air pollution control district
SANTA BARBARA COUNTY

MEMORANDUM

DATE: August 15, 2019

TO: Community Advisory Council (CAC) Members

FROM: Jim Fredrickson

SUBJECT: August 28, 2019 CAC Meeting to Discuss the 2019 Ozone Plan – Introduction and Preliminary Data

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Every three years, the District is required to update our plan to attain and maintain the state 1-hour and 8-hour ozone standards. The 2019 Ozone Plan (2019 Plan) will be the ninth triennial update to the initial state Air Quality Attainment Plan adopted by the Santa Barbara County Air Pollution Control District (District) Board of Directors in 1991. The 2019 Plan will be composed of six chapters that address air quality trends, the emission inventory, stationary source control measures, transportation control measures, and voluntary incentive programs.

The District will discuss the 2019 Plan at the August 28, 2019 Community Advisory Council meeting, which will be informational only (i.e., no formal CAC recommendation sought). At the meeting, we will provide background on the history of our planning efforts and discuss the process for developing and updating the plan. To help with the discussions, a draft version of Chapters 1-3 is attached. These chapters address air quality trends and the emission inventory.

During the August meeting, staff will also review preliminary concepts for Chapters 4-6. These chapters discuss stationary source and transportation control measures as well as voluntary incentive programs. The full text for these chapters will be presented to the CAC at a future meeting, tentatively scheduled for October 23, 2019.

At the October meeting, we plan to present the entire 2019 Plan for the CAC to consider. After CAC consideration, we will bring the Ozone Plan to the District Board for a proposed adoption.

To review the contents of the previously adopted 2016 Ozone Plan, please visit www.ourair.org/planning-clean-air. If there are questions or concerns that you would like to discuss beforehand, please contact me at (805) 961-8892 / e-mail: FredricksonJ@sbcapcd.org.

Attachment:

1) Draft Chapters 1-3 and Appendices A-B of the 2019 Ozone Plan

air pollution control district
SANTA BARBARA COUNTY

2019 Ozone Plan

August 2019 – Draft

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CHAPTER 1 – INTRODUCTION

Updating our Plan for Clean Air in Santa Barbara County

The 2019 Ozone Plan (2019 Plan) is the ninth triennial update to the initial state Air Quality Attainment Plan adopted by the Santa Barbara County Air Pollution Control District (District) Board of Directors in 1991 (other updates were done in 1994, 1998, 2001, 2004, 2007, 2010, 2013, and 2016). Each of the plan updates have implemented an "every feasible measure" strategy to ensure continued progress toward attainment of the state ozone standards.[1] Since 1992, Santa Barbara County has adopted or amended more than 25 control measures aimed at reducing emissions from stationary sources of air pollution. These measures have substantially reduced ozone precursor pollutants, which includes nitrogen oxides (NOx) and reactive organic compounds (ROCs).

Along with the implementation of statewide measures, the District's control measure strategy has successfully improved the County's air quality, as we've witnessed a downward trend in ozone exceedances. For the last four years, Santa Barbara County had three or fewer exceedances of the state 8-hour ozone standard, and the County was designated as nonattainment-transitional in April 2017. This designation means that the District is getting close to attaining the standard and must determine whether additional control measures are necessary to accomplish expeditious attainment of the state standard. The nonattainment-transitional designation and its effect on the District's clean air planning efforts is discussed in more detail in Chapter 2. In order to be designated attainment, air quality measurements must show that both the 1-hour and the 8-hour state ozone standards are not violated.

In the past, the District has prepared air quality attainment plans that have addressed the federal ozone standard, the state ozone standard, or both. This 2019 Plan addresses the state ozone standard only. This is because the District is designated "attainment" for the federal 8-hour ozone standard of 0.070 ppm, which was promulgated by the U.S. Environmental Protection Agency (EPA) in December 2015. The federal attainment designation for Santa Barbara County was finalized in April 2018. Table 1-1 provides a summary of the state and federal ambient air quality standards for ozone, and their effective dates.

[1] Pursuant to California Health and Safety Code section 40914(b), the District employs an alternative emission reduction strategy that employs "*every feasible measure*" and follows an "*expeditious adoption schedule.*"

TABLE 1-1: STATE AND FEDERAL OZONE STANDARDS

Ambient Air Quality Standard	Year Adopted	Concentration	Attainment Status
State 1-Hour	1988	0.09 ppm	Nonattainment-Transitional
State 8-Hour	2005	0.070 ppm	
Federal 8-Hour	1997	0.08 ppm	Attainment
	2008	0.075 ppm	Attainment
	2015	0.070 ppm	Attainment

The California Clean Air Act requires that we report our progress in meeting state mandates and revise our 1991 Air Quality Attainment Plan to reflect changing conditions on a triennial basis. The triennial plan progress report and revision requirements (as codified in California Health and Safety Code section 40910 et seq.) must assess the overall effectiveness of our air quality program and the extent of air quality improvement resulting from the plan. The revision must also incorporate new data and emission inventory projections. Table 1-2 provides a more complete list of the triennial plan report and revision requirements and where they are addressed in the 2019 Plan. When fully compiled, this 2019 Plan will satisfy all state triennial planning requirements.

TABLE 1-2: TRIENNIAL PLAN REPORT AND REVISION REQUIREMENTS

Requirement	CH&SC Section	Ozone Plan Section
Air Quality Trends	§40913(a)(2), §40924(b)(1)	Chapter 2
Population Exposure	§40924(b)(1)	Chapter 2
Population, Vehicular Activity, and Emission Trends	§40913(a)(4), §40925(a)	Chapter 2, Chapter 3, Chapter 5
Emission Inventory	§40913(a)(5), §40918(a)(5)	Chapter 3, Appendix B
Stationary Source Control Measures	§40913(a)(6), §40918(a)(2)	Chapter 4
Transportation Control Measures	§40913(a)(6), §40918(a)(3)	Chapter 5
Contingency Measures	§40915, §40925.5(c)	Chapter 4, Chapter 5
Control Strategy Cost-Effectiveness	§40913(b), §40922	Chapter 4
Every Feasible Measure and Expeditious Adoption	§40914(b), §40925.5(b)	Chapter 4, Chapter 5

Plan Highlights

The most recent monitoring data for 2018 shows that the ozone standards have not been violated in Santa Barbara County for the last three years. This is great news as it means that the District can soon be designated attainment with the state ozone standards, a goal over 30 years in the making. However, there are several steps to California Air Resources Board (CARB)'s designation process under the California Clean Air Act, described more fully in Chapter 2. Until these actions are final, the District continues to be classified as nonattainment-transitional.

The California Health and Safety Code requires that the plan include cost-effective strategies to both attain and maintain of the ozone standard.[2] Each plan update includes an evaluation of feasible reduction measures for stationary sources and considers numerous factors such as technology advancements, efficiency measures, cost-effectiveness, and the successful implementation of measures at other California air districts. All of the control measures that were found to be feasible in prior plan updates have been implemented, and any additional measures that could be proposed yield relatively smaller emission reductions with higher associated costs. Chapter 4 will include a discussion of the stationary source control measures. In this 2019 Plan, we plan to carry forward the contingency measures and some of the "further study" measures from the 2016 Plan. We will also discuss how the Assembly Bill 617 Rule Development Schedule interacts with the 2019 Plan.

CARB continues to pursue substantial reductions of ozone precursor emissions in the mobile source sector. CARB has developed a comprehensive mobile source strategy that implements and/or expands research and pilot projects, incentive programs, and regulations related to on-road light-, medium-, and heavy-duty vehicles, as well as off-road vehicles. California's Advanced Clean Car Program aims to reduce emissions through tighter vehicle exhaust standards, clean fuels requirements, and vehicle efficiency standards. California's Zero Emission Vehicle (ZEV) regulation requires manufacturers to produce increasing numbers of ZEVs and plug-in hybrid electric vehicles in the 2018-2025 model years. Although California's "Truck and Bus" regulation[3] is principally aimed at reducing particulate matter from the heavy-duty fleet, it also achieves substantial reductions in NOx emissions and other criteria pollutants over time. Furthermore, recent legislation allocates a significant amount of state funding to local districts, allowing the districts to achieve ozone and toxic reductions from mobile sources through incentive programs.

Because ozone precursor emissions from marine shipping account for a large percentage of our inventory, we continue to focus our efforts on achieving reductions in this sector. While existing federal and international regulations in the marine shipping sector are expected to achieve

[2] California Health and Safety Code Section 40913 (b) states that, "*Each district plan shall be based upon a determination by the district board that the plan is a cost-effective strategy to achieve attainment of the state standards by the earliest practicable date*."

[3] Title 13, California Code of Regulations, Section 2025, Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from In-Use Heavy-Duty Diesel-Fueled Vehicles.

emission reductions over time, significant reductions of NOx will not be achieved until the shipping fleet "turns over," which may take decades. For this reason, we continue to pursue voluntary incentive programs that will achieve near-term NOx reductions in the marine shipping category.

CHAPTER 2 – LOCAL AIR QUALITY

The California Clean Air Act requires CARB to evaluate and identify air quality-related indicators for the District to use in assessing its progress toward attainment of the state standards.[4] The District is required to assess its progress triennially and report to CARB as part of the triennial plan revision. The assessment must address:

(1) the peak concentrations in the peak "hot spot" subarea,
(2) the population-weighted average of the total exposure, and
(3) the area-weighted average of the total exposure.

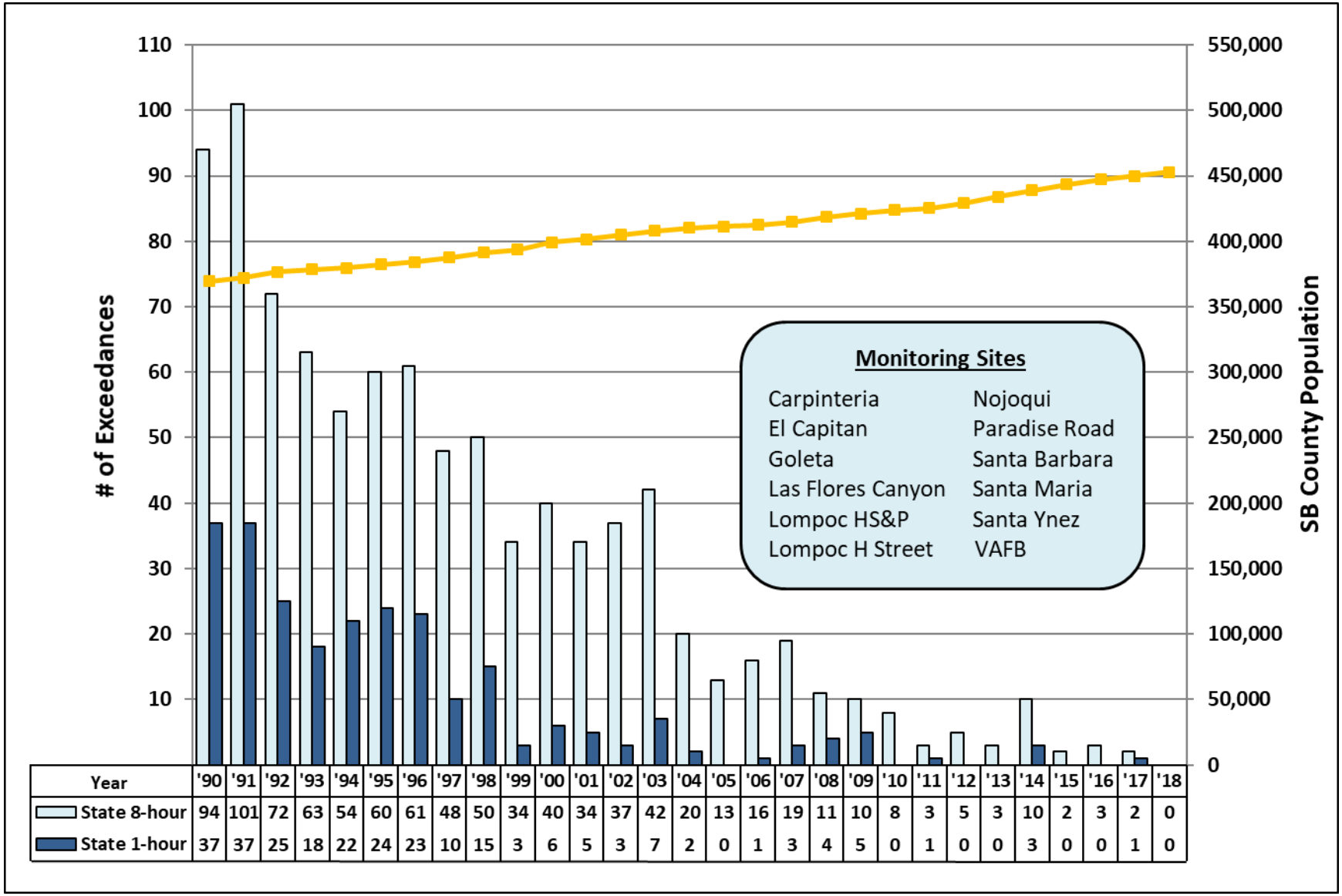
This chapter will demonstrate the progress the District has made over the last few decades in improving the air quality throughout the County. Over time, both voluntary and regulatory measures, as well as technology improvements and better community planning, have led to tremendous improvements in Santa Barbara County's air quality. As a result of these efforts, the overall exposure of residents to ozone continues to decrease.

