

CHAPTER 3

EMISSION INVENTORY

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3. EMISSION INVENTORY

3.1 INTRODUCTION

This chapter describes the baseline emission inventory used in the development of this 2001 Clean Air Plan (2001 Plan). The emission inventory accounts the types and amounts of pollutants emitted from a wide variety of sources, including on-road motor vehicles and other mobile sources, fuel combustion at industrial facilities, solvent and surface coating usage, consumer product usage, and emissions from natural sources. The emission inventory is used to describe and compare contributions from air pollution sources, evaluate control measures, schedule rule adoptions, forecast future pollution, to demonstrate maintenance, and prepare clean air plans.

The emission inventory is divided into two geographical regions: *Santa Barbara County* and the *Outer Continental Shelf (OCS)*. The Santa Barbara County emission inventory encompasses all onshore sources of air pollution in Santa Barbara County and in the State Tidelands (within three miles of the shoreline) and is part of the South Central Coast Air Basin, along with San Luis Obispo and Ventura counties. The OCS emission inventory is an air basin all to itself and includes pollution sources offshore of Santa Barbara County beyond the three mile State Tideland boundary.

This chapter presents both the 1999 Annual Emission Inventory and the 1999 Planning Emission Inventory for both Santa Barbara County and the OCS. (Both of these inventories are shown in Tables 3-1 to 3-4 and displayed in Figures 3-1 to 3-4).

The 1999 Annual Emission Inventory is our most current data available and uses the most current emission estimation techniques. These inventory data were derived from many sources including the APCD's Annual Emission Inventory Questionnaire and Annual Reports programs, the Santa Barbara County Association of Governments, the California Air Resources Board (ARB), surveys from Santa Barbara businesses, and other U.S., state, and county government agencies.

Also included in this chapter is a modified version of the 1999 Annual Emission Inventory, known as a “Planning Emission Inventory,” which will be used as the baseline to forecast emissions for the years 2005, 2010, and 2015. Please refer to Chapter 6, Emission Forecasting, for the discussion on using the 1999 Planning Emission Inventory to forecast future emissions.

A Planning Emission Inventory is a modified subset of an Annual Emission Inventory. The Planning Emission Inventory differs from an Annual Emission Inventory in three ways. First, the creation of the Planning Emission Inventory involves adjusting the Annual Emission Inventory to account for seasonal variation because most exceedances of the state and federal 1-hour ozone standards occur during the April to October ozone season. This is commonly referred to as a summer seasonal inventory. Second, the emissions from natural sources such as biogenics, oil and gas seeps, and wildfires that are part of the Annual Emission Inventory are excluded from the Planning Emission Inventory since they are not regulated or controlled through implementation of emission control measures. Finally, the annual emissions in the Annual Emission Inventory are converted to daily emissions in the Planning Emission Inventory.

3.2 POLLUTANTS

The Annual Emission Inventory and Planning Emission Inventory include two pollutants that contribute to ozone formation, referred to as *ozone precursors*. These pollutants are reactive organic compounds (ROC) and oxides of nitrogen (NO_x). The definition of ROC used in this plan is essentially equivalent to the USEPA's definition of Volatile Organic Compounds (VOC) and ARB's definition of Reactive Organic Gases (ROG), and does not include ethane, acetone or perchloroethylene as reactive organic chemical species.

There are other primary pollutants (those emitted directly into the atmosphere) that are presented in the 2001 Plan. These pollutants, which will only be displayed in Appendix A, Emission Inventory and Forecasting Documentation are: carbon monoxide (CO); oxides of sulfur (SO_x); particulate matter (PM); and, particulate matter smaller than 10 microns (PM_{10}).

3.3 EMISSION INVENTORY HIERARCHY

The emission inventory is organized in a three-tiered hierarchy that categorizes all air pollution sources. The first tier of this hierarchy contains four *divisions*: *Stationary Sources* (individual facilities and aggregated point sources), *Area-Wide Sources* (geographically dispersed area sources), *Mobile Sources* (both on-road vehicles and off-road sources) and *Natural Sources* (not man-made). In the second tier, each of the four divisions is sub-divided into *major source* categories. The third tier divides the major source categories into *summary* categories. Please refer to Appendix A for a comprehensive listing of the entire emission inventory, which includes a fourth tier, *source* categories.

The following sections discuss each of the four divisions of the emission inventory's first tier.

3.3.1 STATIONARY SOURCES

The *Stationary Sources* emission inventory division contains five major source categories:

- 1) Fuel Combustion,
- 2) Waste Disposal,
- 3) Cleaning and Surface Coatings,
- 4) Petroleum Production and Marketing, and
- 5) Industrial Processes.

The specific summary categories and sources of emissions associated with these major categories are identified and described as follows.

3.3.1.1 Fuel Combustion

This major source category contains emissions produced by stationary fossil fuel combustion equipment such as boilers and engines. Fuel combustion is the greatest source of NO_x emissions within the Stationary Sources division. Emissions in the Fuel Combustion major source category are produced in the following eight summary categories:

1. Electric Utilities: Diesel and natural gas turbines used at electrical generation facilities.
2. Cogeneration: Natural gas combustion used in the production of electrical energy and useful thermal energy.
3. Oil and Gas Production (Combustion): Stationary internal combustion engines, boilers, process heaters, turbines, and steam generators at facilities engaged in the extraction and processing of petroleum products for shipment, using fuels such as natural gas, distillate oil, and liquefied petroleum gas (LPG). Most of the emissions in this summary category are produced from untreated natural (field) gas fired internal combustion engines used in oil production operations.
4. Petroleum Refining (Combustion): Natural gas, distillate and residual oil burning equipment such as boilers and process heaters located at refineries.
5. Manufacturing and Industrial: The same type of equipment as listed under Oil and Gas Production, but used in other industrial and manufacturing activities such as: sand, rock, and gravel processing; concrete and asphalt production; mineral processing; and, surgical appliance manufacturing.
6. Food and Agricultural Processing: Diesel-fired internal combustion engines used for agricultural irrigation, natural-gas-fired boilers, oil-fired boilers, and process heaters at food processing and feed preparation facilities, and orchard heaters.
7. Service and Commercial: Fuel combustion equipment burning natural gas, distillate and residual oil and LPG, including commercial space and water heaters and small boilers and engines at non-industrial facilities.
8. Other (Fuel Combustion).

3.3.1.2 Waste Disposal

This major source category contains emissions associated with wastewater treatment plants, municipal landfills and incineration in four summary categories:

1. Sewage Treatment.
2. Landfills: Decomposition of waste material at class II landfill sites. Landfill gas emissions are the result of natural biodegradation and emissions are predominantly non-reactive organic gases.

3. Incinerators: Incinerators burning process gas.
4. Other (Waste Disposal).

3.3.1.3 Cleaning and Surface Coatings

This major source category consists entirely of evaporative ROC emissions from solvents and coatings, in the following six summary categories:

1. Laundering: Use of petroleum-based solvents at dry cleaning facilities.
2. Degreasing: Petroleum and synthetic solvents used to clean parts and material at industrial and commercial facilities, such as surgical appliance and semi-conductor manufacturers. An important change to this degreasing category is that the ARB has increased the level of detail in their degreaser inventory from five general categories to 32 specific categories.
3. Coatings and Related Process Solvents: Automotive, aerospace, metal parts, furniture and wood product coatings and associated solvent and thinner use.
4. Printing: Inks, solvents and cleaning agents.
5. Adhesives and Sealants: Organic solvent-based and water-based adhesives and sealants used in various commercial and industrial applications.
6. Other (Cleaning and Surface Coating): Solvents not accounted for in any other category.

