SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft South Coast Air Basin Attainment Plan for 2006 24-Hour PM2.5 Standard

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

GOVERNING BOARD

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EXECUTIVE SUMMARY

The South Coast Air Basin (Basin) is classified as a Serious nonattainment area for the 2006 24-hour PM2.5 national ambient air quality standard (standard) with an attainment deadline of December 31, 2019. Since 2001, PM2.5 concentrations in the Basin have significantly decreased due to the implementation of regulations and programs by South Coast Air Quality Management District (South Coast AQMD) and California Air Resources Board (CARB). Despite this progress, based on the 2017-2019 monitoring data, the Basin failed to attain the 2006 standard by the required date. Extreme drought conditions in the 2013-2016 timeframe hampered the efforts for the Basin to meet this standard earlier. Figure ES-1 illustrates the Basin's progress in attaining the 24-hour standard.

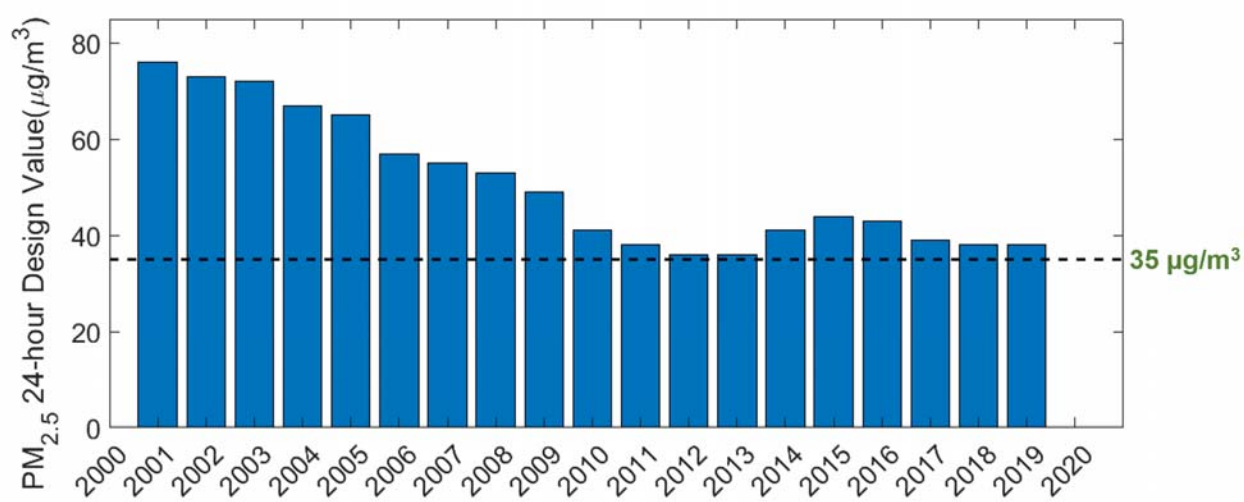

FIGURE ES-1

Progress towards attaining the federal 24-hour PM2.5 standard in South Coast Air Basin

The Basin's recent failure to attain the standard is due to exceedances of the standard at two monitoring stations: Compton and Mira Loma. PM2.5 levels in Mira Loma have decreased steadily over the years and are now very close to the standard. A few days of unusually high PM2.5 levels were observed in Compton in 2017, resulting in that site exceeding the standard over the 2017-2019 three-year averaging period. The high PM episodes at Compton in 2017 have not reoccurred since, and were likely driven by unknown local human activities which would not have been reflected in the emissions inventory.

On July 10, 2020, the U.S. Environmental Protection Agency (U.S. EPA) issued a proposed rule determining that the Basin has failed to attain the standard by the attainment date. For a Serious PM nonattainment area that fails to attain, the Clean Air Act (CAA) requires that a revision to the

State Implementation Plan (SIP) be submitted to U.S. EPA within 12 months after the applicable attainment date. The revised SIP must demonstrate attainment of the standard as expeditiously as possible but no later than 5 years from the date of the U.S. EPA's final determination of failure to attain the standard. In addition to the attainment demonstration, the updated SIP must also address several other federal CAA requirements.

This draft Plan is developed to demonstrate attainment of the 2006 24-hour PM2.5 standard and to address the other federal CAA requirements. The attainment demonstration in this Plan is based on a two-fold hybrid approach which addresses the exceedances observed in Mira Loma and Compton. For Mira Loma (and other stations excluding Compton), a traditional approach using chemical transport modeling is used, which shows that the standard will be attained in 2023, if not earlier. Indeed, recent data suggests that Mira Loma may even attain the standard by the end of 2020, before the U.S. EPA considers this plan. For Compton, the traditional modeling approach is not appropriate because the emissions inventory used in modeling does not reflect the anomalous localized sources causing the high PM2.5 levels observed in 2017. As a result, applying the traditional approach to Compton would require unrealistic levels of emissions reductions in a regional scale, which may not be effective in reducing levels in Compton. Therefore, a supplemental weight of evidence analysis is provided for Compton in the Plan based on ambient air quality trends for PM2.5 and PM2.5 precursors, emissions trends, and other statistical analyses to demonstrate attainment of the PM2.5 standard as early as the end of 2020. Monitoring data since 2018 further indicates that Compton will very likely attain the standard over the 2018-2020 time period, which would also be before U.S. EPA considers this Plan.

Based on the analysis provided in this Plan, given that Compton will likely attain by the end of the year and that Mira Loma is on the edge of attainment, the Basin is expected to attain the 2006 24-hour PM2.5 standard in 2023 based on the continued implementation of existing and recently adopted regulations and programs by South Coast AQMD and CARB. These existing regulations provide significant amount of reductions in nitrogen oxides (NOx) emissions, which is the pollutant largely contributing to PM2.5 levels. With the Basin so close to attainment, the emissions reductions associated with these measures are expected to provide the needed reductions well in advance of the 2025 statutory attainment date.

1. INTRODUCTION

Background

The Federal Clean Air Act (CAA) requires the U.S. EPA to develop and enforce standards to protect the public from airborne contaminants known to be hazardous to human health. Accordingly, the U.S. EPA sets National Ambient Air Quality Standards (NAAQS or federal standards) for criteria pollutants such as particulate matter less than 2.5 microns (PM2.5) and designates areas as being in attainment or in nonattainment of the NAAQS. The U.S. EPA first promulgated the NAAQS for PM2.5 in July 1997. The 24-hour PM2.5 standard was set at a level of 65 micrograms per cubic meter (µg/m3) based on the three-year average of the 98th percentile of 24-hour concentrations. The annual PM2.5 standard was set at a level of 15 µg/m3, based on the three-year average of annual mean PM2.5 concentrations. In 2006, the U.S. EPA strengthened the 24-hour standard to 35 µg/m3. The annual standard stayed at 15 µg/m3 until December 14, 2012, when it was reduced to 12 µg/m3. Table 1-1 summarizes the attainment status of South Coast Air Basin (Basin) for all federal PM2.5 standards.

TABLE 1-1

South Coast Air Basin Attainment Status for PM2.5 National Ambient Air Quality Standards

Standard	Level	Attainment Deadline	South Coast Attainment Status
1997 Annual PM2.5	15 µg/m^3	2015	Attained in 2013
1997 24-hour PM2.5	65 µg/m^3	2015	Attained in 2013
2006 24-hour PM2.5	35 µg/m^3	2019	Serious Nonattainment
2012 Annual PM2.5	12 µg/m^3	2025	Serious Nonattainment

Following the U.S. EPA's adoption of the PM2.5 standards in 1997, South Coast Air Quality Management District (South Coast AQMD) began routine monitoring of PM2.5 concentrations within the Basin. In 2005, a maximum 24-hour average concentration of 132.7 µg/m3 (recorded in East San Gabriel Valley area) and a maximum annual average PM2.5 concentration of 21.0 µg/m3 (recorded in Metropolitan Riverside County area) were 203 and 139 percent of the 1997 24-hour and annual average standards, respectively.[1] However, PM2.5 concentrations in the Basin have experienced a steady and significant decline over the last two decades, where levels have decreased by 51% since 2001 (see Chapter 2- Air Quality Trends for details). South Coast AQMD and CARB's aggressive regulatory programs resulted in attainment of the original 1997 PM2.5 standards in 2013, two years ahead of the attainment deadline. The remarkable historical

[1] 2007 AQMP (Page 2-5). http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2007-air-quality-management-plan/2007-aqmp-final-document.pdf?sfvrsn=2

improvement in PM2.5 air quality is the direct result of Southern California's comprehensive, multiyear strategy of reducing air pollution from various sources.

For the 2006 24-hour PM2.5 standard, the Basin was initially classified as a Moderate nonattainment area with an attainment date of December 31, 2014, and later extended to 2015, pursuant to CAA Subpart 4. Attainment of the 2006 24-hour PM2.5 NAAQS (35 µg/m3) was not achieved by the end of 2015. The region was reclassified as a Serious nonattainment area, giving the Basin until 2019 to attain the 2006 24-hour PM2.5 NAAQS.

History of Air Quality Planning for the 2006 PM2.5 Standard

The CAA requires nonattainment areas to develop and implement an emission reduction strategy that will bring the area into attainment of NAAQS in a timely manner. The state is required to submit a State Implementation Plan (SIP) to demonstrate how and when the NAAQS will be achieved and maintained. The federal SIP requirements for the Basin nonattainment area are addressed through the Air Quality Management Plans (AQMP), which are regional blueprints for achieving air quality standards, developed to meet both federal and state CAA planning requirements. Each AQMP is prepared by the South Coast AQMD in collaboration with the California Air Resources Board (CARB) and the South California Association of Governments (SCAG) through an extensive public process.

2012 AQMP and the 2012 State SIP Strategy: Moderate Area Plan

The purpose of the 2012 AQMP was to set forth a comprehensive program that would lead the Basin into compliance with the 2006 24-hour PM2.5 air quality standard by 2014, and to satisfy the planning requirements of the CAA for a Moderate nonattainment area. The Basin-wide 24-hour PM2.5 attainment strategy was primarily focused on directly emitted PM2.5 and NOx reductions which could be feasibly achieved by the attainment date of 2014. The 2012 AQMP[2] included a number of stationary source control measures covering coatings and solvents, combustion sources, petroleum operations, fugitive VOC sources, multiple component sources, incentive programs, and educational programs as well as on-road mobile source control measures focusing on light-, medium-, and heavy-duty vehicles, and off-road vehicles and equipment. Directly emitted PM2.5 emissions were targeted to be substantially reduced by several control measures including episodic curtailment of residential wood burning and open burning and emission reductions from under-fired charbroilers, as well as secondary PM2.5 reductions through ammonia emission reductions from livestock waste. The 2012 PM2.5 Plan was fully approved by the U.S. EPA in 2018.[3]

[2] 2012 AQMP. https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-carb-epa-sip-dec2012/2012-aqmp-carb-epa-sip-submittal-main-document.pdf
[3] 81 FR 22025 (May 16, 2016) and 83 FR 5923 (March 14, 2018).

2015 Supplement: Subpart 4 Requirements

In January 2013, the U.S. Court of Appeals, D.C. Circuit ruled that the U.S. EPA erred in implementing the 1997 PM2.5 NAAQS pursuant solely to the general implementation provisions of Subpart 1 of the CAA, without considering the particulate matter specific provisions of Subpart 4. Although Subpart 4 relates to PM10, the Court reasoned that the plain meaning of the CAA requires implementation of the 1997 PM2.5 standards under Subpart 4 because PM2.5 falls within the statutory definition of PM10 and are thus subject to the same statutory requirements as PM10. Subpart 4 is more specific about what states must do to bring areas into attainment through the establishment of a two-tier classification system for nonattainment areas (Moderate or Serious). Subpart 4 also has specific provisions regarding regulation of precursors of PM emissions that are not present in Subpart 1. On June 2, 2014, the U.S. EPA classified the Basin as Moderate nonattainment under Subpart 4. Subpart 4 provides for an attainment year of 2015 for Moderate areas, one year later than the attainment year in the 2012 AQMP. Thus, the Basin was provided the new attainment date of December 31, 2015 to meet the 2006 PM2.5 standard for Moderate nonattainment areas.

Based on the ambient monitoring data from 2012-2014, attainment of the 2006 24-hour PM2.5 NAAQS (35 µg/m3) was not achieved by the end of 2014 as anticipated in the 2012 AQMP. The higher PM2.5 levels observed in 2013 and 2014 affected by extreme drought conditions in Southern California had reversed the long-term trend of improving PM2.5 concentrations resulting in nonattainment. To address the Subpart 4 requirements, the 2015 Supplement included a demonstration of attainment of the 24-hour PM2.5 NAAQS by 2015; a discussion of the effects of the drought on the 2014 attainment date; provided new transportation conformity budgets for 2015; updated RACM/RACT analysis; updated list of control strategy commitments; and a demonstration of compliance that applies to major stationary source PM2.5 precursors.[4] The 2015 Supplement was submitted to the U.S. EPA on March 4, 2015 and was fully approved by the U.S. EPA in 2018.[5]

2016 AQMP and 2016 State SIP Strategy: Serious Area Plan

In July 2015, South Coast AQMD submitted a formal request to the U.S. EPA to reclassify the Basin as a Serious nonattainment area for the 24-hour PM2.5 NAAQS based on the monitoring data, which indicated that attainment was not practicable by December 31, 2015. In January 2016, the U.S. EPA approved the Basin's re-designation as Serious nonattainment and the commitment to plan for attainment of the 24-hour PM2.5 NAAQS as expeditiously as practicable, but no later than December 31, 2019. Portions of the 2016 AQMP were developed to satisfy the SIP submittal requirements of the federal CAA as a Serious nonattainment area of the 2006 24-hour standard.[6]

[4] 2015 Supplement https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/2015-supplement-pmsip.pdf?sfvrsn=2

[5] 81 FR 22025 (May 16, 2016) and 83 FR 5923 (March 14, 2018).

[6] 2016 AQMP. http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf?sfvrsn=15

The 2016 AQMP included new and innovative ways to accomplish these goals through incentive programs, efficiency improvements, recognizing co-benefits from other programs, as well as traditional regulatory measures. It described how reductions in NOx, SOx, VOC, and ammonia emissions will contribute to attaining the PM2.5 standard in the South Coast area and contained the evaluation of available control measures for all four of these PM2.5 precursor pollutants as well as direct PM2.5, consistent with the regulatory presumptions under Subpart 4. Based on the 2016 AQMP's updated emission inventory and modeling, attainment of the 2006 standard was expected to be achieved by 2019 using baseline emissions, which incorporated the control impacts of already adopted rules and regulations. The Serious Area Plan, as included in the 2016 AQMP and 2016 California SIP, was approved by the U.S. EPA in 2019.[7]

Monitoring data from 2017 to 2019 indicated that the Basin did not attain the 2006 24-hour PM2.5 standard by December 31, 2019. Two air monitoring stations, Mira Loma and Compton, exceeded the PM2.5 NAAQS. While Mira Loma has been the design value site since 2008, Compton became the highest site in 2017 due to three anomalous high readings recorded in January and December 2017. On July 10, 2020, the U. S. EPA issued a proposed rule determining that the Basin has failed to attain the standard by the attainment deadline.[7] For a Serious PM nonattainment area that fails to attain, Section 189(d) of the CAA requires that within 12 months after the applicable attainment date, a revision to the California SIP must be submitted, that, among other elements, provides for expeditious attainment within the time limits prescribed by regulation and provides for a five percent annual reduction in the emissions of direct PM2.5 or a PM2.5 precursor pollutants.

PM2.5 Precursors

PM2.5 is either directly emitted into the atmosphere (primary particles) or formed through atmospheric chemical reactions from precursor gases (secondary particles). Primary PM2.5 includes road dust, diesel soot, combustion products, and other sources of fine particles. Secondary PM2.5 products, such as sulfates, nitrates, and complex organic carbon compounds, are formed from reactions with oxides of sulfur, oxides of nitrogen, VOCs, and ammonia. The majority of PM2.5 in the South Coast Air Basin is secondary in nature.

Subpart 4 of the CAA specifies that the attainment plan requirements apply to emissions of all four precursor pollutants and direct PM2.5 from all types of stationary, area, and mobile sources, except as otherwise provided in the Act (*e.g.*, in CAA Section 189(e)). Under CAA Section 189(e), control requirements that apply to PM2.5 are also applicable to the precursors of PM, namely NOx, SOx, VOC and ammonia. In August 2016, U.S. EPA issued the Final Rule of "*Fine Particle Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*" (81 FR 58010) that provides a planning requirement framework for the 2012 and future PM2.5 NAAQS pursuant to Subpart 4. States must evaluate and adopt control measures for direct PM2.5 and all

[7] 84 FR 3305 (March 14, 2019).

four PM2.5 precursors from stationary, mobile and area sources, unless states can demonstrate that the contribution of a precursor is insignificant.

Purpose of This Plan

This plan (Plan or Section 189(d) Plan) is developed to address the attainment planning requirements for the Basin due to its failure to attain the 2006 PM2.5 standard by the attainment deadline. The attainment plan addresses directly-emitted PM2.5 as well as the four PM2.5 precursors, namely NOx, SOx, VOC, and ammonia emissions. Chapter 2 of this document presents the PM2.5 air quality trends. Chapter 3 describes the base-year emissions inventory and future projections of emissions. Chapter 4 describes the overall control strategy based on the continued implementation of regional and statewide control measures for attaining the 2006 24-hour PM2.5 standard in the Basin. Chapter 5 presents the attainment demonstration and future air quality projections. Other federal CAA requirements are discussed in Chapter 6.

2. AIR QUALITY TRENDS

Introduction

In this chapter, ambient fine particulate matter (PM2.5) as monitored by South Coast AQMD is summarized for the year 2019, along with prior year trends, in the South Coast Air Basin (Basin). The factors influencing PM2.5 concentrations are also discussed. The Basin's recent air quality is compared to the NAAQS and to the California Ambient Air Quality Standards (CAAQS or State standards). Data presented indicate the current attainment or nonattainment status for the various NAAQS and CAAQS PM2.5 standards, showing the progress made to date and assisting the South Coast AQMD in planning for future attainment.

The South Coast AQMD began regular monitoring of PM2.5 in 1999 following the U.S. EPA's adoption of the national PM2.5 standards in 1997. In 2019, ambient PM2.5 concentrations were monitored at 24 locations throughout the South Coast Air Basin, including two near-road sites. Filter-based Federal Reference Method (FRM) PM2.5 sampling was employed at 17 of these stations and 8 of the FRM measurement stations sampled daily beyond the federally required 1-in-3-day sampling schedule, including the two near-road sites. Fifteen stations, including one near-road site, employed continuous PM2.5 monitors and 8 of these were collocated with FRM measurements. Except for the continuous federal equivalent method (FEM) PM2.5 monitors in Anaheim, Rubidoux, Long Beach (South) and Ontario Route 60, only FRM filter-based monitors meet the U.S. EPA criteria to be used for NAAQS comparison[8]. These four monitors recently passed a comparability assessment and therefore, daily averages can be used to supplement FRM measurements on days with missing data. South Coast AQMD has been granted annual waivers by U.S. EPA precluding the use of all other FEM monitors for NAAQS attainment consideration since they do not meet comparability criteria. The continuous data is used for forecasting, real-time air quality alerts, and for evaluating hour-by-hour variations. Figure 2-1 provides the location of all regulatory PM2.5 monitors within the Basin.

[8] The continuous PM2.5 monitors deployed by South Coast AQMD are FEM-designated Beta Attenuation Monitor (BAM) instruments. The U.S. EPA waiver from NAAQS compliance for the continuous samplers is re-evaluated annually as part of the South Coast AQMD Annual Air Quality Monitoring Network Plan [http://www.aqmd.gov/home/library/clean-air-plans/monitoring-network-plan].

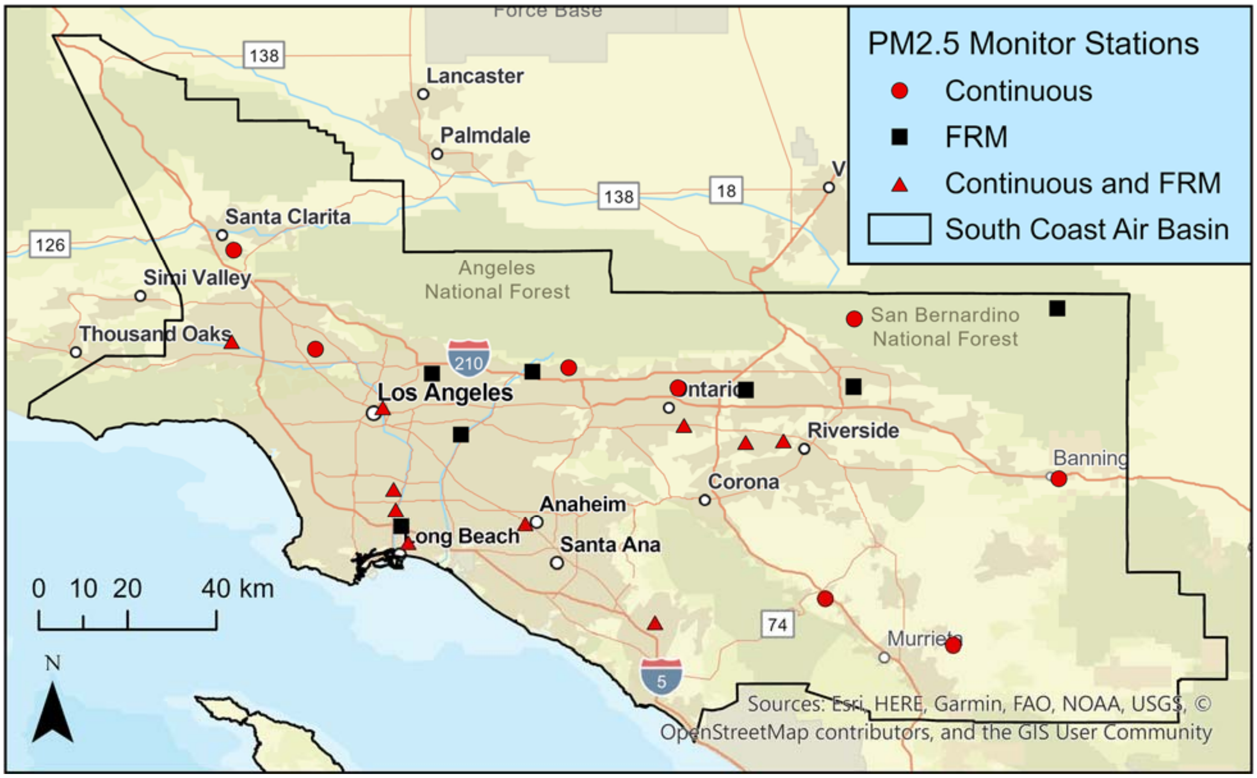

FIGURE 2-1

Location of All Regulatory Monitors in the South Coast Air Basin. All FRM monitors and the continuous monitors in Anaheim, Rubidoux, Long Beach (South) and Ontario Route 60 meet the U.S. EPA criteria to be used for NAAQS comparison.

Inhalation of fine particulate matter has been associated with a wide variety of health effects such as exacerbation of symptoms in patients with respiratory or cardiovascular disease, decline in pulmonary function in children, increased risk of premature death, increased risk of lung cancer, and potentially may be linked to adverse reproductive and cognitive effects. The impacts of these health effects may be seen in increased asthma-related hospital admissions, increased school absences and lost work days. Elevated PM2.5 concentrations also impair visibility. This list of health and welfare effects is not comprehensive; detailed health effects information can be found in Appendix I: Health Effects in the 2016 AQMP or in the U.S. EPA NAAQS documentation at https://www.epa.gov/naaqs.

