quality.

On-going Oil and Gas Activities. The existing energy related projects considered in Federal and State waters to cumulatively contribute with the proposed Purisima Point Unit project include air emissions from Platform Irene, the Point Arguello Unit and the Santa Ynez Unit. The existing platforms identified within the vicinity of the proposed project are within the jurisdiction of the SBCAPCD and have current Permits to Operate. Ambient air monitoring levels form the nearest monitoring station were combined with the predicted OCD modeled concentrations from the Purisima Point Unit and no violation of the ambient air standards is expected. It is assumed that the monitoring data represents ambient concentrations from the existing OCS oil and gas facilities in the project area. The emission sources from those facilities have been controlled and fully offset and are in full compliance with SBCAPCD Rules and Regulations and ambient air pollutant concentrations from these facilities are reflected in monitored data. Thus, the additional incremental emissions levels expected with the proposed project will have been fully offset and is not expected to have a cumulative air quality impact with existing controlled and fully offset Federal oil and gas activities.

Marine Shipping and Tankering. Other offshore emission sources considered in this analysis are marine shipping and tankering operations. Emissions from marine vessels traversing the Santa Barbara Channel are not regulated by federal, state or local air authorities and may combine with emissions from the proposed project to affect onshore air quality. Emissions from the proposed project will be permitted and offset per Santa Barbara APCD Rules and Regulations and are not expected to incrementally add to the cumulative air quality impact of marine shipping and tankering.

Onshore Projects. No major onshore projects are pending or approved in the vicinity of the Purisima Point Unit project which have the potential of cumulatively impacting regional air quality.

Conclusions. The potential for the incremental emissions increase associated with the Point Purisima Unit delineation project to cumulatively impact regional air quality is considered to be low. Emission increases associated with the proposed project will be fully offset and permitted by SBCAPCD and are not expected to contribute significantly to the potential impact to regional air quality that may be expected from existing offshore oil and gas activities and marine shipping and tankering emissions. Emission modeling of the project demonstrates a negligible short-term impact to overall regional air quality and is not expected result in any violation of Federal or State ambient air quality standards.

Gato Canyon Unit. A single drill rig has been proposed by the applicants to drill all the proposed delineation wells. Section 5.2.1 discusses the expected air quality impacts from each of the Proposed Actions. The OCD model predicted emission concentrations for

the projected Gato Canyon Unit to be within the maximum allowable limits for a Class II area. The predicted concentrations were added to existing ambient background levels for NO_2 and demonstrate that the proposed Gato Canyon Unit emissions are estimated to be less than the maximum increases allowed under both the Federal and state ambient air standards (Table 5.2.1-34). Non drilling equipment will require a Permit to Operate from SBCAPCD and will be in accordance with BACT and emission offset provisions to ensure a net air quality benefit.

Proposed Federal and State Oil and Gas Activities. Federal and state oil and gas activities considered in the Gato Canyon Unit cumulative analysis include the Tranquillon Ridge Unit, the proposed Aera projects (Purisima Point Unit, Point Sal Unit), Nuevo's Bonito Unit, and Samedan's Sword Unit. Air emission impacts would be associated with delineation drilling from the MODU and extended reach drilling from adjacent OCS platforms. The delineation drilling projects will not run concurrently due to utilizing a single drill rig and any short-term emission impacts from the individual activities are not expected to overlap. Emission potentials are unavailable at this time for the Tranquillon Ridge and Sword Unit projects. All of the proposed Federal and state oil and gas projects will be subject to SBCAPCD permit requirements, including NSR provisions which require the implementation of BACT and emissions offsets to result in a net air quality benefit for the projects. Therefore, the proposed projects will be permitted and analyzed by the SBCAPCD to ensure that emissions from the proposed projects will be below levels deemed significant to regional air quality.

On-going Oil and Gas Activities. The existing energy related projects considered in Federal and State waters to cumulatively contribute with the proposed Gato Canyon Unit project include air emissions from Platform Irene, the Point Arguello Unit and the Santa Ynez Unit. Additional southern Santa Barbara County OCS and state facilities have also been considered for their cumulative contributions with the proposed project. The existing platforms identified within the vicinity of the proposed project are within the jurisdiction of the SBCAPCD and have current Permits to Operate. Ambient air monitoring levels form the nearest monitoring station were combined with the predicted OCD modeled concentrations from the Gato Canyon Unit and no violation of the ambient air standards is expected. It is assumed that the monitoring data represents ambient concentrations from the existing OCS oil and gas facilities in the project area. The emission sources from those facilities have been controlled and fully offset and are in full compliance with SBCAPCD Rules and Regulations and ambient air pollutant concentrations from these facilities are reflected in monitored data. Thus, the additional incremental emissions levels expected with the proposed project will have been fully offset and is not expected to have a cumulative air quality impact with existing controlled and fully offset Federal oil and gas activities.

Marine Shipping and Tankering. Other offshore emission sources considered in this analysis are shipping and tankering operations. Emissions from marine vessels traversing the Santa Barbara Channel are not regulated by federal, state or local air authorities and may combine with emissions from the proposed project to affect onshore air quality. Emissions from the proposed project will be permitted and offset per Santa Barbara APCD Rules and Regulations and are not expected to incrementally add to the cumulative air quality impact of marine shipping and tankering.

Onshore Projects. No major onshore projects are pending or approved in the vicinity of the Gato Canyon Unit project which have the potential of cumulatively impacting regional air quality.

Conclusions. The potential for the incremental emissions increase associated with the Gato Canyon Unit delineation project to cumulatively impact regional air quality is considered to be low. Emission increases associated with the proposed project will be fully offset and permitted by SBCAPCD and are not expected to contribute significantly to the potential impact to regional air quality that may be expected from existing offshore oil and gas activities and marine shipping and tankering emissions. Emission modeling of the project demonstrates a negligible short-term impact to overall regional air quality and is not expected result in any violation of Federal or State ambient air quality standards.

Summary and Conclusions (2002 – 2006): The potential for the incremental emissions associated with the Proposed Actions to add to cumulative impacts to air quality in the central Santa Barbara Channel and southern Santa Barbara County is considered to be low. There is no temporal overlap expected of the proposed delineation projects for the period 2002-2006 due to the utilization of a single drilling rig that would add to the expected peak hour emission estimates. Geographical overlap is limited presently to the air pollutant contributions of existing OCS oil and gas activities and ongoing marine shipping and tankering operations. All proposed projects will be subject to Santa Barbara APCD permit and NSR requirements to ensure individual projects do not result in regional air quality impacts. The total emissions for each Proposed Action are compared to the most recently published 1996 OCS emission inventory for Santa Barbara County in Table 5.2.1-37 and result in less than 1.5% of that emission budget. A smaller percentage contribution is expected to the onshore emission budget. Therefore, no impacts to cumulative air quality are expected from the incremental project contribution.

5.2.2 WATER QUALITY

As noted in section 4.5, water quality in the Study Area (Point Lobos to Point Fermin) Bight is quite good. The following sections describe the potential for impacts to that water quality, first, from the proposal (section 5.2.2.1). Section 5.2.2.2 then considers potential impacts to water quality cumulatively by considering all other relevant inputs to the ocean that could also affect water quality. Section 6.2.2 then considers the potential cumulative impacts to water quality, over the timeframe of 2002 to 2030, if development of the oil and gas resources that are proposed to be drilled occurs.

5.2.2.1 IMPACTS OF THE PROPOSED ACTION

IMPACT LEVEL DEFINITIONS FOR WATER QUALITY

The following significance criteria were used in the following analysis to determine whether the Proposed Action would result in significant impacts to water quality.

High (Significant): Project may cause or contribute to changes in standard, measurable water quality parameters resulting in unreasonable degradation[1] to the water quality over an area, defined as greater than 10,000 m (32,000 ft) from the discharge point.

Moderate (Significant): Project may cause or contribute to changes in standard, measurable water quality parameters resulting in unreasonable degradation to the water quality over an area, defined as from 5,000 m to 10,000 m (16,000 to 32,0000 ft) from the discharge point.

Low (Insignificant): Project does not cause or contribute to changes in standard, measurable water quality parameters resulting in unreasonable degradation to the water quality over an area defined as from 100 m to 5,000 m (320 to 16,000 ft) from the discharge point.

Negligible: A negligible impact to water quality may cause changes in water quality parameters for a short period, within 100 m (320 ft), but might still be worthy of an enforcement action by the Environmental Protection Agency (EPA) or the U. S. Coast Guard (USCG). This might take the form of a violation of a National Pollutant Discharge Elimination System (NPDES) permit, either by exceeding a limit or by creating an oil sheen (also a violation of USCG regulations). However, the act of violation, under this scenario, would not constitute an unreasonable degradation to water quality. Marine oil spills are not regulated under NPDES regulations or permits.

MITIGATION THAT IS PART OF THE PROPOSED ACTION

National Pollutant Discharge Elimination System permits. A mitigation that will be part of the Proposed Action, via EPA regulation, is the NPDES permit in-place at the time of the proposed drilling projects. Historically, mobile offshore drilling units (MODUs) have acquired Individual NPDES permits in order to operate offshore California. If the new General permit is in-place by the time these proposed operations occur, the MODU will operate under that General permit. In any case, either an Individual or the new General permit will be required by EPA for any of the delineation drilling operations to commence.