Exceedance Trends

The County's air quality has improved dramatically over the years as evidenced by the declining number of state 1-hour and 8-hour ozone exceedances. As displayed in Figure 2-1, 1-hour ozone exceedances have decreased from a high of 37 days in 1990 to zero days in six out of the last nine years. The number of 8-hour ozone exceedance days range from a high of 101 days in 1991 to zero days in 2018. This represents a significant milestone as 2018 is the first year in which the County did not exceed the 8-hour ozone standard. These improvements in air quality have occurred despite a 20 percent increase in countywide population since 1990. For a listing of the most recent 8-hour exceedances by monitoring station, see Table 2-1 below.

[4] California Health and Safety Code, section 39607 (f) and (g).

FIGURE 2-1: 8-HOUR AND 1-HOUR OZONE EXCEEDANCE TRENDS VS POPULATION SANTA BARBARA COUNTY, 1990-2018 [5]



Year	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18
State 8-hour	94	101	72	63	54	60	61	48	50	34	40	34	37	42	20	13	16	19	11	10	8	3	5	3	10	2	3	2	0
State 1-hour	37	37	25	18	22	24	23	10	15	3	6	5	3	7	2	0	1	3	4	5	0	1	0	0	3	0	0	1	0

[5] Population data in Figure 2-1 is from the State of California Department of Finance.

TABLE 2-1: SANTA BARBARA COUNTY EXCEEDANCE DAYS, 2016-2018

Monitor Location	Number of Days > State 8-Hour Standard		
	2016	2017	2018
Carpinteria	0	0	0
El Capitan	2	0	0
Goleta	1	0	0
Las Flores Canyon	1	1	0
Lompoc HS&P	0	0	0
Lompoc H St.	0	0	0
Nojoqui	0	0	0
Paradise Road	1	0	0
Santa Barbara	1	0	0
Santa Maria	0	0	0
Santa Ynez	0	0	0
Vandenberg AFB	0	1	0
Total Exceedance Days *	**3**	**2**	**0**

** Total Exceedance Days indicates the number of days within a year where an exceedance was measured at one or more monitoring locations in Santa Barbara County.*

Air Quality Indicators – Peak Concentrations

One of the indicators that is used to assess where air quality "hot spots" are located in the county is the Expected Peak Day Concentration (EPDC). The EPDC is provided to the District by CARB for each monitoring site in Santa Barbara County and represents the maximum ozone concentration expected to occur once per year. The EPDC for each site is based on a statistical calculation using the daily maximum 1-hour and 8-hour ozone concentrations for a rolling three calendar years. For example, the 2018 EPDC for a monitoring site uses data from 2016, 2017, and 2018. The EPDC is useful for tracking air quality progress at individual monitoring stations since it is relatively stable, thereby providing a trend indicator that is not heavily influenced by year-to-year changes in meteorological conditions.

Figures 2-2 and 2-3 show the 1-hour and 8-hour EPDC trends for the years 1990 through 2018 for the five selected monitoring sites in the County that typically record the highest ozone concentrations. These figures show that both the 1-hour and 8-hour peak day concentrations have significantly decreased over time, and for every monitoring station except the Las Flores Canyon monitoring station, the EPDC value is below the state standard for both 1-hour and 8-hour ozone concentrations. A listing of the EPDC values for these five monitoring sites can be found in Appendix A.

Figure 2-2: State 1-Hour Ozone Expected Peak Day Concentration
Top 5 Santa Barbara County Monitoring Sites, 1990-2018

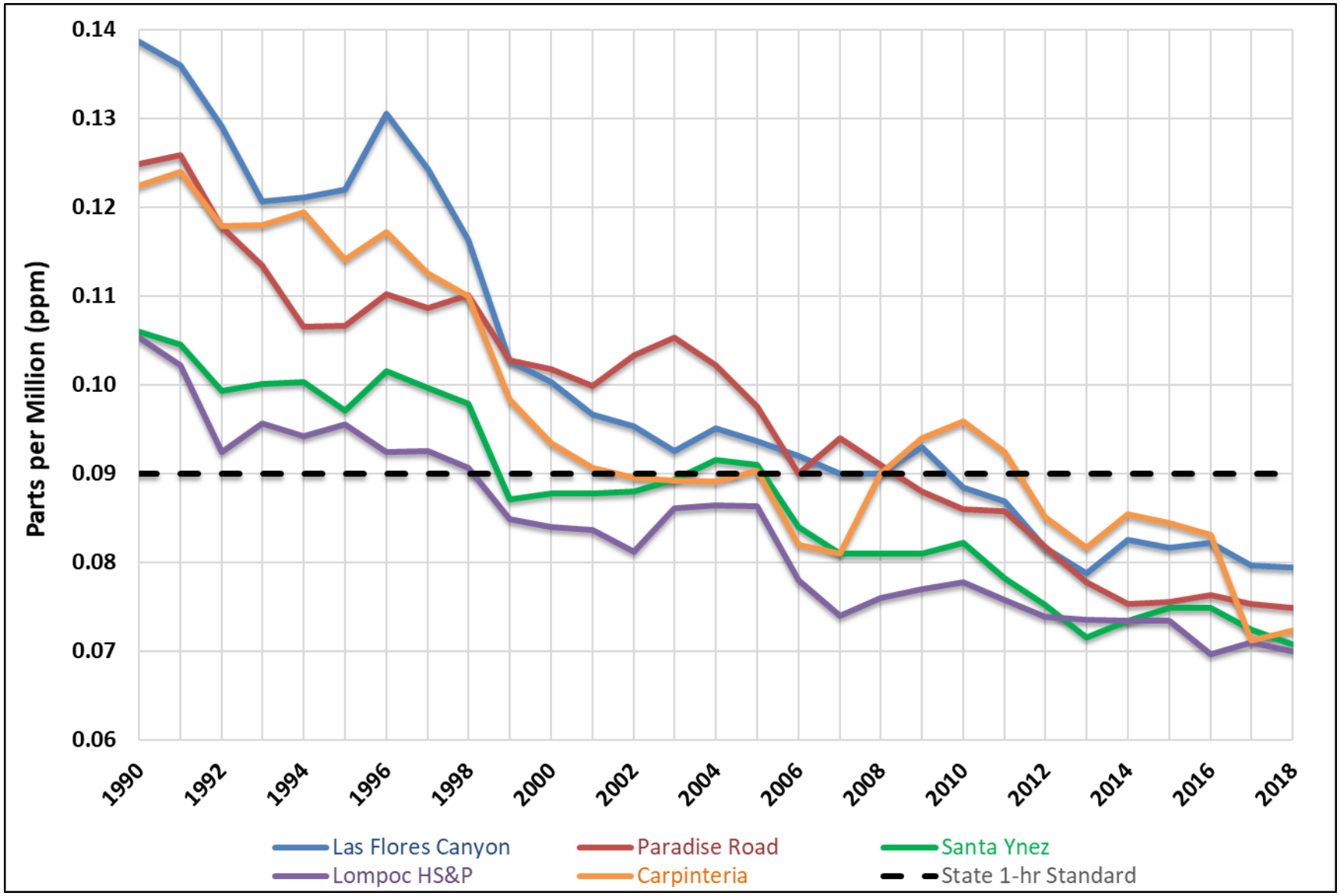
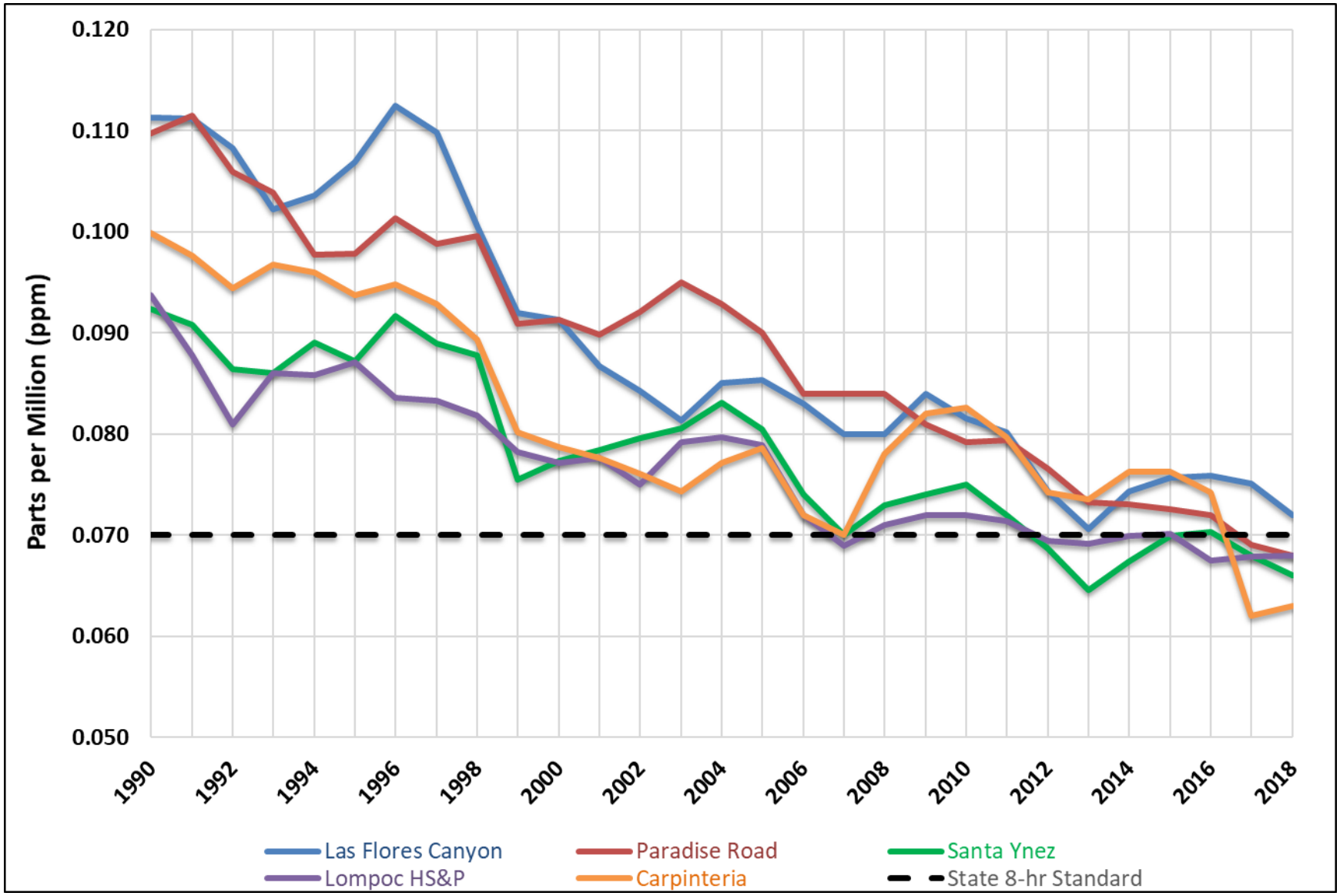