Factors that Influence PM2.5 Concentrations

The South Coast Air Basin's air pollution problems are a consequence of the combination of direct emissions from the nation's second largest urban area, atmospheric chemical reactions from those precursor pollutants, meteorological conditions adverse to the dispersion of those emissions, and mountainous terrain surrounding the Basin that traps pollutants as they are pushed inland with the sea breeze. PM2.5 is a suspension of solid or liquid particles that are less than 2.5 micron in diameter. These particles can be directly emitted by combustion sources or can be formed in the atmosphere. (Figure 2-2). Gas-phase volatile organic compound (VOCs), oxides of nitrogen

(NOx), oxides of sulfur (SOx) and ammonia (NH_3) react with each other and other atmospheric oxidants to form species with lower volatility that condense into the particle-phase. The precursors are from mobile, point and area sources, with the largest portion resulting from fuel combustion. Both directly emitted PM2.5 and PM2.5 that is formed in the atmosphere contribute to measured PM2.5 concentrations, but in the South Coast Air Basin, secondary PM2.5 formation is responsible for roughly two thirds of the total PM2.5 mass (Figure 2-3).[9]

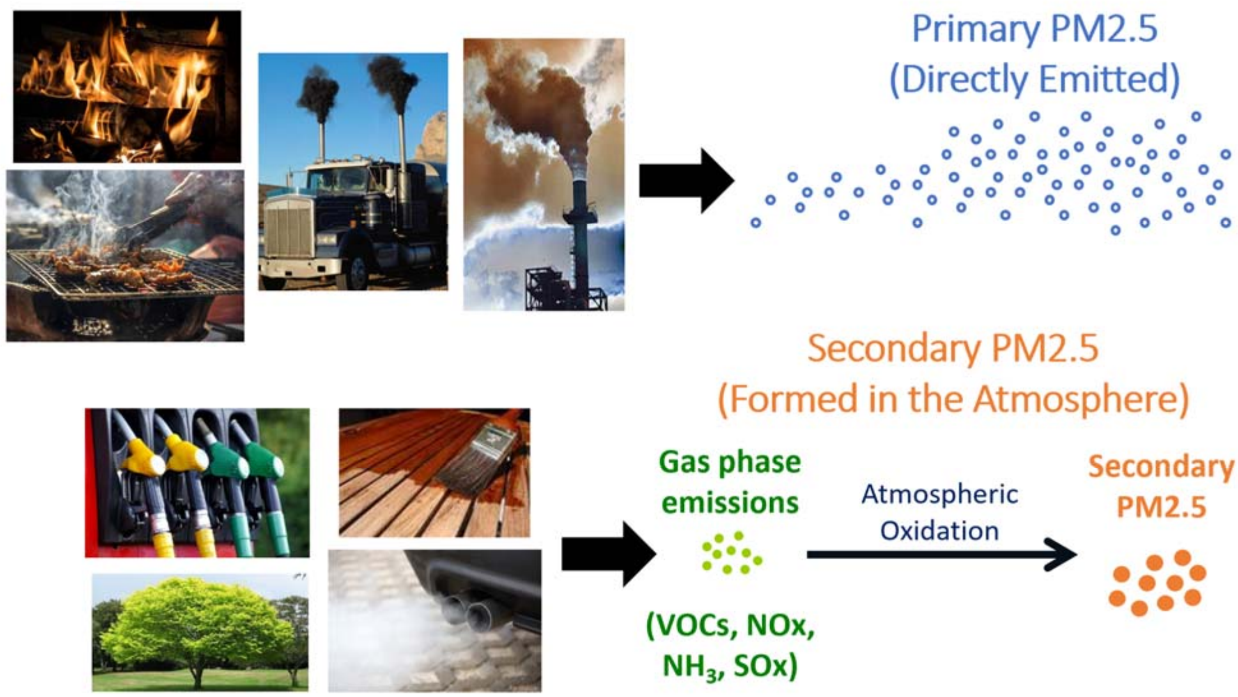

FIGURE 2-2
PM2.5 Formation Mechanisms

[9] Fractions of primary and secondary PM were estimated using the PM2.5 speciation data measured at the Los Angeles-North Main street from June 2012 to July 2018. The total mass of the elemental carbon and metals was assigned as primary PM2.5. The total mass of inorganic ions was assigned as secondary PM2.5. For organic aerosols, we referred to Figure V-6-20 in the Appendix V of the South Coast AQMD's 2016 Air Quality Management Plan (AQMP) and assigned 30% of the organic aerosol as primary PM2.5 and 70% to the secondary PM2.5 fraction. Appendix V of the South Coast AQMD's 2016 Air Quality Management Plan (AQMP) is available at https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-v.pdf?sfvrsn=10.

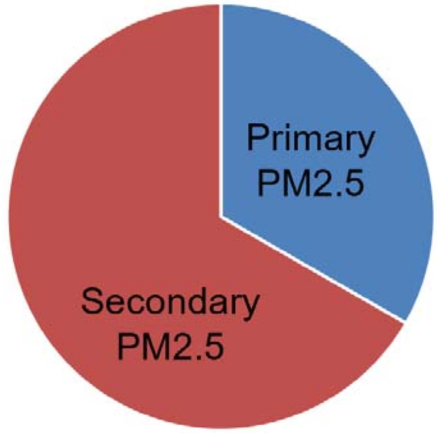

FIGURE 2-3

Approximate Contribution of Primary and Secondary PM2.5. Formation Processes in the South Coast Air Basin. The contribution was calculated based on annual averaged PM2.5 speciation measurements conducted at the Los Angeles-North Main street station from June 2012 to July 2018.[9]

Most sources of PM2.5 and PM2.5 precursors have regular patterns of emissions that may vary by day of the week or possibly by season. However, episodes of elevated PM2.5 can be caused by adverse meteorological conditions and emission sources that occur infrequently such as wildfires, fireworks, or residential wood combustion. Wildfires are an important source of PM2.5 and PM2.5 precursors and can lead to significant PM2.5 episodes, especially during the summer and fall months when wildfire activity is more likely. Fireworks, either from commercial displays or personal use, are a significant source of PM2.5 on July 4th and 5th each year; concentrations recorded on these days are typically the highest measured in the entire year. To a lesser extent, fireworks also influence PM2.5 concentrations on January 1st in some areas of the South Coast Air Basin. Residential wood combustion is also an important source of PM2.5 and PM2.5 precursors, predominantly during the months of November through February. Residents are more likely to burn wood on cool nights, on the weekends, and during holiday periods. Wood burning patterns also vary throughout the Basin.

While long term trends in PM2.5 concentrations are largely driven by changes in emissions, the observed daily variations in pollutant concentrations are primarily the result of meteorological changes and to some extent, residential wood combustion, except on days with elevated atypical emissions such as fireworks and wildfires. Elevated PM2.5 concentrations can occur in the Basin throughout the year but occur most frequently in fall and winter. This is mainly due to the unfavorable meteorological conditions that are more common in those months. Figure 2-5 summarizes the meteorological factors that influence PM2.5 concentrations.

FIGURE 2-5

Important Factors That Influence PM2.5 Concentrations

The average wind speed for Los Angeles is the lowest of the nation's 10 largest urban areas. In addition, the summertime daily maximum mixing heights[10] in Southern California are the lowest, on average, due to strong temperature inversions in the lower atmosphere that effectively trap pollutants near the surface. Southern California also has abundant sunshine, which drives the photochemical reactions that form a significant portion of fine particulate mass (PM2.5). Periods of fog or high humidity can also lead to elevated PM2.5 concentrations as chemistry in fog droplets can increase fine particle mass.

Storms, which predominantly occur during the winter months, are effective in reducing ambient PM2.5 concentrations. Enhanced ventilation and destruction of temperature inversions facilitate atmospheric mixing. Rainfall is extremely effective form of deposition, which can significantly reduce PM2.5 concentrations in the atmosphere. The frequency of these storms during the winter months can strongly influence the 98th percentile daily average concentration, which is a key parameter to determine attainment of the 24-hour PM2.5 standard.

[10] The maximum mixing height is an index of how well pollutants can be dispersed vertically in the atmosphere.

Ambient Air Quality Standards

Federal and State Standards

Ambient air quality standards have been set by both the federal government and the State of California for fine particulate matter. In this chapter, statistics capturing the number of days exceeding federal standards are presented along with concentration trends and design values. Exceedance metrics are instructive regarding trends and control strategy effectiveness. However, it should be noted that an exceedance of the concentration level of a federal standard does not necessarily mean that the NAAQS was violated or that it would cause nonattainment. The form of the standard must also be considered. For example, for 24-hour PM2.5, the form of the standard is the annual 98th percentile measurement of all the 24-hour PM2.5 daily samples at each station.

For PM2.5 NAAQS attainment/nonattainment decisions, the most recent three years of data are considered along with the form of the standard, to calculate a *design value* for each station.[11] The overall design value for an air basin is the highest design value of all the stations in that basin. The California State air quality standards are values that are not to be exceeded, typically evaluated over a 3-year period, and the data is evaluated in terms of a *State designation value*, which allows for some statistical data outliers and exceptional events. Attainment deadlines for the State standards are 'as soon as practicable.'

TABLE 2-1

National Ambient Air Quality Standards (NAAQS) and Design Value Requirements for Fine Particulate Matter

Averaging Time**	NAAQS Level	Design Value Form of NAAQS*
24-Hour (2006)	**35 µg/m^3**	**3-year average of the annual 98th percentile of daily 24-hour concentration**
24-Hour (1997) [revised 2006]***	65 µg/m^3	
Annual (2012)	**12.0 µg/m^3**	**Annual average concentration, averaged over 3 years** *(annual averages based on average of 4 quarters)*
Annual (1997) [revised 2012]***	15.0 µg/m^3	

Bold text denotes the current and most stringent NAAQS

* The NAAQS is attained when the design value (form of concentration listed) is equal to or less than the level of the NAAQS

** Year of U.S. EPA NAAQS update review shown in parenthesis and revoked or revised status in brackets; for revoked or revised NAAQS, areas may have continuing obligations until that standard is attained.

***On July 25, 2016 U.S. EPA finalized a determination that the Basin attained the 1997 annual (15.0 µg/m^3) and 24-hour PM2.5 (65 µg/m^3) NAAQS, effective August 24, 2016.

[11] Note that for modeling attainment demonstrations, the U.S. EPA modeling guidance recommends a 5-year weighted average for the design value instead of a 3-year average.

TABLE 2-2

California Ambient Air Quality Standards (CAAQS) and Designation Value Requirements for Fine Particulate Matter

Averaging Time**	CAAQS Level	Designation Value Form of CAAQS*
Annual (2012)	**12.0 µg/m^3**	**Annual average of the daily 24-hour concentrations. Maximum value in a three year period.**

* The CAAQS is attained when the design value (form of concentration listed) is equal to or less than the level of the CAAQS

Under the Exceptional Events Rule,[12] U.S. EPA allows certain air quality data to not be considered for NAAQS attainment status when that data is influenced by exceptional events that meet strict evidential requirements, such as high winds, wildfires, volcanoes, or some cultural events (such as Independence Day or New Year's fireworks). An exceptional event meets the following criteria:

- The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation
- The event was not reasonably controllable or preventable
- The event was caused by human activity that is unlikely to recur at a particular location or was a natural event

For a few PM measurements in the Basin between 2016 and 2019, the District applied the U.S. EPA Exceptional Events Rule to flag some PM2.5 data due to wildfires and fireworks on Independence Day. All of the exceptional event flags through 2019 have been submitted with the affected data to U.S. EPA's Air Quality System (AQS) database. The preparation of the District's documentation for those events that affect regulatory decisions is under way and U.S. EPA's concurrence will be requested if these events have regulatory significance. The process to achieve an attainment designation for PM2.5 in the South Coast Air Basin will likely depend upon U.S EPA's concurrence with the exceptional event flags and the appropriate demonstrations showing that exceedances were caused by wildfire smoke and/or Independence Day fireworks.

PM2.5 Air Quality Trends

24-hour Standard

Over the past two decades, the number of 24-hour PM2.5 exceedance days have continuously decreased. The number of days when the Basin-maximum 24-hour PM2.5 exceeded the 24-hour NAAQS in each month from 2000 to 2019 are shown in Figure 2-6. Compared with data collected in 2000, the number of days exceeding the standard in 2019 decreased by 89%, from 109 days to 12 days. In the 2000s, exceedance days were recorded in every month. However, in recent years,

[12] The Final 2016 U.S. EPA Exceptional Events Rule is available at https://www.epa.gov/air-quality-analysis/final-2016-exceptional-events-rule-supporting-guidance-documents-updated-faqs

the 24-hour standard is typically only exceeded in the winter months, from November to February. Even in the winter months, there are considerably fewer number of exceedance days than in past decades.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000	16	5	8	10	13	4	6	2	9	12	9	15	109
2001	12	1	15	8	21	7	7	7	12	19	18	11	138
2002	12	9	2	8	6	6	7	10	7	22	11	13	113
2003	13	2	7	0	12	12	4	0	14	18	4	8	94
2004	14	3	14	4	0	11	2	1	4	10	6	4	73
2005	4	0	5	1	2	2	3	1	3	8	8	13	50
2006	4	9	0	2	11	2	2	0	0	5	8	3	46
2007	1	4	5	5	6	1	2	0	0	5	16	2	47
2008	4	1	2	0	1	0	2	0	2	2	8	4	26
2009	4	2	3	0	4	0	1	4	1	0	6	5	30
2010	1	4	0	1	0	0	1	0	0	2	1	2	12
2011	0	1	0	0	0	0	1	0	0	5	3	5	15
2012	2	0	0	0	0	0	1	0	0	1	7	6	17
2013	1	3	1	0	0	0	0	0	0	4	2	1	12
2014	8	0	0	0	1	0	0	0	0	0	0	2	11
2015	13	10	3	3	0	0	1	0	0	0	0	0	30
2016	3	1	1	0	0	0	1	0	0	1	0	3	10
2017	1	0	1	0	1	0	2	0	0	1	5	8	19
2018	6	0	0	0	0	0	2	0	0	2	5	4	19
2019	2	0	0	0	0	0	2	0	0	0	7	1	12
2020	4	1	0	0	0	0							

FIGURE 2-6

Number of Days When the Basin-Maximum 24-Hour PM2.5 Concentrations Exceeded the 24-Hour PM2.5 Standard (35.4 μg/m^3) in Each Month from January 2000 to June 2020 in the South Coast Air Basin.

The trend of the Basin-maximum 98th percentile 24-hour PM2.5 measured in the South Coast Air Basin is presented in Figure 2-7. This parameter is an important metric for tracking progress towards clean air goals as the three-year average of the 98th percentile concentration at each station represents the design value. As shown in the figure, the basin maximum 98th percentile 24-hour PM2.5 values have declined significantly over the past two decades. The value recorded in 2019 has decreased by 58% compared with the value recorded in 2000, from 85.6 μg/m^3 to 36.2 μg/m^3. With the exception of 2012, Mira Loma has had the highest 98th percentile value in all years before 2017. Compton had the highest 98th percentile value in 2017 due to three anomalous measurements

(See Chapter 5 and Appendix V). The highest 98th percentile in the Basin in 2018 and 2019 was recorded at the CA710 near road monitor and Mira Loma, respectively.

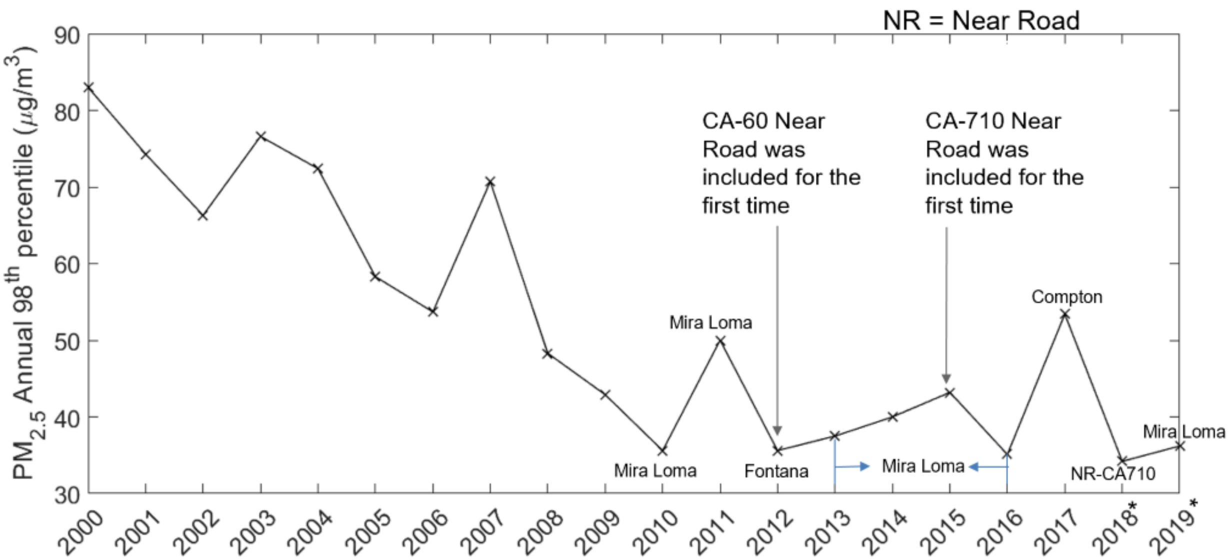

FIGURE 2-7

Basin-Maximum 98th Percentile 24-Hour PM2.5 Concentrations Measured in the South Coast Air Basin from 2000-2019

* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

The trend of the 24-hour basin-maximum PM2.5 design value measured in the South Coast Air Basin is shown in Figure 2-8. The 24-hour PM2.5 design value has continuously declined and is approaching the 24-hour PM2.5 federal standard (35 μg/m^3). Compared with the design value in 2001, the 24-hour PM2.5 design value has declined by 50%, from 76 μg/m^3 in 2001 to 38 μg/m^3 in 2019. From 2008 to 2016, the highest design value was recorded in Mira Loma. However, in the last two years, Compton has replaced Mira Loma as the station with highest 24-hour PM2.5 design value due to three anomalous values recorded in 2017 (See Chapter 5 and Appendix V). The slight increasing trend in the 2014 and 2015 3-year design values is due in large part to extreme drought conditions experienced in Southern California and the associated lack of periodic storm events in the winter months that facilitate dispersion and washout of pollutants.[13]

[13] South Coast AQMD, Final Supplement to the 24-Hour PM2.5 State Implementation Plan for the South Coast Air Basin. Attachment B, Effects of the Drought. http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/2015-supplement-pmsip.pdf?sfvrsn=2. Last accessed Sept 9th, 2020.

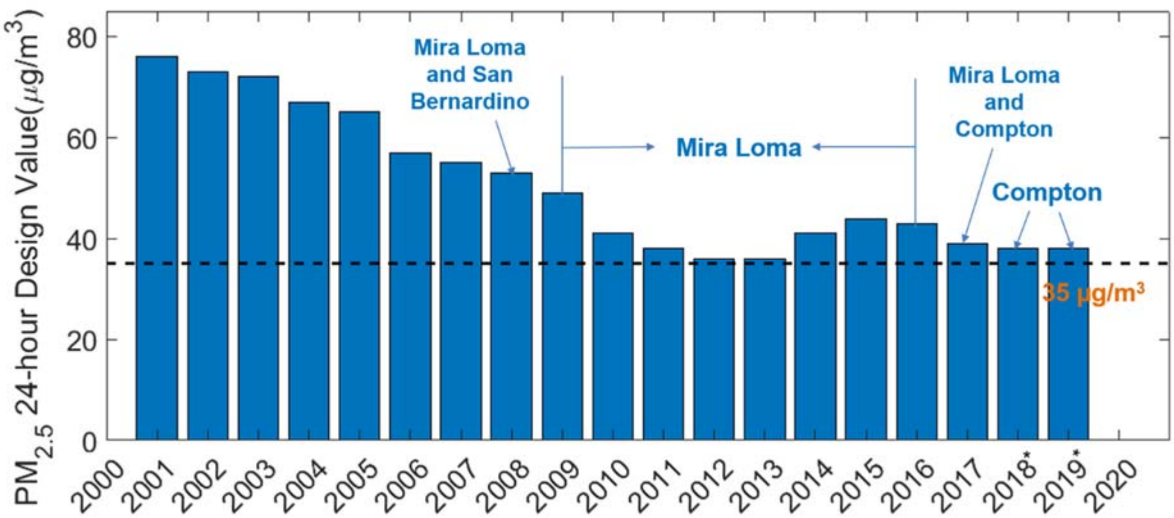

FIGURE 2-8

24-Hour PM2.5 Design Value in the South Coast Air Basin from 2000-2019

* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

Annual Standard

The trend of the annual average PM2.5 concentration measured in the South Coast Air Basin is presented in Figure 2-9. As shown in the figure, the Basin-maximum annual average PM2.5 has decreased significantly over the past two decades. The annual average recorded in 2019 has decreased 58% compared with the value recorded in 2000, from 30.2 $\mu g/m^3$ to 12.6 $\mu g/m^3$. Between 2010 and 2015, the highest annual average PM2.5 concentration was recorded in Mira Loma. However, annual averages recorded at the Ontario Route-60 near road station exceed averages in Mira Loma since 2015. The 2019 annual average is the lowest on record.

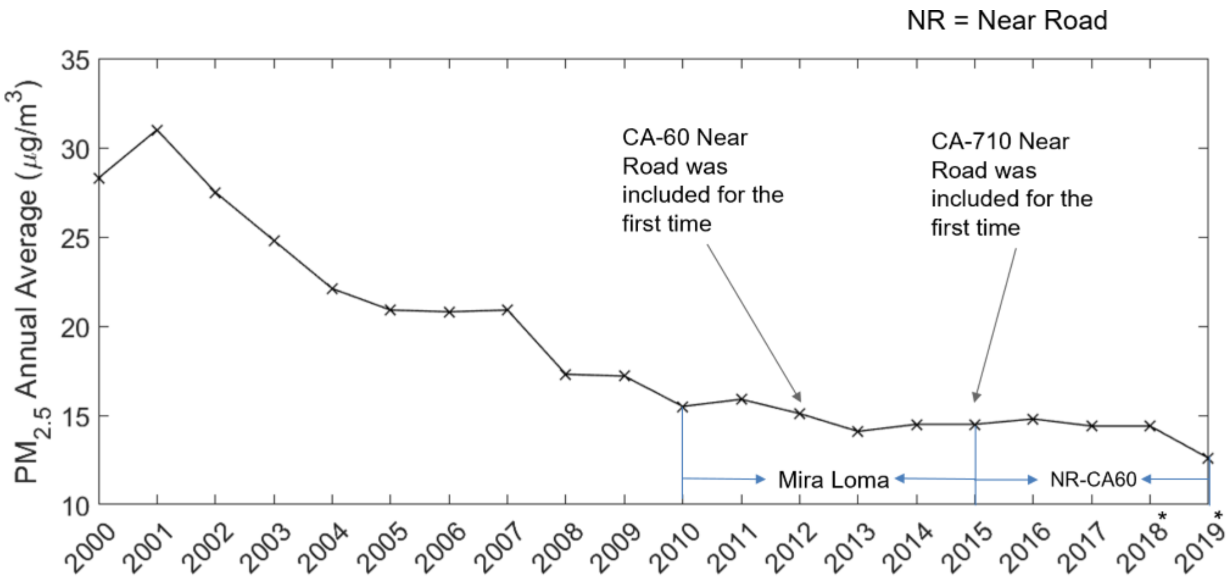

FIGURE 2-9

Basin-Maximum Annual Average PM2.5 Concentrations Measured in the South Coast Air Basin from 2000-2019

* Data likely to be approved as exceptional events by U.S. EPA removed from analysis.

Trends in the annual PM2.5 design values measured in the South Coast Air Basin are shown in Figure 2-10. The annual PM2.5 design value has decreased significantly over the past two decades. Compared with the design value in 2001, the annual PM2.5 design value in 2019 decreased by 54%, from 29.8 µg/m^3 to 13.8 µg/m^3. The Ontario Route-60 Near Road station currently has the highest annual design value. By the end of 2019, the annual PM2.5 design value in the South Coast Air Basin was only1.8 µg/m^3 higher than the 2012 annual PM2.5 federal standard. The 2019 design value is the lowest since measurements began.

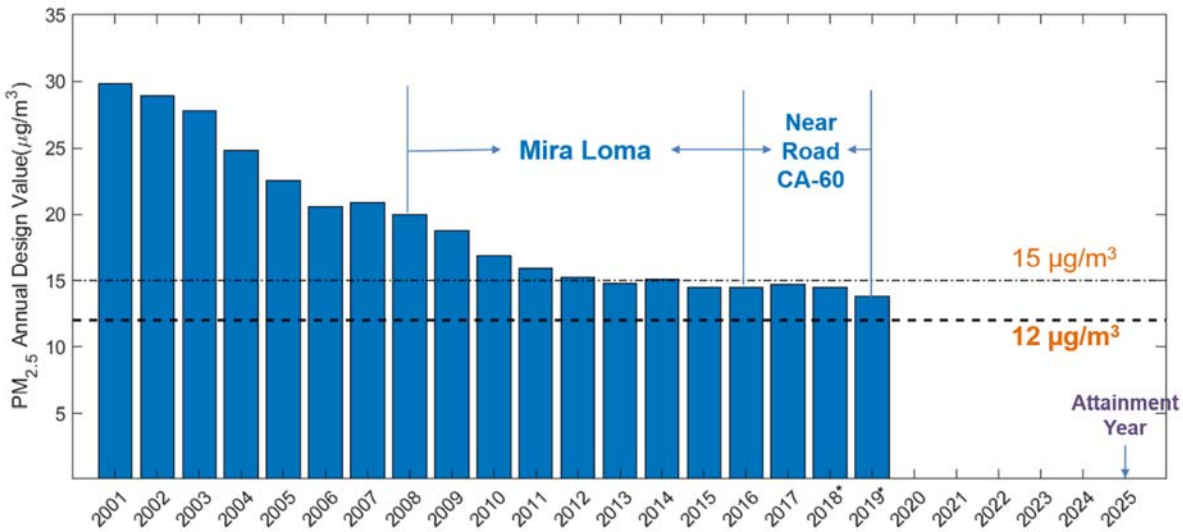

FIGURE 2-10

Annual average PM2.5 design value in the South Coast Air Basin from 2000-2019

* Data likely to be approved as exceptional events by U.S. EPA have been removed from analysis.

Attainment Status (24-hour Standard)

The 2019 PM2.5 24-hour design values are summarized in Table 2-3. Data likely to be approved as exceptional events by U.S. EPA are removed from this analysis. PM2.5 concentrations were highest in South Central LA County and the inland valley areas of metropolitan Riverside County. The highest 2019 PM2.5 24-hour design value of 38 μg/m^3 was measured in the South Central LA County area at the Compton air monitoring station. The next highest 2019 PM2.5 24-hour design value was 37 μg/m^3, measured in the Metropolitan Riverside County area at the Mira Loma air monitoring station. All other 2019 PM2.5 24-hour design values were below the 24-hour NAAQS (35 μg/m^3).