Two sources of pollution that could affect water quality during the operations of the delineation activities are turbidity raised from the sea floor during the placement and recovery of the drilling vessel anchors and from as many as 17 discharges emanating from the drilling vessel (table 5.2.2.1-1). No oil spills are expected from these delineation drilling projects.

RESUSPENSION AND TRANSPORT PROCESSES

Resuspension of sediments, whether from anthropogenic or natural sources, occurs in the bottom portion of the water column and can result in short-term changes in various sediment characteristics, including grain size and chemistry, and water quality parameters. Resuspension processes can play a role in certain offshore oil and gas activities such as anchoring and drilling mud fates. For example, sediment stirred up during anchoring activities would drift down-current for some distance, eventually resettling. Also, drilling mud that settled close to the discharge point could also be resuspended by bottom currents and dispersed down-current. Both of these aspects are discussed below. Finally, changes in sediment characteristics can affect the infauna communities living within the sediments. This is discussed in the section on sea floor resources (section 5.2.4).

Turbidity currents or flows (sediment-laden, density-driven currents that "avalanche" downslope, along the sea floor) bring large pulses of sediment from the

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

Table 5.2.2.1-1. Potential impacting agents and the associated specific pollutants, potential water quality parameters affected, and the estimated distance from the point of discharge the parameter could be affected.

Impacting agent	Pollutant(s)	Affected Water Quality Parameter(s)	Estimated Distance of Effect (meters)*
Anchoring activities	Particulate material	Turbidity	100 to 500
Drilling muds	Particulate material	Turbidity	7,000
	Barium, chromium, cadmium, mercury, iron, zinc, and other metals	Increased metal levels	1,000
	Additives including: sodium bicarbonate, ground nut shells, mica, cellophane, cellulose polymers, starch, aluminum stearate, alcohols, bactericides	General pollution**	1,000
Drilled cuttings	Particulate material	Turbidity	1,000
Well completion fluids	Oil and grease	Increased hydrocarbons	100
Deck drainage	Oil and grease	Increased hydrocarbons	100
Treated sewage	Chlorine	Increases in chlorine	100
	Fecal coliform bacteria	Bacterial contamination	100
	Floating solids and foam	General pollution	At the point of discharge
Domestic wastes	Floating solids and foam	General pollution	At the point of discharge
Excess cement slurry	Particulate material	Increases in turbidity	100
	Carbonates and other chemicals	General pollution	100
Blowout preventer fluid	Oil and grease	Increases in hydrocarbons	100
	Floating solids and foam	General pollution	At the point of discharge
Desalination unit discharge	Floating solids and foam	General pollution	At the point of discharge
Fire control system test water	Floating solids and foam	General pollution	At the point of discharge
	Chlorine (for antifouling)	Increase in chlorine	100
	Chemical inventory (if chemicals are used in the effluent)	General pollution	100
Noncontact cooling water	Floating solids and foam	General pollution	At the point of discharge
	Chlorine (for antifouling)	Increase in chlorine	100
	Chemical inventory (if chemicals are used in the effluent)	General pollution	100
Ballast storage and displacement water	Oil and grease	Increases in hydrocarbons	100

Table 5.2.2.1-1. Potential impacting agents and the associated specific pollutants, potential water quality parameters affected, and the estimated distance from the point of discharge the parameter could be affected (continued).

Impacting agent	Pollutant(s)	Affected Water Quality Parameter(s)	Estimated Distance of Effect (meters)*
	Floating solids and foam	General pollution	At the point of discharge
Bilge water	Oil and grease	Increases in hydrocarbons	100
	Floating solids and foam	General pollution	At the point of discharge
Boiler blowdown	Floating solids and foam	General pollution	At the point of discharge
Test fluids	Floating solids and foam	General pollution	At the point of discharge
	Chlorine (for antifouling)	Increase in chlorine	100
	Chemical inventory (if chemicals are used in the effluent)	General pollution	100
Uncontaminated water	Floating solids and foam	General pollution	At the point of discharge
Laboratory wastes	Oil and grease	Increases in hydrocarbons	100
	Floating solids and foam	General pollution	At the point of discharge
Muds, cuttings and cement at the sea floor	Oil and grease	Increases in hydrocarbons	100
	Floating solids and foam	General pollution	At the point of discharge

*In most cases this distance may equal background levels or concentrations of the pollutant.
**EPA defines a pollutant as a material that does not occur naturally at the levels input into the receiving waters. Not all pollutants are specifically regulated via limitations or other monitoring tools.

continental shelf toward deep water. Often, these pulses are associated with the large sediment input from rivers, for example, during the 1969 winter storm flood conditions (Drake et al., 1972). About 60 to 70 percent of the sediment input consists of silts and clays with sand and some gravel making up the rest (Gorsline et al. 1984). Since the heavier sand and gravel particles drop out of turbidity flows sooner, only finer, silt and clay-sized particulate material arrives in deeper water, further from the source. Once these pulses of sediments settle, they also become subjected to the resuspension processes described above. If a turbidity current passed over an area where drilling discharges had settled, they too could be rapidly redistributed and mixed with the sediment contained within the flow.

Nephaloid layers have been examined by various researchers including Kolpack et al. (1972) and Gorsline et al. (1984). These sediment-laden, bottom-founded, isothermal layers of water can range from 5 to 35 m (16 to 112 ft) in thickness above the sea floor. Tidally-associated currents and input from up-shelf turbidity flows contribute to this phenomenon.

While the Kolpack and Gorsline studies examined sediment processes in the Santa Barbara Channel, there have been only the MMS-sponsored California Monitoring Program (CaMP) studies in the western Channel and Santa Maria Basin. For example, Steinhauer and Imamura (1990 *in* EPA, 2000c) found that sediments in the vicinity of the Point Arguello Unit platforms consisted of approximately 35-85 percent fines (silts and clays) and 15-65 percent sands with no predominant trends with depth or distance offshore. Unit-specific information is given below in the discussion on anchoring activities.

DRILLING DISCHARGES

The following discussion addresses the various effluents that can emanate from exploratory, operations on the OCS. All the effluents are regulated by the new General NPDES permit (EPA, 2000a). The limitations under this permit cover a wide range of parameters including, toxicity, metals, oil and grease, chlorine, and sheens, foam and floating solids. Potential water quality impacts regarding these effluents will be the same for all the units.

The permit covers 22 possible effluents. Not all of these will emanate from delineation operations; this is noted where necessary. For example, of the first

five effluents discussed below (drilling muds and cuttings, produced water, well treatment completion and workover fluids, deck drainage and domestic and sanitary wastes), produced water and well treatment and workover fluids will not be discharged from the proposed operations; thus, they are not discussed below. However, discussions in other parts of this EIS will include assessments for potential impacts to the water quality from existing and future development and production operations.

The principal impact-producing activities associated with drilling of the proposed wells that could affect water quality are discharges of drilling muds and cuttings. The parameters that could affect water quality due to this discharge are turbidity, hydrocarbons, metals, and additives used in the drilling-mud systems (table 5.2.2.1-1).

Drilling Muds. Drilling mud is discharged under two general conditions. First, during drilling, some mud adheres to the drilled cuttings and is discharged in small quantities with the cuttings. Second, when the driller needs to change the mud system or comes to the end of the well, much of the mud system is discharged (some small amount may remain in the well, and some may be lost to the formation). The following paragraphs discuss the processes by which drilling mud is moved from the point of discharge, through the water column and to sea floor and beyond to eventual mixing with existing sediments. This discussion of the fate will include how studies have traced drilling discharges, how currents move the material and the role of resuspension.

The most comprehensive study done on drilling discharge fates and effects is the CaMP. The purpose of this 8-year, three-phase project, was to examine the effects of drilling discharges on nearby deep-water rocky reef habitats. In the process, an immense amount of auxiliary data was collected and analyzed. Much of the information presented below comes from these studies. Monitoring of Platforms Hermosa, Harvest and Hidalgo during CaMP was conducted from 1986 to 1994. During this time 44 wells were drilled. Drilling muds were discharged at 34 m (109 ft) below the surface at Hidalgo and Hermosa and 91 m (291 ft) at Harvest and were highly variable, ranging from zero to 1,300 bbl per day with typical discharges of 100 to 200 bbl/day.

Fate of Drilling Muds. The fate of drilling discharges is important because the amount that remains in the water column, and eventually settles to the sea floor, can help to determine the extent of any environmental impact. To determine the fate of drilling muds, barium has often been used as a tracer. It is used as a weighting agent (materials used to increase the weight of the column of drilling mud – enabling better well control – without overly increasing the volume) and is the single most common metal used in drilling mud formulations (SAIC and MEC, 1995). For example, Jenkins et al. (1988) traced barium in sediments which was discharged with drilling muds during the drilling of an exploratory well in State waters near Gaviota. About 866,000 kg (1,905,200 lb.) of barite ($BaSO_4$) was used in the drilling of the well. The currents in the area caused the drilling mud plume to deposit the barite and other associated solids in a fairly narrow pattern to the west of the drilling site. The authors found that barium levels reached background with 1, 500 m (4,800 ft) of the well site.