3.3.1.4 Petroleum Production and Marketing

This major source emission category includes emissions resulting from the handling of petroleum liquids and gases at petroleum extraction, processing, transport, and marketing facilities. This category is comprised primarily of ROC emissions and is the most significant source of ROC emissions in the Stationary Sources division. The emissions are produced from processes in the following three summary categories:

1. Oil and Gas Production: Fugitive hydrocarbon emissions from oil wells, valves and fittings, compressor seals, flanges, fixed and floating roof tanks, crude oil sumps, pits and

well cellars, glycol regenerator vents, tank car and truck loading operations, and combustion emissions from flares at oil and gas extraction and processing facilities.

2. Petroleum Refining: Fugitive hydrocarbon emissions from valves, fittings, storage tanks and loading racks at oil and gas production facilities.
3. Petroleum Marketing: Fugitive hydrocarbon emissions from crude oil storage tanks affiliated with pipelines, and loading of marine vessels and tank cars and trucks with crude oil, natural gas transmission losses, refined fuel vapor losses from underground storage tanks, gasoline dispensing facilities, and bulk fuel storage plants.

3.3.1.5 Industrial Processes

The Industrial Processes major source category pertains to industries other than the petroleum industry. Industrial Processes produce only a small fraction of the county's ROC and NO_x emissions. They include the following summary categories:

1. Chemical: ROC emissions from fiberglass operations and plastic product manufacturing.
2. Food and Agriculture: ROC emissions from wine fermentation and aging. SO_x and PM emissions from sugar beet and other agricultural processing.
3. Mineral Processes: Substantial PM as well as other pollutant emissions from crushed rock, diatomaceous earth processing, asphalt and cement concrete production and limestone processing.
4. Metal Processes.
5. Wood and Paper.
6. Other (Industrial Processes): CO and PM emissions resulting from aerospace operations (missile launches).

3.3.2 AREA-WIDE SOURCES

The *Area-Wide Sources* emission inventory division is composed entirely of emissions from sources that are not subject to APCD permitting requirements. Emissions are geographically dispersed throughout the county but are aggregated into two major source emission categories: Solvent Evaporation; and, Miscellaneous Processes.

3.3.2.1 Solvent Evaporation

The Solvent Evaporation major source category consists entirely of evaporative ROC emissions from consumer product use, architectural coatings, and pesticide use. The Solvent Evaporation major source category includes the following four summary categories.

1. Consumer Products: Solvents used in antiperspirants and deodorants, air fresheners, automotive windshield wiper fluids, bathroom cleaners, consumer engine cleaners, barbecue lighter fluid, aerosol paint and product propellants, and solvents. An important change to the Consumer Products category is that the ARB has increased their level of detail from five general categories to 135 specific categories.
2. Architectural Coatings and Related Process Solvents: Oil and water-based paints and thinners used to paint commercial and residential buildings and other structures. The ARB has also increased their level of detail from three to 64 individual categories of Architectural Coatings.
3. Pesticides/Fertilizers: Pesticides used in agricultural, structural and consumer product applications.
4. Asphalt Roofing and Paving: Asphalt roofing, cutback asphalt, emulsified asphalt, hot-mix asphalt, road oils, and asphalt roofing.

3.3.2.2 Miscellaneous Processes

The emissions produced by miscellaneous processes are listed in the following 10 summary categories:

1. Residential Fuel Combustion: NO_x, CO, and PM emissions from natural gas, distillate oil, liquified petroleum gas, and wood combustion used for cooking, space and water heating.
2. Farming Operations: Fugitive dust PM emissions from tilling, harvest season operations and cattle feedlots.
3. Construction and Demolition: Fugitive dust PM emissions from residential, commercial and industrial building and demolition, and road construction.

4. Paved Road Dust: Fugitive dust PM emissions from vehicular travel on paved roads, including freeways, major roads, and local streets.
5. Unpaved Road Dust: Fugitive dust PM emissions from vehicular travel on unpaved roads, including city and county, farm and federal land roads.
6. Fugitive Windblown Dust: Fugitive dust PM emissions from wind erosion of agricultural fields, pastures, and unpaved roads.
7. Fires: CO, ROC and NO_x emissions from automobile and structural fires.
8. Waste Burning and Disposal: Burning of agricultural debris, weed abatement and range management burning, prescribed forest management burning and fire fighting training resulting in some ROC, NO_x, CO, and PM emissions.
9. Cooking: Commercial charbroiling, producing mostly PM emissions.
10. Other (Miscellaneous Processes).

3.3.3 MOBILE SOURCES

The *Mobile Sources* emission inventory division contains emissions related to on-road motor vehicles and a variety of off-road vehicles and equipment, including aircraft, recreational vehicles and marine vessels. Mobile Sources consists of two major source categories: On-Road Motor Vehicles and Other Mobile Sources.

The Mobile Sources emission inventory category contains most of the NO_x emissions and substantial amounts of the ROC emissions in the county's onshore and offshore inventory.

3.3.3.1 On-Road Motor Vehicles

The On-Road Motor Vehicles emission inventory in the 2001 Plan will be based on a new ARB model known as EMFAC2001. The on-road emission inventory developed from ARB's EMFAC2001 model, incorporates county-specific activity data generated by SBCAG's Santa Barbara Travel Model, and updated vehicle demographic data from the Department of Motor Vehicles (DMV). SBCAG coordinates with CalTrans and the ARB to estimate vehicle emissions by vehicle class. This 2001 Plan uses techniques that are the most technically sound and acceptable to both the ARB and the U.S. EPA for estimating on-road emissions.

Based on the MVEI7G model, the 1998 CAP used 10 different on-road summary categories. In the EMFAC2001 model, seven additional summary categories have been added to the on-road inventory.

The On-Road Motor Vehicles major source category now includes gasoline and diesel light-duty passenger vehicles (automobiles), gasoline and diesel light-duty trucks (pick-up trucks), medium-duty trucks, light heavy-duty trucks, medium heavy-duty trucks, and heavy heavy-duty trucks, motorcycles, heavy-duty gasoline and diesel buses, school buses, and motor homes. The categories are described below:

1. Light Duty Passenger (LDA): Catalytic and non-catalytic converter-equipped gasoline engine and diesel engine automobiles designed primarily for transportation and having a design capacity of 12 persons or less.
2. Light Duty Trucks – 1 (LDT1): Catalytic and non-catalytic converter-equipped gasoline engine and diesel engine trucks rated at less than or equal to 3,750 pounds gross vehicle weight designed primarily for transportation of property but also includes Sport Utility Vehicles (SUV).
3. Light Duty Trucks – 2 (LDT2): Catalytic and non-catalytic converter-equipped gasoline engine and diesel engine trucks from 3,751 to 5,750 pounds gross vehicle weight designed primarily for transportation of property but also includes Sport Utility Vehicles (SUV).
4. Medium Duty Trucks (MDV): Catalytic and non-catalytic converter-equipped gasoline engine and diesel engine trucks from 5,751 to 8,500 pounds gross vehicle weight. Some larger SUV are included in this vehicle class.
5. Light Heavy Duty Gas Trucks – 1 (LHDV1): Catalytic and non-catalytic converter-equipped gasoline engine trucks from 8,501 to 10,000 pounds gross vehicle weight.
6. Light Heavy Duty Gas Trucks – 2 (LHDV2): Catalytic and non-catalytic converter-equipped gasoline engine trucks from 10,001 to 14,000 pounds gross vehicle weight.
7. Medium Heavy Duty Gas Trucks (MHDV): Catalytic and non-catalytic converter-equipped gasoline engine trucks from 14,001 to 33,000 pounds gross vehicle weight.
8. Heavy Heavy Duty Gas Trucks (HHDV): Catalytic and non-catalytic converter-equipped gasoline engine trucks from 33,001 to 60,000 pounds gross vehicle weight.