TABLE 2-3

2017–2019 24-hour PM2.5 Design Values by County*

County	2017–2019 PM2.5 24-Hour Design Value (μg/m³)	Percent of Current (2006) PM2.5 NAAQS (35 μg/m³)	Area of Design Value Max
Los Angeles	38	109	South Central LA County
Orange	17**	49	Saddleback Valley
Riverside	37	106	Metropolitan Riverside County 3
San Bernardino	32	91	CA-60 Near Road

*Data likely to be approved as exceptional events by U.S. EPA removed from analysis

**Anaheim in the Central Orange County area does not have a valid design value because measurements do not meet data completeness requirements

2019 PM2.5 24-hour design values measured at all station in the South Coast Air Basin are presented in Figure 2-11. There is no state 24-hour PM2.5 standard. Although the South Coast Air Basin did not attain the 24-hour NAAQS by the 2019 deadline, if the 98th percentile 24-hour PM2.5 of all stations in 2020 are below the 24-hour NAAQS, the South Coast Air Basin will attain the standard by 2020. The 2-year average (2018-2019) of the 98th percentile 24-hour PM2.5 measured at all stations in the South Coast Air Basin are shown in Figure 2-12. As shown in the figure, the 2-year average is below the 24-hour federal standard at all stations. At the two highest stations, Mira Loma and Ontario Route-60 Near Road, if the 2020 98th percentile 24-hour PM2.5 values are below 35.8 $\mu g/m^3$ and 44.0 $\mu g/m^3$, respectively, both stations will have a design value below the 24-hour federal standard in 2020.

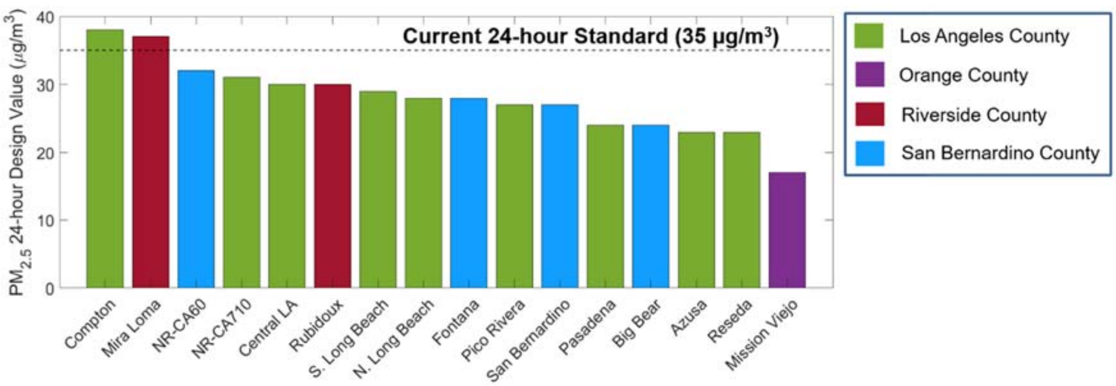

FIGURE 2-11

Three year (2017-2019) 24-Hour PM2.5 Design Values Measured at All Stations in the South Coast Air Basin. Anaheim does not have a valid design value because incomplete data in the 2017 4th quarter. Data likely to be approved as exceptional events by U.S. EPA has been removed from the analysis.

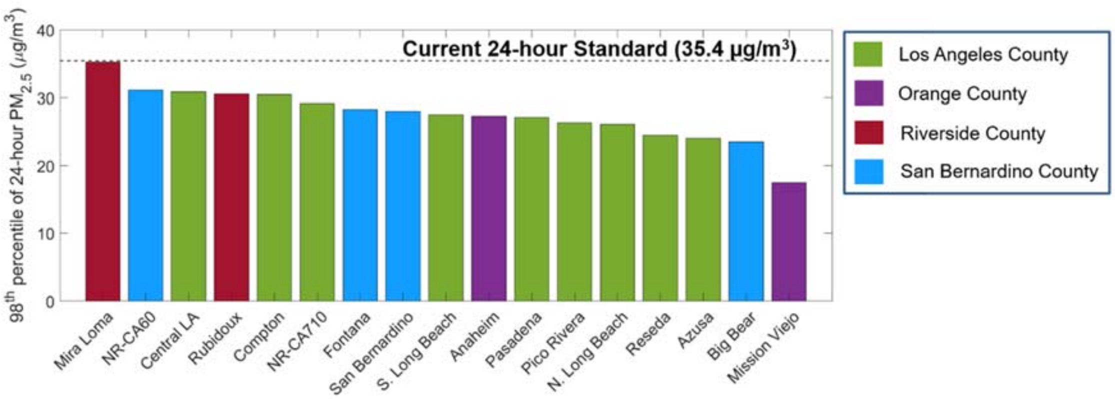

FIGURE 2-12

Two-year average (2018-2019) 98th percentile 24-Hour PM2.5 values at all Stations in the South Coast Air Basin. Data likely to be approved as exceptional events by U.S. EPA has been removed from the analysis.

Attainment Status (Annual Standard)

The 2019 PM2.5 annual federal design values are summarized in Table 2-4. Data likely to be approved as exceptional events by U.S. EPA are removed from this analysis. The highest 2019 PM2.5 federal annual design value of 13.8 μg/m^3 was measured in the Ontario Route-60 Near Road air monitoring station. The next highest 2019 PM2.5 federal annual design value was 13.4 μg/m^3, measured in the Metropolitan Riverside County area at the Mira Loma air monitoring station.

TABLE 2-4

2017–2019 Annual Federal Design Values by County*

County	2017–2019 PM2.5 Annual Design Value (μg/m³)	Percent of Current (2012) PM2.5 NAAQS (12.0 μg/m³)	Area of Design Value Max
Los Angeles	12.4	103	South Central LA County
Orange	7.9**	66	Saddleback Valley
Riverside	13.4	112	Metropolitan Riverside County
San Bernardino	13.8	115	CA-60 Near Road

*Data likely to be approved as exceptional events by U.S. EPA removed from analysis

**Anaheim in the Central Orange County area does not have a valid design value because measurements do not meet data completeness requirements

The 2019 PM2.5 annual state designation values are summarized in Table 2-5. The 2019 PM2.5 annual state designation values measured in Los Angeles, Riverside, and San Bernardino Counties exceed the state standard of 12 µg/m^3. The highest 2019 PM2.5 state annual designation value of 17 µg/m^3 was measured in the West San Fernando Valley area at the Reseda air monitoring station. State Designation Values are based on the maximum annual average recorded in a three-year period, and therefore, they are less responsive to year-to-year changes in concentrations. Exceptional events were not removed when calculating these state designation values, which explains why the highest annual average was recorded in the West San Fernando Valley—a location where wildfire smoke is common in the summer and fall.

TABLE 2-5

2017–2019 Annual State Designation Values by County

County	2017–2019 PM2.5 Annual State Designation Value (µg/m^3)	Percent of Current PM2.5 CAAQS (12 µg/m^3)	Area of Design Value Max
Los Angeles	17	142	West San Fernando Valley
Orange	12	100	Central Orange County
Riverside	15	125	Metropolitan Riverside County
San Bernardino	16	133	CA-60 Near Road

Figure 2-13 illustrates the spatial trend of the 2019 PM2.5 annual design values at all FRM PM2.5 stations in the South Coast Air Basin. The highest PM2.5 annual averages are in northwestern Riverside County (Mira Loma area), southwestern San Bernardino County (CA-60 Near Road), and the southern portion of Los Angeles County.

2019 PM2.5 annual design values measured at all stations in the South Coast Air Basin are presented in Figure 2-14. As shown in the figure, the 2019 PM2.5 annual design value exceeded the federal standard at four stations (Ontario Route-60 Near Road, Mira Loma, Compton, Long Beach Route-710 Near Road), with design values of 13.8 µg/m^3, 13.4 µg/m^3, 12.4 µg/m^3, and 12.2 µg/m^3, respectively (115, 112, 103, and 102 percent of the annual NAAQS).

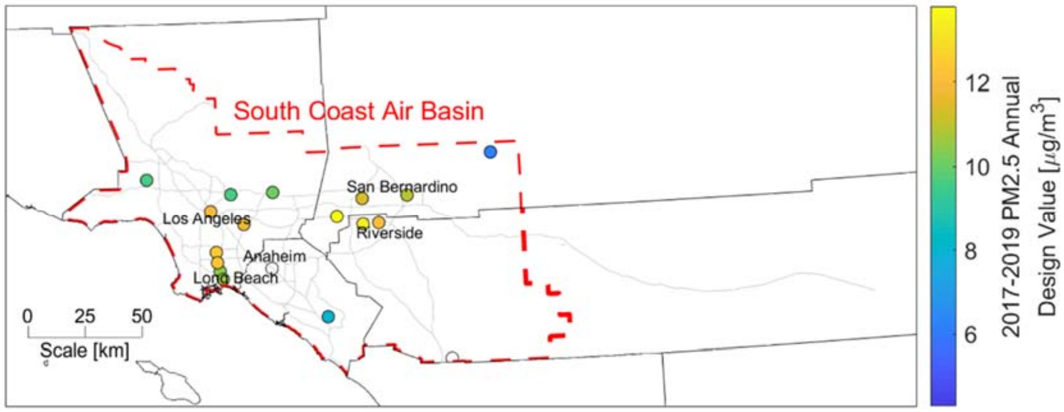

FIGURE 2-13

All FRM PM2.5 Stations in the South Coast Air Basin. The colors of circles represent the 2017-2019 annual PM2.5 design value measured at each station. Anaheim in the Central Orange County area does not have a valid design value because measurements do not meet data completeness requirements. Data likely to be approved as exceptional events by U.S. EPA has been removed from analysis.

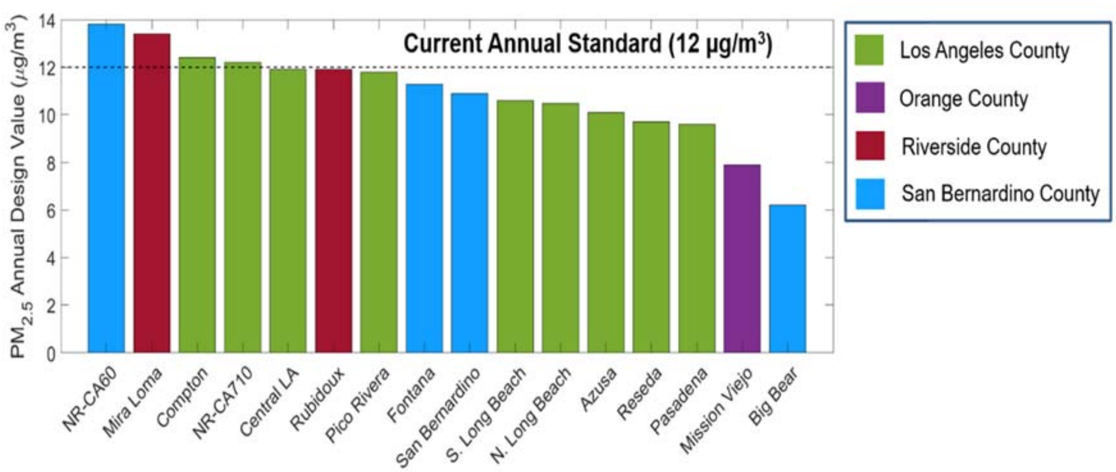

FIGURE 2-14

2017-2019 Annual PM2.5 Design Values Measured at All Stations in the South Coast Air Basin. Anaheim in the Central Orange County area does not have a valid design value because measurements do not meet data completeness requirements. Data likely to be approved as exceptional events by U.S. EPA has been removed from analysis.

The number of days when the 24-hour PM2.5 exceed the 24-hour federal PM2.5 standard (35.4 µg/m^3) in each month of 2019 at each FRM PM2.5 station in the South Coast Air Basin are presented in Figure 2-15. With the exception of the fourth and fifth of July, which are influenced by Independence Day fireworks, all exceedances occur in the months of November through January. Exceedances in the winter months are predominantly caused by cold and humid weather conditions that favor the formation of secondary inorganic aerosols and residential wood smoke. Exceedances caused by Independence Day fireworks are considered to be exceptional events; these exceedances will not be considered when determining attainment status upon U.S. EPA approval of a successful exceptional event demonstration.

Wood burning and unfavorable meteorology (Jan) — July 4th and 5th Fireworks (Jul) — Wood burning & unfavorable meteorology (Nov–Dec)

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mira Loma (Van Buren)	2	0	0	0	0	0	1	0	0	0	6	1
Ontario-Route 60 Near Road	1	0	0	0	0	0	1	0	0	0	4	0
Rubidoux	1	0	0	0	0	0	1	0	0	0	3	0
Fontana	1	0	0	0	0	0	1	0	0	0	1	0
Anaheim	0	0	0	0	0	0	1	0	0	0	3	0
Azusa	0	0	0	0	0	0	1	0	0	0	0	0
Pasadena	0	0	0	0	0	0	1	0	0	0	0	0
Pico Rivera #2	0	0	0	0	0	0	1	0	0	0	0	0
San Bernardino	0	0	0	0	0	0	1	0	0	0	0	0
Compton	0	0	0	0	0	0	0	0	0	0	1	0
Long Beach-Route 710 Near Road	0	0	0	0	0	0	0	0	0	0	1	0
Los Angeles-North Main Street	0	0	0	0	0	0	0	0	0	0	1	0
Big Bear	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach (North)	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach (South)	0	0	0	0	0	0	0	0	0	0	0	0
Mission Viejo	0	0	0	0	0	0	0	0	0	0	0	0
Reseda	0	0	0	0	0	0	0	0	0	0	0	0

FIGURE 2-15

Number of Days the 24-Hour PM2.5 Exceeded the 24-Hour Federal PM2.5 Standard (35.4 µg/m^3) in Each Month at Each FRM PM2.5 Station in the South Coast Air Basin in 2019. The red boxes are exceptional events that are likely to be approved by U.S. EPA.

Summary

While the Basin has not yet attained the latest 24-hour and annual federal PM2.5 standards, PM2.5 concentrations have declined considerably since monitoring began in the early 2000s. PM2.5 concentrations in recent years have been approaching federal standards with the lowest annual average PM2.5 value recorded in 2019. In addition, the two-year average (2018-2019) of the 98th percentile daily value is below the standard at all stations in the Basin, making attainment of the 24-hour standard by the end of 2020 a distinct possibility. Attainment of 24-hour standard and the annual standard to a lesser extent, depends significantly on weather, especially humid and cold conditions that favor the formation of secondary PM2.5 and the frequency of storms during the winter months.

3. BASE-YEAR AND FUTURE EMISSIONS

Introduction

This chapter summarizes the PM2.5 and PM2.5 precursor emissions in the South Coast Air Basin for the 2018 baseline year as well as the projected emissions for the year 2023. The 2018 base year emissions inventory reflects actual point source emissions and estimated emissions for other categories subject to adopted regulations with current compliance dates as of 2018, whereas the 2023 future baseline emissions inventory is based on economic projections and adopted regulations for all categories with both current and future compliance dates. The annual average emissions inventory is used to perform PM2.5 modeling and to report emission reduction progress as required by the federal CAA.

Emission Inventory Methodology

Emissions in the inventory can be grouped into four categories: point, area, on-road mobile and off-road mobile sources. Emissions from each category are estimated using specific methodologies described briefly in the next sections. The methodologies used in this Plan are consistent with those used in the 2016 AQMP with updates where applicable. While more detailed information regarding the emissions inventory development for the base and future years is available in Chapter 3 and Appendix 3 of the 2016 AQMP[14], a brief description for the four groups of emissions is provided below. Three main changes to the emissions inventory introduced in this Plan compared to the 2016 AQMP are: 1) point source emissions for the baseline year of 2018 are based on the reported actual emissions obtained from South Coast AQMD's Annual Emissions Reporting (AER) program, 2) on-road vehicle emissions are estimated using the EMFAC2017 model, which is an upgrade of the EMFAC2014 model used in the 2016 AQMP, and 3) updates in ocean-going vessel (OGV) emissions that account for growth rates for containerships, the delayed introduction of Tier 3 engines in California waters and other activity data for the ports.

Point Sources

Point sources generally correspond to permitted facilities with one or more emission sources at an identified location (e.g., power plants, refineries). The larger point source facilities with annual emissions of 4 tons or more of either Volatile Organic Compounds (VOC), Nitrogen Oxide (NOx), Sulfur Oxide (SOx), or total Particulate Matter (PM), or annual emissions of over 100 tons of Carbon Monoxide (CO) are required to report their criteria pollutant emissions and selected air toxics pursuant to Rule 301 through the Annual Emission Reporting (AER) Program. These facilities need to report emissions on an annual basis and are subject to emission audits. This Plan uses the 2018 annual reported emissions for the 2018 baseline, as opposed to the projected emissions from 2012 that were used in the 2016 AQMP.

[14] South Coast AQMD (2017), 2016 Air Quality Management Plan, Appendix III, Base and future year emission inventory. Available at:http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-iii.pdf?sfvrsn=6

Area Sources

Area sources consist of many small emission sources (e.g., residential water heaters, architectural coatings, consumer products and permitted sources that are smaller than the above thresholds) which are distributed across the region and are not required to individually report their annual emissions. There are about 400 area source categories for which emission estimates are jointly developed by CARB and the South Coast AQMD. The emissions from these sources are estimated using specific activity information and emission factors. Activity data are usually obtained from survey data or scientific reports (e.g., Energy Information Administration (EIA) reports for fuel consumption other than natural gas, Southern California Gas Company for natural gas consumption, paint suppliers under Rule 314 and South Coast AQMD databases). Emission factors are based on rule compliance factors, source tests, manufacturer's product or technical specification data, default factors (mostly from the U.S. EPA's AP-42 published emission factor compilations), or weighted emission factors derived from the point source facilities' annual emissions reports. The overall methodology for area sources is described in Appendix III of the 2016 AQMP. The area source emissions in this Plan are the same emissions projected in the 2016 AQMP for 2018 and 2023, using growth and control factors derived from regulatory and socio-economic data.

On-Road Sources

On-road sources include motor vehicles such as passenger cars, buses and trucks that travel on roads, streets, and highways. Emissions from on-road sources are calculated using travel activity and vehicle-specific emission factors that depend on temperature and relative humidity. This Plan uses the same travel activity data from SCAG's 2016 RTP/SCS[15] that was used in the 2016 AQMP, but on-road emission factors are updated based on CARB's EMFAC 2017 model, which is an update to the EMFAC 2014 model that was used in the 2016 AQMP. In addition, the Emission Spatial and Temporal Allocator (ESTA, https://github.com/mmb-carb/ESTA) tool developed by CARB is used to distribute the emissions spatially and temporally to generate inputs to the air quality model used in the attainment demonstration air quality simulations. CARB's EMFAC 2017 model has undergone revisions from the previous version (EMFAC 2014) which include changes in emission rates for light-, medium- and heavy-duty vehicles. More detailed information on the changes incorporated in EMFAC 2017 can be found at CARB's website.[16]

Figure 3.1 compares the on-road emissions estimated using EMFAC 2014 in the 2016 AQMP and EMFAC 2017 used in the in this Plan for milestone years 2018 and 2023. In general, EMFAC 2017 tends to estimate lower VOC emissions, compared to EMFAC 2014. NOx emissions in 2018 are comparable between the two EMFAC versions. However, future NOx emissions estimated

[15] SCAG 2016, The 2016-2040 Regional Transportation Plan/sustainable Communities Strategy: A Plan for Mobility, Accessibility, Sustainability and a High Quality of Life. Available at http://scagrtpscs.net/SiteAssets/ExecutiveSummary/index.html

[16] https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-modeling-tools-emfac

with EMFAC2017 are higher than NOx emissions estimated with EMFAC2014. In addition, the differences in NOx estimates tend to increase in future years, compared to estimates projected by EMFAC 2014. The main contributor to higher future NOx emissions estimated by EMFAC 2017 is the higher in-use NOx emission rates from medium- and heavy-duty vehicle model years of 2010 and newer. Also, light-duty vehicles have lower running exhaust emissions, but have higher start emissions in the newer version of EMFAC.

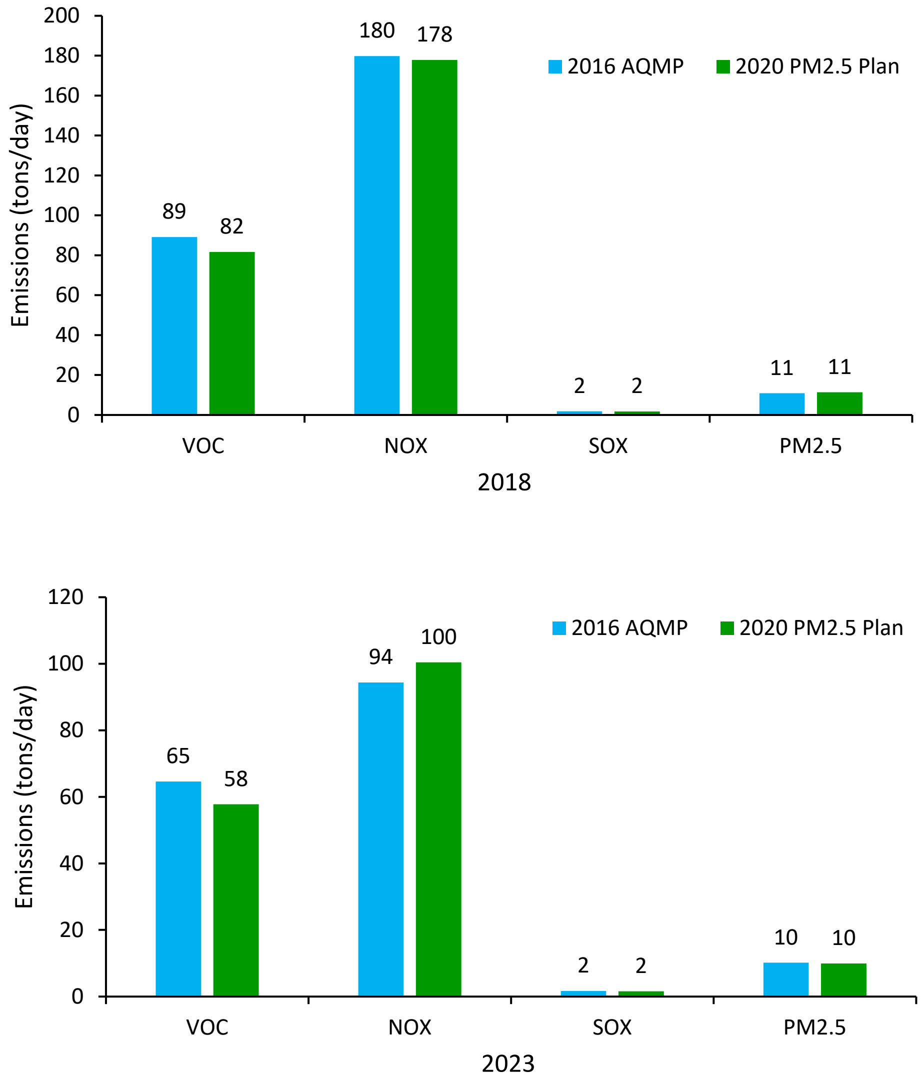

FIGURE 3-1

Comparison of On-Road Annual Average Emissions Estimated Using EMFAC 2014 in 2016 AQMP and EMFAC 2017 in Current Plan

Off-Road Sources

Mobile sources not included in the on-road mobile source emissions inventory are classified as off-road mobile sources. CARB uses several models to estimate emissions for more than 100 off-road equipment categories of different fuel types, engine sizes, and engine types. The models account for the effects of various adopted regulations, technology types, and seasonal effects on emissions. The models combine equipment population, equipment activity, horsepower, load factors, population growth, survival rates, and emission factors to yield the annual emissions by county, air basin, or statewide. Temporal usage profiles are used to develop seasonal emission estimates that are then spatially allocated to or within the county or air basin using surrogates such as population[17]. The off-road inventory for this Plan was primarily based on the 2016 AQMP inventory, which used a suite of category-specific models, with the exception of OGVs.

The only adjustment in the off-road emissions inventory since the adoption of the 2016 AQMP is for the OGV category to account for growth rates for containerships, the delayed introduction of Tier 3 engines in California waters and other activity data in ports. The OGV emissions in the 2016 AQMP had anticipated a faster turnover to cleaner vessels (i.e., vessels meeting International Maritime Organizations' Tier 3 engine standards). However, the updated OGV inventory shows NOx emissions increasing with time reflecting delayed turnover to cleaner vessels in the near future, while PM2.5 emissions decrease due to the impact of existing regulations. See CARB 2018 Updates to the California State Implementation Plan[18] for further details.

Base Year (2018) Emission Inventory

Table 3-1 shows the 2018 annual average emissions inventory for the South Coast Air Basin by major source category. Figure 3-2 characterizes relative contributions by stationary and mobile source categories. On- and off-road sources continue to be major contributors for each of the five pollutants. Overall, total mobile source emissions account for 44 percent of the VOC and 84 percent of the NOx emissions. The on-road mobile category alone contributes 22 percent of the VOC and 48 percent of the NOx emissions. For primary PM2.5, mobile sources represent 28 percent of the emissions with another 14 percent due to vehicle-related entrained road dust. Stationary sources account for 72% of the total directly emitted PM2.5. Paved and unpaved road dust account for 18 percent of PM2.5 emissions in the stationary source category. Under the stationary source category, commercial cooking is the predominant source of directly emitted PM2.5 emissions (26 percent). Stationary sources emit most of the SOx emissions with the point and area source categories contributing 50 percent and 8 percent of the SOx emissions in the Basin, respectively. Area sources play a major role in VOC emissions, emitting 50 percent of total emissions, with consumer products being the single largest VOC emitting source category.