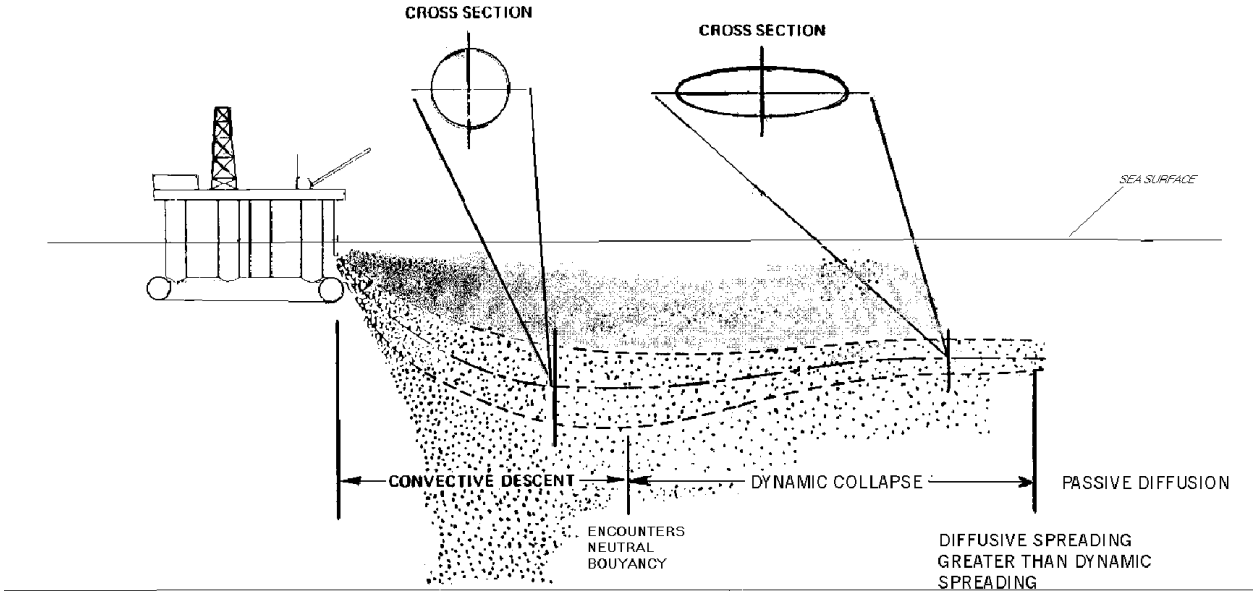
Coats (1991) used the deposition of barium to study the lighter fractions of drilling muds that were initially deposited at mid- and far-field locations (greater than 0.5 and 1.0 km (0.31 to .62 mi) from the discharge point, respectively). Barium in the drilling fluids used was 150 times more concentrated than that in natural sediments, allowing detection of relatively small fractions of drilling particulates in samples at distances up to 6,800 m (21,760 ft) from the discharge point. From 1986 to 1989, the three Point Arguello platforms, Hermosa, Hidalgo and Harvest, released an estimated 5,120,000 kg (11,264,000 lb) of barite, with an annual average of 1,280,000 kg (2,816,000 lb) (Steinhauer, et al., 1991 – Chapter 2). Furthermore, other metals, including iron, lead, zinc, mercury, arsenic, chromium, cadmium, nickel and copper had concentrations closer to local ambient levels (Steinhauer et al., 1991 – Chapter 6).

Coats (1991) suggested that discharged drilling muds accounted for 1.97 percent of the suspended sediment flux (direct impingement out of the water column) at one of the near-field stations in CaMP, indicating that this factor could be used to determine barium enrichment. Further, due to this small fraction of total suspended material derived from drilling material, compared to natural sources, any increase in other inorganic contaminants would also be small and be below statistical power to detect changes.

Steinhauer, et, al. (1991 – Chapter 2) noted that after drilling ceased at Platform Hidalgo in 1989, barium levels gradually declined to near-background by October 1989 (between 749 and 959 μg/g). Overall, within 1.5 years after drilling ceased in the Arguello Field, barium collected in sediment traps had dropped to background. Since barium can be reliably used to trace fates of drilling mud discharges, it can be reasonably concluded that the drilling discharges from the Hidalgo drilling activity were also dispersed to background.

Dispersion of discharged drilling muds occurs upon initial discharge by local mid-depth and near-bottom currents, and later by bottom currents resuspending the material. A good example of the type of mid-depth and near-bottom currents that disperse drilling mud discharges was noted during the CaMP studies (Coats, 1991; Savoie, et, al., 1991). To a large extent, fluctuations in mid-depth current flow dictated trajectories and depositional patterns of drilling muds,

Figure 5.2.2.1-1. Idealized view of drilling mud discharge – not to scale (from Battelle, 1991).



while near-bottom currents played a major role in resuspension and further dispersion of this effluent (surface waves – even during storm conditions – did not influence resuspension dynamics due to the water depth). At the Point Arguello area, where this study was conducted, mid-depth and near-bottom currents followed isobaths to the extent that drilling discharges were deposited parallel to shore in a fairly narrow band. Currents in this area were poleward at mid-depth (54 m (173 ft)) and near-bottom (126 m(403 ft)) and did not exhibit a seasonal reversal, as did surface currents, although they did weaken around the same time.

Once a drilling fluid plume has passed through the influence of the initial gravity-driven phase of the discharge (labeled as dynamic collapse in figure 5.2.2.1-1), it begins to disperse by passive diffusion. The fine clay particulate material, commonly used in drilling fluids, tend to flocculate (clump together) when they contact seawater. This electrostatically-driven process results in much of the particulate settling to the sea floor sooner than if flocculation did not occur. Some of the clay particles, do not flocculate. These may remain in the water column indefinitely, eventually diffusing to background levels. These lighter, smaller particles have been calculated to dilute to greater than 1,500 to 1 beyond a distance of 32 to 96 m (100-300 ft) from the point of discharge (ADL, 1984a). Between 70 and 80 percent of the drilling mud volume was water (sea or fresh) while fractions of coarse sand, coarse silt and slit/clay ranged (in percent) from 0.77-1.55 ; 9.91-12.28; and 7.27-17.87, respectively.

Modeled seafloor deposition of solids, based on discharges and oceanographic conditions at Platform Hidalgo, showed that only 17-20 percent of the solids settled out within a 16.6 hour period (Coats, 1991). The remaining 80 percent of the solids would be distributed over an increasingly large volume of water and area of seafloor resulting in very small, and probably undetectable, additions to the ambient levels of particulate material. Similarly, sediment traps and subsequent modeling at Platform Hermosa showed that heavier particles fell close to the platform and covered about 2.75 km^2 (679.5 acres) while silts and clays were widely dispersed (greater than 16 km (9.9 mi) in some cases). Measured current speeds of 7 cm/s (0.14 kts) were strong enough to transport material about 6 km/day (3.7 mi/day).

Given a discharge depth of 34 m (111 ft), a water depth of 183 m (603 ft), an average current speed of 7 cm/s (0.15 kts), and the following sinking rates per 100 m (310 ft): (sand/and other coarse materials, .32 hours; coarse silt, 20 hours, light slit/clay, 56 hours), it can be seen that the lighter particles would be very widely dispersed in a large volume of water. While the concentration of mud particulates could exceed the ambient concentration by about 500 times during a mud dump at 100 m (320 ft) from the discharge point (according to a generalized model), this condition is temporary due to dispersion of the particulate material over a wide area and throughout the water column.

Modeling at the end of the CaMP studies confirmed this assumption of wide dispersion, giving an average bottom accumulation of drilling particulate

material of 1.5 to 7.5 microns (1 micron equal 1 millionth of a meter), corresponding to a very large footprint of 100 to 550 km^2 (24,710 to 135,905 acres) depending on particle size, as well as the dispersion of 40 to 80 percent of the finest-grained material beyond the study region (SAIC, and MEC, 1995). One source of information that explains why so much of the finer particulate material remains in the water column comes from Kolpack et al. (1972). In this paper, the authors noted that flood-associated sediments from rivers formed several mid-water sediment layers associated with thermal stratification. These mid-water density strata prevented some fine particulate matter from settling to the sea floor and were, instead, advected with mid-water column currents. If a drilling mud outfall was above a sufficiently strong thermocline, then much of the fine particulate material could be advected within the mid-water column currents in much the same way as the documented river sediments.

Resuspension of drilling muds. Boundary layer (near-bottom) currents cause resuspension of drilling muds, as well as natural sediments, and is the other primary factor in the dissipation of drilling discharge particulates (Parr et al., 1991). In nondepositional environments with relatively strong currents, the mud solids may be resuspended from their original site of deposition and be moved to lower energy areas. Resuspension of surficial sediment in the Point Arguello area averaged over 25 g/m^2/day, and was the most likely source for much of the material captured by sediment traps since the ambient fallout of detrital and terrigenous material ranged from 0.6 to 2.5 g/m^2/day (Steinhauer et al., 1991 – Chapter 6). However, resuspension of drilling muds is not considered a water quality issue for two reasons: (1) no resuspension process will raise sedimentary material greater than one or two meters above the sea floor and (2) the same resuspension process that moves drilling mud material will also raise natural sediments, further mixing the two together and dispersing the drilling mud component.

As noted above, several aspects of drilling muds can affect water quality. These include, turbidity, hydrocarbons, metals, and additives and are discussed briefly below.