9. Light Heavy Duty Diesel Trucks – 1 (LHDV1): Diesel engine trucks from 8,501 to 10,000 pounds gross vehicle weight.
10. Light Heavy Duty Diesel Trucks – 2 (LHDV2): Diesel engine trucks from 10,001 to 14,000 pounds gross vehicle weight.
11. Medium Heavy Duty Diesel Trucks (MHDV): Diesel engine trucks from 14,001 to 33,000 pounds gross vehicle weight.
12. Heavy Heavy Duty Diesel Trucks (HHDV): Diesel engine trucks from 33,001 to 60,000 pounds gross vehicle weight.
13. Motorcycles (MCY): Non-catalytic converter equipped gasoline engines in vehicles with not more than three wheels and weighing less than 1,500 pounds.
14. Heavy Duty Diesel Urban Buses (UB): Diesel engine buses typically used for municipal transportation.
15. Heavy Duty Gas Urban Buses (UB): Gas engine buses typically used for municipal transportation.
16. School Buses (SB).
17. Motor Homes (MH).

3.3.3.2 Other Mobile Sources

The Other Mobile Sources category pertains to emission sources that do not produce their emissions on roads and highways. These include ships, boats, airplanes, trains, residential utility equipment, and construction equipment. Although the ARB has the primary responsibility for estimating the emissions from these categories, the APCD currently estimates the emissions from ships and aircraft.

The most significant change to this major category since the 1998 CAP is that ARB has now developed a model known as OFFROAD, which has modified the way these emissions are calculated. The OFFROAD model consists of four main modules: population, activity, emissions, and control factor. The 1990 base year equipment population is adjusted for growth and scrappage, producing population distributions for specified calendar years from 1970 through 2020. The statewide population is allocated to each geographic region, including air basin and county. The base emission factors are corrected for in-use and ambient conditions.

The annual equipment emissions are adjusted for seasonal and diurnal factors, producing the base emissions output.

Virtually all of these Other Mobile Source emissions are related to fuel combustion in engines. A significant percentage of the NO_x emissions come from marine vessels that operate in the State Tidelands and the Outer Continental Shelf. The Other Mobile Sources category is divided into seven summary categories:

1. Aircraft: Primarily CO and ROC emissions from piston and jet powered commercial, civil, and military aircraft, and agricultural crop dusting.
2. Trains: Primarily NO_x combustion emissions from locomotives on the railway line linking the Los Angeles area with the San Francisco Bay area.
3. Ships and Commercial Boats: A variety of large tanker and cargo vessels, both of US and foreign origin, traversing the Santa Barbara Channel, commercial fishing vessels, and crew and supply boats servicing offshore oil production platforms produce significant quantities of NO_x, SO_x and CO emissions.
4. Recreational Boats: Mostly CO and ROC emissions from gasoline and diesel powered boats, determined by ARB's OFFROAD model. These emissions are divided equally between the Santa Barbara County onshore (which includes the State Tidelands) and the Outer Continental Shelf.
5. Off-Road Recreational Vehicles: CO and ROC emissions from four-wheel drive all-terrain and off-road passenger vehicles, and off-road motorcycles, determined by ARB's OFFROAD model.
6. Off-Road Equipment: Substantial CO and NO_x emissions from gasoline, diesel and LPG powered construction and industrial equipment. Light duty equipment with engines less than 175 horsepower, such as forklifts, mobile cranes, airport ground support equipment, portable generators, compressors, and pumps. Heavy-duty non-farm equipment with engines greater than or equal to 175 horsepower including construction equipment such as pavers, scrapers, loaders and mining equipment. Diesel powered refrigeration units on trucks and trailers. This category also includes emissions from lawn and garden equipment, which include small horsepower two and four stroke utility engines driving chainsaws, lawn mowers, leaf blowers, portable compressors and generators used in

residential and commercial applications. Lastly, there are emissions from oil drilling and workover, and military tactical support equipment. The emissions from these categories are determined by ARB's OFFROAD model.

7. Farm Equipment: CO and NO_x emissions from gasoline and diesel heavy-duty farm equipment, including tractors, mowers, combines and other mobile agricultural equipment. The emissions from these categories are determined by ARB's OFFROAD model.

3.3.4 NATURAL SOURCES

The *Natural Sources* emission inventory division consists of emissions that are not man-made. Emission estimates for these categories tend to be difficult to quantify with any degree of certainty. Note that natural emissions are excluded from the Planning Emission Inventory.

3.3.4.1 Natural Sources

There are four summary categories of Natural Sources emissions:

1. Biogenic Sources: ROC emissions from vegetation, typically estimated using a complex regional model incorporating biomass types and distribution, plant species emission factors and climate correction factors. Soil microorganisms contribute some NO_x emissions. Estimates of ROC emissions from natural vegetation are generated using the Urban Airshed Model's Biogenic Emission Inventory System (BEIS).
2. Geogenic Sources: ROC emissions from naturally occurring oil and gas seeps located off the southern coast of Santa Barbara County. Seep emissions flow out from subsurface sources on the ocean floor, primarily in the State Tidelands, and exhibit a high degree of temporal and spatial variability. We have worked in cooperation with the Institute of Crustal Studies at the University of California at Santa Barbara to determine estimates of seep emissions in the Santa Barbara Channel. The results of their research have been used in this inventory.
3. Wildfires: Timber, grass and brush wildfires. This is different from the planned or prescribed burn fires that are part of the Area-Wide Source division, Miscellaneous

Processes major source category, Waste Burning and Disposal summary category. CO and PM are the most significant pollutants.

4. Windblown Dust.

Based on information presented in Sections 3.2 and 3.3, the 1999 Annual Emission Inventory and 1999 Planning Emission Inventory will be described in the following sections. These two inventories will form the basis for determining emission reductions and forecasting future inventories.

3.4 1999 ANNUAL EMISSION INVENTORY

The 1999 Annual Emission Inventory contains the most recent data and emission estimation methods, including using the latest On-Road Motor Vehicle activity data and emission estimation models. The 1999 Santa Barbara County and the Outer Continental Shelf Annual Emission Inventory documents the current sources of air pollution, both in quantity and relative contribution.

A modified version of the 1999 Annual Emission Inventory, described as a Planning Emission Inventory, is discussed in more detail in section 3.5. This inventory will serve as the baseline to forecast emission inventories for the years 2005, 2010, and 2015, which is the focus of Chapter 6, Emission Forecasting and the basis for our Maintenance Demonstration.

The 1999 Santa Barbara County Annual Emissions Inventory of ROC and NO_x in tons per year is presented in Table 3-1. The Santa Barbara County inventory represents onshore and State Tidelands emission sources, and includes natural sources (i.e., non-man made emissions related to oil and gas seeps, vegetation, and wildfires). While the Annual Emission Inventory and Planning Emission Inventory in this chapter only include emissions of ROC and NO_x, emissions of SO_x, CO, and PM, and PM₁₀ are included in Appendix A, Emission Inventory and Forecasting Documentation.

3.4.1 SANTA BARBARA COUNTY ANNUAL EMISSIONS

The 1999 Santa Barbara County Annual Emission Inventory estimates 44,639 tons per year of ROC and 19,236 tons per year of NO_x. Figure 3-1 shows each major source category's relative contribution for each pollutant during 1999. The largest sources of each pollutant and their percent of contribution are as follows:

1999 Santa Barbara County ROC Annual Emissions: 44,639 tons

- **7% Stationary Sources: 3,059 tons**

Primarily from Cleaning and Surface Coatings (Coatings and Process Solvents-Thinning and Cleanup Solvents, Degreasing-Petroleum Naphtha, and Adhesives and Sealants-both Water-based and Organic Solvent-based) and from Petroleum Production and Marketing (Oil and Gas Production-Fugitives from Crude Oil Valves).

- **7% Area-Wide Sources: 3,271 tons**

Primarily from Solvent Evaporation (Consumer Products, Pesticides & Fertilizers-Methyl Bromide, and Architectural Coatings and Related Process Solvents).