FIGURE 2-3: STATE 8-HOUR OZONE EXPECTED PEAK DAY CONCENTRATIONS
TOP 5 SANTA BARBARA COUNTY MONITORING SITES, 1990-2018



Designation Values

For an area to attain the state ozone standard, air quality measurements must show that both the 1-hour and the 8-hour standards were not violated during the previous three calendar years. This can be shown through each monitoring site's *designation value*, which is the highest representative reading over the last three years. According to the state designation process, measured concentrations that are higher than the site's EPDC are identified as being affected by an extreme concentration event (e.g., weather conditions conducive to high concentrations of ozone) and are not considered violations of the state standard. The designation value for each site is therefore the highest concentration observed that is less than or equal to the EPDC at that site.

For example, the top five measured values for the Las Flores Canyon station over the course of the last three years is shown below in Table 2-2. The two exceedances that occurred on April 18, 2016 and September 2, 2017 are considered extreme events since the Las Flores Canyon station EPDC is equal to 0.072 ppm. Hence, the 2018 designation value for the Las Flores Canyon station is 0.069 ppm because it is the highest measured value that is less than or equal to the EPDC.

TABLE 2-2: TOP 5 MEASURED VALUES AT LAS FLORES CANYON, 2016-2018

Date	Measured value 8-hr ozone (ppm)	Measured value exceeds 8-hr ozone standard?	Measured value violates 8-hr ozone standard?	Rationale
9/2/2017	0.076	Yes	No	2018 EPDC = 0.072 ppm
4/18/2016	0.075	Yes	No	2018 EPDC = 0.072 ppm
9/27/2016	0.069	No	No	less than 0.070 ppm
11/25/2017	0.069	No	No	less than 0.070 ppm
10/26/2018	0.069	No	No	less than 0.070 ppm

Following the state designation process, if all the designation values within the District are below the state standard, then no violations have occurred and the District can be reclassified to attainment by CARB. Table 2-3 presents the 8-hour ozone designation values for all of the Santa Barbara County monitoring stations for the last three years.

TABLE 2-3: SANTA BARBARA COUNTY 8-HOUR EPDCS AND DESIGNATION VALUES, 2016-2018

Monitor Location	8-Hour State EPDCs (ppm)			8-Hour State Designation Value (ppm) *		
	2016	2017	2018	2016	2017	2018
Carpinteria	0.074	0.062	0.063	**0.073**	0.062	0.063
El Capitan	0.069	0.067	0.066	0.069	0.065	0.064
Goleta	0.071	0.068	0.065	**0.071**	0.068	0.065
Las Flores Canyon	0.076	0.075	0.072	**0.075**	**0.075**	0.069
Lompoc HS&P	0.068	0.067	0.068	0.067	0.065	0.067
Lompoc H St.	0.063	0.058	0.056	0.063	0.056	0.056
Nojoqui	0.068	0.065	0.061	0.067	0.065	0.060
Paradise Road	0.072	0.069	0.068	0.068	0.069	0.067
Santa Barbara	0.071	0.069	0.067	0.067	0.068	0.067
Santa Maria	0.060	**	**	0.060	0.063	0.063
Santa Ynez	0.070	0.068	0.066	0.068	0.068	0.065
Vandenberg AFB	0.065	0.067	0.067	0.065	0.067	0.067

** Designation values greater than the state ozone standard are in bold.*
*** Insufficient data available to determine the value.*

In 2018, the designation values for all monitoring stations dropped below the state 8-hour standard. Furthermore, Figure 2-2 shows that the District has not violated the state 1-hour ozone standard for the last several years since all monitoring sites have 1-hour EPDCs below the standard. In conclusion, no violations have occurred in the last three years and the District attains both the 1-hour and the 8-hour ozone standard.

The Path Toward Attainment

When the state 1-hour ozone standard was first adopted in 1988, Santa Barbara County was classified as nonattainment due to having multiple violations of the ozone standard. However, the 1-hour standard alone was not sufficiently protective of human health, as people experienced respiratory symptoms, asthma exacerbation, and airway inflammation when being exposed to ozone for longer than an hour. Hence, in 2005, CARB adopted the 8-hour ozone standard based on the recommendation from the Office of Environmental Health Hazard Health Assessment (OEHHA). State law requires the ambient air quality standards to be reviewed and modified whenever substantial pertinent new information becomes available. The OEHHA studies surrounding the health effects of ozone showed that the 8-hour standard was needed.

To help the County meet the health-based standards, the District adopted multiple control measures and strategies over the course of the last three decades to reduce ozone precursor emissions in our jurisdiction. These control strategies have been effective as we've seen the declining number of exceedances countywide, as evidenced in Figure 2-1 above.

In April 2017, Santa Barbara County's designation for ozone under the California Clean Air Act changed from nonattainment to nonattainment-transitional. This change in designation occurred because Santa Barbara County continues to have three or fewer exceedances of the ozone standard per calendar year. As a result, the District was required to examine whether additional control measures were necessary to accomplish expeditious attainment or to maintain the state standard. Consistent with CAC recommendations, the District Board of Directors modified the 2016 Ozone Plan control measure schedule at its August 2017 hearing to focus on the remaining NOx control measures and shift the ROC measures to contingency, as it was demonstrated that the NOx control measures would assist the District in achieving and maintaining the state ozone standard.

While the 2018 monitoring data shows that the District can now be designated as attainment, there are several steps to the California Air Resources Board (CARB)'s designation process[6] under the California Clean Air Act:

1. CARB reviews and verifies the accuracy of the reported 2018 ozone monitoring data,
2. CARB staff recommends changes in designations for Board approval, and
3. Designation changes are forwarded to the California Office of Administrative Law, which issues a formal approval of the changes.

This process could take up to a year to be completed. Until these actions are final, the District continues to be classified as nonattainment-transitional and is required to update the 2019 Ozone Plan and assess what is necessary for the region to reach and maintain the state ozone standard. If new exceedances are observed at the District's monitoring stations, they may affect whether the District is redesignated as attainment.

Air Quality Indicators – Population and Area Exposure

CARB has developed a methodology to assess exposure to air pollutants within the County. The "exposure indicators" are the population-weighted exposure (PWE) indicator and the area-weighted exposure (AWE) indicator. These metrics provide an indication of the potential for chronic adverse health impacts. Unlike the EPDC, which tracks progress at individual locations, the population-weighted and area-weighted exposure indicators consolidate hourly ozone measurements from all sites within the District into a single average exposure value.

The calculation methodology assumes that an "exposure" occurs when a 1-hour ozone measurement is higher than 0.09 ppm, the level of the state 1-hour ozone standard. The PWE and AWE consider both the magnitude and the duration of hourly ozone concentrations above the state standard. The difference is that PWE will be higher if the exposure is recorded near population centers, while AWE will be higher if the exposure covers more land area, based on the monitoring station network. The resulting annual exposure indicator is the sum of all the

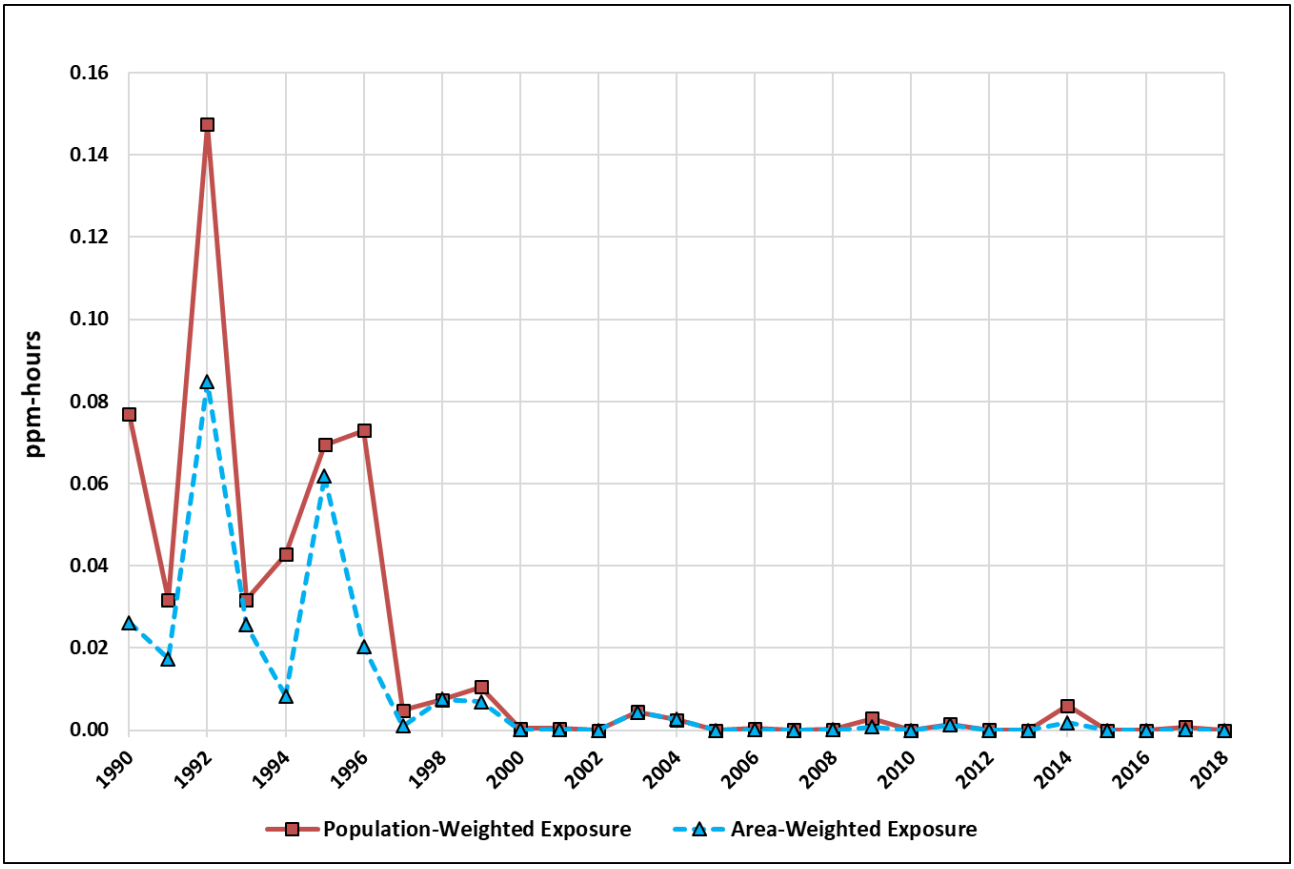
[6] As codified in California Health and Safety Code, section 39608.

hourly exposures during the year and presents the results as an average per exposed person (PWE indicator) or average per exposed unit of land area (AWE indicator).