Turbidity. Increases in turbidity would arise from the discharge of drilling muds and cuttings. The new General NPDES Permit does not directly regulate this parameter. While it is apparent from the discussion above that much of the drilling mud fraction remains in the water column for extended distances and periods of time, dispersion processes continue to work on the particulate, spreading it in three dimensions. This process will eventually reduce the particulate loading to background. A conservative estimate for drilling-related particulate to reach background is 7,000 m (22,960 ft). However, natural variations in particulate range widely throughout the water column, up to several orders of magnitude greater than measured background levels (SAIC and MEC, 1995). Thus, any increase in particulate material due to drilling activities, even over a wide area, will not cause an impact to water quality since it will be temporary and transient, be within natural variability and be dispersed to background.

Metals. Barium, chromium, cadmium, mercury, iron, zinc, lead, arsenic, nickel and copper can all be found in drilling muds. However, only barium, in the form of barite (barium sulfate - $BaSO_4$ - the form of barium that is added to drilling muds) is added to mud formulations. Iron is generally not present while many of the others, including silver, vanadium, cadmium, mercury, arsenic, nickel and copper, are contaminants in barite. Lead and zinc were detected during the CaMP studies and were traced back to the use of pipe dope, a material used to lubricate the threads on drilling pipe when building or taking apart drill pipe strings (SAIC and MEC, 1995).

Sea water background concentrations of metals are (in μg/l): arsenic, 3; copper, 2; mercury, 0.0005; silver, 0.16; and zinc, 8 (EPA, 2000a). All other metals are presumed not to occur in sea water at detectable levels. By comparison these metals were found in drilling mud samples taken from the mud pits on the platform, before discharge, to be (in μg/g *dry weight*[2]): arsenic, 0.28; copper, 30; mercury, 0.13; silver, 0.28; and zinc, 290 (Steinhauer et al. (1991 – Chapter 6). As can be seen, some metals are higher, some lower and some about the same as in natural sea water. All the metals in drilling fluids, except barium, are found in the less than 1 part per million (ppm) range. Additionally, once the effluent is discharged and becomes dispersed, as discussed above, levels of the metals in the effluent will decrease to background.

Further, Steinhauer et al. (1991 – Chapter 6) found that zinc and barium were the only metals analyzed from drilling mud samples at Platform Hidalgo found to be significantly higher than those found in the surface sediments. Similarly, only concentrations of lead, zinc and barium were significantly elevated in drill cuttings relative to concentrations in marine sediments. The presence of lead and zinc in the CaMP study, while unexpected but detectable, was judged to not have any impact on the benthic environment by SAIC and MEC (1995).

Neither barium nor iron (as an alternative to barite) have been monitored in the old General or Individual NPDES Permits, nor will they be monitored in the new General Permit. Only mercury and cadmium are monitored in the barite. EPA's justification for this is that, so called "clean" barite will exhibit low levels of contamination of, not only mercury and cadmium, but of the other metals, as well (EPA, 2000b). The use of chromlignosulfonate is specifically prohib-

ited due to the potential presence of hexavalent chromium, a toxic form of chromium. As a result, EPA has not and will not require a full metals analysis of drilling fluid formulations in the new General NPDES Permit. None of the metals used or contained in the drilling muds for these projects will cause impacts to water quality.

Additives. The new (and old) General NPDES permit allow the use of eight generic mud types. These eight types were determined by EPA to be of low toxicity. The additives listed in table 5.2.2.1-1 are all commonly used in one or more of the eight generic drilling fluids. Therefore, EPA determined that these eight types will not cause harm to the water quality or the organisms in the water as long as the operator stays within the permissible contents of the various additives (EPA 1984).

Drilled Cuttings. Drilled cuttings are produced as a result of the drill bit pulverizing the penetrated formations. Sizes of cuttings range from pebble (about 0.6 cm (0.25 in)) to fine sand (less than 0.25 cm (1/10 in)). Cuttings also vary in terms of specific gravity, of density, which, along with the size determines how fast they sink in water. More dense and larger particles will sink faster than, for example particles of the same size but are less dense. Because of their large size and weight (relative to drilling mud particulates, which are clay-sized and of nearly the same density), drilled cuttings fall more quickly through the water column than drilling muds. The references to "coarse material" in the above discussion on drilling muds refer to cuttings. While the fall is not vertical, no cuttings are expected to remain in the water column more than an hour after they leave the end of the disposal caisson (de Margerie, 1989), which will be between 30 and 40 m (100 and 130 ft) below the sea surface.

Little research has been conducted on drilled cuttings due to this tendency to fall more directly to the sea floor and contact a limited area of the sea floor near the discharge point. However, an estimated maximum of 33 percent of the cuttings volume could be drilling muds adhering to the cuttings (de Margerie, 1989). Consequently, while there will be a continuous plume of muds that come loose from the cuttings during their fall through the water column, some proportion of the cuttings pile near the base of the drilling vessel will consist of muds.

Steinhauer et al. (1991 – Chapter 6) conducted an analysis of drilled cuttings discharged from Platform Hidalgo during the CaMP studies. Similarly to the analysis of metals in drilling muds, only lead zinc and barium were significantly elevated above the background levels found in the natural sediments. The authors surmised that barium was elevated due, in part, to drilling through barium-enhanced sediments, as well as from the remainder of drilling muds that adhered to the cuttings. The source of the lead and zinc was from the pipe dope as noted above.

Since the cuttings will not remain in the water column for very long and fall relatively close to the discharge point, there will be no impacts to the water quality.

OTHER DISCHARGES

Well Treatment, Completion and Workover Fluids. Only well completion fluids will be used during the proposed exploratory operations. Well completion fluids are salt solutions, weighted brines, polymers, and various additives used to prevent damage to the well bore during operations which prepare the drilled well for hydrocarbon production (EPA, 2000b). The General permit will require volume monitoring, no discharge of free oil monitored by using a static sheen test and a once per job oil and grease samples with limits set at 29 mg/l monthly average or 42 mg/l daily maximum (EPA, 2000a).

Deck Drainage. Deck drainage is mostly water that contains materials that is washed from the decks into drains and thence into the sea. Materials on the deck of the drilling vessel may range from small spills of hydrocarbons, drilling-related material, and cleaning solutions. The decks made be washed down, testing of fire systems may wash these material down the drains, or rain may fall. The drains lead to a tank where solids fall to the bottom and any hydrocarbons float to the surface. In some cases, hydrocarbons are removed by treatment in an oil-water separator of some type. The solids would eventually be removed, containerized, and sent to shore for disposal while the hydrocarbons would be collected and stored until they can added to the test barge. The new General permit will require volume monitoring and no discharge of free oil, monitored by visual observations.

Sanitary and Domestic Wastes. Sanitary wastes are human body wastes from toilets and urinals. These wastes are treated by treatment machines onboard the platforms and include maceration and the addition of chlorine to kill fecal coliform bacteria. Chlorine is limited to less than 10 mg/l but greater than, and as close as possible, to 1 mg/l. Domestic wastes are materials from sinks, showers, laundries, safety showers, eyewash stations, and galleys. No treatment of these materials is necessary. However, if foam appears on the sea surface, then domestic wastes must be

[2] The terms μg/l and μg/g *dry weight* , both represent parts per billion (ppb), and are only loosely comparable since they are determined using different methods. However, this analysis is given to show differences and trends, rather than absolute comparisons, since the effluent undergoes high dilution upon discharge.

checked to ascertain if the foam is coming from there. The above requirements apply only for facilities manned by more than 10 persons.

The remaining potential effluents that could emanate from the proposed exploratory operations and a short description of the effluent (EPA, 2000a) and NPDES permit limitations and monitoring (L&M) are given below (EPA, 2000b).

- Blowout preventer fluid: fluids used to actuate the hydraulic equipment on blowout preventers. During testing or use, they could be spilled. L&M: no discharge of free oil, floating solids or foam.
- Desalination unit wastes (brines): Wastewater associated with the process of creating fresh water from sea water. It is in the form of concentrated sea water, usually around 40 parts per thousand (ppt). L&M: no floating solids or foam.
- Fire control system test water: Sea water used during the training of personnel in fire protects and the testing and maintenance of fire protection equipment. These water may be treated with chlorine or other biocide to control fouling of the piping. L&M: monthly chemical inventory, monitoring of chlorine used, no floating solids or foam.
- Non-contact cooling water: sea water used to cool machinery via heat exchangers. The water does not contact the machinery itself, it merely removes heat and is discharged directly into the sea. L&M: flow rate, chemical inventory, chlorine monitoring and no floating solids or foam.
- Ballast and storage displacement water: sea water used to stabilize a drilling vessels draft and trim. L&M: flow rate, no discharge of free oil, no floating solids or foam.
- Bilge water: sea water which collects in the lower internal areas of a drilling vessel's hull and may be contaminated with oil and grease or rust. Bilge water is directed to an oil/water separator before discharge, which occurs intermittently. L&M: flow rate, chemical inventory, chlorine monitoring and no floating solids or foam.
- Boiler blowdown: This is the discharge of circulation water and minerals from boilers necessary to minimize solids build-up in the boilers (if any – at this time, it is unknown if boilers will be aboard the drilling vessel). This is an intermittent discharge. L&M: no floating solids or foam.
- Test fluids: these are discharges that could occur if hydrocarbons are located during exploratory drilling and tested for formation pressure and content. It is unknown at this time what the exact character of these test fluid are, or if they will actually be discharged during testing procedures. As noted above, no produced water will be discharged. What other fluids are possible is unknown. L&M: flow rate, no discharge of free oil, chemical inventory, no discharge of floating solids or foam.
- Bulk transfer material overflow: This refers to bulk materials, such as barite, bentonite, or cement which may be discharged during transfer operations from supply ships to the drilling vessel. This often takes the form of dust in the form of small particles of the material being blown through the loading system below the sea surface. L&M: no discharge of floating solids or foam.
- Uncontaminated freshwater: This effluent could come from such sources as air conditioning condensate or potable water transfer operation spills. L&M: no discharge of floating solids or foam.
- Laboratory wastes: this discharge includes small volumes of discharges associated with laboratory testing occurring on the drilling vessel. Given the small volume of this waste, it is not expected to pose an environmental risk. L&M: no discharge of free oil, no discharge of floating solids or foam.
- Excess cement slurry, and drilling muds, cuttings, and cement at the seafloor: these wastes result from marine riser disconnect and well abandonment and plugging. L&M: no discharge of free oil, no discharge of floating solids or foam.