- **21% Mobile Sources: 9,379 tons**

Predominantly On-Road Motor Vehicles (specifically Light Duty Passenger, Light Duty Trucks, Medium Duty Trucks). Significant emissions also come from the Other Mobile Sources, Recreational Boats, and Off-Road Equipment.

- **65% Natural Sources: 28,930 tons**

Mostly Biogenic Sources with a significant contribution from Geogenic Sources.

1999 Santa Barbara County NO_x Annual Emissions: 19,236 tons

- **10% Stationary Sources: 2,001 tons**

Almost exclusively Fuel Combustion (Oil and Gas Production-Untreated Natural (Field) Gas IC Engines and Food and Agricultural Processing-Agricultural IC Engines).

- **3% Area-Wide Sources: 551 tons**

Mostly Miscellaneous (Residential Fuel Combustion-Natural Gas Space and Water Heating and Waste Burning and Disposal-Forest Management).

- **80% Mobile Sources: 15,319 tons**

The majority from On-Road Motor Vehicles (Light Duty Passenger, Light Duty Trucks, and Heavy Heavy Duty Diesel Trucks). There is also a large contribution from Other Mobile Sources (Off-Road Equipment-Diesel Construction and Mining Equipment and Farm Equipment-Diesel Agricultural Equipment).

- **7% Natural Sources: 1,365 tons**

Mostly from Biogenic Sources with some Wildfire-Timber and Brush emissions.

In summary, Natural Sources (both Biogenic and Geogenic Sources) contribute the most significant ROC emissions in the Annual Emission Inventory. On-Road Motor Vehicles, specifically Light Duty Passenger, also produce large amounts of ROC emissions and most of the NO_x emissions. On-Road Motor Vehicles, Light Duty Trucks, and Other Mobile Sources, Off-Road Equipment and Farm Equipment, also contribute large amounts of NO_x emissions.

3.4.2 OCS ANNUAL EMISSIONS

The 1999 OCS emission inventory is presented in Table 3-2. The OCS emissions are summarized separately from the onshore emission inventory for clarity.

The 1999 OCS Annual Emission Inventory estimates 3,033 tons per year of ROC and 10,612 tons per year of NO_x. Figure 3-2 shows each major source's relative contribution for each pollutant during 1999. The largest sources of each pollutant and their percent of contribution are discussed below.

1999 OCS ROC Annual Emissions: 3,033 tons

- **12% Stationary Sources: 377 tons**

Primarily Petroleum Production and Marketing (Oil and Gas Production-Fugitives from Crude Oil Valves).

- **22% Mobile Sources: 651 tons**

Mostly Other Mobile Sources (Ships and Commercial Boats-Foreign Motor Ships).

- **66% Natural Sources: 2,004 tons**

All from Geogenic Sources-Gas and Oil Seeps.

1999 OCS NO_x Annual Emissions: 10,611 tons

- **2% Stationary Sources: 255 tons**

Primarily Fuel Combustion (Oil and Gas Production-Natural Gas Turbine IC Engines).

- **98% Mobile Sources: 10,356 tons**

Predominantly Other Mobile Sources: (Ships and Commercial Boats-Foreign Motor Ships and U.S. Motor Ships).

In summary, two thirds of the ROC emissions in the OCS are from Natural Sources, specifically offshore oil and gas seeps. Ships and Commercial Boats in transit, and Oil and Gas Production, primarily offshore platform fugitive hydrocarbons, contribute the largest remaining portions of ROC emissions to the OCS inventory. Ships and Commercial Boats also account for almost all of the NO_x emissions.

3.5 1999 PLANNING EMISSION INVENTORY

The 1999 Planning Emission Inventory was developed by modifying the Annual Emission Inventory three significant ways. First, seasonal variations are factored into the Planning Emission Inventory because most exceedances of the federal ozone standard occur during the May to October ozone season. Second, the Planning Emission Inventory excludes emissions from natural sources such as biogenics, oil and gas seeps, and wildfires, since they are not regulated or controlled. Third, the emission values are converted from tons per year to tons per day.

3.5.1 SANTA BARBARA COUNTY PLANNING EMISSION INVENTORY

As shown in Table 3-3, the 1999 Santa Barbara County Planning Emission Inventory estimates 40.85 tons per day of ROC and 48.56 tons per day of NO_x. Figure 3-3 shows each major

source's relative contribution for each pollutant during 1999. The largest sources of each pollutant and their percent of contribution are discussed below.

1999 Santa Barbara County ROC Planning Emissions: 40.85 tons per day

- **21% Stationary Sources: 8.47 tons per day**

Primarily Cleaning and Surface Coatings (Coatings and Process Solvents and Degreasing) and Petroleum Production and Marketing (Oil and Gas Production).

- **19% Area-Wide Sources: 7.96 tons per day**

Almost exclusively from Solvent Evaporation: (Consumer Products and Pesticides/Fertilizers).

- **60% Mobile Sources: 24.42 tons per day**

Mostly from On-Road Motor Vehicles (Light Duty Passenger and Light Duty Trucks).

1999 Santa Barbara County NO_x Planning Emissions: 48.56 tons per day

- **11% Stationary Sources: 5.30 tons per day**

Predominantly Fuel Combustion (Oil and Gas Production-Combustion and Food and Agricultural Processing).

- **2% Area-Wide Sources: 0.76 tons per day**

Almost entirely Miscellaneous (Residential Fuel Combustion).

- **87% Mobile Sources: 42.51 tons per day**

Mostly On-Road Motor Vehicles (Light Duty Passenger, Light Duty Trucks, and Heavy Heavy Duty Diesel Trucks). There is also a large contribution from Other Mobile Sources (Off-Road Equipment and Farm Equipment).

In summary, On-Road Motor Vehicles, specifically Light Duty Passenger cars and Light Duty Trucks produce about two thirds of the ROC emissions along with significant contributions from Cleaning and Surface Coatings, Solvent Evaporation, and Petroleum Production and Marketing. On-Road Motor Vehicles, primarily Light Duty Passenger cars, Light Duty Trucks, and Heavy, Heavy Duty Diesel Trucks, along with the Other Mobile Source categories of Off-Road Equipment and Farm Equipment, produce the majority of the NO_x emissions.

3.5.2 OCS PLANNING EMISSION INVENTORY

The 1999 OCS Planning Emission Inventory is presented in Table 3-4. The OCS emissions are summarized separately from the onshore emission inventory for clarity.

The 1999 OCS Planning Emission Inventory estimates 2.82 tons per day of ROC and 29.09 tons per day of NO_x. Figure 3-4 shows each major source's relative contribution for each pollutant during 1999. The largest sources of each pollutant and their percent of contribution are discussed below.

1999 OCS ROC Planning Emissions: 2.84 tons per day

- **37% Stationary Sources: 1.05 tons per day**
Primarily Petroleum Production and Marketing (Oil and Gas Production).
- **63% Mobile Sources: 1.79 tons per day**
All Other Mobile Sources (Ships and Commercial Boats).

1999 OCS NO_x Planning Emissions: 29.08 tons per day

- **2% Stationary Sources: 0.70 tons per day**
Primarily Fuel Combustion (Oil and Gas Production-Combustion).
- **98% Mobile Sources: 28.38 tons per day**
All Other Mobile Sources (Ships and Commercial Boats).

In summary, the most significant contributor of ROC and NO_x emissions to the 1999 Planning Emission Inventory on the OCS is from Other Mobile Sources (Ships and Commercial Boats).

3.6 CONCLUSION

In this chapter we have described how our emission inventories are categorized into Stationary Sources, Area-Wide Sources, Mobile Sources and Natural Sources. Since the focus of this plan is to demonstrate maintenance of the federal one-hour ozone standard, the emphasis in the 2001 Plan is on the ozone precursors of ROC and NO_x. We have also discussed the development of the 1999 Annual Emission Inventory and 1999 Planning Emission Inventory for both Santa Barbara County and the Outer Continental Shelf. These inventories provide the foundation for this plan and are key elements to calculating emission reductions attributable to control measures and for forecasting future emission inventories for 2005, 2010, and 2015.