Population- and area-weighted exposure data are obtained from CARB, and it is presented in Figure 2-4. This figure shows that since 1990 both exposure indicators have decreased over time and that these air quality indicators have been very low during the last several years due to dramatic improvements in local air quality. The values are near zero since ozone levels in the County rarely exceed 0.09 ppm for an hour period.

Over time, Santa Barbara County's exposure to levels above the one-hour standard has become less frequent, and is currently close to zero.

FIGURE 2-4: POPULATION- AND AREA-WEIGHTED EXPOSURE SANTA BARBARA COUNTY, 1990-2018



CHAPTER 3 – EMISSION INVENTORY

This chapter presents the reactive organic compound (ROC) and nitrogen oxide (NOx) emission inventory used in the development of this 2019 Plan. The District's emission inventory accounts for pollutants emitted from all emission sources, including fuel combustion at industrial facilities, consumer product usage, and motor vehicles. Every type of emission in the County will fall under one of the following source categories:

- **Stationary Sources** – typically larger facilities that are subject to District permitting requirements.
- **Area-Wide Sources** – typically small, geographically dispersed processes that are not subject to District permitting requirements.
- **Mobile Sources** – this source type is subdivided into two categories:
  - **On-Road Motor Vehicles** – passenger cars, motorcycles, trucks, and buses.
  - **Other Mobile Sources** – ships, planes, trains, and off-road equipment.

The inventory includes emissions from two geographical regions: Santa Barbara County and the Outer Continental Shelf (OCS). The County region encompasses all onshore sources of air pollution within Santa Barbara County and the State Tidelands (all waters within three nautical miles of the shoreline). The OCS extends from the State Tideland boundary out to 100 nautical miles from the shoreline.

The inventories presented in this chapter are "planning emissions inventories," commonly referred to as "summer seasonal" inventories. A planning inventory accounts for seasonal variation because most exceedances of the ozone standards occur during the April to October ozone season. A planning inventory does not include the emissions from natural sources such as biogenics, oil and gas seeps, and wildfires since they are not regulated or controlled through implementation of emission control measures. However, in order to provide additional perspective on the overall emission inventory of Santa Barbara County, information on natural sources can be found in Appendix B.

Baseline Inventory

For every inventory, a baseline year has to be chosen. This 2019 Plan uses 2017 as the base year because the 2017 inventory is the most complete and accurate inventory available for all of the source categories. In deciding to use the 2017 inventory for the base year, District staff considered whether there were any over-arching changes in the economy, technology, or regulations that would make 2017 an inappropriate choice as a base year; none were identified. Furthermore, CARB will be using a 2017 base year for inclusion in their 2019 State Implementation Plan (SIP) submittal to the EPA, so the data has been thoroughly reviewed.

The emission inventory is divided into four major categories: stationary, area, on-road motor

vehicle, and other mobile sources. Emissions from each category are calculated with approved methodologies that use the most current data available for the category. For example, the 2017 base year stationary source emissions are calculated with annual data that facilities reported to the District. The area source emissions are estimated jointly by the CARB and the District. On-road motor vehicle emissions are calculated by applying CARB's EMission FACtor (EMFAC) model output to the transportation activity data provided by the Santa Barbara County Association of Governments (SBCAG).[7] Finally, CARB provides emission estimates for other mobile sources such as ocean-going vessels, locomotives, agricultural equipment, and aircraft.

Figure 3-1 shows the emissions and relative contribution of ROC and NOx during 2017 for each major source category. Due to the large amount of marine shipping emissions in the District's emission inventory, the District has broken out ocean-going vessels from the other mobile sources category so that the relative impact can be more easily identified.

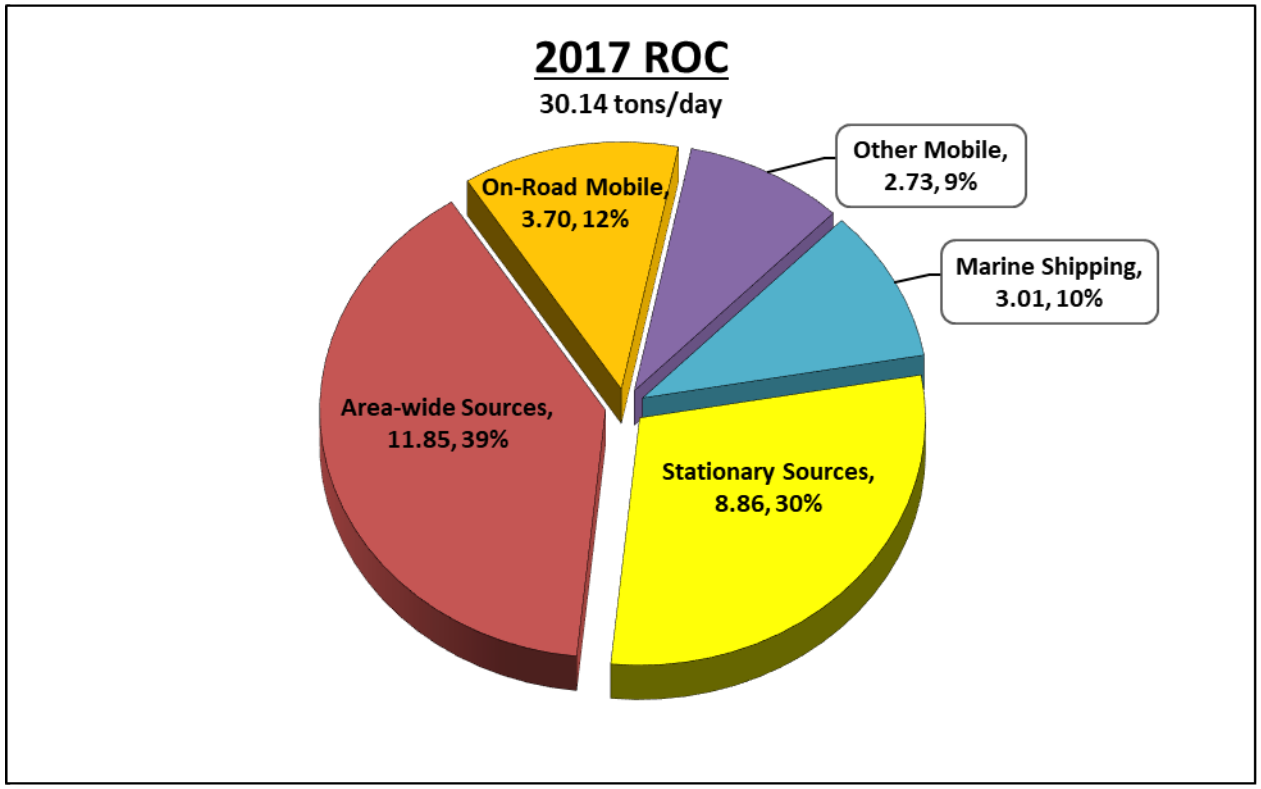
As presented in the figure, stationary and area-wide sources account for about 69 percent of the baseline ROC inventory. The majority of these emissions are from coating and solvent operations, oil and gas operations, and pesticide and fertilizer usage. On-road motor vehicles account for 12 percent of the ROC emissions, with the remaining 19 percent coming from sources in the other mobile and ocean-going vessels category.

For NOx, 77 percent of the inventory is attributed to ocean-going vessels in the OCS (see "Impacts from Marine Shipping" at the end of this chapter for further discussion). An estimated 10 percent of the NOx emissions in the baseline inventory are from on-road motor vehicles. Area-wide sources, stationary sources, and the remaining other mobile sources contribute the remaining 13 percent of the baseline NOx emissions.

The combined amount of ozone precursors (ROC + NOx) is shown in Figure 3-2. The stationary source emissions are approximately 12 percent of the total inventory, which is a positive reflection of the District's stationary source control program. It is estimated that the stationary source emission inventory would be four times greater if no emission control rules were adopted by the District.

[7] More information regarding the process and assumptions for the on-road mobile source emission estimates and projections can be found in Chapter 5.

FIGURE 3-1: BASELINE ROC AND NOX EMISSIONS (TONS PER DAY) AND DISTRIBUTION (%)



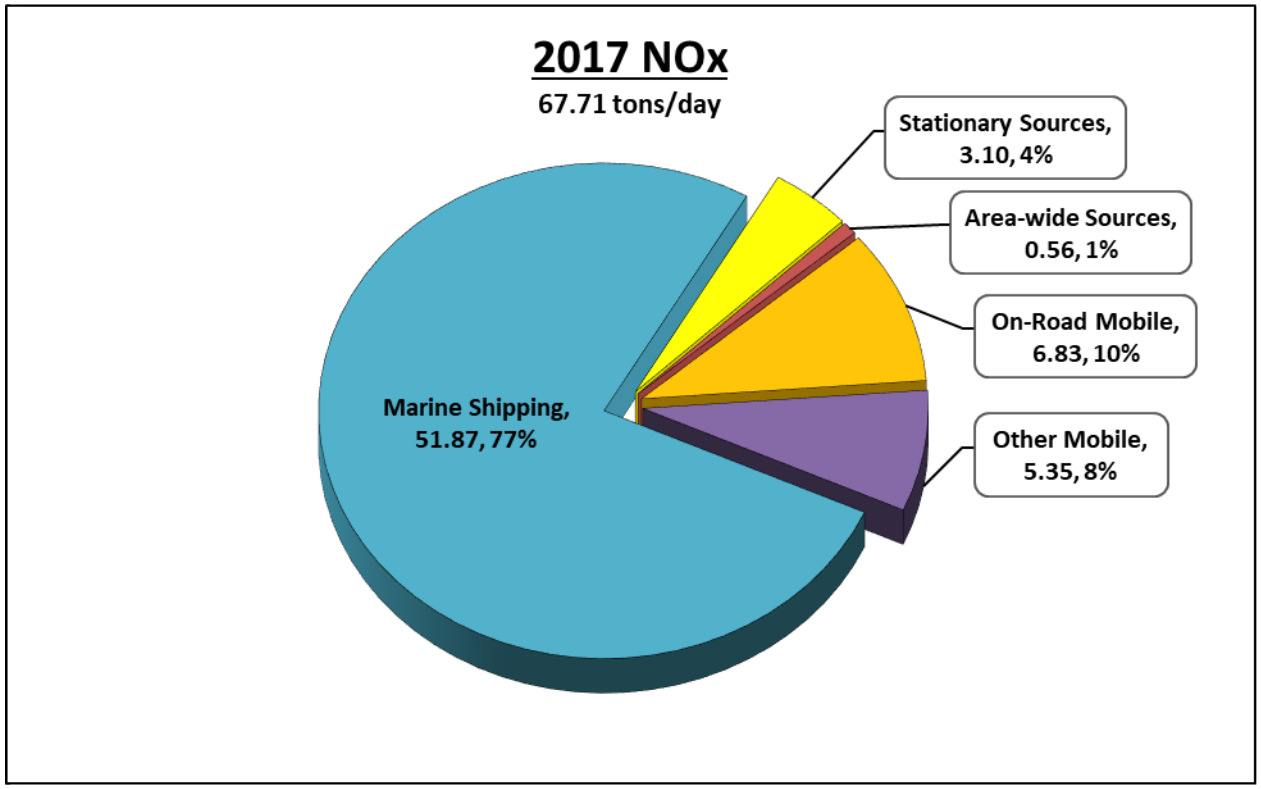
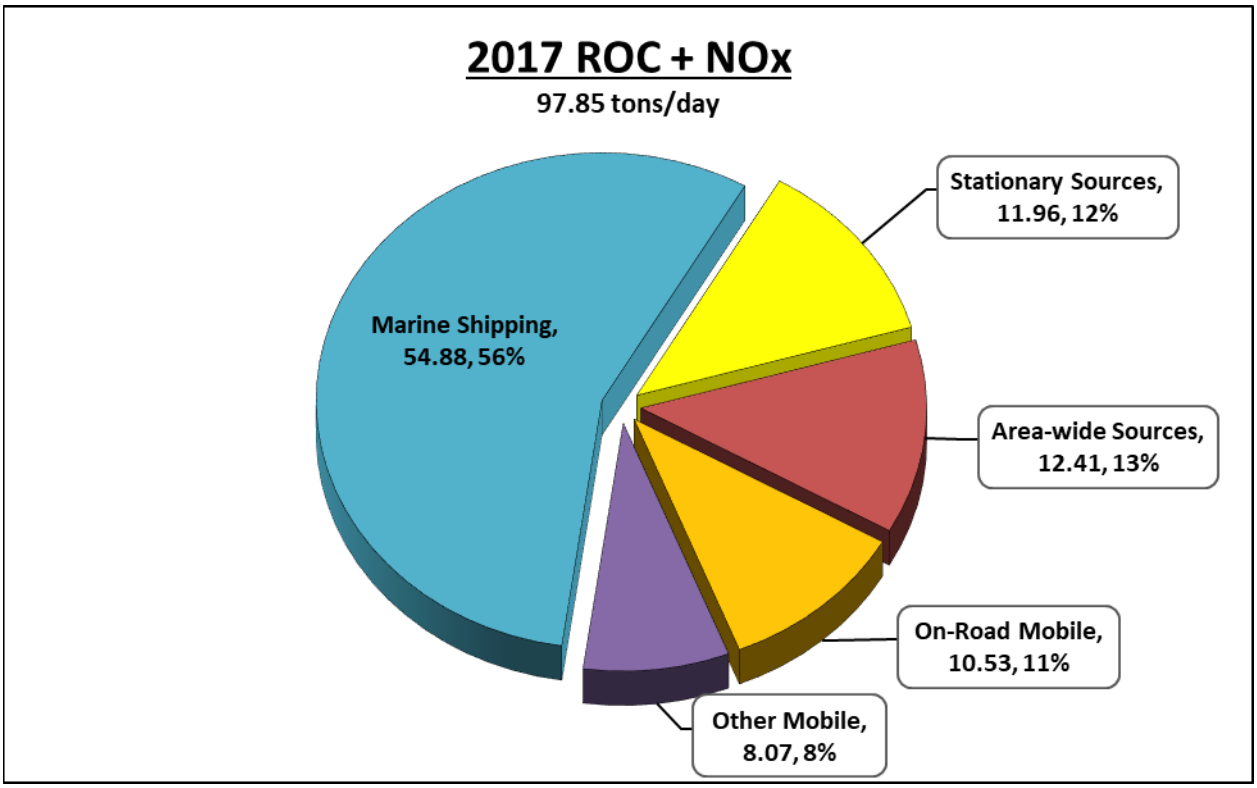