None of the discharges, described above, except for muds and cuttings, will affect the water quality within the Study Area.

ANCHORING ACTIVITIES

A total of eight anchors will be set and raised for each wellsite. These anchors impact the sea floor and raise clouds of sediment a few meters into the water column. This particulate material is then redistributed by the bottom currents until it settles some distance away. This distance is dependant primarily on grain size and bottom current speed. Unit-specific descriptions of grain size is given below. No site-specific grain size data is available, but the CaMP conducted sediment grain size studies (SAIC, 1986) in the

Santa Maria Basin and western Santa Barbara Channel. For all Units, bottom current speeds ranged between 5 and 50 cm/s (0.1 to 1 kt) (SAIC, 1986).

Gato Canyon Unit. The proposed wellsite is located on a fairly steep slope, indicating that grain size is probably poorly sorted. Although no site-specific data is known to exist for this wellsite, since the wellsite is within 5 miles of shore, it is likely that the area would be dominated by nearly equal measures of silt and sand.

Bonito Unit. Potential well locations are located between 200 and 500 m (640 and 1,600 ft) of water in a complex canyon topography. The grain size in the Bonito Unit area is dominated by silts; in places more than 90 percent of the sediments were classified as silt. Clay averaged between 5 and 25 percent and sand between 10 and 60 percent. These areas were classified as poorly sorted, in large part due to the complex canyon topography.

Point Sal and Purisima Point Units. These units are located on a broad, flat shelf offshore Purisima Point and Point Sal and are both less than 200 m (620 ft) of water. They are dominated by silty sediments, ranging between 50 and 80 percent. Clay sediments ranged between 15 and 30 percent while sand was usually less than 10 percent. These areas were classified as well-sorted.

Conclusion (Anchoring Activities). For all four units, the presence of large percentages of silt will cause clouds of sediment to rise into the water column, as discussed above. Only transient impacts to the water quality will occur, either vertically or horizontally, since these silty sediments will likely settle to background within 500 m (1,600 ft**;** table 5.2.2.1-1) and will not rise vertically within the water column in such a fashion to affect background sediment levels (normally 1-5 mg/l) over a large area (SAIC, 1986; 1995).

IMPACTS COMMON TO ALL UNITS

None of the discharges discussed above, except drilling discharges, will cause any water-quality impacts due to the small volume of the discharge, the treatment systems required, and the short-term nature of the drilling activities at each unit. Each of the discharges will dilute quickly to background levels.

Impacts arising from drilling discharges are discussed below. While the physical characteristics for each unit might vary (for example, water depth, current speed, etc.) the impacts to water quality are likely to be the same. Therefore, for clarification, some unit-specific information is included below, but the conclusion applies to all units. Also, no produced water is expected to be discharged during any of the proposed drilling or well testing activities. Produced water, as an effluent from other existing and future OCS activities, is discussed in the cumulative analysis (sections 5.2.2.2.1 and 2).

Because the primary impact from drilling muds is the dispersion of the muds into the water column, local mid-depth and bottom currents at each well site are the most important information. These give an indication of the direction and extent of the mud dispersion and whether they are in two primary directions, along isobaths, as was seen during the CaMP studies, or more cross-shelf. Additional detail on the physical oceanography of the study area may be found in section 4.4.

Gato Canyon. Mid-depth and bottom current measurements taken in the Santa Ynez Unit, just east of the proposed Gato Canyon Unit drilling site indicated that currents tended westward, toward the western Channel exit at current meter stations to the shelf-break, about 200 m (ADL, 1984). Deeper than that, currents began to experience the Ekman spiral, where the Coriolis effects begins to be felt and twists currents to the right with depth. The proposed Gato Canyon well site location is in about 230 m (755 ft) water depth so that drilling discharges from there may experience some Eckman-related current modification to the southwest. Averaged mid-depth and bottom current speeds were on the order of 10 to 12 cm/s (0.19 to 0.23 kts) somewhat comparable to the 7 cm/s (0.14 kts) current speeds described for the CaMP study area (SAIC, 1986). Therefore, much of the drilling muds would be carried along the west to southwest direction, spreading throughout the water column and dispersing to background particulate levels.

Bonito Unit. The Bonito Unit is located to the west of the Arguello platforms and in deeper water. The well sites under consideration by Nuevo for drilling range in water depth from about 300 to 500 m (960 to 1,600 ft). No site-specific mid-depth or bottom current measurements have been taken in this area. However, it is reasonable to estimate that these currents would be similar to those measured for the Point Arguello area, except with greater variability and more cross-bathymetric characteristics (pers. comm. David Browne, Oceanographer, MMS). Thus, due to greater current variability and water depth, both drilling muds and cuttings would be spread over a potentially very large volume of water, falling onto the sea floor over a wide-spread area, perhaps on the order of several hundred square kilometers.

Point Sal and Purisima Point Units. The water depth for the locations of these proposed well sites range from 60 to 100 m (192 to 320 ft). An ongoing MMS-sponsored study has been examining the currents in the Santa Maria Basin. Results from this study indicate, as was seen for the Point Arguello area, that mid-depth and bottom currents are nearly constantly poleward. Since the slope of the sea floor in the area of these well sites gently slopes to the west, there would not be much of a cross-shelf current aspect. Mid-depth and bottom current speeds may range

from 27 to 50 cm/s (0.5 to 1 kt) with occasional burst of 150 cm/s (2.9 kts) according to manned submersible observations (ADL, 1985). Drilling mud discharges may not contact the sea floor anywhere near the discharge point, given current speeds such as these, even though the water depth is fairly shallow. Given the potential turbulence and mixing capability of the currents and waves, dispersion of drilling muds and cuttings would be very rapid.

Impacts to water quality from the discharge of drilling muds and cuttings to water quality from these projects are anticipated to be low because:

- Discharges at any particular drilling site would occur from only one well;
- The combination of water depth and mid-depth and bottom currents at all sites will disperse drilling muds over a wide area, arriving at background levels at distances between 100 and 7,000 m (320 to 22,400 ft) from the discharge point.
- The operator will be following the limits of the new General NPDES permit. This includes use of generic muds, toxicity limits, inventory of mud ingredients used, and mercury and cadmium limits in barite.

IMPACTS UNIQUE TO EACH UNIT

There are no unit-specific impacts to water quality from the Proposed Action.

5.2.2.1.1 SUMMARY AND CONCLUSIONS

Overall, activities associated with the proposed delineation activities are expected to cause low impacts to water quality because the projects do not cause or contribute to changes in standard, measurable water quality parameters resulting in unreasonable degradation to the water quality. This is due to the following reasons:

- The new General NPDES permit will be in place by the time these proposed wells are drilled. The level of monitoring and more strict limitations on all the effluents, including drilling discharges will help to ensure that water quality is protected.
- Water quality impacts will be limited to the discharge of drilling muds and cuttings.
- Only one well will be drilled at each site, thus limiting the overall amount of drilling effluents discharged.
- While changes to standard, measurable water quality parameters will occur during the discharge of muds and cuttings, they will be transient and temporary, and limited to between 100 and 7,000 m, (320 to 22,400 ft) at most, from the discharge point.
- While resuspension of discharged drilling mud will occur for the small amount (less than 2 percent of the total volume of the muds and 20 percent of the total solids) that will contact the sea floor, since the overall amount of muds subjected to this process is small and the process does not impinge upward into the water column more than 10 to 20 m (32 to 64 ft), only negligible impact to water quality is anticipated.
- Other discharges will not cause any impacts to water quality due to the small volume of the discharge, the treatment systems required, and the short-term nature of the drilling activities at each unit. Each of the discharges will dilute quickly to background levels within 100 m (320 ft).

5.2.2.1.2 MITIGATION MEASURES FOR IMPACTS FROM THE PROPOSED ACTION

Mitigation measures are actions taken on the part of the operator, either as part of the Proposed Action or as conditions of approval, that serve to reduce the severity of impacts on the environment due to the Proposed Action. One mitigation measure will help to reduce the already low impacts to the water quality, as follows:

- EPA/MMS NPDES monitoring and enforcement . EPA Region 9 and MMS's Pacific Region conduct inspections and collect samples for analysis. These are compared to the standards in the inspected facility's NPDES permit. If EPA identifies exceedences, they can take appropriate steps, which may range from corrective (for example, working with the operator to apply mechanical fixes and personnel training) to both civil and criminal actions. Over the past 10 years, only two exceedences have been detected during nearly 130 individual inspections.