For additional information on the 1999 Annual Emission Inventory, please refer to Appendix A, Emission Inventory and Forecasting Documentation. This appendix contains an inventory that includes all sources of air pollution and all criteria pollutants. The 1999 Planning Emission Inventory is also detailed in Appendix A, and is also discussed in Chapter 6, Emission Forecasting.

TABLE 3-1**1999 Annual Emission Inventory - Santa Barbara County (Tons per year)**

	ROC	NOx
STATIONARY SOURCES		
<i>FUEL COMBUSTION</i>		
010 ELECTRIC UTILITIES	0.92	30.15
020 COGENERATION	13.05	48.68
030 OIL AND GAS PRODUCTION (COMBUSTION)	174.35	781.36
040 PETROLEUM REFINING (COMBUSTION)	0.84	17.46
050 MANUFACTURING AND INDUSTRIAL	9.84	169.98
052 FOOD AND AGRICULTURAL PROCESSING	47.85	637.52
060 SERVICE AND COMMERCIAL	16.47	233.69
099 OTHER (FUEL COMBUSTION)	0.00	0.00
<i>FUEL COMBUSTION TOTAL</i>	263.32	1,918.84
<i>WASTE DISPOSAL</i>		
110 SEWAGE TREATMENT	0.06	2.94
120 LANDFILLS	178.35	8.50
130 INCINERATORS	0.52	4.59
140 SOIL REMEDIATION	0.00	0.00
199 OTHER (WASTE DISPOSAL)	0.00	0.00
<i>WASTE DISPOSAL TOTAL</i>	178.93	16.03
<i>CLEANING AND SURFACE COATINGS</i>		
210 LAUNDERING	0.55	0.00
220 DEGREASING	539.21	0.00
230 COATINGS AND RELATED PROCESS SOLVENTS	588.51	0.00
240 PRINTING	163.07	0.00
250 ADHESIVES AND SEALANTS	297.37	0.00
299 OTHER (CLEANING AND SURFACE COATINGS)	33.30	0.00
<i>CLEANING AND SURFACE COATINGS TOTAL</i>	1,622.01	0.00
<i>PETROLEUM PRODUCTION AND MARKETING</i>		
310 OIL AND GAS PRODUCTION	721.81	34.66
320 PETROLEUM REFINING	16.76	0.03
330 PETROLEUM MARKETING	204.01	0.00
<i>PETROLEUM PRODUCTION AND MARKETING TOTAL</i>	942.58	34.69
<i>INDUSTRIAL PROCESSES</i>		
410 CHEMICAL	6.60	0.00
420 FOOD AND AGRICULTURE	37.76	0.00
430 MINERAL PROCESSES	1.46	18.90

TABLE 3–1**1999 Annual Emission Inventory - Santa Barbara County (*Tons per year*)**

	ROC	NOx
440 METAL PROCESSES	NA	NA
450 WOOD AND PAPER	NA	NA
499 OTHER (INDUSTRIAL PROCESSES)	6.46	13.00
INDUSTRIAL PROCESSES TOTAL	52.28	31.90
STATIONARY SOURCES TOTAL	3,059.12	2,001.46
AREA-WIDE SOURCES		
SOLVENT EVAPORATION		
510 CONSUMER PRODUCTS	1,157.30	0.00
ARCHITECTURAL COATINGS AND RELATED PROCESS		
520 SOLVENTS	507.10	0.00
530 PESTICIDES/FERTILIZERS	803.60	0.00
540 ASPHALT PAVING/ROOFING	102.60	0.00
SOLVENT EVAPORATION TOTAL	2,570.60	0.00
MISCELLANEOUS		
610 RESIDENTIAL FUEL COMBUSTION	220.97	362.06
620 FARMING OPERATIONS	0.00	0.00
630 CONSTRUCTION AND DEMOLITION	0.00	0.00
640 PAVED ROAD DUST	0.00	0.00
645 UNPAVED ROAD DUST	0.00	0.00
650 FUGITIVE WINDBLOWN DUST	0.00	0.00
660 FIRES	1.23	0.42
670 WASTE BURNING AND DISPOSAL	468.47	188.58
690 COOKING	9.48	0.00
699 OTHER (MISCELLANEOUS PROCESSES)	0.00	0.00
MISCELLANEOUS TOTAL	700.15	551.06
AREA-WIDE SOURCES TOTAL	3,270.75	551.06

MOBILE SOURCES**ON-ROAD MOTOR VEHICLES**

710 LIGHT DUTY PASSENGER (LDA)	3,420.05	2,489.30
722 LIGHT DUTY TRUCKS - 1 (LDT1)	1,244.65	1,175.30
723 LIGHT DUTY TRUCKS - 2 (LDT2)	879.65	1,164.35
724 MEDIUM DUTY TRUCKS (MDV)	511.00	678.90
732 LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	379.60	149.65

TABLE 3-1**1999 Annual Emission Inventory - Santa Barbara County (Tons per year)**

	ROC	NOx
733 LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	51.10	54.75
734 MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	229.95	135.05
736 HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	182.50	448.95
742 LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	3.65	36.50
743 LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV1)	3.65	80.30
744 MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	14.60	543.85
746 HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	80.30	1,653.45
750 MOTORCYCLES (MCY)	127.75	21.90
760 HEAVY DUTY DIESEL URBAN BUSES (UB)	7.30	175.20
762 HEAVY DUTY GAS URBAN BUSES (UB)	43.80	40.15
770 SCHOOL BUSES (SB)	10.95	73.00
780 MOTOR HOMES (MH)	51.10	105.85
ON-ROAD MOTOR VEHICLES TOTAL	7,237.95	9,022.80
<i>OTHER MOBILE SOURCES</i>		
810 AIRCRAFT	188.01	87.62
820 TRAINS	26.95	806.03
830 SHIPS AND COMMERCIAL BOATS	40.57	244.43
840 RECREATIONAL BOATS	265.51	20.39
850 OFF-ROAD RECREATIONAL VEHICLES	114.46	7.70
860 OFF-ROAD EQUIPMENT	731.57	2,342.94
870 FARM EQUIPMENT	377.52	2,787.34
890 FUEL STORAGE AND HANDLING	396.28	0.00
<i>OTHER MOBILE SOURCES TOTAL</i>	2,140.87	6,296.45
MOBILE SOURCES TOTAL	9,378.82	15,319.25
NATURAL SOURCES		
<i>NATURAL SOURCES</i>		
910 BIOGENIC SOURCES	22,532.47	882.48
920 GEOGENIC SOURCES	6,041.62	0.00
930 WILDFIRES	356.31	482.10
940 WINDBLOWN DUST		
<i>NATURAL SOURCES TOTAL</i>	28,930.40	1,364.58
NATURAL SOURCES TOTAL	28,930.40	1,364.58
SANTA BARBARA COUNTY EMISSION INVENTORY TOTAL	44,639.09	19,236.35