FIGURE 3-2: BASELINE ROC AND NOX EMISSIONS (TONS PER DAY) AND DISTRIBUTION (%)



Growth Profiles

To understand how the emission inventory will change over time, the 2017 inventory is projected into the future using activity-specific growth profiles. Growth profiles contain the estimated changes in the values of pollution-producing activities, known as "activity indicators." Examples of activity indicators include population, housing, and economic output, and the ratio of these activity indicators (relative to the base year) create the growth factor for a specific year. CARB has developed dozens of growth profiles by collecting information from reputable sources such as the California Energy Commission and the Department of Finance. These growth profiles are then applied to the affected source categories to build the forecasted inventory. If the District has more accurate information or estimates based on local data, the District can work with CARB to refine the growth profiles. In this plan, the growth profiles are established to demonstrate the projected emission inventory could look like in the years 2025 and 2035. Growth profile data is shown below in Table 3-1.

TABLE 3-1: SANTA BARBARA COUNTY GROWTH PROFILES

Activity Indicator	Units	Value			Growth Factor		Data Source
		2017	2025	2035	2025	2035	
Population	Residents	451,700	477,700	505,300	1.06	1.12	1
Housing	Households	146,800	155,300	164,300	1.06	1.12	1
Natural Gas Combustion: Residential	Million therms	53.99	55.07	53.43	1.02	0.99	2
Natural Gas Combustion: Commercial	Million therms	22.09	24.74	26.66	1.12	1.21	2
Natural Gas Combustion: Industrial	Million therms	9.87	10.39	11.02	1.05	1.12	2
Ocean Going Vessel: Auto Vehicles	Port of LA/LB ktons	6,223	7,714	9,821	1.24	1.58	3
Ocean Going Vessel: Container Commodities	Port of LA/LB ktons	49,799	71,910	108,216	1.44	2.17	3
Ocean Going Vessel: Tanker Products	Port of LA/LB ktons	58,849	61,639	63,672	1.05	1.08	3
Petroleum Wells	No Units	1	1	1	1	1	4
Petroleum Production: Onshore	No Units	1	1	1	1	1	4
Petroleum Production: OCS	No Units	1	1	1	1	1	5

Data Source References:

1) Department of Finance, which is similar to the SBCAG Regional Growth Forecast 2050 [January 2019]
2) REMI (Regional Economic Models, Inc.) output using California Energy Commission data
3) Freight Analysis Framework model, compiled by the Bureau of Transportation Statistics and the Federal Highway Administration
4) Community Advisory Council recommendation, 2013 Clean Air Plan
5) Community Advisory Council recommendation, 2001 Clean Air Plan

Discussion on Oil & Gas Growth Profiles

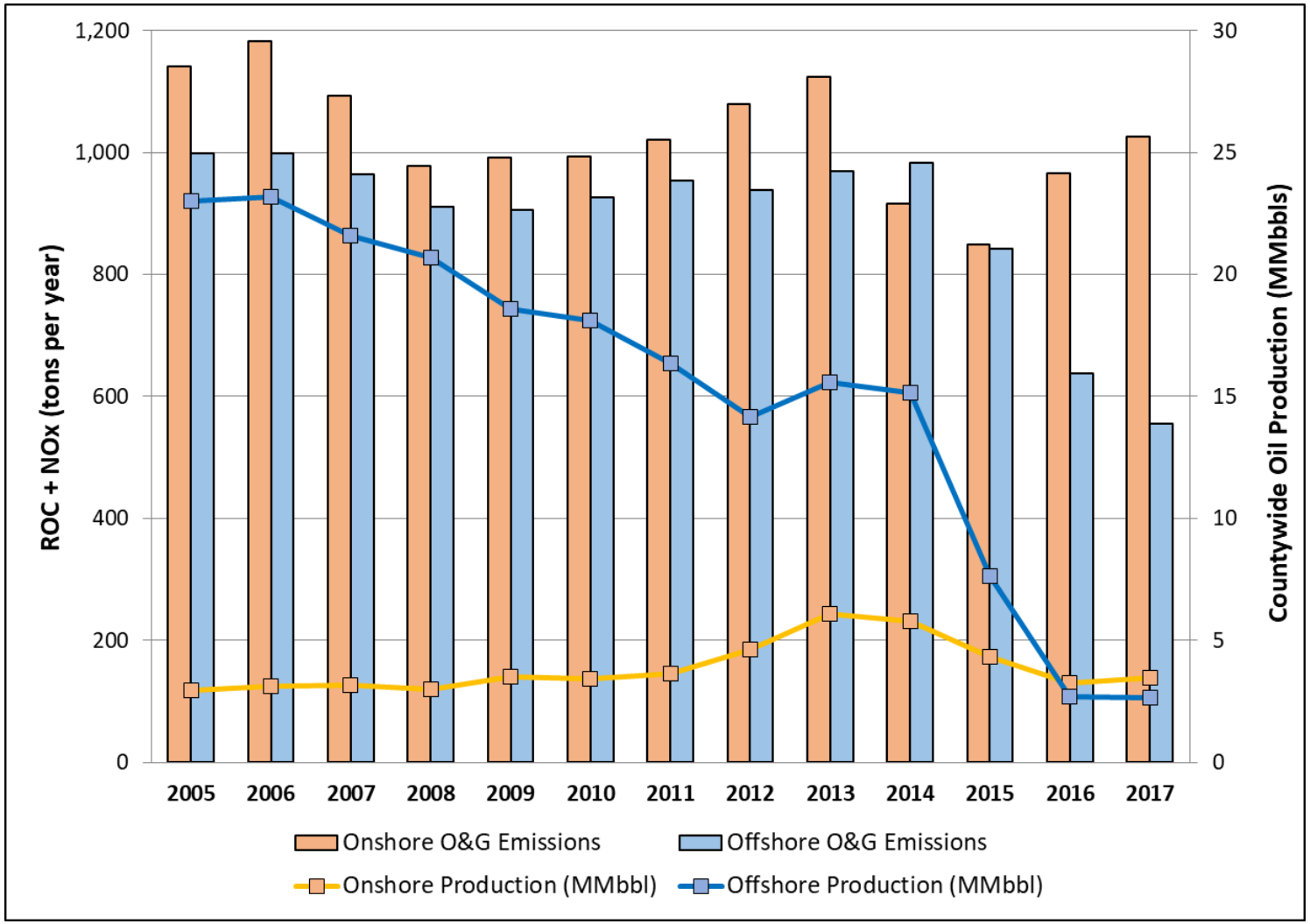
The California Air Resources Board estimates that statewide, oil production in California will decrease by approximately 2.9% each year.[8] However, since the 2013 Plan, the District has set the growth factors for onshore oil and gas-related activities to "1" due to uncertainty in the sector for Santa Barbara County over the long term. This is based on four considerations:

1) The growth projections cover a long time, and petroleum production has gone both up and down in the past. Projecting growth in the petroleum industry out to 2035 would be speculative. Each triennial plan update presents an opportunity to revise this assumption if there is new data that would support a different growth factor.
2) From Figure 3-3, it can be seen that increases in oil production may cause an increase in emissions (as shown in 2006 and 2013), but the convention does not hold true for the remaining years. The figure shows that ozone precursor emissions do not trend at a 1:1 ratio with oil production in the County.
3) While some major oil and gas projects are on the horizon, Best Available Control Technology (BACT) will typically be required during the permit process at these large sources, driving down the overall project emissions. This is because BACT improves over time. For example, NOx emission control requirements for steam generators decreased from 30 parts per million in the 1990s to BACT levels as low as 5 parts per million today.
4) Large oil and gas developments would also be required to offset their emissions that exceed the District's New Source Review offset threshold. These projects could use emission reduction credits (ERCs), which are already accounted for as forecasted growth, or new ERCs must be generated by decreasing the actual emissions either at the source or elsewhere.

Locally, we have seen emission decreases in the oil and gas sector over the last few years. Some of the reductions can be attributed to the rupture of the Plains All American Pipeline, which occurred in May 2015. The shutdown of the pipeline has prevented multiple offshore facilities from producing oil, reducing their economic viability and forcing two operators to decommission their offshore platforms. If a replacement pipeline is constructed, there may be a partial resurgence of the offshore emissions associated with platform operations and crew and supply vessels. However, the emissions from the oil and gas sector are not expected to increase beyond their recorded level in 2005.

[8] Based on the annual production reports from the CA Department of Conservation, Division of Oil Gas, and Geothermal Resources (DOGGR), data trend from 2000 – 2016.