[17] More information about off-road models can be found at http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles
[18] CARB 2018 Updates to the California State Implementation Plan, Available at https://ww3.arb.ca.gov/planning/sip/2018sipupdate/2018update.pdf

Figure 3-3 shows the fraction of the 2018 inventory by responsible agency for VOC, NOx, SOx, directly emitted PM2.5 and NH3. The U.S. EPA and CARB have primary authority to regulate emissions from mobile sources. The U.S. EPA's authority primarily applies to aircraft, locomotives, ocean going vessels (OGVs), and some categories of on- and off-road mobile equipment. CARB also has authority over on-road categories and some off-road mobile and area source categories including OGV and consumer products, while the South Coast AQMD has direct authority over all point sources and most area sources, with limited authority over mobile sources. As shown in Figure 3-3, most of the NOx and VOC emissions in the Basin are from sources that fall under the primary jurisdiction of the U.S. EPA and CARB. For example, the U.S. EPA and CARB have direct control over 85 percent and over 70 percent of the Basin's total NOx and VOC emissions, respectively. Conversely, 58 percent of the SOx emissions, 72 percent of the directly emitted PM2.5 emissions and 79 percent of the ammonia emissions are from sources under South Coast AQMD's authority. NOx and VOC are important precursors to form ozone and PM2.5, and SOx and NH3 along with directly emitted PM2.5, contribute to the region's PM2.5 air quality. This illustrates that actions at the federal, state, and local levels are all needed to ensure the region attains the federal ambient air quality standards.

TABLE 3-1

Summary of Emissions by Major Source Category in the South Coast Air Basin: 2018 Base Year Average Annual Day (tpd[1])

SOURCE CATEGORY	Annual Average					
	VOC	NOx	CO	SOx	PM2.5	NH3
STATIONARY SOURCES						
Fuel Combustion	10.4	23.2	40.4	1.3	4.8	7.6
Waste Disposal	13.9	1.4	0.7	0.4	0.3	5.5
Cleaning and Surface Coatings	37.3	0.0	0.1	0.0	1.6	0.2
Petroleum Production and Marketing	21.0	0.3	2.7	0.3	0.9	0.1
Industrial Processes	10.3	0.1	0.8	0.1	6.7	9.4
Solvent Evaporation:						
Consumer Products	87.6	0.0	0.0	0.0	0.0	0.0
Architectural Coatings	11.5	0.0	0.0	0.0	0.0	0.0
Others	2.3	0.0	0.0	0.0	0.0	1.2
Misc. Processes	12.5	14.8	56.1	0.5	30.5	34.6
Residential Fuel Combustion	8.4	14.6	46.8	0.5	6.6	0.1
Paved Road Dusts	0.0	0.0	0.0	0.0	8.1	0.0
Cooking	1.9	0.0	0.0	0.0	11.5	0.0
Others	2.1	0.3	9.3	0.0	4.3	34.5
RECLAIM SOURCES	0.0	17.8	0.0	5.5	0.0	0.0
Total Stationary Sources	**206.8**	**57.7**	**100.7**	**8.2**	**44.8**	**58.6**
MOBILE SOURCES						
On-Road Vehicles	81.6	177.9	760.3	1.7	11.4	14.2
Off-Road Vehicles	80.8	134.9	691.3	4.1	6.3	0.2
Total Mobile Sources	**162.4**	**312.8**	**1,451.6**	**5.8**	**17.6**	**14.4**
TOTAL	**369.2**	**370.5**	**1,552.3**	**14.0**	**62.4**	**72.9**

[1] Values may not sum due to rounding errors

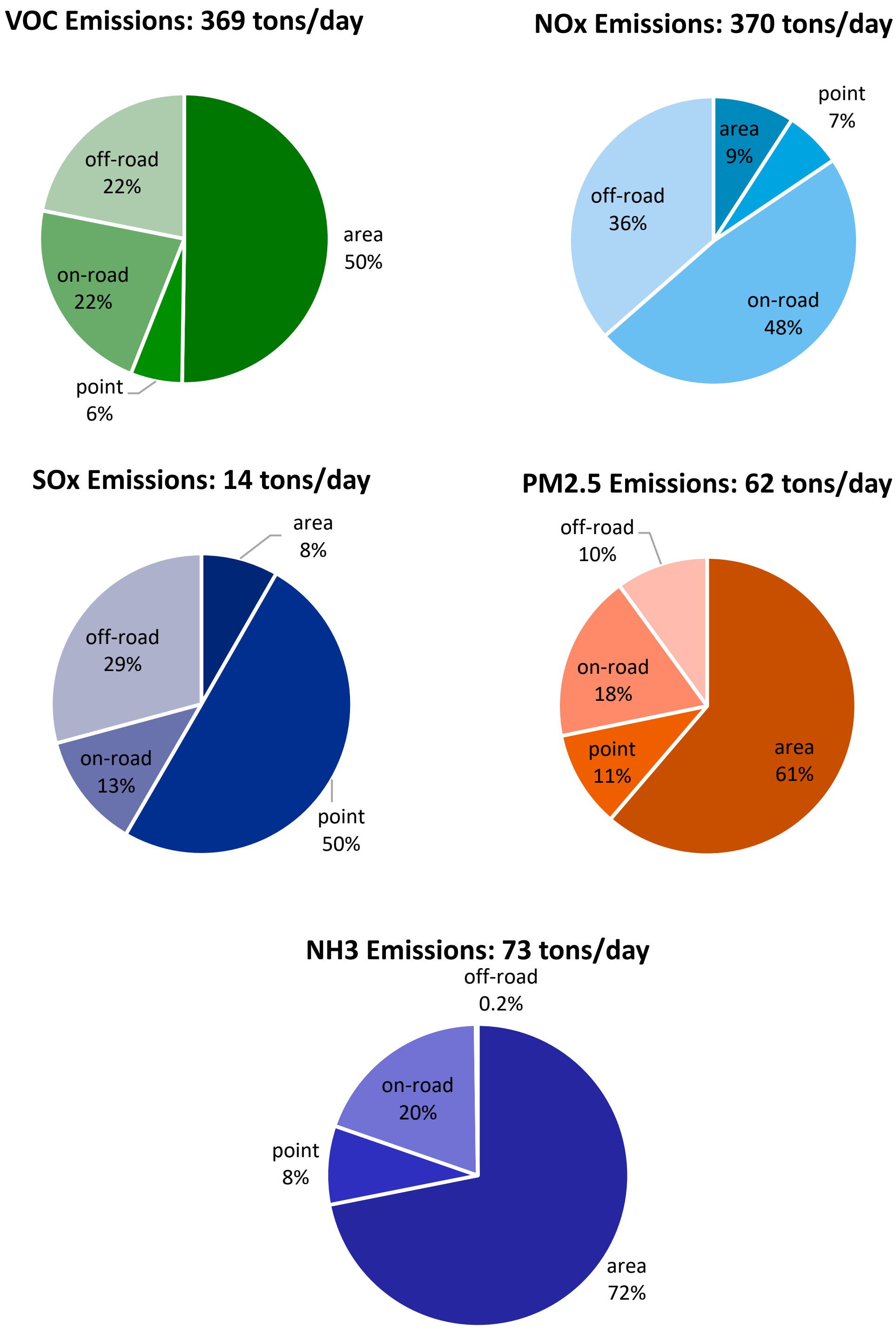

FIGURE 3-2

Relative Contribution by Source Category to 2018 Emission Inventory.

*Values are rounded to nearest integer and may not sum due to rounding

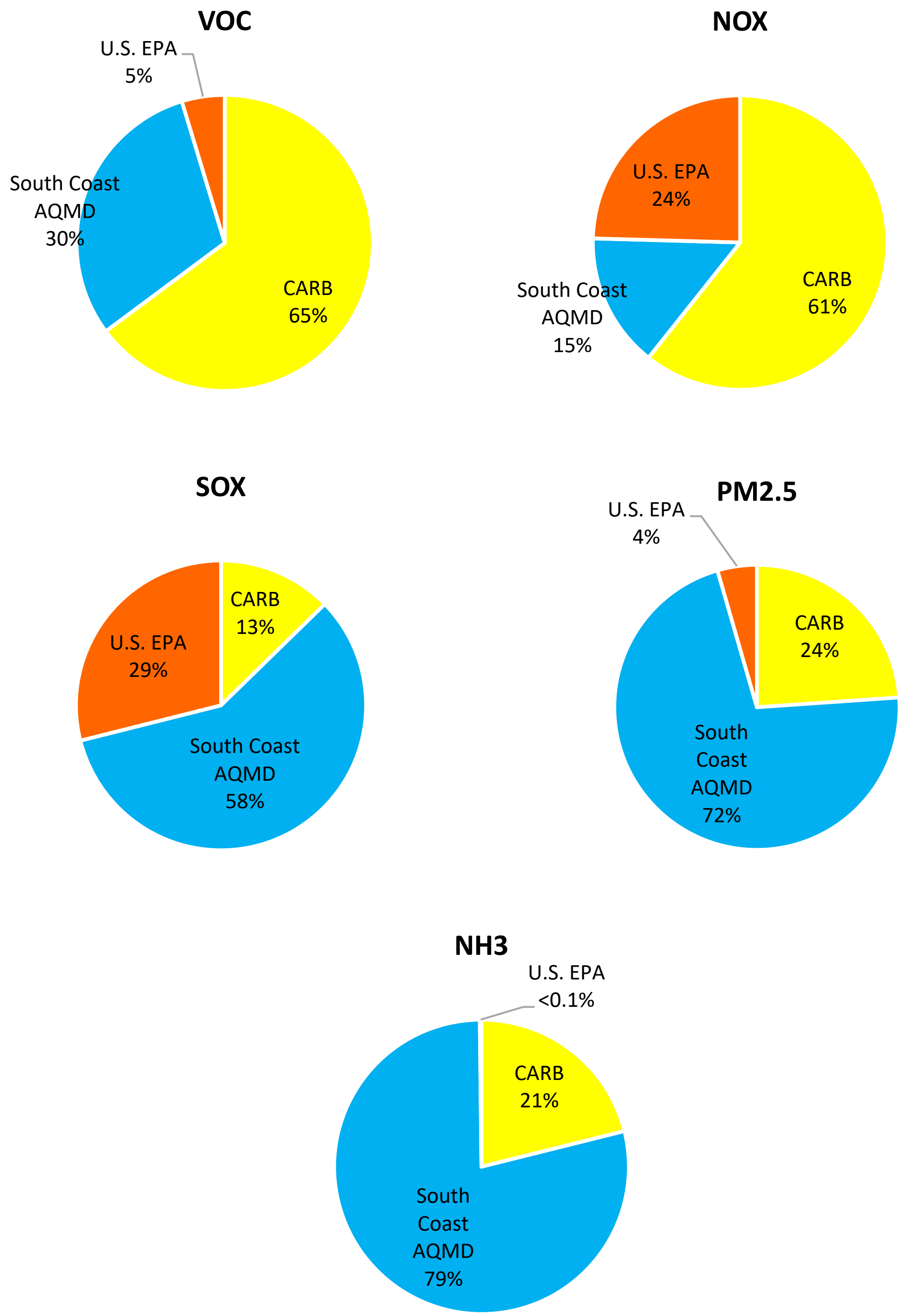

FIGURE 3-3

2018 Annual Emission Inventory Agency Primary Responsibility

*Values are rounded to nearest integer and may not sum due to rounding.

Future Emissions

Stationary and off-road mobile sources, except for OGV, in the 2023 future emissions inventory in this Plan were projected using growth and control factors developed for the 2016 AQMP, while OGV emissions were projected using later estimates from the 2018 updates to the California SIP Plan[19] to reflect a slower turnover to cleaner vessels. On-road mobile source emissions were projected using EMFAC 2017 emission factors applied to the 2023 vehicle activity projected in SCAG's 2016 RTP.

Future-year stationary source emissions are divided into RECLAIM and non-RECLAIM point source emissions and area sources. RECLAIM stands for REgional CLean Air Incentives Market is the world's first comprehensive market program to reduce NOx and SOx emissions using a cap-and-trade approach. Future NOx and SOx emissions from RECLAIM point sources are estimated based on their allocations as specified by South Coast AQMD Rule 2002 –Allocations for NOx and SOx. The forecasts for area source emissions were derived for the 2016 AQMP using: (1) emissions from the 2012 base year, (2) expected controls based on implementation of South Coast AQMD's rules as reflected in the 2016 AQMP, and (3) activity growth in various source categories between the base and future years. Chapter 3 and Appendix III of the 2016 AQMP provide more information on how the emissions were projected. Non-RECLAIM point sources were derived similarly to area sources, but projections were based on reported 2018 emissions.

The 2023 projected emissions reflect already adopted rules and regulations implemented up to and including 2023. Tables 3-2 presents the annual average emissions for 2023. Emissions inventories for the attainment year and the Reasonable Further Progress (RFP) milestone years (2020 and 2026) as well as the base year can be found in Appendix I.

For mobile sources, NOx emissions are expected to decrease due to existing regulations such as engine standards for new and existing on-road and off-road mobile sources and in-use fleet requirements. Emissions from on-road mobile sources are projected to decline for all pollutants from 2018 to 2023. Off-road emissions are also expected to decline, except for CO and SOx. Emissions from stationary sources, except for NOx and NH3, are expected to increase due to an increase in population and economic activity. Figure 3-4 illustrates the relative contribution to the 2023 inventory by source category. A comparison of Figures 3-2 and 3-4 indicates that the mobile category continues to be the largest contributor to NOx emissions. Figure 3-5 compares the annual average emissions of VOC and NOx between 2018 and 2023 for the four major categories. PM2.5 emissions are dominated by area sources with cooking, demolition, and road dust categories as main contributors. Because of the growth in population, economic activity and vehicle miles travelled (VMT), and existing regulations, the area source contribution to PM2.5 is projected to increase from 61 percent in 2018 to 64 percent in 2023. Emissions from paved road dust are

[19] CARB 2018 Updates to the California State Implementation Plan, Available at https://ww3.arb.ca.gov/planning/sip/2018sipupdate/2018update.pdf

proportional to VMT and they are categorized as area sources, and not as an on-road mobile source. Point sources are the major contributor to SOx; 50 percent in 2018 and 51 percent in 2023 followed by aircraft and ocean-going vessels which are the second and third largest SOx emitters. Finally, emissions of NH3 are expected to decline slightly, due to decreases in on-road mobile and area sources.

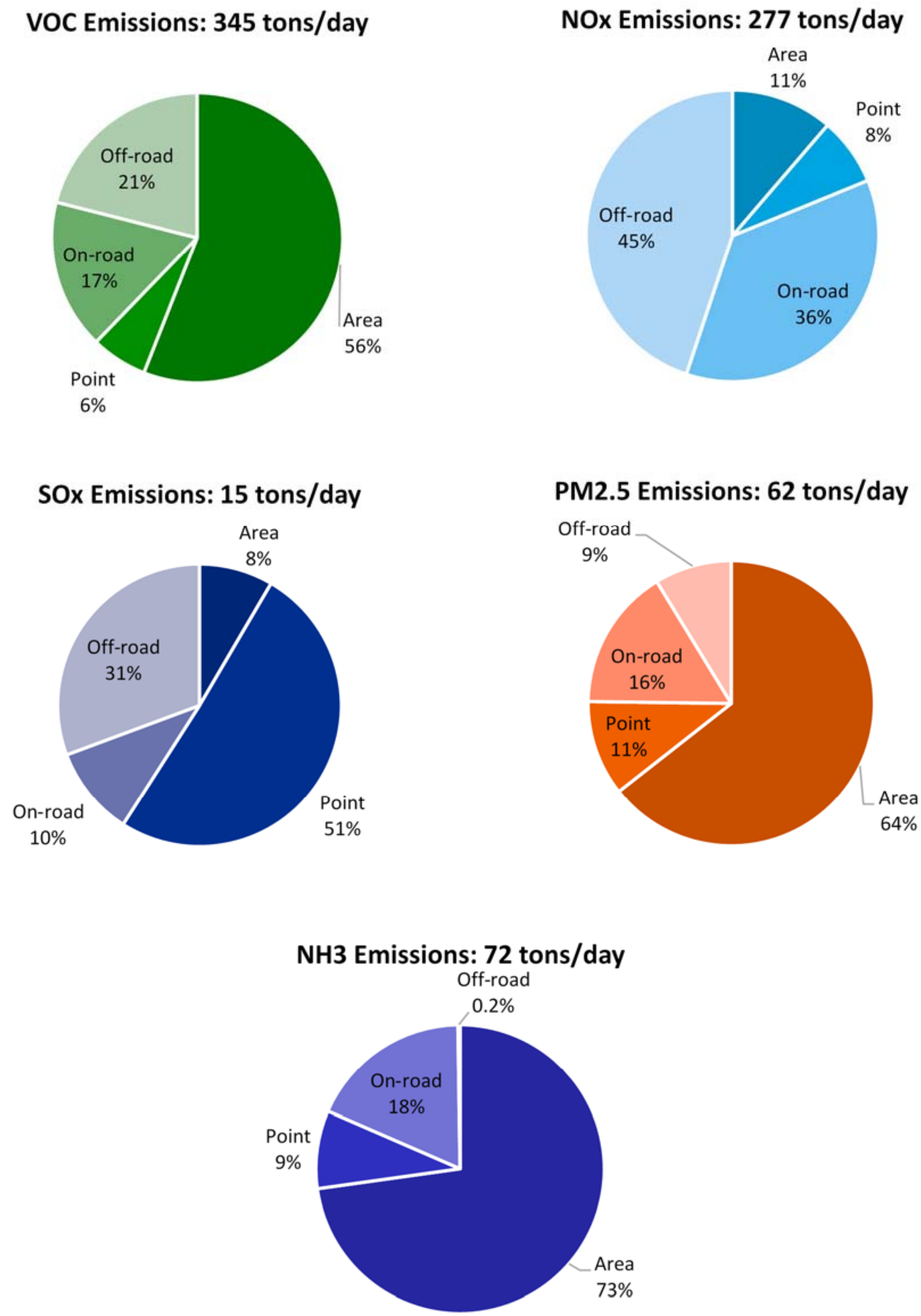

FIGURE 3-4

Relative Contribution by Source Category to 2023 Annual Emission Inventory

*Values are rounded to nearest integer and may not sum due to rounding.

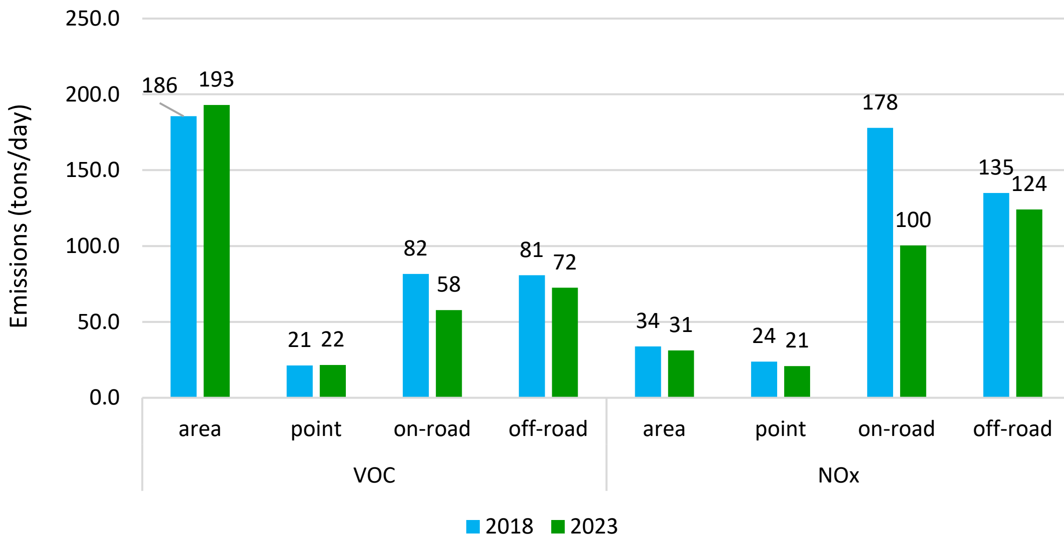

FIGURE 3-5

Comparison of NOx and VOC Annual Average Emission Inventory in Year 2018 and 2023 By Major Source Category

TABLE 3-2

Summary of Emissions By Major Source Category: 2023 Baseline Average Annual Day (tpd[1])

SOURCE CATEGORY	Annual Average					
	VOC	NOx	CO	SOx	PM2.5	NH3
STATIONARY SOURCES						
Fuel Combustion	10.3	22.4	40.6	1.5	4.9	7.5
Waste Disposal	15.1	1.5	0.7	0.5	0.3	5.8
Cleaning and Surface Coatings	41.4	0.0	0.1	0.0	1.7	0.2
Petroleum Production and Marketing	19.8	0.3	2.7	0.3	0.9	0.1
Industrial Processes	10.9	0.1	0.8	0.1	7.1	9.4
Solvent Evaporation:						
Consumer Products	90.1	0.0	0.0	0.0	0.0	0.0
Architectural Coatings	12.0	0.0	0.0	0.0	0.0	0.0
Others	2.5	0.0	0.0	0.0	0.0	1.1
Misc. Processes	12.4	13.2	55.7	0.5	31.7	34.3
Residential Fuel Combustion	8.4	12.9	46.4	0.5	6.5	0.1
Paved Road Dust	0.0	0.0	0.0	0.0	8.5	0.0
Cooking	2.0	0.0	0.0	0.0	12.1	0.0
Others	2.0	0.3	9.3	0.1	4.5	34.2
RECLAIM SOURCES[2]	0.0	14.5	0.0	6.1	0.0	0.0
Total Stationary Sources	**214.5**	**52.0**	**100.6**	**9.0**	**46.5**	**58.4**
MOBILE SOURCES						
On-Road Vehicles	57.8	100.4	535.6	1.6	9.9	13.1
Off-Road Vehicles	72.5	124.2	720.0	4.7	5.4	0.2
Total Mobile Sources	**130.3**	**224.6**	**1,255.5**	**6.2**	**15.3**	**13.2**
TOTAL	**344.8**	**276.6**	**1,356.2**	**15.2**	**61.8**	**71.6**

[1] Values are rounded to nearest integer and may not sum due to rounding

[2] Includes 2015 RECLAIM NOx shaves

Top Ten Source Categories (2018 and 2023)

The top ten sources of criteria pollutants in the annual inventories for 2018 and 2023 are briefly discussed in this section. Figures 3-6 and 3-7 provide the top ten categories for VOCs for the years 2018 and 2023, respectively. Consumer products are the largest contributors to VOC emissions, and are expected to continue to grow through 2023 due to the projected growth in population. Other VOC sources from industrial activities, such as coating and degreasing processes, are also expected to increase due to the increased industrial activity. In contrast, on-road emissions from light and medium duty vehicles decline from 2018 to 2023 as a result of existing regulations. Off-road equipment which include commercial/industrial, lawn and garden, construction/mining and various other mobile equipment rank the 2nd highest source of VOCs in 2023. The top 10 categories account for 72 percent of the total VOC inventory in 2018 and 71 percent in 2023.

Figures 3-8 and 3-9 show the top ten categories for NOx emissions for 2018 and 2023, respectively. Mobile source categories remain the predominant contributor to NOx emissions. Heavy-duty diesel trucks, off-road equipment, and ocean-going vessels are the top three emitters on the list for both years. NOx emissions from all top emitters are projected to decline from 2018 to 2023, except for ocean-going vessels and aircraft. The top ten categories account for 76 percent of the total NOx inventory in 2018, and 77 percent in 2023.

Figures 3-10 to 3-11 show the top ten source categories for SOx emissions in the years 2018 and 2023. The main contributors to SOx emissions represent a wide variety of sectors that include RECLAIM facilities, fuel combustion for industrial applications, and on-road and off-road sources. SOx emissions from the off-road mobile category are expected to increase reflecting increased activities at the ports and airports. The top 10 categories represent 90 percent of the SOx emissions in 2018 and 91 percent in 2023.

Figures 3-12 and 3-13 show the top ten source categories for primary PM2.5 in 2018 and 2023, respectively. Commercial and industrial cooking and paved road dust are the largest contributors to PM2.5 emissions and are expected to increase slightly between 2018 and 2023, due to increased population and traffic activity. The top ten categories represent 72 percent of the total primary PM2.5 inventory in 2018 and 74 percent in 2023.

Figures 3-14 and 3-15 show the top ten source categories for ammonia (NH3) in 2018 and 2023, respectively. Miscellaneous processes, which include human perspiration and respiration, human and pet waste, household ammonia use, cigarette smoke and domestic fertilizer use, are the largest contributor to total ammonia emissions. Other industrial and farming activities, and on-road sources also contribute to total NH3 emissions. The top ten categories represent 92 percent of the total ammonia inventory in 2018 and 91 percent in 2023.