TABLE 3-2

1999 Annual Emission Inventory - Outer Continental Shelf (*Tons per year*)

		ROC	NO _x
STATIONARY SOURCES			
<i>FUEL COMBUSTION</i>			
030	OIL AND GAS PRODUCTION (COMBUSTION)	25.89	243.55
	<i>FUEL COMBUSTION TOTAL</i>	25.89	243.55
<i>CLEANING AND SURFACE COATINGS</i>			
230	COATINGS AND RELATED PROCESS SOLVENTS	20.03	0.00
	<i>CLEANING AND SURFACE COATINGS TOTAL</i>	20.03	0.00
<i>PETROLEUM PRODUCTION AND MARKETING</i>			
310	OIL AND GAS PRODUCTION	331.32	11.44
	<i>PETROLEUM PRODUCTION AND MARKETING TOTAL</i>	331.32	11.44
<i>INDUSTRIAL PROCESSES</i>			
430	MINERAL PROCESSES	0.00	0.00
	<i>INDUSTRIAL PROCESSES TOTAL</i>	0.00	0.00
	STATIONARY SOURCES TOTAL	377.24	254.99
MOBILE SOURCES			
<i>OTHER MOBILE SOURCES</i>			
810	AIRCRAFT	4.48	3.50
830	SHIPS AND COMMERCIAL BOATS	395.28	10,332.38
840	RECREATIONAL BOATS	251.46	20.39
	<i>OTHER MOBILE SOURCES TOTAL</i>	651.22	10,356.27
	MOBILE SOURCES TOTAL	651.22	10,356.27
NATURAL SOURCES			
<i>NATURAL SOURCES</i>			
920	GEOGENIC SOURCES	2,004.38	0.00
	<i>NATURAL SOURCES TOTAL</i>	2,004.38	0.00
	NATURAL SOURCES TOTAL	2,004.38	0.00
OUTER CONTINENTAL SHELF EMISSION INVENTORY TOTAL		3,032.84	10,611.26

TABLE 3–3**1999 Planning Emission Inventory - Santa Barbara County (Tons per day)**

		ROC	NOx
STATIONARY SOURCES			
<i>FUEL COMBUSTION</i>			
010	ELECTRIC UTILITIES	0.0025	0.0826
020	COGENERATION	0.0357	0.1334
030	OIL AND GAS PRODUCTION (COMBUSTION)	0.4986	2.1407
040	PETROLEUM REFINING (COMBUSTION)	0.0023	0.0478
050	MANUFACTURING AND INDUSTRIAL	0.0312	0.4716
052	FOOD AND AGRICULTURAL PROCESSING	0.1293	1.7466
060	SERVICE AND COMMERCIAL	0.0958	0.4509
099	OTHER (FUEL COMBUSTION)	0.0000	0.0000
<i>FUEL COMBUSTION TOTAL</i>		0.7954	5.0736
<i>WASTE DISPOSAL</i>			
110	SEWAGE TREATMENT	0.0002	0.0081
120	LANDFILLS	0.4886	0.0233
130	INCINERATORS	0.0014	0.0126
140	SOIL REMEDIATION	0.0000	0.0000
199	OTHER (WASTE DISPOSAL)	0.0000	0.0000
<i>WASTE DISPOSAL TOTAL</i>		0.4902	0.0440
<i>CLEANING AND SURFACE COATINGS</i>			
210	LAUNDERING	0.0015	0.0000
220	DEGREASING	1.4773	0.0000
230	COATINGS AND RELATED PROCESS SOLVENTS	1.6124	0.0000
240	PRINTING	0.4468	0.0000
250	ADHESIVES AND SEALANTS	0.8147	0.0000
299	OTHER (CLEANING AND SURFACE COATINGS)	0.0912	0.0000
<i>CLEANING AND SURFACE COATINGS TOTAL</i>		4.4439	0.0000
<i>PETROLEUM PRODUCTION AND MARKETING</i>			
310	OIL AND GAS PRODUCTION	1.9775	0.0950
320	PETROLEUM REFINING	0.0459	0.0001
330	PETROLEUM MARKETING	0.5589	0.0000
<i>PETROLEUM PRODUCTION AND MARKETING TOTAL</i>		2.5823	0.0951
<i>INDUSTRIAL PROCESSES</i>			
410	CHEMICAL	0.0181	0.0000

TABLE 3–3**1999 Planning Emission Inventory - Santa Barbara County (*Tons per day*)**

		ROC	NO _x
420	FOOD AND AGRICULTURE	0.1195	0.0000
430	MINERAL PROCESSES	0.0040	0.0518
440	METAL PROCESSES	NA	NA
450	WOOD AND PAPER	NA	NA
499	OTHER (INDUSTRIAL PROCESSES)	0.0177	0.0356
	<i>INDUSTRIAL PROCESSES TOTAL</i>	0.1593	0.0874
	STATIONARY SOURCES TOTAL	8.4711	5.3001

AREA-WIDE SOURCES***SOLVENT EVAPORATION***

510	CONSUMER PRODUCTS	3.1707	0.0000
	ARCHITECTURAL COATINGS AND RELATED PROCESS		
520	SOLVENTS	1.4220	0.0000
530	PESTICIDES/FERTILIZERS	2.2015	0.0000
540	ASPHALT PAVING/ROOFING	0.3583	0.0000
	<i>SOLVENT EVAPORATION TOTAL</i>	7.1525	0.0000

MISCELLANEOUS

610	RESIDENTIAL FUEL COMBUSTION	0.1250	0.4957
620	FARMING OPERATIONS	0.0000	0.0000
630	CONSTRUCTION AND DEMOLITION	0.0000	0.0000
640	PAVED ROAD DUST	0.0000	0.0000
645	UNPAVED ROAD DUST	0.0000	0.0000
650	FUGITIVE WINDBLOWN DUST	0.0000	0.0000
660	FIRES	0.0034	0.0011
670	WASTE BURNING AND DISPOSAL	0.6525	0.2595
690	COOKING	0.0260	0.0000
699	OTHER (MISCELLANEOUS PROCESSES)	0.0000	0.0000
	<i>MISCELLANEOUS TOTAL</i>	0.8069	0.7563

AREA-WIDE SOURCES TOTAL 7.9594 0.7563

MOBILE SOURCES***ON-ROAD MOTOR VEHICLES***

710	LIGHT DUTY PASSENGER (LDA)	8.73	6.92
722	LIGHT DUTY TRUCKS - 1 (LDT1)	3.18	3.27

TABLE 3–3**1999 Planning Emission Inventory - Santa Barbara County (*Tons per day*)**

		ROC	NOx
723	LIGHT DUTY TRUCKS - 2 (LDT2)	2.24	3.23
724	MEDIUM DUTY TRUCKS (MDV)	1.30	1.89
732	LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.97	0.41
733	LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.13	0.15
734	MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.57	0.38
736	HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.48	1.28
742	LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.01	0.10
743	LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV1)	0.01	0.22
744	MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.04	1.55
746	HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.22	4.66
750	MOTORCYCLES (MCY)	0.33	0.07
760	HEAVY DUTY DIESEL URBAN BUSES (UB)	0.02	0.49
762	HEAVY DUTY GAS URBAN BUSES (UB)	0.11	0.11
770	SCHOOL BUSES (SB)	0.03	0.21
780	MOTOR HOMES (MH)	0.14	0.30
<i>ON-ROAD MOTOR VEHICLES TOTAL</i>		18.51	25.24
<i>OTHER MOBILE SOURCES</i>			
810	AIRCRAFT	0.5152	0.2401
820	TRAINS	0.0738	2.2083
830	SHIPS AND COMMERCIAL BOATS	0.1134	0.6813
840	RECREATIONAL BOATS	0.7274	0.0559
850	OFF-ROAD RECREATIONAL VEHICLES	0.3576	0.0247
860	OFF-ROAD EQUIPMENT	2.0043	6.4190
870	FARM EQUIPMENT	1.0343	7.6366
890	FUEL STORAGE AND HANDLING	1.0857	0.0000
<i>OTHER MOBILE SOURCES TOTAL</i>		5.9117	17.2659
MOBILE SOURCES TOTAL		24.4217	42.5059
SANTA BARBARA COUNTY EMISSION INVENTORY TOTAL		40.8522	48.5623