FIGURE 3-3: SANTA BARBARA COUNTY OIL PRODUCTION VS. OIL & GAS SECTOR EMISSIONS



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Onshore Emissions (tpy)	1,141	1,182	1,093	978	991	994	1,021	1,078	1,124	916	849	967	1,026
Offshore Emissions (tpy)	999	999	964	911	905	926	954	938	969	983	842	637	555
Total Emissions (tpy)	2,139	2,181	2,057	1,889	1,896	1,920	1,975	2,016	2,092	1,899	1.691	1,604	1,581
Total Growth Factor (relative to 2005)	1.00	1.02	0.96	0.88	0.89	0.90	0.92	0.94	0.98	0.89	0.79	0.75	0.74

Inventory Forecast

After applying the growth profiles to the District's 2017 Base Year Inventory, the District-wide ozone precursor emissions are forecasted for 2025 and 2035. This is accomplished through CARB's California Emission Projection Analysis Model (CEPAM). CEPAM incorporates county-specific economic and demographic growth profiles and emission control profiles that are derived from adopted District rules and statewide regulations. Table 3-2 displays a summary of the results. A detailed summary of emissions by source sub-category is provide at the end of this chapter in Table 3-3. Figures 3-5 and 3-6 provide graphical displays of the projected emissions from the baseline year of 2017 out to forecast years 2025 and 2035.

TABLE 3-2: ROC AND NOX EMISSION FORECASTS (TONS PER DAY)

Source Category	2017		2025		2035	
	ROC	NOx	ROC	NOx	ROC	NOx
Stationary Sources	8.86	3.10	9.04	3.07	9.38	3.07
Area-wide Sources	11.85	0.56	12.03	0.47	12.20	0.44
On-Road Vehicles [9]	3.70	6.83	1.81	2.65	1.61	2.11
Other Mobile [10]	2.73	5.35	2.28	3.75	2.04	3.02
Marine Shipping	3.01	51.87	4.25	66.72	6.33	78.84
ERCs	-	-	0.31	0.76	0.31	0.76
Total	**30.14**	**67.71**	**29.71**	**77.42**	**31.87**	**88.23**

As shown in the table, NOx emissions are projected to increase substantially over the next several years primarily due to the marine shipping sector. Emissions of NOx are projected to increase from 67.71 tons per day in 2017 to 88.23 tons per day by 2035. This trend is slightly counteracted by reductions in emissions from on-road vehicles.

Whereas, the ROC emissions trend remains relatively stable over the period with about a 1.7 tons per day increase from 2017 to 2035. On-road emissions account for most of the ROC reductions over the period, while marine shipping operations are responsible for the increase.

The emission inventory forecasts have been adjusted upward based on the ERCs that were in the District Source Register as of June 2019. These ERCs represent previous voluntary emission reductions that can be used as an emission credit in the future, to compensate for emission increases from a new or modified stationary source. If the ERCs are used for future projects, offset trading ratios may also be applied, further reducing the amount of potential emission increases related to the use of ERCs.

[9] Draft data, may be changed based on updated information from SBCAG.
[10] Marine Shipping emissions have been broken-out of the Other Mobile category in this table.

Impacts from Marine Shipping

Large ships traveling along the coast of Santa Barbara County produce significant air emissions. In the base year (2017), over 1,400 different vessels made around 6,500 total transits through the Santa Barbara Channel Region.[11] Due to the massive engines on these ships, these transits are responsible for more than 75 percent of the NOx inventory - making marine shipping the single largest source of NOx emissions in the County.

The District has studied the local meteorological conditions that have led to high ozone readings and exceedances of the state and federal ozone standards. Exceedances typically occur between April and October (the ozone "season"), and the conditions that are most conducive to exceedances include stagnant air, temperature inversions, and the presence of ozone precursor pollutants. The Santa Barbara area frequently experiences a pressure gradient that moves air from offshore to onshore. This means that air pollution produced by ships transiting off the coast can contribute to the ozone levels that are measured onshore.

Marine Shipping Emission Methodology

Marine shipping emissions are estimated by CARB using its "Ocean Going Vessel" (OGV) model, which makes assumptions about vessel types, speeds, and the routes taken based on available information. The model also incorporates estimates of growth in marine shipping activities, as well as and control profiles.[12] NOx emissions from this sector are forecast to increase approximately 50 percent over the next 20 years. This projected growth is primarily due to anticipated increases in container ship traffic to transport commodities, such as furniture, electronics, and other manufactured goods, to the Ports of Los Angeles and Long Beach.

In regards to control measures, there are new regulations under the International Maritime Organization (IMO) and United States Environmental Protection Agency (EPA) that require lower NOx standards for newly built vessel engines. New engines have to meet the Tier 3 standard, which emit approximately 80% less NOx as compared to the Tier 1 engines that are being used on most ships today. However, it will take approximately 10-20 years to phase out the older, dirty engines, and in the meantime, the marine shipping sector continues to be the largest source of NOx within the County.

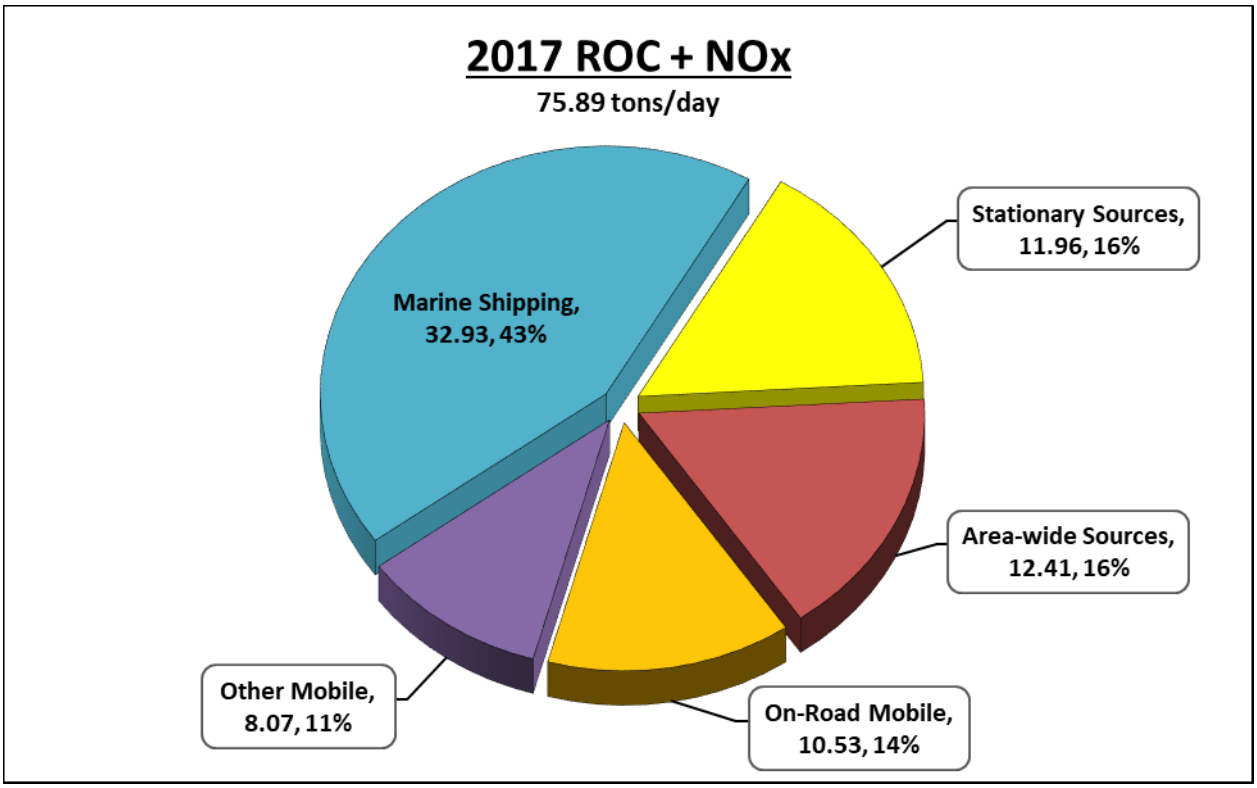
The emissions are associated with all shipping activity from the shoreline out to 100 nautical miles. Projections include both shipping growth and the phase-in of new engine standards.

[11] Based on compiled AIS (Automatic Identification System) data, which records the location, speed, and direction of the ocean-going vessels.

[12] "Control profiles" reflect the assumed amount of emission controls that will reduce emissions in this source category each year, due to regulatory requirements.

While CARB strives to provide accurate estimates of current and future marine shipping emissions in Santa Barbara County, it is important to note that there is an inherent uncertainty about emissions in the marine shipping source category. The current OGV model assumes that container ships in the Santa Barbara Channel Region travel at a speed of 21-22 knots. However, the District has reviewed vessel speed data in detail and notes that during the last few years, many vessels operate at a slower rate of speed. District staff estimate that the average speed off the coast is now approximately 14-15 knots based on review of vessel-specific Automatic Identification System (AIS) data. These reductions in vessel speed in the Santa Barbara Channel Region are estimated to reduce the NOx inventory from the source category by 40%, or around 21 tons per day of NOx. Figure 3-4 shows what the total ozone precursor emission inventory might look like if CARB revised the calculation methodology for marine shipping to reflect the lower speeds, and thus lower engine loads, that the District has observed.

FIGURE 3-4: REDUCED MARINE SHIPPING METHODOLOGY - BASELINE ROC AND NOX EMISSIONS (TONS PER DAY) AND DISTRIBUTION (%)



The District has discussed this concern with CARB staff so that it can be addressed the next time the OGV model is updated. Furthermore, the District will continue to track the wide range of factors that influence the emission inventory, including the types of vessels in use, variations in international trade activities and routes, as well as changing vessel speed and traffic patterns.

TABLE 3-3: EMISSIONS BY SOURCE CATEGORY (TONS PER DAY)

	2017		2025		2035	
STATIONARY SOURCES	**ROC**	**NOx**	**ROC**	**NOx**	**ROC**	**NOx**
ELECTRIC UTILITIES	0.02	0.04	0.02	0.05	0.02	0.04
COGENERATION	-	-	-	-	-	-
OIL AND GAS PRODUCTION (COMBUSTION)	0.07	1.07	0.07	1.07	0.07	1.07
PETROLEUM REFINING (COMBUSTION)	-	-	-	-	-	-
MANUFACTURING AND INDUSTRIAL	0.02	0.53	0.02	0.56	0.02	0.59
FOOD AND AGRICULTURAL PROCESSING	0.02	0.35	0.02	0.27	0.01	0.22
SERVICE AND COMMERCIAL	0.08	0.93	0.08	0.94	0.09	0.95
OTHER (FUEL COMBUSTION)	0.01	0.06	0.01	0.06	0.01	0.06
SEWAGE TREATMENT	-	-	-	-	-	-
LANDFILLS	0.07	0.01	0.07	0.01	0.08	0.01
INCINERATORS	0.01	0.01	0.01	0.01	0.01	0.01
SOIL REMEDIATION	-	-	-	-	-	-
OTHER (WASTE DISPOSAL)	0.68	-	0.72	-	0.76	-
LAUNDERING	0.01	-	0.01	-	0.01	-
DEGREASING	1.35	-	1.31	-	1.23	-
COATINGS AND RELATED PROCESS SOLVENTS	1.04	-	1.17	-	1.36	-
PRINTING	0.49	-	0.58	-	0.71	-
ADHESIVES AND SEALANTS	0.94	-	0.97	-	1.01	-
OTHER (CLEANING AND SURFACE COATINGS)	0.14	-	0.15	-	0.18	-
OIL AND GAS PRODUCTION	3.01	0.06	3.01	0.06	3.01	0.06
PETROLEUM REFINING	0.05	-	0.05	-	0.05	-
PETROLEUM MARKETING	0.59	-	0.49	-	0.44	-
OTHER (PETROLEUM PRODUCTION)	-	-	-	-	-	-
CHEMICAL	0.01	-	0.01	-	0.01	-
FOOD AND AGRICULTURE	0.25	-	0.27	-	0.30	-
MINERAL PROCESSES	-	0.04	0.01	0.05	0.01	0.05
OTHER (INDUSTRIAL PROCESSES)	-	-	-	-	-	-
STATIONARY SOURCE TOTAL	**8.86**	**3.10**	**9.04**	**3.07**	**9.38**	**3.07**