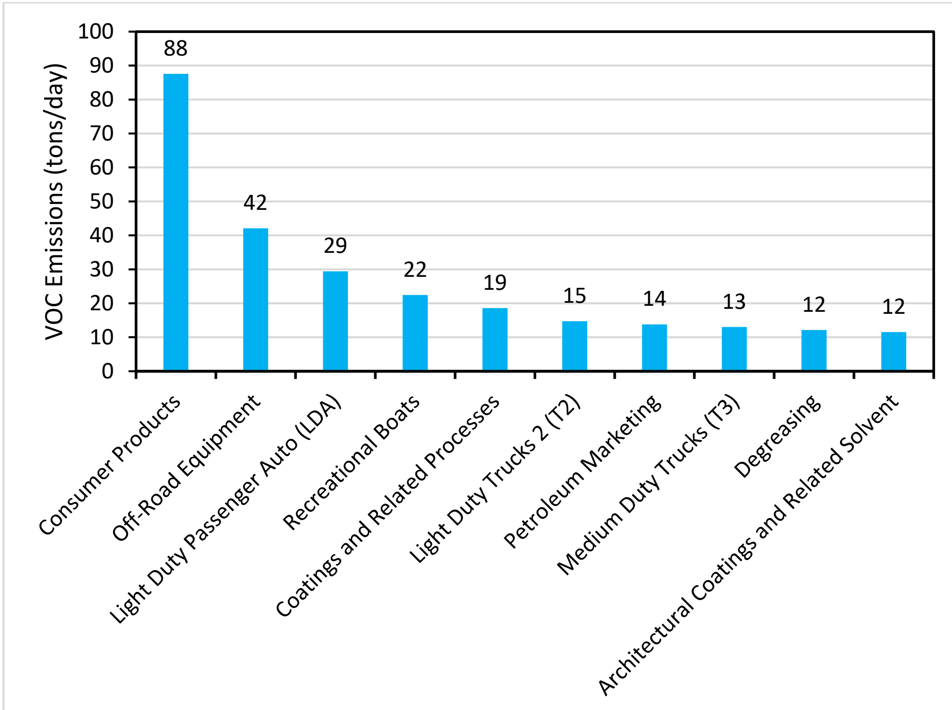

FIGURE 3-6

Top Ten Emitter Categories for VOC in 2018 (Annual Average)

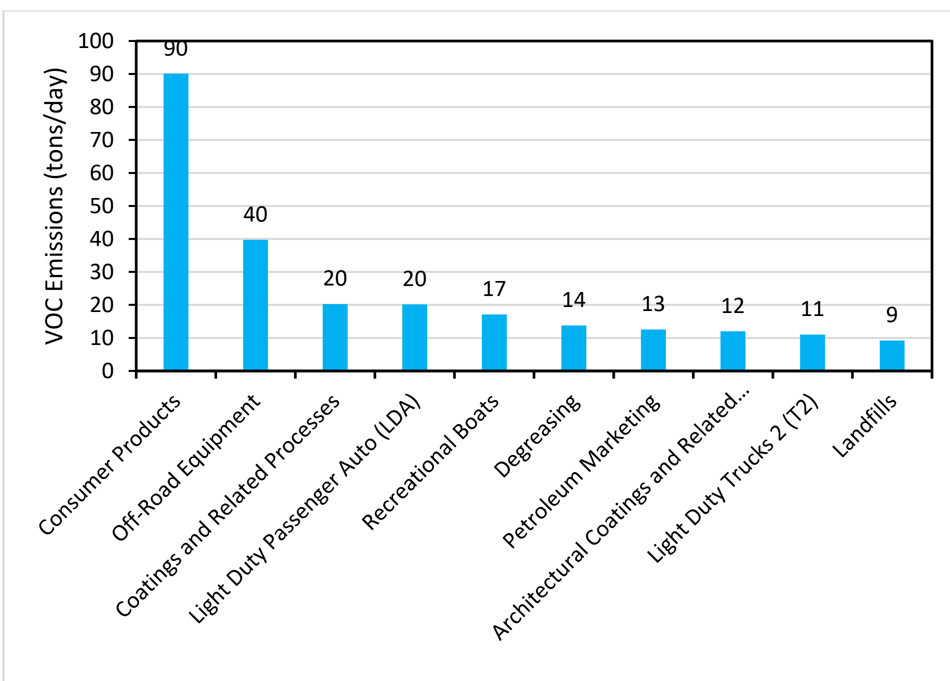

FIGURE 3-7

Top Ten Emitter Categories for VOC in 2023 (Annual Average)

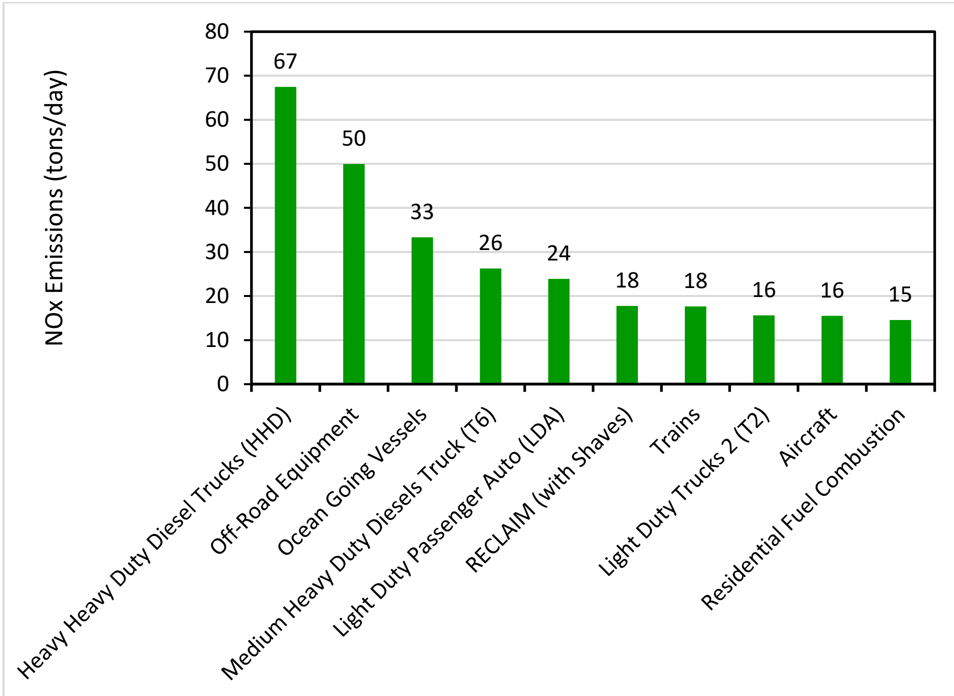

FIGURE 3-8

Top Ten Emitter Categories for NOx in 2018 (Annual Average)

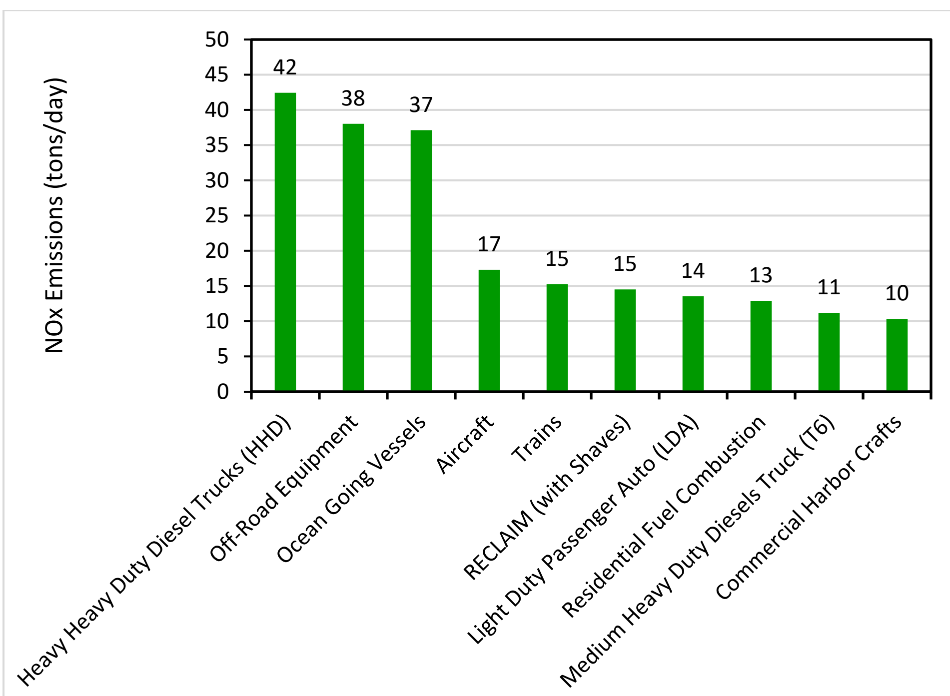

FIGURE 3-9

Top Ten Emitter Categories for NOx in 2023 (Annual Average)

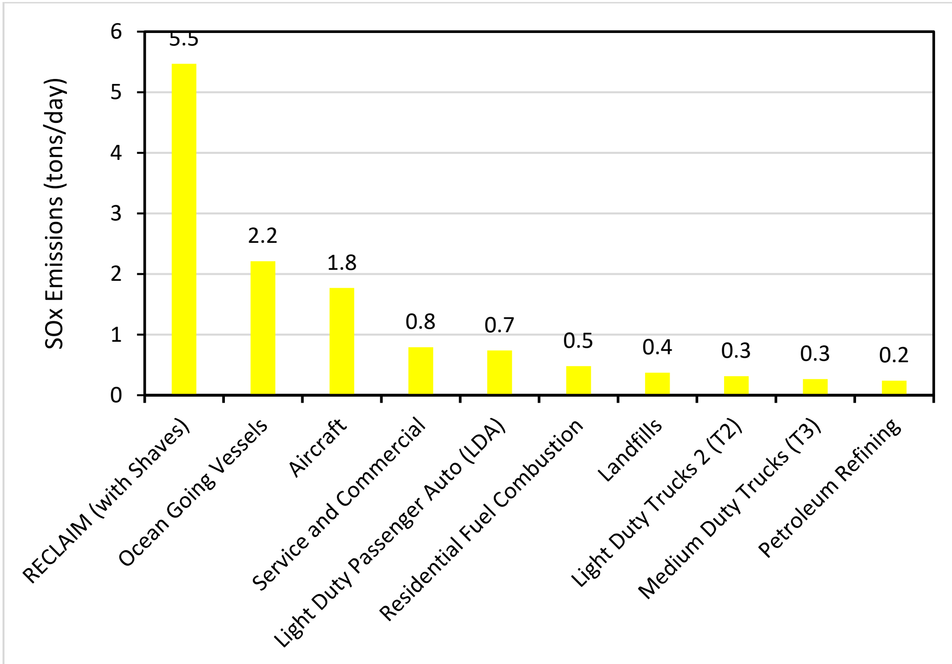

FIGURE 3-10

Top Emitter Categories for SOx in 2018 (Annual Average)

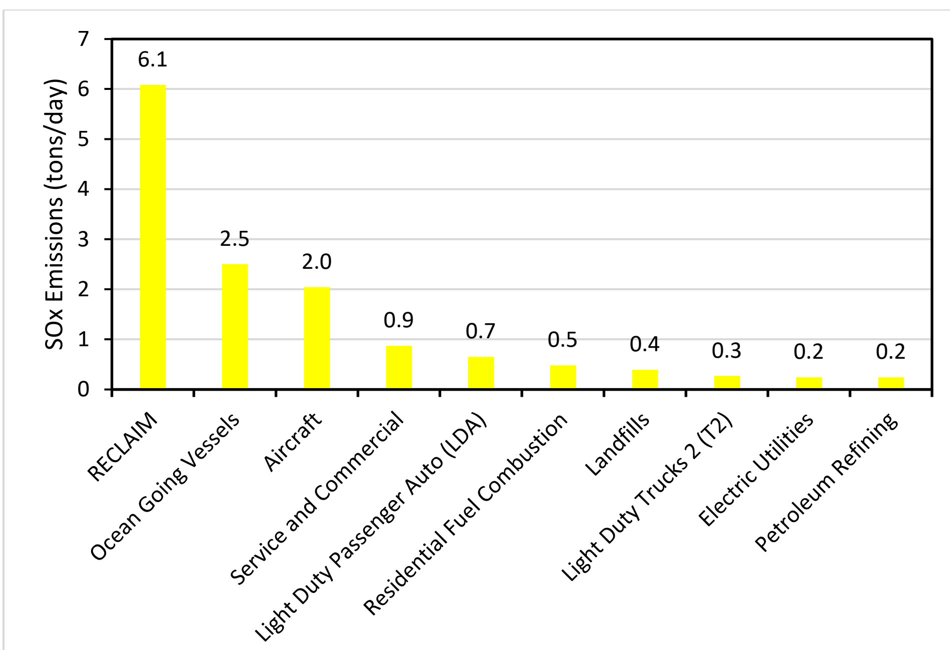

FIGURE 3-11

Top Emitter Categories for SOx in 2023 (Annual Average)

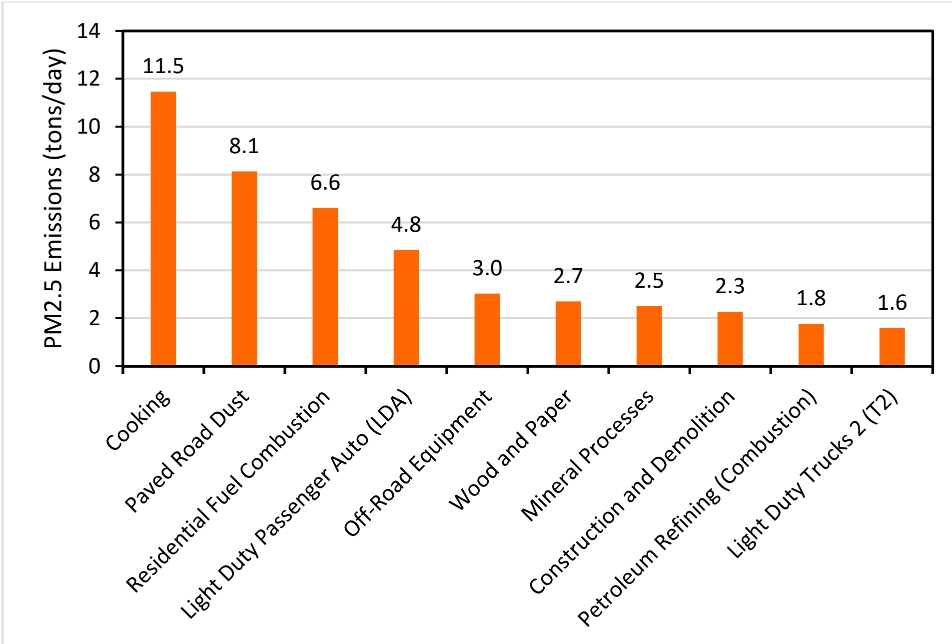

FIGURE 3-12

Top Ten Emitter Categories for Directly Emitted PM2.5 in 2018 (Annual Average)

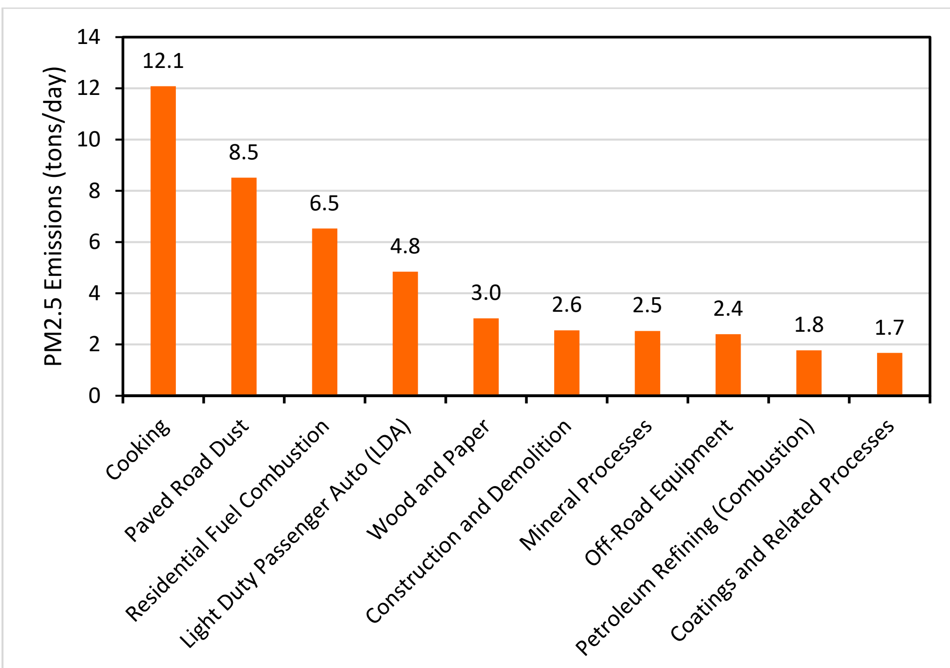

FIGURE 3-13

Top Ten Emitter Categories for Directly Emitted PM2.5 in 2023 (Annual Average)

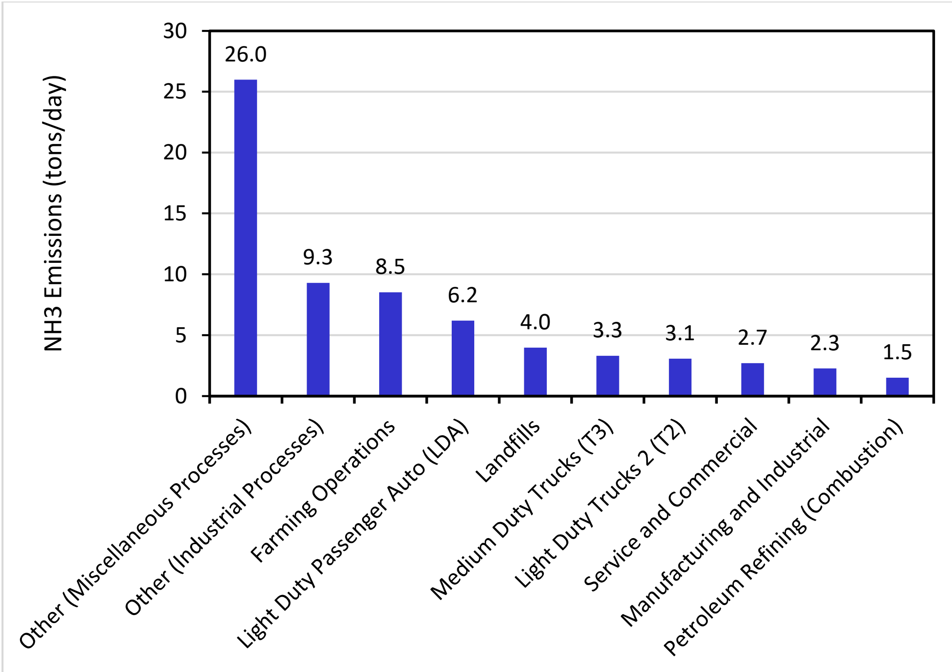

FIGURE 3-14

Top Ten Emitter Categories for Directly Emitted NH3 in 2018 (Annual Average)

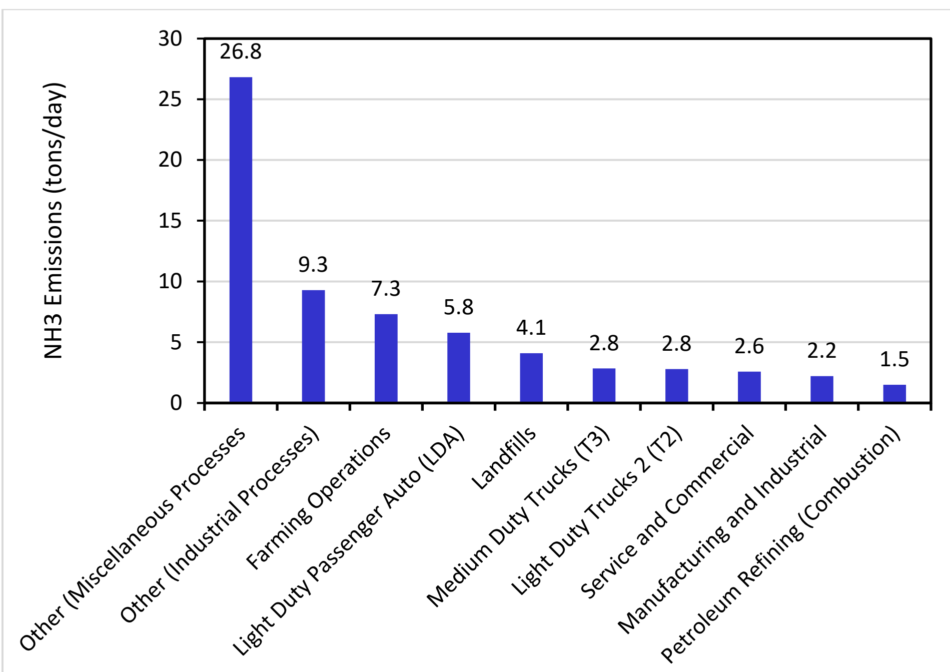

FIGURE 3-15

Top Ten Emitter Categories for Directly Emitted NH3 in 2023 (Annual Average)

Condensable and Filterable Portions of PM2.5 Emissions

Per PM2.5 NAAQS final implementation rule[20], the SIP emissions inventory is required to identify the condensable and filterable portions of PM2.5 separately, in addition to primary PM2.5 emissions. Primary PM emissions consist of condensable and filterable portions. Condensable PM is the material that is in vapor phase in stack conditions. The U.S. EPA's Air Emissions Reporting Requirements (AERR) requires states to report annual emissions of filterable and condensable components of PM2.5 and PM10, "as applicable," for large sources for every inventory year and for all sources every third inventory year, beginning with 2011.[21] Subsequent emissions inventory guidance[22] from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR." Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions." Primary PM2.5 is the sum of condensable and filterable PM2.5 emissions.

Category specific conversion factors developed by CARB and used in the Imperial County 2018 SIP[23] were applied in the current analysis to estimate condensable PM and then filterable PM was calculated by subtracting the condensable from the total PM2.5 primary emissions. The baseline 2018, future attainment year 2023, and the RFP milestone years 2020 and 2026 are included in the analysis. Details on the condensable and filterable PM2.5 emissions are provided in Appendix I of this Plan.

Uncertainties in the Emissions Inventory

An effective AQMP/State Implementation Plan requires a complete and accurate emissions inventory. Over the years, significant improvements have been made to quantify emission sources for which control measures are developed. Increased use of continuous monitoring and source testing has contributed to the improvements in point source inventories. Technical assistance provided to facilities and auditing of reported emissions by the South Coast AQMD have also improved the accuracy of the point source emissions inventory. Area source inventories that rely on average emission factors and regional activity data have inherent uncertainties. Industry-specific surveys and source-specific studies during rule development have also provided certain degree of refinements to these emissions estimates. Mobile source inventories are also continuously updated and improved. As described earlier, many improvements are included in the on-road mobile source model EMFAC 2017, which estimates emissions from trucks, passenger cars, and buses. Improvements and updates are also included in the off-road models. Overall, the emissions inventory in this Plan is based on the most current data and methodologies, resulting in the most accurate inventory available.

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[20] 40 CFR 51.1008(a)(1)(iv)

[21] 40 CFR §51.15(a)(1) and §51.30(b)(1)

[22] USEPA. 2017. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Available at: https://www.epa.gov/sites/production/files/2017-7/documents/ei_guidance_may_2017_final_rev.pdf.

[23] Imperial County 2018 Annual Particulate Matter less than 2.5 microns in Diameter State Implementation Plan, April 2018. Available at https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf

Relative to future emissions, there are many challenges inherent in making accurate growth projections, such as where vehicle trips will occur, distribution between various modes of transportation (such as trucks and trains), as well as estimates for population growth and the number and type of jobs. Forecasts are made with the best information available; nevertheless, there is uncertainty in emissions projections. AQMP updates are generally developed every three to four years, thereby allowing for frequent updates and improvements to the inventories. Interim SIP revisions between AQMPs also provide an opportunity to revisit assumptions and data used in the emissions development and to update the inventory based on best available data. In sum, the emission projected for future years in this Plan represent a reasonable forecast with the best available information and latest updates to all sectors.

4. CONTROL STRATEGY

The overall control strategy for meeting the 2006 PM2.5 standard in the Basin is based on the continued implementation of existing South Coast AQMD and CARB regulations and programs over the next few years. With the Basin being close to attainment, the emissions reductions associated with these measures are expected to provide the needed reductions. Also, recently adopted regulations, discussed in this section, will provide additional emission reductions which will further ensure attainment of the standard before the attainment date. Chapter 5 presents future air quality and provides details on the air quality modeling analysis and attainment demonstration.

The 2016 PM2.5 Plan discussed the five primary pollutants that contribute to the mass of the ambient aerosol (*i.e.,* directly emitted PM2.5, NOx, SOx, VOC, and ammonia). Various combinations of reductions in these pollutants could be effective in improving PM2.5 air quality. Given the Basin's challenge to attain the federal ozone standards, in which the NOx control path is the most effective and efficient strategy in meeting the 8-hour ozone standards, a comprehensive and integrated plan focusing on NOx reduction was determined to be the most effective path to attain both PM2.5 and ozone standards for the Basin. The updated modeling analysis described in Chapter 5 further confirms this conclusion.

Since the PM2.5 standard was first promulgated in 1997, CARB and South Coast AQMD have made great progress in reducing PM2.5 levels over the last several decades. Emissions of NOx, the most dominant PM precursor on elevated 24-hour PM2.5 days, have been reduced by 76% through implementation of existing regulations and programs, contributing to reductions in PM2.5 concentrations. Significant NOx controls have been implemented in stationary sources, including engine standards, retrofitting existing sources with add-on controls (e.g., selective catalytic reduction), equipment modification (e.g., low-NOx burners), and replacement of old high-emitting equipment with new and cleaner units. Aggressive NOx controls have also been implemented for mobile sources including emission standards, fleet requirements, alternative fuels, repowering with cleaner engines, and incentive programs. VOC reductions have been achieved through reformulations in consumer products, solvents, adhesives, and coatings. SOx emissions have reduced substantially through implementation of Ocean Going Vessel Fuel Regulation by CARB as well as mandatory SOx RECLAIM reductions. In addition to the above-mentioned regulations and programs, reductions of directly emitted PM2.5 have also been achieved through stationary source regulations on significant PM sources such as residential wood burning and under-fired charbroilers and mobile source regulations for heavy-duty trucks, off-road equipment and OGVs.