5.2.2.2 CUMULATIVE IMPACT ANALYSIS FOR WATER QUALITY

5.2.2.2.1 CUMULATIVE IMPACTS (2002-2006)

CUMULATIVE IMPACTS WITHOUT THE PROPOSED ACTION (2002-2006)

The following discussion on cumulative impacts to water quality considers these reasonably foreseeable projects with the potential to impact water quality and are likely to occur between 2002 and 2006:

- Offshore oil and gas development and production projects (including the possibility of oil spills):
- The existing 22 offshore oil and gas platforms;
- Cavern Point Unit exploration and subsequent development;
- Rocky Point Unit development;
- Sword Unit development;
- Tranquillon Ridge Unit development;
- Pacific Offshore Operators, Inc. (POOI) Federal/State development.

NON-OCS ACTIVITIES INCLUDING:

- Municipal and industrial wastewater discharges;
- River runoff and other nonpoint sources;
- Oil spills from nonOCS-associated tankering.

Water quality impacts from these items are assessed below. These impacts are then compared with the timeframe and impacts associated with the proposed exploratory projects and an assessment made to determine if these is any overlap in time and space between the two. If there was an overlap, a determination of level of impact according to the significance criteria in section 5.2.2 was made. More specifically, only those aspects of the proposal that affected water quality will be addressed in this section. A discussion of all possible sources of cumulative impacts to water quality by development of the 36 undeveloped leases is below in section 6.2.2.

Offshore oil and gas exploration, development, and production. The variety of potential effluents that could be discharged from any existing or future OCS exploratory or development and production facilities are given below (table 5.2.2.2-1). Not all effluents would be discharged from any particular facility; however, this table shows all potential effluents for completeness. Likewise, not all effluents will be analyzed in this section since, for example, no produced water will be discharged from the delineation drilling activities. As noted above, a more comprehensive cumulative impact discussion that addresses all potential impacts to water quality due to the potential development of the 36 undeveloped leases is given in section 6.2.2.

Drilling muds and cuttings. Impacts to water quality from these effluents was described in section 5.2.2.1. To summarize, some drilling muds flocculate and fall from the water column to the sea floor. Those that do no flocculate, may drift some distance (perhaps, greater than 16 km) from the point of discharge. This dispersion process may dilute to 1500 to 1 within 32 to 96 m (100-300 ft) from the point of discharge (ADL, 1984a). The fine particulate material may average around 12 percent of the total volume of the drilling mud discharged. While the concentration of mud particulates, during a mud dump, could exceed the ambient concentration by about 500 times at 100 m (320 ft) from the discharge point (according to a generalized model), this condition is temporary due to dispersion of the particulate material over a wide area and throughout the water column. Average bottom accumulation of drilling particulate material of 1.5 to 7.5 microns (1 micron equal 1 millionth of a meter) was measured by SAIC, and MEC (1995), corresponding to a depositional area of 100 to 550 km^2 (24,710 to 123,500 acres) depending on particle size, as well as the dispersion of 40 to 80 percent of the finest-grained material beyond the CaMP study region.

Drilled cuttings fall more quickly to the sea floor than do drill muds and are not expected to remain in the water column more than an hour after they leave the end of the disposal caisson (de Margerie, 1989). A continuous plume of drilling mud drifts from the cuttings discharge due to muds adhering to the cuttings will drift down-current. Also, there will be some amount of mud in the cuttings pile near the base of any facility that had discharged cuttings. Since the cuttings will not remain in the water column for very long and fall relatively close to the discharge point, there will be only negligible impacts to the water quality. Section 5.2.2.1 also discussed the resuspension of drilling muds, turbidity, and effects of metals and additives, all of which resulted in a finding of low impact to the water quality.

Section 5.2.2.1 also discusses all the other types of discharges listed in table 5.2.2.1-1. It was concluded there that none of those discharges would cause any water quality impacts due to the small volume of the discharge and the treatment systems required. Similarly, since there is no overlap in space between existing or future exploration or development and production offshore oil and gas activities, as listed above (al-

Table 5.2.2.2-1. Possible effluents, the type of facility (Platform/MODU), distance of influence on water quality, and limitations from the new General NPDES Permit.

Effluent*	Estimated Distance of Effect (meters)**	General Permit Limits
Anchoring activities	100 to 500	Turbidity
001 Drilling Discharges (muds and cuttings) (MODU & Platform)	1,000	Total volume limits applied to each platform End-of well toxicity No discharge of oil-based drilling mud or mud contaminated with diesel Limits on cadmium and mercury in barite Continuous constituent and additive inventory Static sheen test Use of generic mud
002 Produced Water (Platform)	100	Weekly oil and grease samples (29 mg/l monthly average; 42 mg/l daily max.) Flow limits applied for each platform Quarterly monitoring of metals and other parameters Whole effluent toxicity (chronic)
003 Well Treatment, Completion and Workover Fluids (Platform)	100	Volume monitoring No discharge of free oil monitored by static sheen test Once per job oil and grease samples (29 mg/l monthly average; 42 mg/l daily max.)
004 Deck Drainage (MODU & Platform)	100	Volume monitoring No discharge of free oil monitored by visual observations
005 Sanitary / Domestic Wastes (MODU & Platform)	100 / At the point of discharge	Flow rate Observation of floating solids (for facilities manned by 9 or fewer persons) Residual chlorine and foam for domestic wastes (for facilities manned by 9 or more persons)
006 Blow-out Preventer Fluid (MODU)	100 / At the point of discharge	No free oil in the receiving water Floating solids and foam
007 Desalination Unit Discharge (MODU & Platform)	At the point of discharge	Floating solids and foam
008 Fire Control System Test Water (MODU & Platform)	At the point of discharge	Chemical inventory Chlorine (for antifouling) Floating solids and foam
009 Noncontact Cooling Water (MODU & Platform)	100 / At the point of discharge	Flow rate Chemical inventory (if chemicals are used in the effluent) Chlorine (for antifouling) Floating solids and foam
010 Ballast and Storage Displacement Water (MODU)	100 / At the point of discharge	Flow rate No free oil in the receiving water Floating solids and foam
011 Bilge Water (MODU)	100 / At the point of discharge	Flow rate No free oil in the receiving water Floating solids and foam
012 Boiler Blowdown (MODU)	At the point of discharge	Floating solids and foam
013 Test Fluids (MODU & Platform)	100 / At the point of discharge	Flow rate No free oil in the receiving water Chemical inventory Floating solids and foam
014 Diatomaceous Earth Filter Media (Platform)	At the point of discharge	No free oil in the receiving water Floating solids and foam

Table 5.2.2.2-1. Possible effluents, the type of facility (Platform/MODU), distance of influence on water quality, and limitations from the new General NPDES Permit (continued).

Effluent*	Estimated Distance of Effect (meters)**	General Permit Limits
015 Bulk Transfer Material Overflow (MODU & Platform)	At the point of discharge	Floating solids and foam
016 Uncontaminated Water (MODU & Platform)	At the point of discharge	Floating solids and foam
017 Water flooding (Platform)	100	No free oil in the receiving water Chemical inventory Floating solids and foam
018 Laboratory wastes (MODU & Platform)	100 / At the point of discharge	No free oil in the receiving water Floating solids and foam
019 Excess Cement Slurry (MODU)	100 / At the point of discharge	Flow rate No free oil in the receiving water Floating solids and foam
020 Muds, Cuttings and Cement at Seafloor (MODU)	100 / At the point of discharge	No free oil in the receiving water Floating solids and foam
021 Hydrotest water (Platform)	100 / At the point of discharge	Flow rate No free oil in the receiving water Chemical inventory Chlorine Floating solids and foam
022 H_2S Gas Processing Waste Water (Platform)	100 / At the point of discharge	Flow rate No free oil in the receiving water Floating solids and foam

*For clarity, the words, "Platform" and "MODU," are inserted in the "Effluent" column; this indicates when some effluents will only occur from one source or the other or both.

**As seen in the General Permit Limits column, some limits consist of water quality-related limitations (e.g., chlorine) and others consist of nonwater quality-related limits (e.g., floating foam and solids). Water quality limits must be met within 100 m of the discharge (according to the General NPDES permit) while nonwater quality-related limits must be met at the point of discharge.

though all of the existing facilities will be discharging during the time the proposed projects are ongoing). Thus, there is no cumulative impact to water quality parameters due to the proposed projects.

OIL SPILLS

No oil spills are expected to result from the proposed activities. As discussed in Section 5.1.3, the cumulative oil spill risk for the project area results from several sources: ongoing and projected oil and gas production from existing OCS facilities in the Santa Barbara Channel and Santa Maria Basin, several proposed development projects on the Federal OCS, ongoing production from one facility in State waters in the Santa Barbara Channel, two reasonably foreseeable oil and gas projects in State waters, and the tankering of Alaskan and foreign-import oil through area waters (table 4.0.1-9). Tables 5.1.3.1-2, and 5.1.3.1-3 present the estimated mean number of spills of various sizes and the probability of their occurrence as a result of the described activities.