TABLE 3-3: EMISSIONS BY SOURCE CATEGORY (TONS PER DAY)

	2017		2025		2035	
AREA SOURCES	**ROC**	**NOx**	**ROC**	**NOx**	**ROC**	**NOx**
CONSUMER PRODUCTS	2.35	-	2.47	-	2.60	-
ARCHITECTURAL COATINGS AND SOLVENTS	1.21	-	1.27	-	1.35	-
PESTICIDES/FERTILIZERS	6.36	-	6.50	-	6.56	-
ASPHALT PAVING / ROOFING	0.13	-	0.13	-	0.13	-
RESIDENTIAL FUEL COMBUSTION	1.00	0.44	1.00	0.35	1.00	0.32
FARMING OPERATIONS	0.59	-	0.44	-	0.35	-
CONSTRUCTION AND DEMOLITION	-	-	-	-	-	-
PAVED ROAD DUST	-	-	-	-	-	-
UNPAVED ROAD DUST	-	-	-	-	-	-
FUGITIVE WINDBLOWN DUST	-	-	-	-	-	-
FIRES	-	-	-	-	0.01	-
MANAGED BURNING AND DISPOSAL	0.17	0.12	0.17	0.12	0.17	0.12
COOKING	0.03	-	0.03	-	0.04	-
OTHER (MISCELLANEOUS PROCESSES)	-	-	-	-	-	-
AREA SOURCE TOTAL	**11.85**	**0.56**	**12.03**	**0.47**	**12.20**	**0.44**

ON-ROAD MOTOR VEHICLES	**ROC**	**NOx**	**ROC**	**NOx**	**ROC**	**NOx**
LIGHT DUTY PASSENGER (LDA)	1.23	0.90	0.49	0.31	0.27	0.14
LIGHT DUTY TRUCKS - 1 (LDT1)	0.19	0.12	0.06	0.03	0.03	0.01
LIGHT DUTY TRUCKS - 2 (LDT2)	0.83	0.83	0.44	0.28	0.26	0.12
MEDIUM DUTY TRUCKS (MDV)	0.52	0.67	0.33	0.25	0.33	0.17
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.23	0.27	0.13	0.12	0.30	0.35
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.02	0.04	0.01	0.01	0.01	0.01
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.05	0.08	0.01	0.02	0.01	0.02
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.01	0.02	-	0.01	-	0.02
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.03	0.60	0.02	0.24	0.03	0.16
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.01	0.16	0.01	0.04	0.01	0.01
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.07	0.86	0.01	0.32	0.01	0.34
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.09	1.44	0.02	0.61	0.02	0.43

TABLE 3-3: EMISSIONS BY SOURCE CATEGORY (TONS PER DAY)

	2017		2025		2035	
ON-ROAD MOTOR VEHICLES (Continued)	**ROC**	**NOx**	**ROC**	**NOx**	**ROC**	**NOx**
MOTORCYCLES (MCY)	0.34	0.10	0.27	0.08	0.32	0.10
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.02	0.41	0.01	0.15	-	0.10
HEAVY DUTY GAS URBAN BUSES (UB)	0.02	0.02	-	0.01	-	0.01
SCHOOL BUSES - GAS (SBG)	0.01	0.01	-	0.01	-	-
SCHOOL BUSES - DIESEL (SBD)	0.01	0.14	-	0.10	-	0.04
OTHER BUSES - GAS (OBG)	0.01	0.02	-	0.01	-	-
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	-	0.04	-	0.02	-	0.03
ALL OTHER BUSES - DIESEL (OBD)	-	0.07	-	0.03	-	0.02
MOTOR HOMES (MH)	0.01	0.04	-	0.01	0.00	0.03
ON-ROAD MOTOR VEHICLE TOTAL	**3.70**	**6.83**	**1.80**	**2.65**	**1.61**	**2.11**

OTHER MOBILE SOURCES	**ROC**	**NOx**	**ROC**	**NOx**	**ROC**	**NOx**
AIRCRAFT	0.23	0.12	0.24	0.13	0.26	0.15
TRAINS	-	0.68	-	0.28	-	0.24
OCEAN GOING VESSELS	3.01	51.87	4.25	66.72	6.33	78.84
COMMERCIAL HARBOR CRAFT	0.17	1.81	0.17	1.52	0.15	1.29
RECREATIONAL BOATS	0.42	0.08	0.28	0.07	0.18	0.06
OFF-ROAD RECREATIONAL VEHICLES	0.25	0.01	0.23	0.01	0.24	0.01
OFF-ROAD EQUIPMENT	1.15	1.31	1.00	0.85	0.97	0.73
FARM EQUIPMENT	0.27	1.34	0.19	0.89	0.14	0.54
FUEL STORAGE AND HANDLING	0.23	-	0.17	-	0.10	-
OTHER MOBILE SOURCE TOTAL	**5.73**	**57.22**	**6.53**	**70.47**	**8.37**	**81.86**

TOTAL – ALL SOURCE CATEGORIES	**30.14**	**67.71**	**29.40**	**76.66**	**31.56**	**87.47**
EMISSION REDUCTION CREDITS	-	-	0.31	0.76	0.31	0.76
GRAND TOTAL FOR SANTA BARBARA COUNTY	**30.14**	**67.71**	**29.71**	**77.42**	**31.87**	**88.23**

* Cells with a "-" denote that the source category contributes less than 0.005 tons/day of ROC or NOx.

FIGURE 3-5: ROC EMISSION TRENDS BY SOURCE CATEGORY

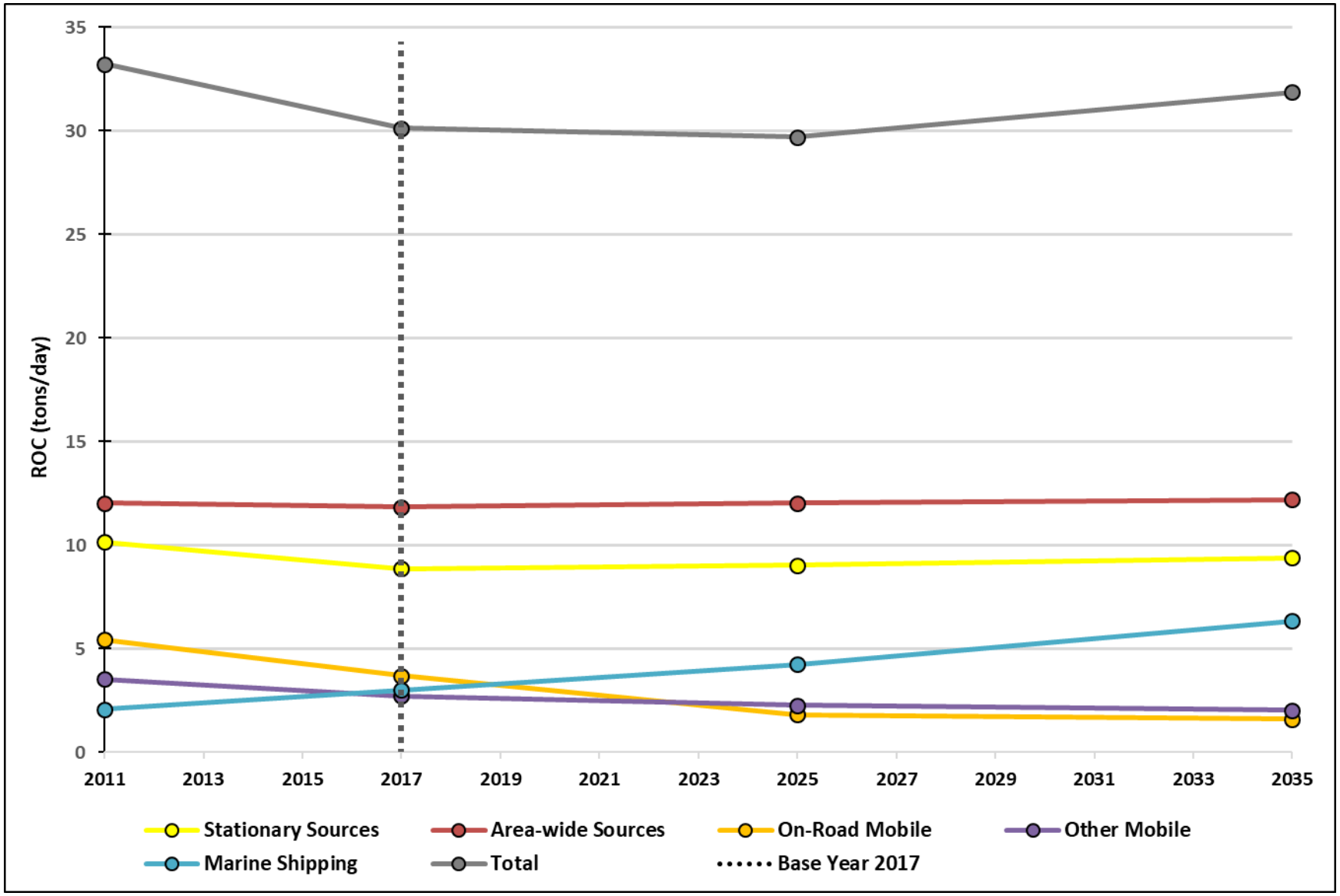
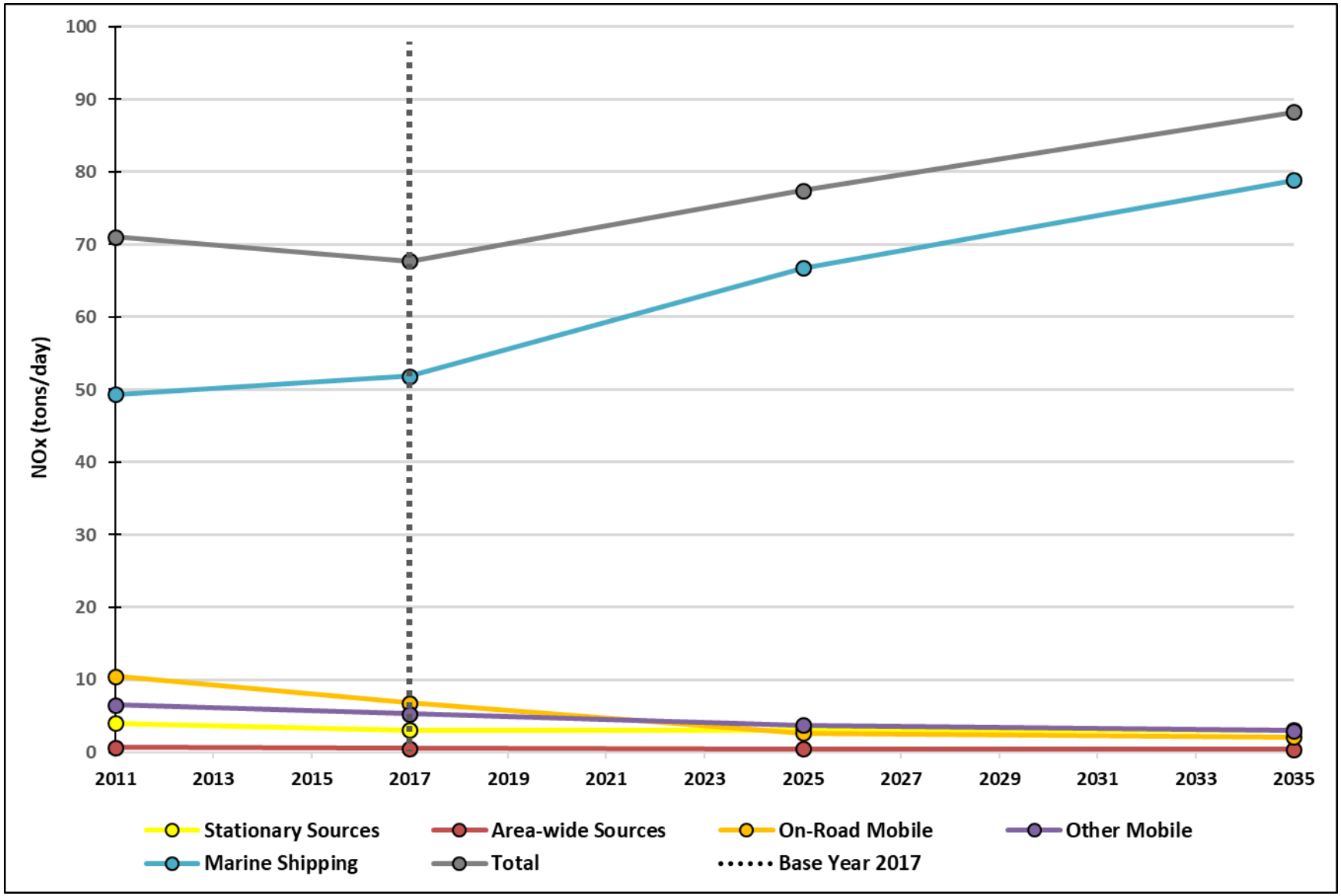