This chapter describes existing regulations and programs providing emission reductions for the attainment of the 2006 PM2.5 standard by 2023. In addition, this chapter describes the recently adopted regulations and programs since the adoption of the 2016 AQMP. These newly adopted measures will provide additional reductions beyond the existing regulations and give further assurance for meeting the 2006 24-hour PM2.5 standard by the 2023 attainment date.

South Coast AQMD Existing Regulations and Programs Providing Emission Reductions in Future Baseline Emissions

South Coast AQMD has implemented aggressive PM2.5 and PM2.5 precursor emission reduction strategies in the past several decades to attain the federal PM2.5 standards in the Basin. The emissions benefits of these regulations and programs are reflected in the future baseline emissions inventory which is used for air quality modeling and attainment demonstration purposes. These emissions reflect the specific control requirements in existing rules and regulations as well as the natural turnover of engines, equipment, and appliances. Appendix II provides a complete list of the South Coast AQMD's existing PM2.5, NOx, VOC, NH3 and SOx rules and regulations.

The following is a brief description of the South Coast AQMD's adopted rules for stationary sources that are not yet fully implemented and will provide further emission reductions in the next few years.

- RECLAIM Program (Regulation XX)
  The NOx RECLAIM regulation, a cap-and-trade program first adopted in 1993, has been revised several times to reduce NOx emissions from the largest NOx emitting stationary sources within the South Coast AQMD's jurisdictional boundary. It has promoted additional NOx reductions by allocating and re-assessing RECLAIM Trading Credits (RTC) which periodically decline based on assessments of Best Available Retrofit Control Technology (BARCT) for a wide range of NOx-emitting equipment, such as boilers, heaters, furnaces, ovens, kilns, coke calciner, fluid catalytic cracking units, internal combustion engines, and turbines. In 1994, the initial RECLAIM RTC allocation was 110 tpd of NOx, which will be reduced to 14.5 tpd in 2022. NOx RECLAIM is currently transitioning to a command-and-control regulatory structure to achieve source-specific and/or industry-specific BARCT level of NOx controls, which will provide further emission reductions (more details are provided in the next section under South Coast AQMD's Adopted Rules and Programs Since 2016 AQMP).

  On November 5, 2010, the Governing Board of the South Coast AQMD adopted amendments to its Regional Clean Air Incentives Market (RECLAIM) program that result in cumulative reductions of 5.7 tons per day, or more than 51 percent reduction, of SOx from all RECLAIM facilities by 2019.

- Rule 1111 (Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces) and CLEANair Furnace Rebate Program
  Rule 1111 was originally adopted in 1978 to reduce NOx emissions from natural-gas-fired, fan-type central furnaces used for residential and commercial space heating. Rule 1111 was amended in 2009 to lower the NOx emission limit from 40 to 14 ng/Joule (ng/J), and was again amended in 2014 to include a mitigation fee option where manufacturers can pay a

per-unit fee in lieu of meeting the Ultra Low-NOx emission limit of 14 ng/J. In addition, through the CLEANair Furnace Rebate Program, South Coast AQMD provides an incentive to residents who purchase and install a compliant furnace that meets the Rule 1111 NOx emission limit. Emission reduction benefits from implementation of Rule 1111 will continue beyond 2026.

- Rule 1146.2 (Large Water Heater, Small Boilers and Process Heaters)
  The 1998 adoption of Rule 1146.2 established NOx emission limits for large water heaters and small boilers ranging from 75,000 Btu/hr up to and including 2 million Btu/hr (MMBtu/hr). New water heaters or boilers greater than 0.4 MMBtu/hr and less than or equal to 2 MMBtu/hr were required to meet an emission limit of 30 ppm of NOx. New units from 75,000 Btu/hr to 0.4 MMBtu/hr were required to meet a NOx emission limit of 55. Rule 1146.2 was amended in May 2006 to address NOx emission limits for new equipment. With the exception for small pool heaters rated less than or equal to 400,000 Btu/hr, new manufactured units greater than 400,000 Btu/hr must meet a NOx emission limit of 20 ppm starting January 1, 2010. Most new manufactured units less than or equal to 400,000 Btu/hr must meet a 20 ppm NOx limit by January 1, 2012. Pool heaters rated less than or equal to 400,000 Btu/hr, will continue to meet the existing limit of 55 ppm. Emission reduction benefits from implementation of Rule 1146.2 will continue until 2020.

- Rule 1147 (NOx Reductions from Miscellaneous Sources)
  Under Rule 1147, equipment requiring South Coast AQMD permits that are not regulated by other NOx rules must meet an emission limit of 30 or 60 parts per million (ppm) of NOx depending upon equipment type and process temperature. Compliance dates for emission limits are based on the date of equipment manufacture and emission limits are applicable to older equipment first. Owners of existing equipment are provided at least 15 years of use before they must meet rule emission limits. Specific categories of newer units have later compliance dates. Smaller and low emission units get more time to comply with emission limits than larger units. These small sources are not subject to rule emission limits until they are at least 20 years old. These units are required to demonstrate compliance with rule emission limits starting July 1, 2017. Rule 1147 was amended in September 2011 to delay implementation dates up to two years, remove a requirement for fuel or time meters and provide compliance flexibility for small and large sources. Emission reduction benefits from implementation of Rule 1147 will continue until 2023.

In addition to the regulatory approach, South Coast AQMD has also implemented incentive funding programs to encourage the immediate use of commercially available, low, near-zero and zero emissions mobile and stationary technologies. These incentive programs provide ongoing emission reductions from a variety of source categories. Examples of those incentive programs include:

- Carl Moyer Memorial Air Quality Standards Attainment Program for heavy-duty diesel engines retrofit and replacement with cleaner technologies;
- Clean School Buses Incentives for public school districts to purchase new alternative fuel school buses in order to retire their older polluting diesel buses and to replace expired alternative fuel bus tanks;
- Electric Lawn and Garden Equipment Program cleans the air through the replacement of gasoline-powered residential lawn mowers and commercial lawn and garden equipment with lower emission models at substantial discounts;
- Surplus Off-Road Opt-In for NOx (SOON) Program for the purchase of low-emission heavy-duty engines for off-road diesel fleet vehicles;
- Proposition 1B – Goods Movement Emissions Reduction Program to reduce diesel air pollution from goods movement operations;
- Enhanced Fleet Modernization Program (EFMP) for retirement of older higher polluting vehicles;
- Volkswagen Environmental Mitigation Trust that provides funding to mitigate excess emissions from the heavy-duty sector through the replacement or repower of older, heavy-duty vehicles, engines and equipment with zero emission and other clean technologies; and
- Mobile Source Air Pollution Review Committee (MSRC) Clean Transportation Initiative that the MSRC is partnering with South Coast AQMD to enhance the initiatives available under the On-Road Heavy-Duty Voucher Incentive Program (VIP). The VIP provides funding to owners/operators with fleets of 10 or fewer vehicles to replace older vehicles with engine models that are 2013 emissions-compliant or newer to help clean up emissions from older, more polluting vehicles.

These incentive programs have resulted in early emission reductions of PM2.5 and PM2.5 precursors from on-road and off-road mobile sources beyond existing regulations.

South Coast AQMD Adopted Rules and Programs Since 2016 AQMP But Not Yet Reflected in the Inventory

Since the adoption of the 2016 AQMP, South Coast AQMD has adopted several rules and programs to further reduce NOx and VOC emissions. While emissions reductions from existing regulations and programs are expected to provide the needed reductions for attaining the 2006 PM2.5 standard, the recently adopted rules and regulations would provide additional emission reductions benefits and assurances towards attainment.

Table 4-1 summarizes NOx and VOC rules that have been adopted or amended by the South Coast AQMD since the 2016 AQMP. Pursuant to directives listed in control measure CMB-05 of the 2016 AQMP and in recently adopted state statute (AB 617), RECLAIM facilities are subject to an expedited schedule to implement additional BARCT no later than December 31, 2023. As a result, Rules 1110.2, 1117, 1134, 1135, and 1146 series have been adopted and/or amended in the 2018-2020 timeframe to implement CMB-05 and AB 617. Rule 1110.2 (Emissions from Gaseous- and Liquid-Fueled Engines) reduces emissions of NOx, VOC, and CO from all stationary and portable engines rated over 50 rated brake horsepower (bhp). Rule 1117 (Emissions of Oxides of Nitrogen from Glass Melting Furnaces) establishes NOx and SOx emission standards for container glass melting and sodium silicate furnaces, including NOx emission limits for auxiliary combustion equipment associated with container glass melting operations. Rules 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines) and 1135 (Emissions of Oxides of Nitrogen from Electricity Generating Facilities) apply to RECLAIM and non-RECLAIM facilities. Both rules include more stringent NOx emission limits to reflect current BARCT and provide implementation timeframes to facilitate the transition of the NOx RECLAIM program to a command-and-control regulatory structure. Amendments of Rule 1146 series (1146, 1146.1, and 1146.2) update the NOx emission limits for boilers, heaters, and steam generators covered under these rules. The revised NOx emission limits represent BARCT and apply to RECLAIM and non-RECLAIM facilities. The implementation of all these rule amendments (Rules 1110.2, 1117, 1134, 1135, and 1146 series) will result in approximately 5.7 tpd of NOx reductions over the implementation schedule specified in these rules.

The 2016 AQMP also includes Facility-Based Mobile Source Measures covering marine ports (MOB-01), railyards (MOB-02), warehouse/distribution centers (MOB-03), commercial airports (MOB-04), and new development and redevelopment projects (EGM-01). These measures are intended to help achieve the emission reductions attributed to CARB's Further Deployment of Cleaner Technology measures by reducing emissions from these facilities through South Coast AQMD actions. In May 2018, the South Coast AQMD Governing Board directed staff to pursue various approaches for reducing emissions from these large indirect sources: a voluntary Memorandum of Understanding (MOU) approach with marine ports and commercial airports, and regulatory approaches for warehouses/distribution centers, railyards and new developments and re-development projects. In December 2019, the Facility-Based Mobile Source Control Measure for Commercial Airports (in the form of MOUs with the five commercial airports) was adopted with an expected reduction of 0.52 tpd of NOx emissions in 2023. This measure implements the 2016 AQMP Control Measure MOB-04, Emission Reductions at Commercial Airports and applies to Los Angeles International Airport, John Wayne Airport, Hollywood Burbank Airport, Ontario International Airport, and Long Beach Airport.

Additional NOx emission reductions are anticipated from continued implementation of existing incentive programs with future funding. Finally, additional reductions are anticipated from deployment of Metrolink's Tier 4 locomotives, which were not included in the 2016 AQMP emissions inventory. South Coast AQMD Rule 445 Wood-Burning Devices was amended in June 2020 to implement the backstop Contingency Control Measure BCM-09 in the 2016 AQMP and to address the CAA contingency measure requirements for the PM2.5 standards. The 2020 amendments extended the No-Burn day requirement Basin-wide when the daily PM2.5 air quality is forecast to exceed 30 $\mu g/m^3$ in any source receptor area, providing additional emission reduction benefits beyond those incorporated in the baseline reductions from this source category. In addition, the No-Burn day thresholds will automatically be lowered upon the EPA's finding of failure to fulfill specific requirements as set forth in 40 CFR § 51.1014(a). The 2020 amendments of Rule 445 provide additional emission reductions in PM2.5 in 2020 and beyond.

TABLE 4-1

Rules and Programs Adopted or Amended by South Coast AQMD since 2016 AQMP (January 2016 to August 2020)

Source	Rule No – Rule Title	Adoption Date	Implementation End Date	VOC Reductions (tons per day)	NOx Reductions (tons per day)	PM Reductions (tons per day)	2016 AQMP Control Measure
Stationary	Rule 1113 – Architectural Coatings	2/5/2016 (Amended)	2019	0.88			CTS-01*
Stationary	Rule 1168 – Adhesive and Sealant Applications	10/6/2017 (Amended)	2023	1.38			CTS-01
Stationary	Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities	11/2/2018 (Amended)	2024		1.7		CMB-01; CMB-05
Stationary	Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	12/7/2018 (Amended)	2023 (RECLAIM) / 2033 (Non-RECLAIM)		0.27 (RECLAIM) / 0.04 (Non-RECLAIM)		CMB-01; CMB-05
Stationary	Rule 1146.1 – Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters						
Stationary	Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters						
Stationary	Rule 1118.1 – Control of Emissions from Non-Refinery Flares	1/4/2019 (Adopted)	2025	0.014	0.18		CMB-03
Stationary	Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines	4/5/2019 (Amended)	2026		2.8		CMB-01; CMB-05
Stationary	Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines	11/1/2019 (Amended)	2023		0.29		CMB-05; CMB-01
Stationary	Rule 1117 – Emissions from Container Glass Melting and Sodium Silicate Furnaces	6/5/2020 (Amended)	2023		0.57		CMB-05
Stationary	Rule 445 – Wood-Burning Devices	6/5/2020 (Amended)				0.070**	BCM-09
Mobile	Facility-Based Mobile Source Measure for Commercial Airports	12/6/2019	2023		0.52		MOB-04

* 2012 AQMP Control Measure

** Up to 0.27 tons per day when all contingency measures are triggered

CARB Key Mobile Source Regulations and Programs Providing Emission Reductions in Future Baseline Emissions

Given the severity of California's air quality challenges and the need for ongoing emission reductions, CARB has implemented the most comprehensive mobile source emissions control program in the nation. CARB's comprehensive program relies on four fundamental approaches:

- Stringent emissions standards that minimize emissions from new vehicles and equipment;
- In-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- Cleaner fuels that minimize emissions during combustion; and
- Incentive programs that remove older, dirtier vehicles and equipment and replace those vehicles with the cleanest technologies.

This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and pre-date the federal CAA of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of CARB's efforts, the CAA provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards under Section 209(b). This waiver provision preserves a pivotal role for California in the control of emissions from new motor vehicles, recognizing that California serves as a laboratory for setting motor vehicle emission standards. Since then, CARB has consistently sought and obtained waivers and authorizations for its new motor vehicle and off-road regulations. CARB's history of progressively strengthening standards as technology advances, coupled with the waiver process requirements, ensures that California's regulations remain the most stringent in the nation. A list of regulatory actions CARB has taken since 1985 is provided at the end of this analysis to highlight the scope of CARB's actions to reduce mobile source emissions.

Since 2000, CARB adopted numerous regulations aimed at reducing exposure to diesel PM and NOx. These regulations are aimed at freight transport sources such as heavy-duty diesel trucks, transportation sources such as passenger cars and buses, and off-road sources such as large construction equipment. Phased implementation of these regulations will produce increasing emission reduction benefits through 2023 and beyond, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

Further, CARB and South Coast AQMD staff work closely on identifying and distributing incentive funds to accelerate cleanup of engines. Key incentive programs include: Low Carbon Transportation, Air Quality Improvement Program, Volkswagen Mitigation Trust, Community Air Protection, Carl Moyer Program, Goods Movement Program, and Funding Agricultural Replacement Measures for Emission Reductions (FARMER). These incentive-based programs work in tandem with regulations to accelerate deployment of cleaner technology.

I) Light-Duty Vehicles

NOx emissions from light-duty vehicles and key programs contributing to those reductions in the Basin have been reduced significantly since 1990 and will continue to go down through 2023 due to the benefits of CARB's longstanding light-duty mobile source program. Key light-duty programs include the Advanced Clean Cars program (ACC), On-Board Diagnostics (OBD), Reformulated Gasoline (RFG), Incentive Programs, and the Enhanced Smog Check Program.

Since setting the nation's first motor vehicle exhaust emission standards in 1966 that led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. California is unique in that it is the only state authorized under the Clean Air Act to set more stringent mobile source standards than the federal standards. Through CARB regulations, today's new cars pollute 99 percent less than their predecessors did thirty years ago. In 1970, CARB required auto manufacturers to meet the first standards to control NOx emissions along with hydrocarbon emissions. The simultaneous control of emissions from motor vehicles and fuels led to the use of cleaner-burning RFG that has removed the emissions equivalent of 3.5 million vehicles from California's roads. Since CARB first adopted it in 1990, the Low-Emission Vehicle Programs (LEV and LEV II) and Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of hundreds of thousands of ZEVs in California.

i. <u>Advanced Clean Cars</u>

CARB's groundbreaking ACC program is now providing the next generation of emission reductions in California and ushering in a new zero emission passenger transportation system. The success of these programs is evident: California is the world's largest market for ZEVs, with over 21 models available today, and a wide variety are now available at lower price points, attracting new consumers. As of October 2019, Californians drive nearly 50 percent of all ZEVs on the road in the United States, while the U.S. makes up about half of the world market. This movement towards commercialization of advanced clean cars has occurred due to CARB's ZEV regulation, part of ACC, which affects passenger cars and light-duty trucks.

CARB's ACC Program, approved in January 2012, is a pioneering approach of a 'package' of regulations that - although separate in construction - are related in terms of the synergy developed to address both ambient air quality needs and climate change. The ACC program combines the control of smog, soot causing pollutants and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. The program assures the development of environmentally superior cars that will continue to deliver the performance, utility, and safety vehicle owners have come to expect.

The ACC program approved by CARB in January 2012 also included amendments affecting the current ZEV regulation through the 2017 model year in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. These ZEV amendments are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions. The ACC Program benefits will increase over time as new cleaner cars enter the fleet displacing older and dirtier vehicles. However, in 2019, the federal government finalized Part 1 of the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule, which revoked California's authority to set more stringent greenhouse gas (GHG) and zero emission vehicle (ZEV) requirements for light duty vehicles. In 2020, Part 2 of that rule was finalized, rolling back previously adopted vehicle standards. These rules threaten the ACC Program and clean air quality progress made in California.

ii. *On Board Diagnostics*

California's first OBD regulation required manufacturers to monitor some of the emission control components on vehicles starting with the 1988 model year. In 1989, CARB adopted OBD II, which required 1996 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines to be equipped with second generation OBD systems. OBD systems are designed to identify when a vehicle's emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer's specifications. CARB subsequently strengthened OBD II requirements and added OBD II specific enforcement requirements for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines.

iii. *Reformulated Gasoline*

Since 1996, CARB has been regulating the formulation of gasoline resulting in California gasoline being the cleanest in the world. California's cleaner-burning gasoline regulation is one of the cornerstones of the State's efforts to reduce air pollution and cancer risk. RFG is fuel that meets specifications and requirements established by CARB. The specifications reduced motor vehicle toxics by about 40 percent and reactive organic gases by about 15 percent. The results from cleaning up fuel can have an immediate impact as soon as it is sold in the State. Vehicle manufacturers design low-emission emission vehicles to take full advantage of cleaner-burning gasoline properties.

iv. *Incentive Programs*

There are a number of different incentive programs focusing on light-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs work in two ways, encouraging the retirement of dirty older cars and encouraging the purchase of a cleaner vehicle.

Voluntary accelerated vehicle retirement or "car scrap" programs provide monetary incentives to vehicle owners to retire older, more polluting vehicles. The purpose of these programs is to reduce fleet emissions by accelerating the turnover of the existing fleet and subsequent replacement with newer, cleaner vehicles. Both State and local vehicle retirement programs are available.

California's voluntary vehicle retirement program is administered by the Bureau of Automotive Repair (BAR) and provides $1,000 per vehicle and $1,500 for low-income consumers for unwanted vehicles that have either failed or passed their last Smog Check Test and that meet certain eligibility guidelines. This program is referred to as the Consumer Assistance Program.

In recent years, the California Legislature has allocated significant funding increases towards incentive-based programs. In fiscal year 2019-20, the Clean Vehicle Rebate Project (CVRP) was allocated $238 million. CVRP is designed to offer vehicle rebates on a first-come, first-serve basis for light-duty ZEVs, plug-in hybrid electric vehicles, and zero-emission motorcycles. Through March 2019, CVRP has provided rebates for nearly 320,000 vehicles at a total of just over $720 million since the project's launch in 2010.

Clean Cars 4 All (formerly known as the Enhanced Fleet Modernization Program Plus-Up Pilot Project) provides incentives for lower-income consumers living in and near disadvantaged communities who scrap their old vehicles and purchase new or used hybrid, plug-in hybrid, or zero-emission vehicle replacement vehicles. Since fiscal year 2014–2015, CARB has allocated $112 million for Clean Cars 4 All.

v. *California Enhanced Smog Check Program*

BAR is the State agency charged with administration and implementation of the Smog Check Program. The Smog Check Program is designed to reduce air pollution from California registered vehicles by requiring periodic inspections for emission-control system problems, and by requiring repairs for any problems found. In 1998, the Enhanced Smog Check program began in which Smog Check stations relied on the BAR-97 Emissions Inspection System (EIS) to test tailpipe emissions with either a Two-Speed Idle (TSI) or Acceleration Simulation Mode (ASM) test depending on where the vehicle was registered. For instance, vehicles registered in urbanized areas received an ASM test, while vehicles in rural areas or received a TSI test.

In 2009, the following requirements were added in to improve and enhance the Smog Check Program, making it more inclusive of motor vehicles and effective on smog reductions:

- Low pressure evaporative test;
- More stringent pass/fail cutpoints;
- Visible smoke test; and
- Inspection of light- and medium-duty diesel vehicles.

The next major change was due to AB 2289, adopted in October 2010, a new law restructuring California's Smog Check Program, streamlining and strengthening inspections, increasing penalties for misconduct, and reducing costs to motorists. This new law sponsored by CARB and BAR, promised faster and less expensive Smog Check inspections by talking advantage of OBD software installed on all vehicles since 2000. The new law also directs vehicles without this equipment to high-performing stations, helping to ensure that these cars comply with current emission standards. This program will reduce consumer costs by having stations take advantage of diagnostic software that monitors pollution-reduction components and tailpipe emissions. Beginning mid-2013, testing of passenger vehicles using OBD was required on all vehicles model years 2000 or newer.

II) Heavy-Duty Trucks

NOx emissions from heavy-duty vehicles and key programs contributing to those reductions in the Basin have decreased significantly since 1990 and will continue to decrease through 2023 due to the benefits of CARB's long-standing heavy-duty mobile source program. Key programs include Heavy-Duty Engine Standards, Clean Diesel Fuel, the Truck and Bus Regulation and Incentive Programs.

i. Heavy-Duty Engine Standards

Since 1990, heavy-duty engine NOx emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower-hour (g/bhp-hr) in 1990 down to the current 0.2 g/bhp-hr standard, which took effect in 2010. In addition to mandatory NOx standards, there have been several generations of optional lower NOx standards put in place over the past 15 years. Most recently in 2015, engine manufacturers can certify in California to three optional NOx emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard of 0.2 g/bhp-hr). The optional standards allow local air districts and CARB to preferentially provide incentive funding to buyers of cleaner trucks, to encourage the development of cleaner engines.

ii. *Clean Diesel Fuel*

Since 1993, CARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel PM, which is considered a toxic air contaminant. In 2006, CARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

iii. *Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)*

The Truck and Bus Regulation was first adopted in December 2008. This rule represents a multi-year effort to turn over the legacy fleet of engines and replace them with the cleanest technology available. In December 2010, CARB revised specific provisions of the in-use heavy-duty truck rule, in recognition of the deep economic effects of the recession on businesses and the corresponding decline in emissions.

Starting in 2012, the Truck and Bus Regulation phases in requirements applicable to an increasingly larger percentage of the truck and bus fleet over time, so that by 2023 nearly all older vehicles will be upgraded to have exhaust emissions meeting 2010 model year engine emissions levels while continuing to lower NOx levels through 2023. The regulation applies to nearly all diesel-fueled trucks and buses with a GVWR greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-state or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles. Approximately 170,000 businesses in nearly all industry sectors in California, and almost a million vehicles that operate on California roads each year are affected. Some common industry sectors that operate vehicles subject to the regulation include: for-hire transportation, construction, manufacturing, retail and wholesale trade, vehicle leasing and rental, bus lines, and agriculture.

In 2017, California passed legislation ensuring compliance with the Truck and Bus Regulation through the California Department of Motor Vehicles (DMV) vehicle registration program. Starting January 1, 2020, DMV will verify compliance to ensure that vehicles subject to the Truck and Bus Regulation meet the requirements prior to obtaining DMV vehicle registration. The law requires the DMV to deny registration for any vehicle that is non-compliant or has not reported to CARB as compliant or exempt from the Truck and Bus Regulation.

CARB compliance assistance and outreach activities that are key in support of the Truck and Bus Regulation include:

- The Truck Regulations Upload and Compliance Reporting System, an online reporting tool developed and maintained by CARB staff;

- The Truck and Bus regulation's fleet calculator, a tool designed to assist fleet owners in evaluating various compliance strategies;
- Targeted training sessions all over the State; and
- Out-of-state training sessions conducted by a contractor.

CARB staff also develops regulatory assistance tools, conducts and coordinates compliance assistance and outreach activities, administers incentive programs, and actively enforces the entire suite of regulations. Accordingly, CARB's approach to ensuring compliance is based on a comprehensive outreach and education effort.

iv. *Incentive Programs*

There are a number of different incentive programs focusing on heavy-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs encourage the purchase of cleaner trucks.

Several State and local incentive funding pools have been used historically, and remain available, to fund the accelerated turnover of on-road heavy-duty vehicles. Since the Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program) began in 1998 nearly $1 billion in Moyer Program incentive grants have been used to clean up over 60,000 older engines in California. This has reduced NOx and ROG emissions by more than 183,000 tons, and particulate matter by more than 6,700 tons statewide.