Three different oil spill scenarios are discussed in this analysis. They are:

- The most likely oil spill scenario for existing and proposed offshore oil and gas activities is that one or more oil spills in the 50 to 1,000-bbl range would occur over the period 2002-2006, and that such a spill would most likely be 200 bbl or less in volume. The probability that one or more spills of this size will occur during this period is 73.9 percent.
- The maximum reasonably foreseeable oil spill volume from future offshore oil and gas activities is 2,000 bbl, assumed for purposes of analysis to be a pipeline spill. The probability of a spill of this size occurring during the period 2002-2006 is 22.3 percent.
- Based on data from tanker spills in U. S. waters, the mean size for a tanker spill is assumed

to be 22,800 bbl (with a probability of occurrence of 38.8 percent for this period). The rationale for these estimated spill sizes is presented in section 5.1.3. This oil spill scenario is discussed below with other non-OCS potential impacting agents, such as river plumes and sewage outfalls.

The following analysis does not consider oil spills (bunker or diesel) from non-tankship spills, such as container or bulk carrier vessels, although spills have and could occur from these sources. A general, qualitative, description of the effects of oil on water quality is below, followed by size-specific descriptions of effects. Additional, general information regarding sources of oil, and responses to spills can be found in section 5.1.3 and appendix 5.3.

As described in section 5.2.2, effects on water quality from oil spills, can range from a few days, to several weeks or months, depending on the size of the spill, the type of oil spilled, and the response dedicated to the spill. Expected water quality effects due to spills could occur in the top 10 to 20 m (32 to 64 ft) of the water column, depending on sea state and the type of oil. These effects include turbidity, biological and chemical oxygen demand and release of hydrocarbons, such as BETX (benzene, ethylbenzene, toluene and xylene), into the water column. The surface slick would be affected by several factors including wind and wave action, dissolution, and volitilization losses. The majority of the dissolved components (BETX and others, which make up about 20 to 50 percent of crude oils) would be lost to volitilization and other processes with 24 to 48 hours (Jordan and Payne, 1980). They would also be subject to dispersion and dilution, as well as to degradation via photolysis and microbial processes. Clean-up actions would also contribute to the minimization of impacts to water quality.

In addition to the spills discussed below, small spills, in the range of less than 1 bbl to 5 to 10 bbl, may occur from any of several sources (for example, minor platform operational mishaps or diesel transfers). For these sized spills, no impacts to water quality are expected.

A 200-bbl spill. Historically, responses to spills of this size have lasted from a few days to a couple of weeks before mechanical recovery and natural processes removed the oil from the sea surface (for example, Platform Irene pipeline, 1997; Platform Heritage, 1996). Meanwhile, processes within the water column, such as dispersion and dissolution, would have served to spread various light-end hydrocarbons (benzene, ethylbenzene, toluene and xylene) to background levels. Depending on the oil, these light-end hydrocarbons would vary in concentration in the water column. Also, depending on the sea state, mixing of oil and its components into the water column would contribute to dispersion, perhaps as deep as 10 m (32 ft) until background levels were reached.

A 2,000 bbl pipeline spill. There has never been a pipeline spill of this magnitude in the Pacific Region. While the Platform Irene spill emanated from a pipeline, the amount of oil spilled was estimated to be 163 bbl. Another aspect of pipeline spills that is somewhat confounding compared to spills from facilities or tankers (see below) is that some pipelines carry wet oil and others dry oil. Wet oil has not been dewatered and may carry as much as 80 percent water and only 20 percent oil. This was the case for the Platform Irene spill. The total amount of fluid escaping from the pipeline for that spill was estimated to be 815 bbl.

It is unclear what effect the presence or absence of water in an oil spill would have on the fate of oil that emerges into the water column from a pipeline laying on sea floor. It depends, in part, on the emulsion characteristics of the oil/water mixture and how well-mixed and tightly bound that mixture is. For example, some amount of the fluid spilled during the Irene event was water only, separated on the bottom of the pipeline, but not emulsified with the oil. This water, probably had dissolved portion of oil in it and was dispersed and diluted into the water column. If an 2,000-bbl spill occurred under these circumstances, water quality could be affected for several kilometers down-current. However, this would dissipate after several days to background.

Dry oil spills would contribute dissolved components from the bottom to the sea surface for as long as the oil leaked from the pipeline[3]. However, since most of the oil would eventually arrive at the sea surface, the depth of the water through which the oil passed would define the amount of hydrocarbons from the oil would remain in the water column. The resulting hydrocarbon plume would disperse more or less rapidly depending on the type of oil, water depth, current speed, and sea state. Once this subsurface plume dissipates, the remaining oil on the sea surface would be subject to the same processes as described above for the 200-bbl spill, except that much of the dissolved components would have been removed during the passage of the oil through the water column. Under this scenario, more water column effects would probably occur during the initial spill than later.

NON-OCS ACTIVITIES

As was discussed in section 5.2.2.1 and summarized below, water quality in the study area may be generally divided into two subregions. The offshore oil and gas units proposed to be drilled are as follows:

[3] The largest spill from a pipeline ever to occur in the Pacific Region was 900 bbl in December, 1969.

1. Point Lobos to the western entrance of the Santa Barbara Channel (Point Sal, Purisima, and Bonito); and

2. The northern Southern California Bight (SCB): Santa Barbara Channel to Point Fermin (Bonito and Gato Canyon).

Municipal and industrial wastewater discharges. Only two Publicly-Owned Treatment Works (POTW's or sewage treatment plants), discharge directly into the Pacific Ocean in San Luis Obispo County while three others discharge into local rivers. All the dischargers are small, according to EPA criteria (less than 25 million gallons per day [mgd]). There are no other industrial wastewater discharges north of Point Conception.

There are six POTW's that discharge treated effluent to the Channel. They are all small dischargers whose effluents are at a mixed primary/secondary level of treatment (SCCWRP, 1996). The few other point sources of pollution along the shorelines of the Channel include several power plants discharging heated water, and including some chlorine, which is used to prevent fouling of heat exchangers.

Overall, there are 24 discrete sources of pollution from Point Conception to Point Dume including six sewage dischargers, two power plants, six industrial waste dischargers and 10 sources of runoff (Anderson et al., 1993). The 1975-1978 BLM-sponsored baseline studies in the Southern California Bight (SCB) indicated that most of the metal and hydrocarbon loads of the four basins examined (Santa Barbara Channel, San Pedro, Santa Monica, and San Nicolas) were derived from industrial and municipal wastes, entering the marine environment through direct discharge, indirect run-off and atmospheric transport, all centering around the Los Angeles metropolitan area (BLM, 1979).

River plumes. Rivers are the primary non-point source of pollution within the study area. In part, this is because the relatively easy reductions in point sources of pollution have been accomplished. While non-point sources of pollution have long been recognized, improvements in this source of pollution has been slow and difficult. This is due to the diversity of these sources, resistance to regulatory solutions and the multiple pathways through which the pollution may reach the coastal and ocean environments (NRC, 2001).

The Santa Maria River, on the border of Santa Barbara and San Luis Obispo Counties, and the Santa Ynez River, which flows into the ocean between Points Purisima and Arguello, are the primary sources of pollution to the ocean that exist in the northern-most subregion. Pollutants that could be associated with these rivers are predominantly agricultural.

The two major rivers in the Santa Barbara Channel, the Santa Clara and Ventura, are both in Ventura County and drain largely agricultural lands, although the urban areas of Ojai, Ventura, Oxnard/Port Hueneme and Camarillo contribute pollutants via storm drains and other nonpoint source runoff.

Figure 5.2.2.2-1 shows a typical river plume situation for flows during winter rains for the rivers from the northern Santa Maria Basin to Point Mugu. The river system with the most particulate discharge is the Ventura/Santa Clara river combination while the Santa Ynez and Santa Maria Rivers do not appear to contribute much sedimentation (Mertes et al., 1998). Realizing that this is a "typical" snapshot, Hickey and Kaschel (unpublished) show figures during extreme El Niño-like events. During winter, high runoff periods associated with storm and rain conditions followed by upwelling-favorable winds have driven these river plumes south past Point Conception and to the vicinity of San Miguel Island (Hickey and Kaschel, unpubl.). These river plumes occur only during periods of very high flow and may cross the Santa Barbara Channel to the waters of the Channel Islands National Marine Sanctuary (for the Ventura/Santa Clara Rivers) and, for the Santa Ynez/Santa Maria River plumes, reach south past Point Conception. Sediments that erode from the land and reach the coast in runoff carry various contaminants bound to sediment particles, including trace metals, organic compounds and phosphorus (NRC, 2001). The sediments themselves can constitute a potentially serious form of pollution, including by decreasing water clarity.

While these events are episodic (seasonal for the Mertes et al. (1998) and every 5-7 years for the Hickey and Kaschel data), they would nonetheless overwhelm

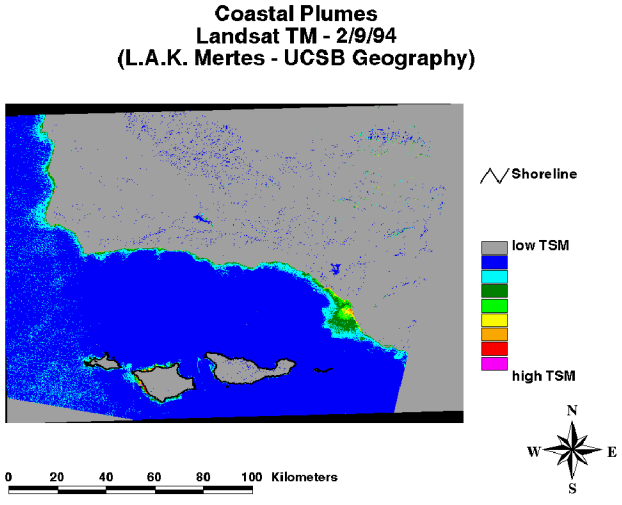


Figure 5.2.2.2-1. View of a "typical" winter runoff situation showing levels of sedimentation emanating from the Ventura/Santa Clara River system as well as from other small creeks and rivers in the Santa Barbara Channel and northern Santa Maria Basin. Source: Mertes (1998).

the effects of any particulate material discharged by drilling operations, wherever the two plumes might meet. Note that the higher the flow, the greater the dilution and the only time the plumes impinge much into the offshore area would be during times of high flow. Thus, pollutants carried by plumes would become well-diluted as they disperse and mix into the sea.