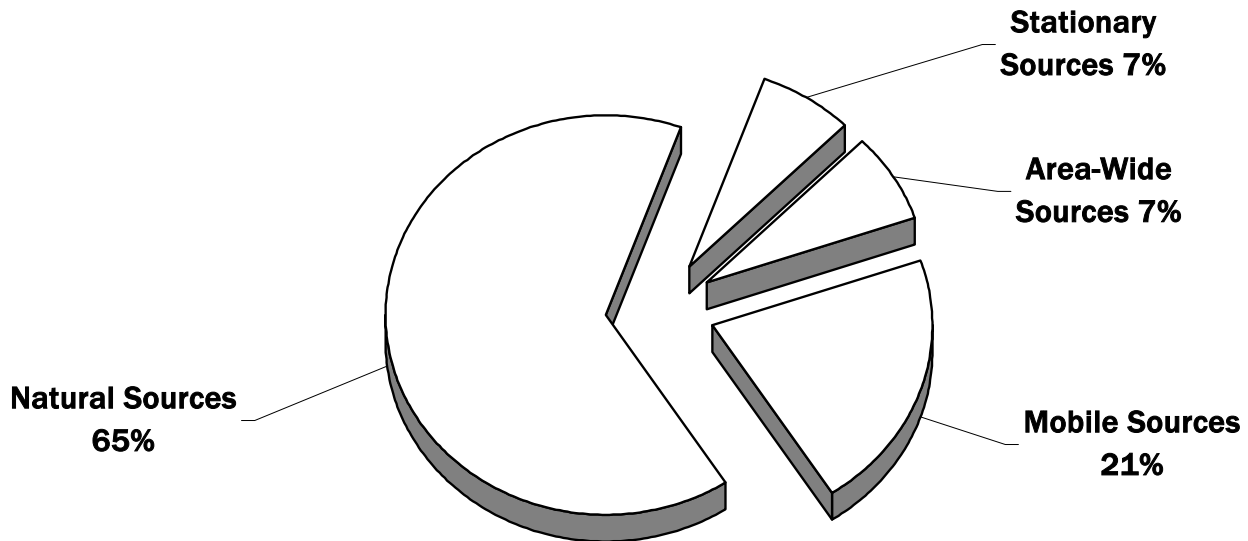
TABLE 3–4**1999 Planning Emission Inventory - Outer Continental Shelf (*Tons per day*)**

	ROG	NO _x
STATIONARY SOURCES		
<i>FUEL COMBUSTION</i>		
030 OIL AND GAS PRODUCTION (COMBUSTION)	0.0956	0.6673
<i>FUEL COMBUSTION TOTAL</i>	0.0956	0.6673
<i>CLEANING AND SURFACE COATINGS</i>		
230 COATINGS AND RELATED PROCESS SOLVENTS	0.0549	0.0000
<i>CLEANING AND SURFACE COATINGS TOTAL</i>	0.0549	0.0000
<i>PETROLEUM PRODUCTION AND MARKETING</i>		
310 OIL AND GAS PRODUCTION	0.9077	0.0313
<i>PETROLEUM PRODUCTION AND MARKETING TOTAL</i>	0.9077	0.0313
<i>INDUSTRIAL PROCESSES</i>		
430 MINERAL PROCESSES	0.0000	0.0000
<i>INDUSTRIAL PROCESSES TOTAL</i>	0.0000	0.0000
STATIONARY SOURCES TOTAL	1.0582	0.6986
MOBILE SOURCES		
<i>OTHER MOBILE SOURCES</i>		
810 AIRCRAFT	0.0123	0.0096
830 SHIPS AND COMMERCIAL BOATS	1.0850	28.3197
840 RECREATIONAL BOATS	0.6889	0.0559
<i>OTHER MOBILE SOURCES TOTAL</i>	1.7862	28.3852
MOBILE SOURCES TOTAL	1.7862	28.3852
OUTER CONTINENTAL SHELF EMISSION INVENTORY TOTAL	2.8444	29.0838

Figure 3-1

1999 Santa Barbara County Annual Emission Inventory

ROC: 44,639 tons per year



NOx: 19,236 tons per year

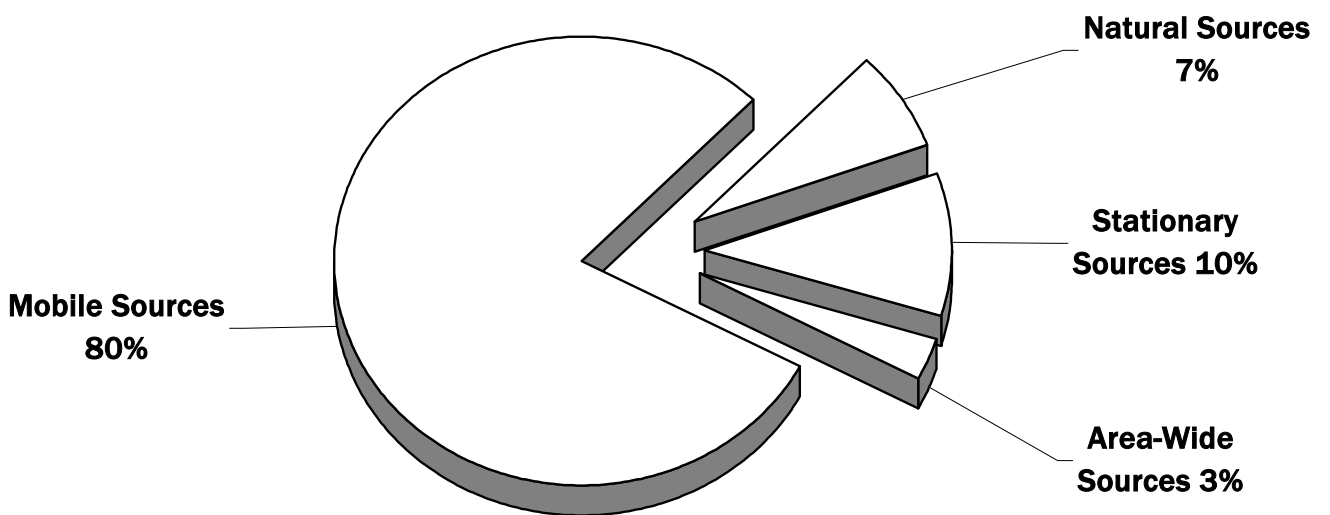
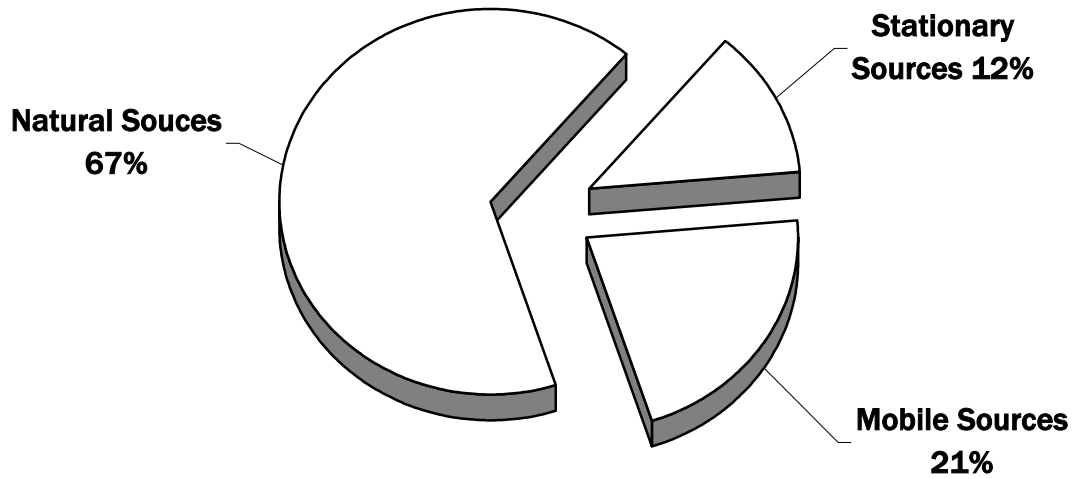