Beginning in 2008, the Goods Movement Emission Reduction Program funded by Proposition 1B has funded cleaner trucks for the region's transportation corridors; the final increment of funds will implement projects through 2020.

The California Legislature has recently allocated significant funding increases towards heavy-duty vehicle incentive-based programs. The Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) is the cornerstone of advanced technology heavy-duty incentives, providing funding since 2010 to support the long-term transition to zero-emission vehicles in the heavy-duty market. Since its inception in 2009, HVIP has been allocated over $447 million. HVIP has supported the purchase of 2,559 zero-emission trucks and buses, 2,631 hybrid trucks, 2,068 low NOx engines, and 195 trucks with electric power take off systems by California fleets through June 30, 2019.

CARB has also administered a Truck Loan Assistance Program since 2009. As of June 30, 2019, about $113.2 million in Truck Loan Assistance Program funding has been expended to provide about $1.5 billion in financing to small-business truckers for the purchase of approximately 26,000 cleaner trucks, exhaust retrofits, and trailers throughout California.

III) Off-Road Sources

Off-road sources encompass equipment powered by an engine that does not operate on the road. Sources vary from ships to lawn and garden equipment and for example, include sources like locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment.

NOx emissions from off-road equipment and key programs contributing to those reductions have decreased significantly in the Basin since 1990 and will continue to decrease through 2023 due to the benefits of CARB's and U.S. EPA long-standing programs. Key programs include Off-Road Engine Standards, Locomotive Engine Standards, Clean Diesel Fuel, Cleaner In-Use Off-Road Regulation and In-Use Large Spark Ignition (LSI) Fleet Regulation.

i. Off-Road Engine Standards

The Clean Air Act preempts states, including California, from adopting requirements for new off-road engines less than 175 HP used in farm or construction equipment. California may adopt emission standards for in-use off-road engines pursuant to Section 209(e)(2), but must receive authorization from U.S. EPA before it may enforce the adopted standards.

CARB first approved regulations to control exhaust emissions from small off-road engines (SORE) such as lawn and garden equipment in December 1990 with amendments in 1998, 2003, 2010, 2011, and 2016. These regulations were implemented through three tiers of progressively more stringent exhaust emission standards that were phased in between 1995 and 2008.

Manufacturers of forklift engines are subject to new engine standards for both diesel and large spark ignition (LSI) engines. Off-road diesel engines were first subject to engine standards and durability requirements in 1996 while the most recent Tier 4 Final emission standards were phased in starting in 2013. Tier 4 emission standards are based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction. LSI engines have been subject to new engine standards that include both criteria pollutant and durability requirements since 2001 with the cleanest requirements phased-in starting in 2010.

ii. Locomotive Engine Standards

The CAA and the U.S. EPA national locomotive regulations expressly preempt states and local governments from adopting or enforcing "any standard or other requirement relating to the control of emissions from new locomotives and new engines used in locomotives" (U.S. EPA interpreted new engines in locomotives to mean remanufactured engines, as well). U.S. EPA has approved two sets of national locomotive emission regulations (1998 and 2008). In 1998, U.S. EPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NOx reductions through Tier 0, 1, and 2 emission standards. Tier 2 NOx emission standards reduced older uncontrolled locomotive NOx emissions by up to 60 percent, from 13.2 to 5.5 g/bhp-hr.

In 2008, U.S. EPA approved a second set of national locomotive regulations. Older locomotives upon remanufacture are required to meet more stringent particulate matter (PM) emission standards which are about 50 percent cleaner than Tier 0–2 PM emission standards. U.S. EPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhp-hr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new Tier 4 (2015 and later model years) locomotive NOx and PM emission standards. The U.S. EPA Tier 4 NOx and PM emission standards further reduced emissions by approximately 95 percent from uncontrolled levels.

In April 2017, CARB petitioned U.S. EPA for rulemaking, seeking the amendment of emission standards for newly built locomotives and locomotive engines and lower emission standards for remanufactured locomotives and locomotive engines. The petition asks U.S. EPA to update its standards to take effect for remanufactured locomotives in 2023 and for newly built locomotives in 2025. The new emission standards would provide critical criteria pollutant reductions, particularly in the disadvantaged communities that surround railyards.

iii. Clean Diesel Fuel

Since 1993, CARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter which is considered a toxic air contaminant. In 2006, CARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

iv. Cleaner In-Use Off-Road Equipment (Off-Road Regulation)

The Off-Road Regulation which was first approved in 2007 and subsequently amended in 2010 in light of the impacts of the economic recession. These off-road vehicles are used in construction, manufacturing, the rental industry, road maintenance, airport ground support and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation will significantly reduce emissions of diesel PM and NOx through 2023 from the over 150,000 in-use off-road diesel vehicles that operate in California. The regulation affects dozens of vehicle types used in thousands of fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls.

The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The regulation also requires that all vehicles be reported to CARB and labeled, restricts the addition of older vehicles into fleets, and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

Fleets are subject to increasingly stringent restrictions on adding older vehicles. The regulation also sets performance requirements. While the regulation has many specific provisions, in general by each compliance deadline, a fleet must demonstrate that it has either met the fleet average target for that year, or has completed the Best Available Control Technology requirements. The performance requirements of the Off-Road Regulation were phased in from January 1, 2014 through January 1, 2019.

Compliance assistance and outreach activities in support of the Off-Road Regulation include the following activities.

The Diesel Off-road On-line Reporting System, an online reporting tool developed and maintained by CARB staff.

The Diesel Hotline (866-6DIESEL), which provides the regulated public with questions about the regulations and access to CARB staff. Staff is able to respond to questions in English, Spanish and Punjabi.

The Off-road Listserv, providing equipment owners and dealerships with timely announcement of regulatory changes, regulatory assistance documents, and reminders for deadlines.

v. LSI In-Use Fleet Regulation

Forklift fleets can be subject to either the LSI fleet regulation, if fueled by gasoline or propane, or the off-road diesel fleet regulation. Both regulations require fleets to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards. The LSI fleet regulation was originally adopted in 2007 with requirements beginning in 2009. While the LSI fleet regulation applies to forklifts, tow tractors, sweeper/scrubbers, and airport ground support equipment, it maintains a separate fleet average requirement specifically for forklifts. The LSI fleet regulation requires fleets with four or more LSI forklifts to meet fleet average emission standards.

vi. Incentive Programs

There are a number of different incentive programs focusing on off-road mobile sources that increase the penetration of cleaner technologies into the market. The incentive programs encourage the purchase of cleaner diesel engines.

The Clean Off-Road Equipment Voucher Incentive Project (CORE) is a voucher project similar to HVIP, but for advanced technology off-road equipment. The fiscal year 2017–2018 Funding Plan allocated $40 million to support zero-emission freight equipment through CORE. CARB launched CORE at the end of 2019.

California's agricultural industry consists of approximately 77,500 farms and ranches, providing over 400 different commodities, making agriculture one of the State's most diverse industries. In recognition of the strong need and this industry's dedication to reducing their emissions, the State Legislature has allocated over $330 million towards the FARMER Program since 2017. CARB staff developed the FARMER Program to meet the State Legislature's objectives and help meet the State's criteria, toxic, and greenhouse gas emission reduction goals. As of September 30, 2019, the FARMER Program has spent $97 million on over 2,500 pieces of agricultural equipment and will reduce 250 tons of PM2.5 and 4,200 tons of NOx over the lifetime of the projects.

A complete listing of CARB's existing regulations and the adoption dates are provided in Appendix III.

CARB Recent Regulations Adopted But Not Yet Reflected in the Inventory

Recent regulations have been adopted for on-road and off-road mobile sources since the release of the 2016 AQMP. The emissions inventory and attainment demonstration included in this Plan reflect all on-road regulations incorporated in EMFAC 2017 and off-road regulations included in the 2016 AQMP. While the emissions benefits from these newly adopted programs are not yet reflected in the base or future inventories, the emissions reductions will support monitored attainment of the 24-hour PM2.5 standard in the Basin. These programs are listed below.

- Amendments to California's Heavy-Duty Vehicle Inspection Program (HDVIP) and Periodic Smoke Inspection Program (PSIP) – The HDVIP and PSIP amendments lower opacity limits for on-road heavy-duty vehicles. The amendments provide PM emissions benefits starting in 2019 as vehicles operating with damaged emissions control components and emitting above the proposed opacity limits are repaired or replaced.
- Innovative Clean Transit - The Innovative Clean Transit (ICT) Regulation seeks to transition buses in California to zero-emission by 2040. The ICT regulation requires California transit agencies to gradually transition their buses to zero-emission technologies beginning with a requirement that only zero emission buses can be purchased starting in 2029. The ICT regulation is structured to allow transit agencies to take advantage of incentive programs by acting early and, also implementing plans that are best suited to their unique situation.
- Zero-Emission Airport Shuttle Bus - The Zero-Emission Airport Shuttle Regulation (Shuttle Regulation) will transition combustion-powered vehicles that serve California's

commercial airports to zero-emission vehicles (ZEVs). Specifically, the Shuttle Regulation requires fixed route airport shuttles serving California's 13 largest airports to transition to 100 percent ZEVs by 2035. The Shuttle Regulation applies to public and private fleets, including operators of parking facilities, rental car agencies, and hotels.

- The Advanced Clean Truck (ACT) regulation adopted by the Board on June 25, 2020 will accelerate the widespread adoption of zero-emission vehicles (ZEVs) in the medium-and heavy-duty truck sector and reduce the amount of harmful emissions generated from on-road mobile sources. The ACT regulation requires truck manufacturers to sell increasing numbers of zero-emission trucks (ZEVs) in California annually. Medium- and heavy-duty vehicle manufacturers must produce and sell ZEVs beginning with the 2024 model year with increasing sales annually through the 2035 model year when 55 percent of annual Class 2b-3 vehicle sales, including pickup trucks, must be ZEVs, 75 percent of annual Class 4-8 vehicle sales must be ZEVs, and 40 percent of Class 7-8 Tractor sales must be ZEVs.
- Ocean Going Vessels-At Berth - The Control Measure for Ocean-Going Vessels at Berth (At Berth Regulation) is designed to achieve added public health and air quality benefits by requiring emission controls at additional ports and terminals, including marine terminals that operate independently from a port or port authority, and vessels not covered by the previous ocean-going vessel regulation.
- Omnibus Low-NOx Regulation - The Heavy-Duty Engine and Vehicle Omnibus Regulation (Omnibus Regulation) establishes new exhaust emission standards, test procedures, and other emission-related requirements for 2024 and subsequent model year California-certified on-road heavy-duty engines. The Omnibus Regulation implements two measures included within CARB's 2016 State Strategy for the State Implementation Plan: a "Low-NOx Engine Standard" which will significantly reduce NOx emissions from new engines during certification; and a "Lower In Use Emission Performance Level," which will ensure in-use heavy-duty vehicles continue to control emissions throughout their useful lives.

As described above, there are several on-going and new programs that will provide significant reductions of NOx and PM2.5 between now and 2023 and beyond 2023. Most notably, of the already approved regulations, are the Truck and Bus regulation and the Off-Road regulation. In addition to these approved regulations, the Board is considering measures that will provide further reductions in 2023.

5. FUTURE AIR QUALITY

Introduction

This chapter presents projected future PM2.5 air quality and demonstrates attainment of the 2006 24-hour PM2.5 standard for the South Coast Air Basin (Basin) in 2023, one year earlier than the statutory attainment year. Future attainment status is generally assessed through the modeled attainment test; however, Compton cannot demonstrate attainment through the traditional modeling approach due to an anomalous baseline design value (see Chapter 2). Therefore, a hybrid approach, combining chemical transport modeling and a suite of supplemental analyses, is used in the current attainment demonstration. This chapter describes the Relative Response Factor (RRF) approach to predict future air quality, the 5-year weighted PM2.5 design values used in the attainment demonstration, the PM2.5 chemical species fractions included in the RRF approach, future PM2.5 concentrations in the Basin, the supplemental weight of evidence approach to demonstrate attainment in Compton, and the unmonitored area analysis.

PM2.5 Modeling Approach

In this attainment demonstration, 2018 is used as the base year from which future design values are projected. 2023 is projected to be the new attainment year of the 2006 24-hour PM2.5 standard for the Basin. The PM2.5 modeling employs the same approach as described in the 2016 AQMP attainment demonstrations except for updates in the modeling platform, input databases, and emissions inventory. Future year design values are determined using site-specific quarterly-averaged RRFs, which are calculated for the following PM2.5 components: ammonium, nitrate, sulfate, organic carbon, elemental carbon, crustal, salt, and particle-bound water. The RRFs are then applied to the baseline 5-year weighted PM2.5 design values per the U.S. EPA guidance (U.S. EPA, 2018).[24] A future design value less than or equal to 35.49 µg/m^3 attains the NAAQS.

Design Values

The 24-hour PM2.5 design value is defined as the three-year average of the 98th percentile of all 24-hour concentrations sampled by Federal Reference Method (FRM) at a monitoring site. Sites with everyday sampling frequency use the 8th highest value, sites with every 3rd day sampling frequency use the 3rd highest value, and sites with every 6th day sampling frequency use the 2nd highest value as the 98th percentile.

As shown in Figure 5-1, the Basin's 24-hour PM2.5 design values have decreased significantly over the last 20 years due to the implementation of regulations by South Coast AQMD and CARB. However, the rate of decrease in the 24-hour design value has slowed or reversed in recent years despite continuing reductions of PM2.5 and its precursor emissions. This was largely due to

[24] U.S. EPA, (2018). Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

adverse meteorology such as persistent drought, which lasted for several years. The design value for 2001 was 76 µg/m^3 while the 2019 design value (based on 2017-2019 data) was 38 µg/m^3. In 2019, the Basin maximum 98th percentile was 36.2 µg/m^3 at Mira Loma.

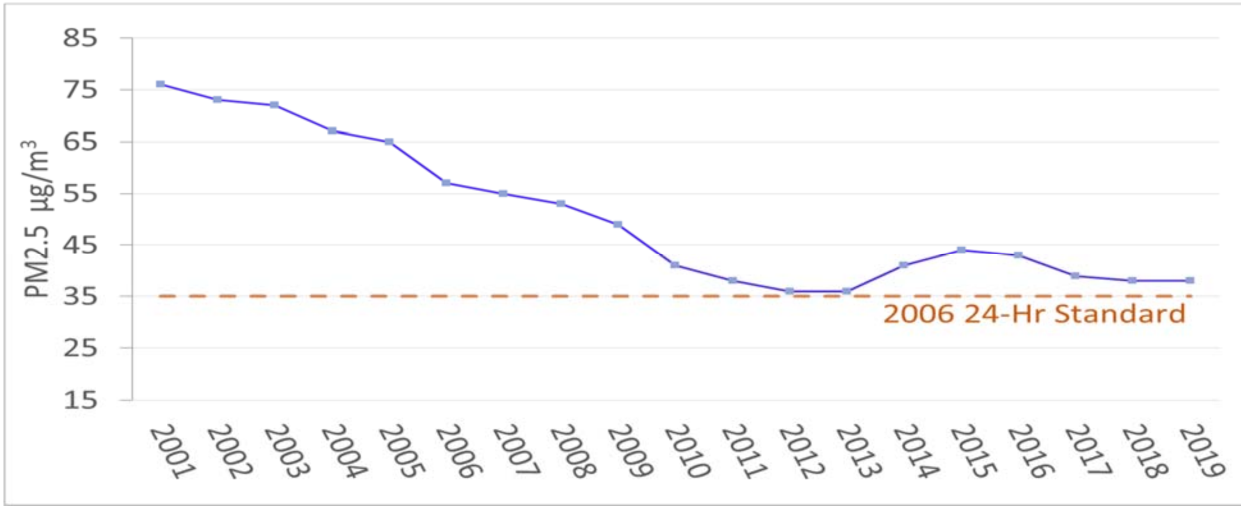

FIGURE 5-1

South Coast Air Basin 24-Hour Design Values

The U.S. EPA guidance (U.S. EPA, 2018)[25] recommends the use of multiple year averages of design values to dampen the effects of single year anomalies due to factors such meteorological variability or radical changes in the local emissions profile. Consistent with this guidance, the attainment demonstration in this Plan relies on the 2015-2019 five-year weighted design value, which includes 2018, the base year selected for the emissions inventory, meteorology and chemical transport modeling. Table 5-1 provides the five-year weighted 24-hour average PM2.5 design values for all the sites that have valid design values during the 5-year period. Compton and Mira Loma currently exhibit the highest 24-hour PM2.5 design values in the Basin. Historically, Mira Loma was the design site between 2008 and 2017. In 2017, Compton's DV was as high as Mira Loma and Compton continued to have the highest DVs in 2018 and 2019. This was due to the atypically high 98th percentile recorded in Compton in 2017, as indicated in Chapter 2.

[25] U.S. EPA, (2018). Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

TABLE 5-1
Five-year Weighted 24-hour PM2.5 Design Values (DV) (µg/m^3)

Monitoring Site	2016 AQMP DV (weighted average for 2010-2014)	Current DV (weighted average for 2015-2019)
Anaheim	26.0	N/A*
Azusa	-	26.0
Big Bear	-	20.3
Compton	-	38.3
Fontana	32.7	29.3
Long Beach – Hudson	-	28.5
Long Beach – South	-	28.6
Long Beach – Near Road	-	32.3
Los Angeles	31.0	30.6
Mira Loma	36.7	37.3
Mission Viejo	-	15.8
Ontario – Near Road	-	34.3
Pasadena	-	25.1
Pico Rivera	-	30.9
Reseda	-	23.7
Riverside Rubidoux	33.0	31.4
San Bernardino	-	28.2

* Does not meet EPA's data completeness requirement and thus no valid design value exists

PM2.5 Composition

PM2.5 is either directly emitted into the atmosphere (primary particles) or formed through atmospheric chemical reactions from precursor gases (secondary particles). Primary PM2.5 includes road dust, diesel soot, combustion products, and other sources of fine particles. Secondary products, such as sulfates, nitrates, and complex organic carbon compounds, are formed from reactions with oxides of sulfur, oxides of nitrogen, VOCs, and ammonia.

PM2.5 speciation data measured at four Chemical Speciation Network (CSN) sites provide the chemical characterization for evaluation and validation of the CMAQ model predictions. With one site in each county, the four CSN sites are strategically located to represent aerosol characteristics in the four counties in the Basin. Riverside-Rubidoux was traditionally the Basin maximum location. Fontana and Anaheim experience high concentrations within their respective counties, and the Los Angeles site was intended to capture the characteristics of an emission source area.

For the 24-hour attainment demonstration, the U.S. EPA's guidance (U.S. EPA, 2018) recommends that the determination of species fractions be based on the top 10% of days in each quarter. This results in two days per quarter for the 1-in-6 day CSN data. Figures 5-2 through 5-5 depict the measured PM2.5 chemical composition from the top two PM2.5 concentration days for each quarter for the four CSN sites in the Basin. In general, concentrations in the first or fourth quarter are higher than those in the other quarters and secondary ammonium, nitrate and sulfate often comprise close to half of the total PM2.5 concentrations. Organic carbon (OC), some of which is also secondary in nature, is another significant component. Due to uncertainties in the measurement of OC, the U.S. EPA recommends using the Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid (SANDWICH) method. Figure 5-2 shows the measured PM2.5 composition at Rubidoux and Figure 5-3 presents the composition after application of the SANDWICH method. Details regarding the SANDWICH method, as well as figures for other CSN sites, can be found in Appendix IV.

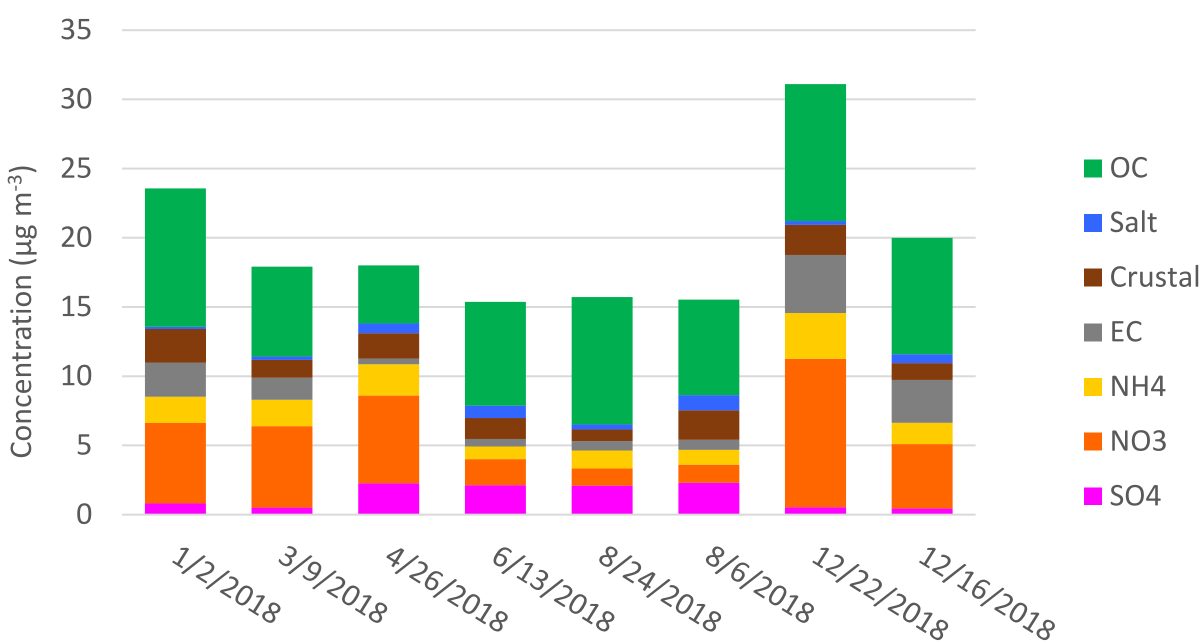

FIGURE 5-2

Rubidoux Quarterly Top Two-Day 24-Hour PM2.5 Mass and Chemical Components Concentrations in 2018

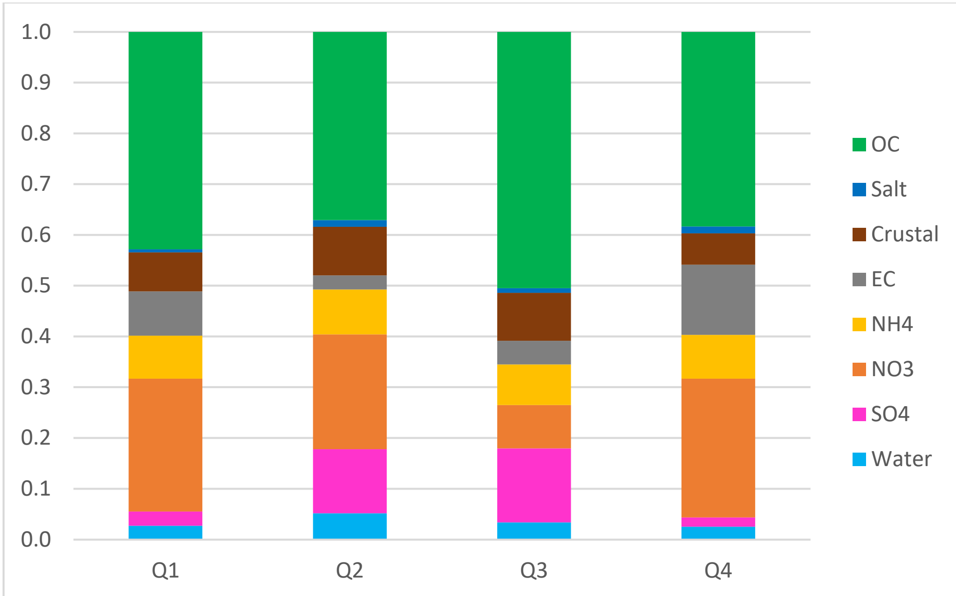

FIGURE 5-3

2018 Rubidoux Top Two-Day Averaged PM2.5 Fraction After SANDWICH

PM2.5 Modeling

The analysis uses 2018 as the baseline year to develop the meteorology and emissions inventory that are used to project future emissions and design values. While the U.S. EPA's guidance recommends to use the center year of the five-year weighted design value as the base year for the modeling and emissions inventory, the guidance states that any one of the five years can be used as the base year. 2018 was chosen to avoid meteorological abnormalities such as severe drought from 2013-2015 and stagnant conditions conducive to poor air quality from 2016-2017. Additionally, 2018 has rich measurement datasets collected during the Multiple Air Toxics Exposure Study V (MATES V), which was conducted during the period of May 2018 to April 2019.

CMAQ 5.0.2 simulations were conducted for 365 days from January 1 to December 31, 2018. The latest available CMAQ model, version 5.3.1 was used as weight of evidence and discussed in Weight of Evidence section of this Chapter. Meteorological inputs were generated using WRF 4.0.3 and biogenic VOC emissions were estimated using MEGANv3. The simulations included 8,760 consecutive hours from which daily 24-hour average PM2.5 concentrations were calculated. The modeling system was applied to 2023 to predict future design values.