FIGURE 3-6: NOX EMISSION TRENDS BY SOURCE CATEGORY



CHAPTER 4 – STATIONARY SOURCE EMISSION CONTROL MEASURES

[Placeholder – to be completed by October 2019]

CHAPTER 5 – ON-ROAD EMISSIONS AND TRANSPORTATION CONTROL MEASURES

[Placeholder – to be completed by October 2019]

CHAPTER 6 – VOLUNTARY INCENTIVE STRATEGIES

[Placeholder – to be completed by October 2019]

APPENDIX A – 1-HOUR AND 8-HOUR EXPECTED PEAK DAY CONCENTRATIONS

TABLE A-1: STATE 1-HOUR OZONE EPDC – TOP 5 MONITORING SITES

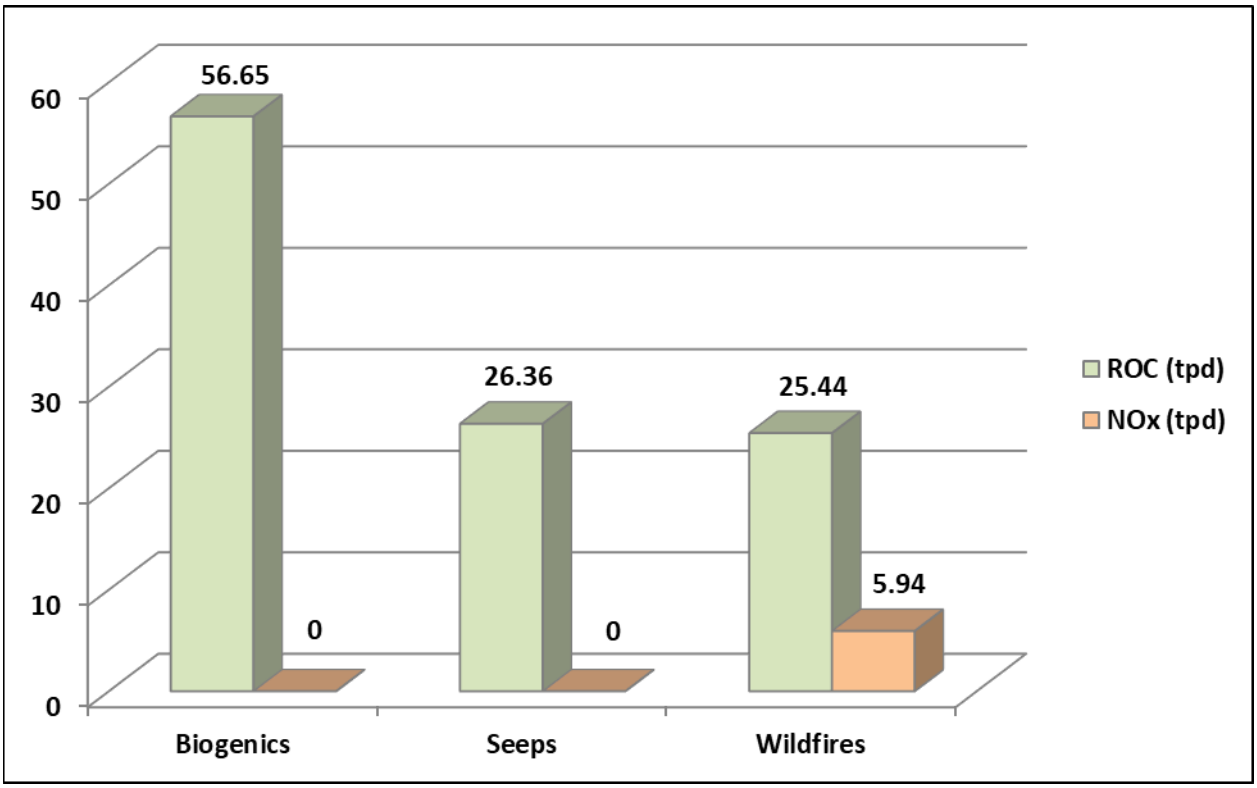
Year	Las Flores Canyon	Paradise Road	Santa Ynez	Lompoc HS&P	Carpinteria	State 1-hr Standard
1990	0.139	0.125	0.106	0.105	0.122	**0.09**
1991	0.136	0.126	0.105	0.102	0.124	**0.09**
1992	0.129	0.118	0.099	0.092	0.118	**0.09**
1993	0.121	0.113	0.100	0.096	0.118	**0.09**
1994	0.121	0.107	0.100	0.094	0.119	**0.09**
1995	0.122	0.107	0.097	0.096	0.114	**0.09**
1996	0.131	0.110	0.102	0.092	0.117	**0.09**
1997	0.124	0.109	0.100	0.093	0.113	**0.09**
1998	0.116	0.110	0.098	0.091	0.110	**0.09**
1999	0.103	0.103	0.087	0.085	0.098	**0.09**
2000	0.100	0.102	0.088	0.084	0.093	**0.09**
2001	0.097	0.100	0.088	0.084	0.091	**0.09**
2002	0.095	0.103	0.088	0.081	0.090	**0.09**
2003	0.092	0.105	0.089	0.086	0.089	**0.09**
2004	0.095	0.102	0.092	0.086	0.089	**0.09**
2005	0.094	0.098	0.091	0.086	0.090	**0.09**
2006	0.092	0.090	0.084	0.078	0.082	**0.09**
2007	0.090	0.094	0.081	0.074	0.081	**0.09**
2008	0.090	0.091	0.081	0.076	0.090	**0.09**
2009	0.093	0.088	0.081	0.077	0.094	**0.09**
2010	0.088	0.086	0.082	0.078	0.096	**0.09**
2011	0.087	0.086	0.078	0.076	0.092	**0.09**
2012	0.082	0.082	0.075	0.074	0.085	**0.09**
2013	0.079	0.078	0.072	0.074	0.082	**0.09**
2014	0.083	0.075	0.073	0.073	0.085	**0.09**
2015	0.082	0.076	0.075	0.073	0.084	**0.09**
2016	0.082	0.076	0.075	0.070	0.083	**0.09**
2017	0.080	0.075	0.072	0.071	0.071	**0.09**
2018	0.079	0.075	0.071	0.070	0.072	**0.09**

TABLE A-2: STATE 8-HOUR OZONE EPDC – TOP 5 MONITORING SITES

Year	Las Flores Canyon	Paradise Road	Santa Ynez	Lompoc HS&P	Carpinteria	State 8-hr Standard
1990	0.111	0.110	0.092	0.094	0.100	**0.070**
1991	0.111	0.111	0.091	0.088	0.098	**0.070**
1992	0.108	0.106	0.086	0.081	0.094	**0.070**
1993	0.102	0.104	0.086	0.086	0.097	**0.070**
1994	0.104	0.098	0.089	0.086	0.096	**0.070**
1995	0.107	0.098	0.087	0.087	0.094	**0.070**
1996	0.112	0.101	0.092	0.084	0.095	**0.070**
1997	0.110	0.099	0.089	0.083	0.093	**0.070**
1998	0.101	0.100	0.088	0.082	0.089	**0.070**
1999	0.092	0.091	0.075	0.078	0.080	**0.070**
2000	0.091	0.091	0.077	0.077	0.079	**0.070**
2001	0.087	0.090	0.078	0.078	0.078	**0.070**
2002	0.084	0.092	0.080	0.075	0.076	**0.070**
2003	0.081	0.095	0.081	0.079	0.074	**0.070**
2004	0.085	0.093	0.083	0.080	0.077	**0.070**
2005	0.085	0.090	0.081	0.079	0.079	**0.070**
2006	0.083	0.084	0.074	0.072	0.072	**0.070**
2007	0.080	0.084	0.070	0.069	0.070	**0.070**
2008	0.080	0.084	0.073	0.071	0.078	**0.070**
2009	0.084	0.081	0.074	0.072	0.082	**0.070**
2010	0.082	0.079	0.075	0.072	0.083	**0.070**
2011	0.080	0.079	0.072	0.071	0.080	**0.070**
2012	0.074	0.077	0.069	0.070	0.074	**0.070**
2013	0.071	0.073	0.065	0.069	0.074	**0.070**
2014	0.074	0.073	0.067	0.070	0.076	**0.070**
2015	0.076	0.073	0.070	0.070	0.076	**0.070**
2016	0.076	0.072	0.070	0.068	0.074	**0.070**
2017	0.075	0.069	0.068	0.068	0.062	**0.070**
2018	0.072	0.068	0.066	0.068	0.063	**0.070**

APPENDIX B – EMISSIONS FROM NATURAL SOURCES

FIGURE B-1: 2017 NATURAL SOURCE ROC AND NOX (TONS PER DAY)



Biogenics:

Biogenic emissions consist of isoprenes, terpenes, and other ROCs that are emitted from plants and trees. The California Air Resources Board estimates biogenic emissions using the MEGAN model (Model of Emissions of Gases and Aerosols from Nature).

Seeps (or Geogenic Emissions):

Oil and gas seeps have occurred naturally off the coast of California for thousands of years. They are associated with cracks in the Earth's crustal layers in which oil floats to the surface of the water and gas bubbles out and escapes into the air. The emissions are estimated by the District using a combination of various studies surrounding Coal Oil Point, which is located in the Santa Barbara Channel.

Wildfires:

A wildfire is an unplanned, natural event that burns a variety of vegetation types. The California Air Resources Board estimates wildfire emissions using the FOFEM model (First Order Fire Effects Model). This model uses Geographic Information Systems (GIS) data on the fire perimeters, vegetation composition, fuel density (tons/acre), and fuel moisture to estimate the emissions. Wildfires do not include prescribed burns, as prescribed burns are planned events to ignite the fire for resource or safety benefits.

FIGURE B-2: 2017 ROC AND NOX EMISSIONS – ALL SOURCES (TONS PER DAY)