Storm drains. Storm drain-associated runoff is the largest source of unregulated pollution to the waterways and coastal areas of the United States (CCC, 2000). However, storm drain-associated pollution would be confined to the near-coastal vicinity since, even during high runoff periods, the volume would not be enough to carry pollutants very far offshore. Also, many storm drains empty into local rivers and streams, mixing with those high-flow effluents.

A 22,800-bbl marine tanker spill. Historically, responses to spills of this size have lasted from a few weeks to several months before mechanical recovery and dispersants and in-situ burning (if allowed), and natural processes removed the oil from the sea surface. The largest vessel-based spill to occur in the Pacific Region was the 7,000 bbl American Trader spill of Alaskan crude oil in February, 1990. The processes described for the less-than 200-bbl spill, would essentially be the same, being different only in the matter of scale. The major difference would be that the top 10 m (32 ft) or so of the water column would be affected for a longer period of time. There would not be a subsurface plume as there would be for a pipeline spill. However, the strength of the "pulse" of oil into the environment would allow greater concentrations of oil and the light-end components to exist for longer in the water column than was described for the <200-bbl spill size.

INCREMENTAL IMPACTS OF THE PROPOSED ACTION (2002-2006)

The following discussion considers the impacts of the proposal when added to the existing and reasonably foreseeable projects, discussed above. The only aspect of the proposal that could affect water quality when combined with the existing and reasonably foreseeable projects is drilling discharges. These are discussed below.

Impacts Common to All Units. There are no sources of pollution that combine in space and time with other sources of pollution that are common to all units. Drilling discharges are analyzed for each unit because of specific oceanographic and water depth differences.

Impacts Unique to Each Unit. Drilling discharges are the only aspect of the proposal that could affect water quality, and thus combine with other pollution sources. This is due to differences in currents and water depths, and thus the fate of the drilling discharges. See below for more detailed information.

Drilling Discharges. It has been determined that drilling muds may have impacts on benthic communities up to 1,000 m from the discharge point (Hard Bottom Committee Report, 1989). Water quality parameters, however, may be affected beyond 1,000 m. For example, Coats (1994) demonstrated that traces of barium on the sea floor from drilling activities near Point Conception could be detected as far as 6.8 km from the point of discharge. This is an indication of the distance drilling mud particulate material traveled for the CaMP studies. Thus, the ellipses shown on figures 5.2.2.2-2 through 5.2.2.2-4 are 7 km (4.3 miles), in the longest direction, from the proposed drilling sites. The ellipsoid shape is due to the estimated net direction of the currents near each proposed drilling site; that is, according to the direction and strength of the net current flow, which results from a combination of all the currents that occur in the area. These currents give a generalized picture of where drilling muds that remain in the water column might be carried. A similar ellipsoid nature was found during the CaMP studies and is illustrated in figure 5.2.2.2-3.

The ellipses are 7 km (4.3 mi) in the longest direction because that is as far as barium was detected by Coats. However, as discussed in section 5.2.2.1, about 7 to 18 percent of the total drilling mud discharge was silt/clay-sized particulate matter and about 80 percent of that material, was advected out of the study area. To better assess unit-specific differences, each proposed drilling site is discussed below by assessing the local oceanography, including an estimate of current direction, for the mid- and near-bottom portion of the water column.

Gato Canyon Unit. The proposed Gato Canyon well site is located approximately 8 km (5 miles) south of Capitan and 13 km (8 miles) east of Platform Hondo in the Santa Barbara Channel (figure 5.2.2.2-2). The well site is in 230 m (755 ft) water depth. Annual net current flow at all depths is westward. This was confirmed by mid-depth and bottom current measurements taken in the Santa Ynez Unit, just east of the proposed Gato Canyon Unit drilling site, which indicated that currents tended westward to the shelf-break, about 200 m (640 ft) (ADL, 1984). Since the well site is in reasonably deep water, the ellipse formed by the drilling mud plume would tend to stretch westward to at least 7 km (4.3 miles), with some cross-shelf spreading to a distance of about 3 km (1.9 miles) due to tides, waves and other physical processes. Averaged mid-depth and bottom current speeds were on the order of 10 to 12 cm/s somewhat comparable to the 7 cm/s current speeds described for the CaMP study area (SAIC, 1986). Therefore, much of the drilling muds would be carried along the west to southwest direction, spreading throughout the water column and dispersing to

background particulate levels. This plume does not intersect with any of the plumes that could be emanating from the Santa Ynez Unit platforms (Hondo, Harmony, and Heritage), if those platforms were discharging drilling muds at the time. Of the three, only Platform Harmony would be discharging produced water and the drilling discharges from the Gato Canyon Unit well site would not overlap in space with that effluent. No other major anthropogenic effluents or other sources of pollution exist near the Gato Canyon Unit well site. Therefore, cumulative impacts to water quality due to drilling at this well site are negligible.

Bonito Unit. One or two wells are proposed to be drilled at any of the four sites indicated on figure 5.2.2.2-3. Nuevo is currently considering which well sites to drill although the current drill site priority, as given by Nuevo in their latest Project Description (Nuevo, 2000), in descending order, are as follows: 1. OCS-P 0446 #5; 2. OCS-P 0443 #4; 4. OCS-P 0446 #3; 7. OCS-P 0500 #2. The oceanography is estimated to be similar amongst all the potential well sites. The Bonito Unit is northwest of the Point Arguello Unit, the site of the CaMP drilling discharges monitoring studies. During CaMP, net flow was to the northwest (poleward). Data collected by the Scripps Institution of Oceanography (SIO) under contract to Minerals Management Service, indicates that net current flow at mid- and near-bottom water depths are poleward (pers. comm. David Browne, Oceanographer, MMS). As can be seen on figure 5.2.2.2-3, the ellipses do overlap each other, but not any other source of anthropogenic pollution. Since any drilling will occur in sequence, no overlap of drilling discharges is expected. The plumes also do not overlap in space with any of the nearest existing platforms. Thus, cumulative impacts to water quality due to any proposed drilling at these well sites would be negligible.

Purisima Point and Point Sal Units. One delineation well is being proposed on the Purisima Point Unit at one of four possible sites and one delineation well is being proposed on the Point Sal Unit at one of three possible sites. Water depths at all seven sites are fairly shallow, ranging from 74 to 112 m (238 to 358 ft). Data from the SIO studies again indicate that the net current flow is estimated to be poleward (northerly). Since the water depths are so shallow, surface-based physical processes (for example, waves and tides) would help to laterally disperse drilling mud plumes. Thus, these plumes would end up being slightly wider than those in deeper water at the other units (figure 5.2.2.2-4). The plumes also do not overlap in space with any of the nearest existing platforms. Due to the lack of any other anthropogenic sources of pollution, as described in section 5.2.2.1, cumulative impacts to water quality due to any proposed drilling at these well sites would be negligible.

SUMMARY AND CONCLUSION (2002-2006)

For the five-year period from 2002 through 2006, only drilling muds and cuttings could overlap in time and space with other existing and reasonably foreseeable projects and activities. Existing OCS oil and gas operations may discharge drilling muds and cuttings on an irregular basis (discussed in the unit-by-unit summary, above). The authors of BLM (1979) suggested that oil and gas development activities would provide only limited input of metals to the Southern California Basins, except, possibly for barium and maybe lead, which could be observably altered in surface sediments. They also noted that hydrocarbon levels increased in all the basins examined (Santa Barbara Channel, San Nicolas, San Pedro, and Santa Monica). Both metals and hydrocarbon loads of the four basins were derived from industrial and municipal wastes, entering the marine environment through direct discharge, indirect run-off and atmospheric transport, all centering around the Los Angeles metropolitan area.

Oil spills might affect water quality depending on the amount and type of oil spilled and the source. Nevertheless, oil spills by themselves could only constitute, at most, a moderate impact to water quality for the short-term the first week or two) and low for the long-term (beyond the first week to two).

Non-oil and gas projects and activities are dominated by onshore sewage discharges and by episodic river runoff. These two items might overlap in time and space with the drilling activities at the four units. However, their contribution to the pollutant loading of the study area greatly exceeds any discharges from the proposed individual or combined wells. Thus, incremental impacts from the Proposed Action are low.

POTENTIAL MITIGATION MEASURES FOR CUMULATIVE IMPACTS

The same mitigation measures described in sections 5.2.2.1 and 5.2.2.1.2 (NPDES permits and EPA/MMS NPDES monitoring), will likely be in-place for oil and gas operations for this time period, as well.