Figure 3-2

1999 OCS Annual Emission Inventory

ROC: 3,033 tons per year



NOx: 10,611 tons per year

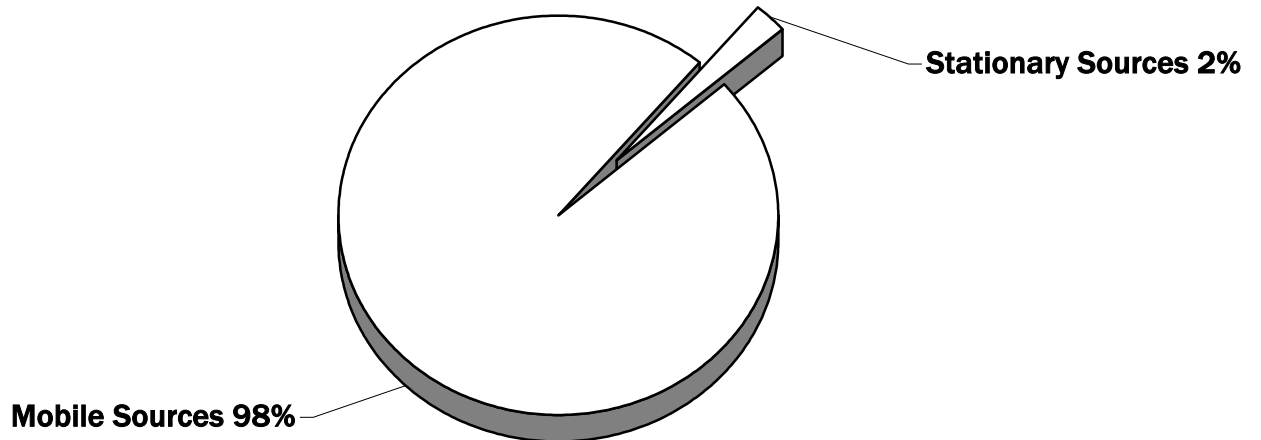
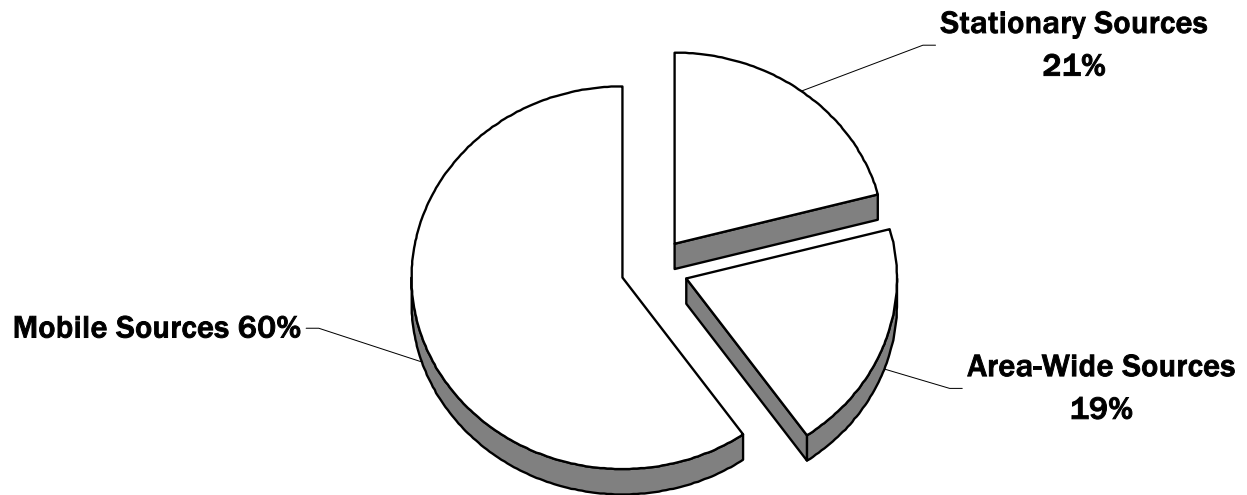


Figure 3-3

1999 Santa Barbara County Planning Emission Inventory

ROC: 40.85 tons per day



NOx: 48.56 tons per day

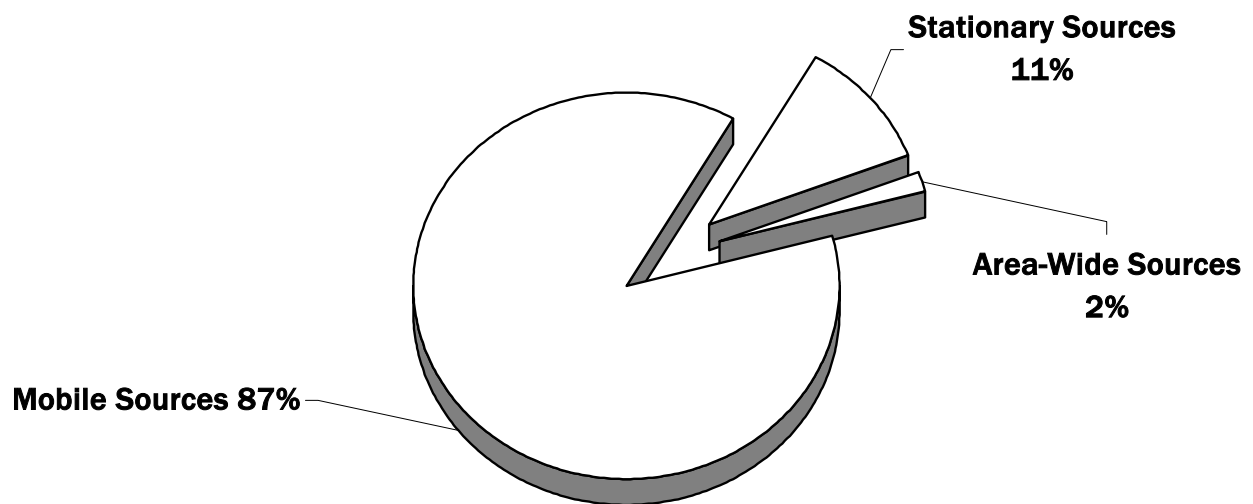
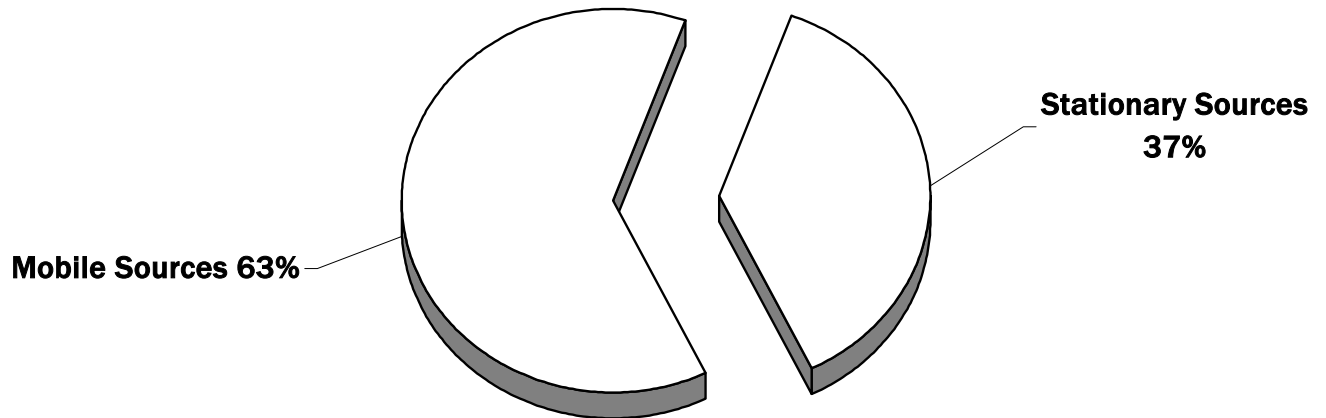


Figure 3-4

1999 OCS Planning Emission Inventory

ROC: 2.84 tons per day



NOx: 29.08 tons per day