A set of RRFs were generated for each future year simulation for the top 10 percent of modeled PM2.5 days based on modeled 24-hour average PM2.5. RRFs were generated for seven species: ammonium (NH4), nitrate (NO3), sulfate (SO4), organic carbon (OC), elemental carbon (EC), sea salts (Salt) and a combined grouping of crustal compounds and metals (Others). Future year concentrations of the seven species were calculated by applying the model generated quarterly RRFs to the speciated 24-hour PM2.5 measured data based on the eight highest PM2.5 concentrations in each quarter of the five year base period. The speciation fractions used to generate 24-hour speciated PM2.5 values were determined from the “high” days included in Figures 5-2 to 5-5. Particle bound water was determined using a regression model based on simulated concentrations of the ammonium, nitrate and sulfate ions (Frank, 2006). A blank mass of 0.2 $\mu g/m^3$ was added to each base and future year simulation. The 32 days in each year (top 8 high PM days per quarter) were then re-ranked based on the sum of all predicted PM species to establish a new 98th percentile concentration each year. A weighted average of the resulting future year 98th percentile concentrations for each of the five years was used to calculate future design values for the attainment demonstration. The 98th percentile value was determined based on the FRM sampling frequency. For example, every day sampling makes the 8th highest day the 98th percentile and every 6th day sampling makes the 2nd highest day the 98th percentile.

Model Performance Evaluation

Model performance was evaluated against corresponding measured PM2.5 mass. Figure 5-10 depicts this comparison for Los Angeles. In general, the model performance is reasonably good, with a tendency to underestimate during summer and overestimate during winter. Statistics for all sites are presented in Table 5-2. Because the U.S. EPA guidance (U.S. EPA, 2018) requires that the model predictions be applied in a relative rather than absolute sense, potential biases present in the model prediction are less likely transferred to future design values.

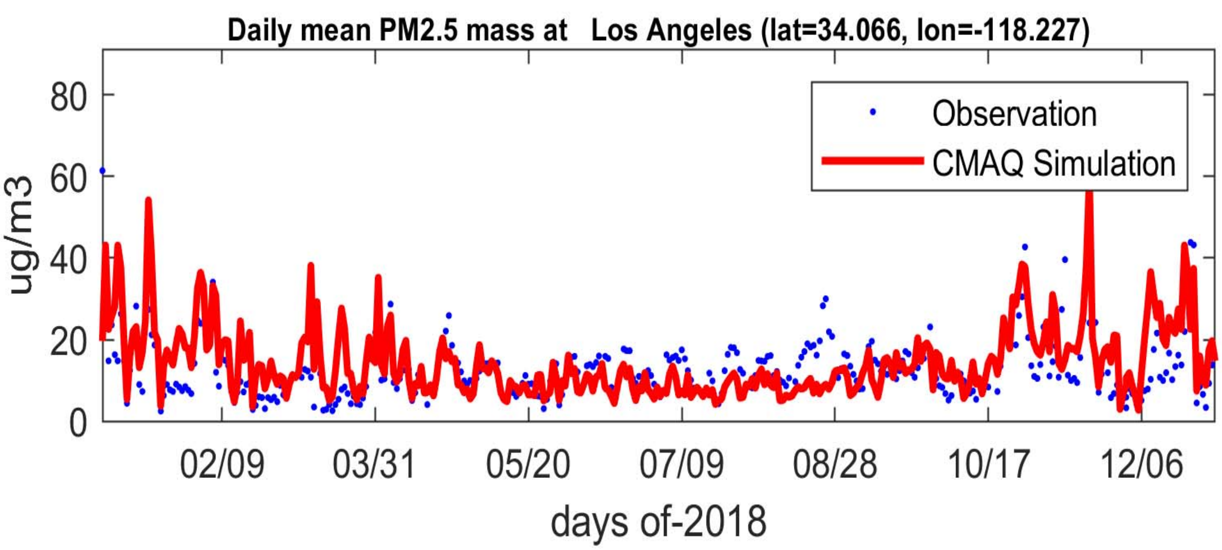

FIGURE 5-10

Time Series Comparison of PM2.5 Observations and Simulated Mass Concentrations at the Los Angeles Monitoring Site

TABLE 5-2

Statistical Comparison of Simulation Results with Observations

Station	OBS_AVE[1] (μg/m³)	SIM_AVE[2] (μg/m³)	R[3]	RMSE[4] (μg/m³)	MB[5] (μg/m³)	MAGE[6] (μg/m³)	NMB[7] (%)	NME[8] (%)
Anaheim	11.437	8.52	0.64	6.698	-2.855	4.553	-25	39.8
Azusa	10.851	9.334	0.42	6.964	-1.656	5.394	-15.3	49.7
Los Angeles	12.918	14.372	0.56	7.9	1.579	5.609	12.2	43.4
Compton	13.299	10.706	0.68	6.867	-2.849	4.989	-21.4	37.5
Fontana	11.125	7.349	0.31	7.452	-4.16	5.57	-37.4	50.1
Long Beach - Hudson	11.486	9.579	0.6	6.784	-2.039	4.65	-17.8	40.5
Long Beach - South	11.572	10.647	0.61	6.653	-0.945	4.604	-8.2	39.8
Mira Loma	14.231	6.8	0.58	10.339	-7.414	7.762	-52.1	54.5
Mission Viejo	8.462	5.46	0.56	5.307	-2.875	4.062	-34	48
Ontario	14.493	9.449	0.58	7.843	-5.012	5.794	-34.6	40
Pasadena	10.278	10.724	0.44	6.326	0.266	4.595	2.6	44.7
Pico Rivera	13.043	9.754	0.6	7.336	-3.288	5.156	-25.2	39.5
Reseda	10.518	6.941	0.4	6.598	-3.597	4.537	-34.2	43.1
Rubidoux	12.539	6.607	0.54	8.392	-5.927	6.41	-47.3	51.1
San Bernardino	11.186	6.868	0.45	6.715	-4.476	5.343	-40	47.8
AVERAGE	11.28	8.26	0.50	6.99	-3.08	5.12	-28.02	45.91

[1] Observation average
[2] Simulation average
[3] Coefficient of correlation
[4] Root Mean Squared Error
[5] Mean Bias
[6] Mean Adjusted Gross Error
[7] Normalized Mean Bias
[8] Normalized Mean Error

PM2.5 Attainment Demonstration (for all sites except Compton)

A CMAQ simulation was conducted for the 2023 baseline emissions scenario to assess the 24-hour PM2.5 future air quality and attainment status in the Basin. Table 5-3 and Figure 5-11 present the PM2.5 design concentrations in 2018 and 2023 based on the modeling analysis. As indicated earlier, attainment in Compton is addressed separately through the supplemental analysis section presented later in this chapter. As indicated in Table 5-3 and Figure 5-11, except for Compton, the highest PM2.5 design concentration is projected to be 34.9 $\mu g/m^3$ at Mira Loma. The 2^{nd} and 3^{rd} highest concentrations are projected at the two near-roadway locations – Long Beach Near-Road and Ontario Near-Road, indicating elevated PM2.5 levels along goods movement corridors. The rest of the stations are forecasted to be below 30 $\mu g/m^3$, well below the standard. The Basin is anticipated to attain the federal 24-hour PM2.5 standard in 2023 with the baseline emissions scenario indicating that emission reductions from adopted regulations are sufficient to attain the 2006 24-hour PM2.5 standard by 2023

TABLE 5-3

24-Hour Average 5-Year Weighted PM2.5 Concentrations (µg/m^3)

Station	2018 Base Year	2023 Baseline
Azusa	26.0	24.6
Big Bear	20.3	18.2
Compton	38.3	38.2
Fontana	29.3	27.9
Long Beach – Hudson	28.5	28.6
Long Beach – South	28.6	28.9
Long Beach – Near Road	32.3	32.5
Los Angeles	30.6	29.3
Mira Loma	37.3	34.9
Mission Viejo	15.8	15.5
Ontario – Near Road	34.3	31.8
Pasadena	25.1	23.5
Pico Rivera	30.9	29.5
Reseda	23.7	22.3
Riverside Rubidoux	31.4	29.1
San Bernardino	28.2	26.4

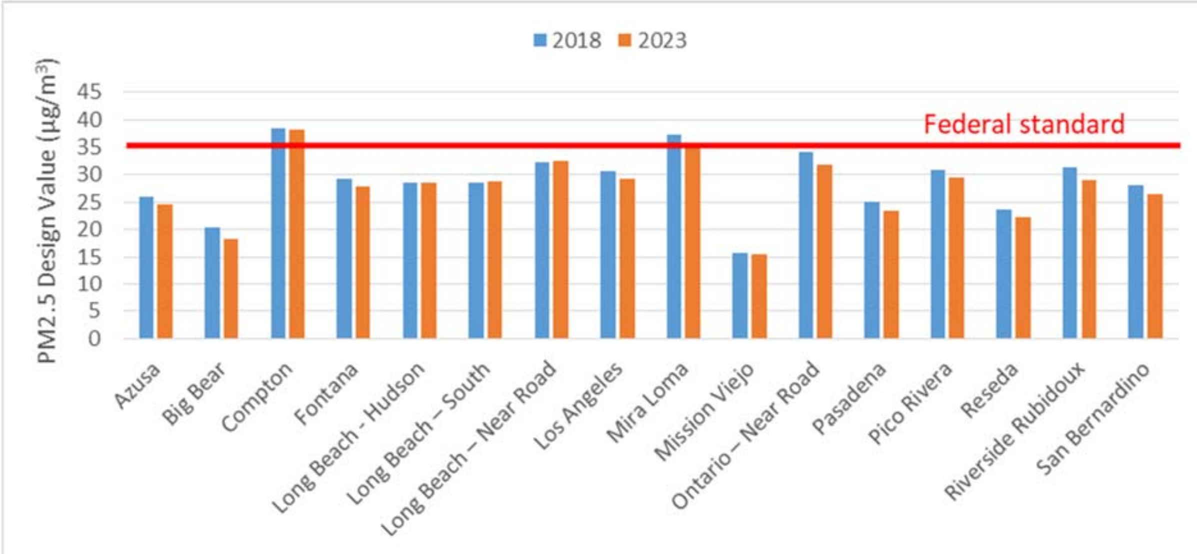

FIGURE 5-11

24-Hour Average PM2.5 Design Concentrations: 2018 Baseline and 2023 Baseline

Unmonitored Area Analysis

The U.S. EPA modeling guidance recommends that the attainment demonstration include a formal analysis to confirm that all grid cells in the modeling domain meet the federal standard. This "unmonitored area analysis" is essential since speciation monitoring is conducted at a limited number of sites in the modeling domain. Variance in the species profiles at selected locations coupled with the differing responses to emissions control scenarios are expected to result in spatially variable impacts to PM2.5 air quality. Based on the unmonitored area analysis conducted for this Plan, attainment of the 2006 24-hour PM2.5 standard was confirmed at all locations within the Basin. This analysis is presented in Appendix IV.

Supplemental Analysis for Attainment Demonstration in Compton

Compton does not show attainment in 2023 with the chemical transport modeling-based attainment demonstration, as shown in the previous section. However, a suite of technical analyses using ambient measurements strongly suggests that Compton will meet the standard before 2023, and most likely in 2020. When the model and prevailing evidence do not align, the U.S. EPA's guidance allows for a "weight of evidence" assessment in order to project attainment (U.S. EPA, 2018).[26] Several analyses are presented herein which demonstrate that Compton's base year design value was anomalous and that attainment by 2023 is highly probable. Consistent with the U.S. EPA's guidance for attainment dates in the near future, ambient data and emissions trends carry the most weight in the analysis. Additional analyses, focusing on meteorological factors and localized emission sources, are presented.

[26] U.S. EPA, (2018). Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

Limitations of Regional Chemical Transport Model

CMAQ-based modeling is inappropriate to apply to Compton due to limitations in the regulatory SIP/AQMP emissions inventory. The supplemental analysis provided in this section suggests that the high PM days in Compton – January 1, December 24th and 27th, 2017 – which caused an atypically high 98th percentile value in 2017 were likely driven by high emissions occurring in local proximity to the monitoring station. The station is located in a public parking lot, which affords access to passersby. The 2017 emission episodes, which have not recurred, were likely microscale events. Such microscale events are not reflected in a regulatory emissions inventory since the inventory is designed to capture a typical annual average day (annual average emissions) or a typical summer day (summer ozone planning emissions), but not an extremely rare event caused by episodic anthropogenic activity. As shown in the Table 5-3, CMAQ modeling predicts that Compton's design value will improve by 0.1 $\mu g/m^3$ from 2018 to 2023, while NOx and VOC combined emissions decrease by 117 TPD during the corresponding time period. This is greater than a 25% reduction from the total Basin-wide baseline NOx emissions. Consequently, a strategy based on CMAQ modeling would lead to unrealistically aggressive emission reductions due to inaccurate characterization of the high PM episodes.

PM2.5 Trend Measured at Compton

Since FRM measurement for PM2.5 began on Dec. 23, 2008, all the DVs prior to 2017 were below the 2006 24-hour PM2.5 standard of 35 $\mu g/m^3$ in Compton. The 2017 DV was 39 $\mu g/m^3$, which was caused by unusually high PM2.5 readings recorded on January 1, December 24th and 27th, 2017. The 98th percentile value used in the DV calculation was 53.4 $\mu g/m^3$ measured on Jan 1st 2017. Since a DV comprises a three-year period, the high reading in 2017 carried over and caused exceedances in 2017, 2018 and 2019. However, as is evident from Figure 5-18, the abnormally high PM episode did not recur after 2017. The three highest values recorded in 2017 are among the top four highest PM2.5 values recorded in Compton since the beginning of the PM2.5 measurements. Further analysis indicates that meteorological conditions were not particularly conducive towards high PM2.5 concentrations on January 1st, whereas meteorological conditions were highly conducive to PM accumulation on December 27th. This suggests that the high PM levels on January 1st and December 24th were likely caused by episodic local emissions.

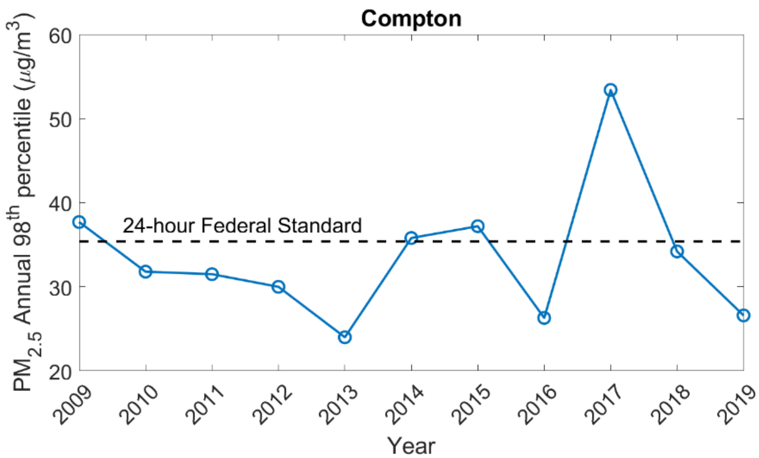

FIGURE 5-18

Annual 98th Percentile 24-Hour PM2.5 Concentrations Measured in Compton

PM2.5 Precursor Trend Measured at Compton

Concentrations of NOx and VOCs, PM2.5 precursors, have decreased significantly over the past decade. Annual average NOx concentrations measured at the Compton station from Feb. 2009 to Aug. 2020 are presented in Figure 5-19. The annual NOx concentration in Compton decreased at an average rate of 1.39 ppb/year from 2009 to 2019. The total speciated VOC concentrations measured in Compton during three Multiple Air Toxics Exposure Studies (MATES)[27] are shown in Figure 5-20. MATES are a series of year-long monitoring, modeling, and evaluation studies conducted in the South Coast Air Basin to evaluate Basin-wide cancer risk exposure caused by toxic air pollutants. The three most recent MATES iterations, MATES III, IV, and V, included monitoring conducted from April 2004 – March 2006, July 2012 – June 2013, and May 2018 – April 2019, respectively. Only speciated VOCs measured in all three MATES campaigns were considered here. As shown in Figure 5-20, VOC concentrations measured in Compton have decreased by more than a factor of two between 2004 and 2019. The emission trend indicates that the Basin-wide emission reductions are evident in the Compton area, even though ambient PM2.5 does not show the same level of reductions due to the complexity of PM chemistry and year-to-year variation in meteorology. Even then, 98th percentile values in Compton have been below or close to the 35 μg/m^3 standard in all years except 2017, as shown in Figure 5-18.

[27] Reports are available at https://www.aqmd.gov/home/air-quality/air-quality-studies/health-studies

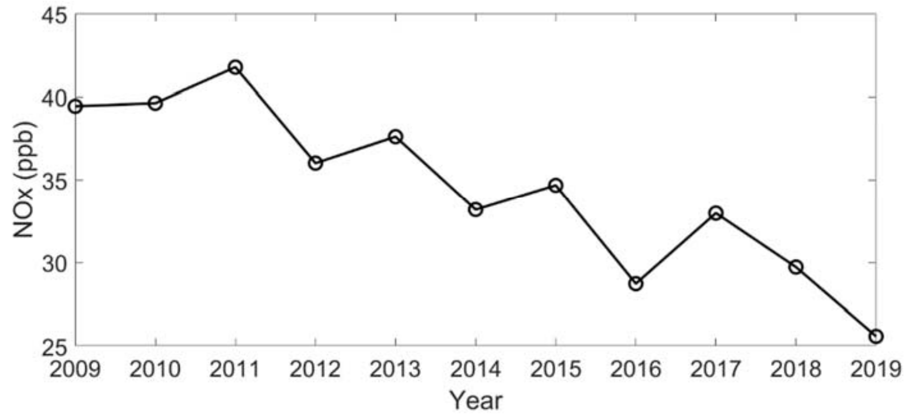

FIGURE 5-19
Annual Average NOx Concentrations Measured in Compton

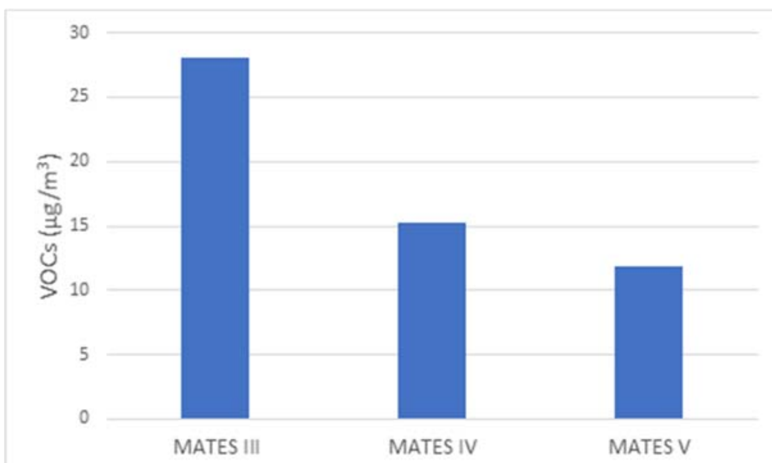

FIGURE 5-20
Total Speciated Volatile Organic Compound (VOC) Concentrations Measured in Compton During the Multiple Air Toxics Exposure Studies (Mates)[28]

[28] MATES V data is preliminary

Emissions Inventory Trend

Based on the emissions inventory, NOx and VOC concentrations are expected to further decrease by 2023 and thereafter. Figure 5-21 demonstrates trends in the Basin-wide VOC and NOx inventories from 2012 to 2024. While the pace of VOC reductions has slowed, NOx reductions are continuing at a steady pace. The emissions trend generally mirrors that of ambient concentrations as shown in Figures 5-19 and 5-20. NOx and VOCs are major PM and ozone precursors and reductions in their emissions are critical for the Basin to attain PM2.5 and ozone standards. In addition to the reductions shown in Figure 5-21, emission reductions resulting from recently adopted regulations that are not reflected in the baseline emissions will further ensure attainment in Compton in 2023. The additional reductions beyond the baseline emissions are discussed in Chapter 4 of this Plan.

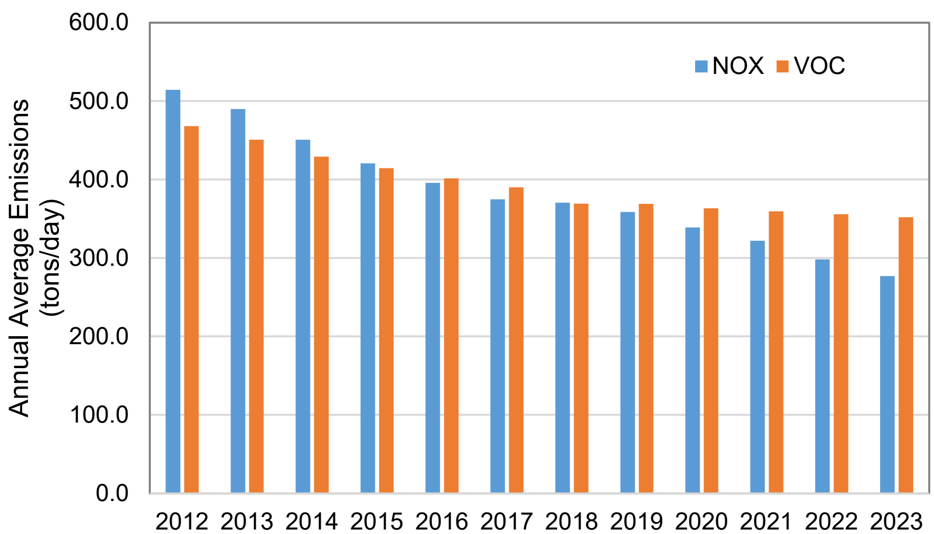

FIGURE 5-21

Basin-Wide Annual Average Emissions of NOx and VOCs.

Additional Analysis

The weight of evidence, based on emissions and air quality trends, strongly suggests that the 24-hour PM2.5 98th percentile in 2017 was anomalous. In order to further strengthen the basis for this hypothesis, additional analyses focusing on meteorological factors and localized emission sources are summarized in this section. The complete analysis is detailed in Appendix V.

Meteorology on December 24th and December 27th, 2017 was Unusual and Highly Conducive for High PM2.5 Levels

The potential to accumulate PM2.5 was evaluated to determine the influence of meteorology on the three highest PM days in 2017. This analysis illustrated that meteorological conditions on December 27, 2017, and to a lesser extent, December 24, 2017, were unusually favorable for high PM2.5 concentrations. This indicates that the high PM2.5 recorded on December 27, 2017 was somewhat expected based on unfavorable meteorology whereas the concentration recorded on December 24th was likely partially driven by meteorology with some contribution from local emissions. The meteorology on January 1st was not particularly conducive to high concentrations, indicating that local emissions played a large role in the exceedance. Refer to Appendix V for further details on this analysis.

A Mathematical Model Suggests That Remarkably High PM2.5 Concentrations in Compton on January 1st, December 24th, and December 27th, 2017 Were Caused by Unusual or Atypical Emission Sources

A model was developed to simulate historical PM2.5 concentrations in Compton based on actual PM2.5 measurements taken during 2009-2020, with meteorological, traffic flow, seasonal, and day-of-week data as predictor variables. The model was used to predict PM2.5 on the dates of interest as well as on dates that were randomly removed from the training dataset (held out dates). Evaluation of model performance by comparing measured concentrations with predicted concentrations on the held-out dates indicated that the model accurately simulates PM2.5 concentrations at Compton. However, the model failed to reproduce the three high PM days in question. This indicates that typical meteorology and seasonality, represented by day of a year, did not completely drive the exceptionally high concentrations recorded in Compton. Therefore, it is likely that local and infrequent episodic emissions significantly contributed to the high PM2.5 levels in Compton on the three highest days in 2017. Additional details of this analysis are provided in Appendix V.

Fireworks Contributed to the High PM2.5 Concentration on January 1st, 2017

To quantify the impact of fireworks on high PM2.5 in Compton on January 1st, 2017, FRM filters collected during July 4th and 5th, 2017 and 2018, and the FRM filter collected at Compton on January 1st, 2017 were analyzed using the X-Ray Fluorescence (XRF) for 50 inorganic and metal species. A full list of analyzed species can be found in Appendix V. Metals are a major chemical component of firework smoke. In the South Coast Air Basin, the highest PM2.5 concentrations in the summer months have always been recorded on July 4th and 5th because of Independence Day fireworks celebrations. There are also some fireworks events on New Year's Eve and widespread use of consumer-grade fireworks. However, fireworks activities on New Year's Eve are usually less intensive than Independence Day. By comparing measurements on Independence Day and New Year' Eve, it is possible to estimate the contribution of firework on PM2.5 in Compton on January 1st, 2017. It is estimated that fireworks were responsible for 7.84 - 12.47 $\mu g/m^3$ of the mass, corresponding to 14.7 – 23.4% of the total PM2.5 mass measured in Compton on January 1st, 2017. While this increased mass from fireworks on January 1st, 2017 was not large enough to make an exceptional event demonstration, it did play an important role in driving the atypically high concentrations on that day. Further details of this analysis are presented in Appendix V.

PM2.5 Design Value is Unlikely to Exceed the PM2.5 24-hour Federal Standards in 2020-2023

To determine the likelihood of future PM2.5 design value exceedances in Compton during 2020 – 2023 a statistical technique was developed to estimate future concentrations based on past measurements. For the purposes of this analysis, it was conservatively assumed that PM2.5 precursor emissions and meteorology in future years will remain at 2009-2019 levels. We estimated the PM2.5 concentration on a given future day (all days between July 2020 and December 2023) by randomly sampling one historical PM2.5 measurement recorded during the same time of the year. The whole process was iterated 10,000 times to get a distribution of estimated design values for each year. The probabilities that the PM2.5 design value for the year 2020, 2021, 2022, and 2023 will exceed the 24-hour federal standard are 0, 0.07%, 4.6%, and 4.5% respectively. This suggests that it is very unlikely that the design value for the year 2020, 2021, 2022, and 2023 will exceed the 24-hour standard even with the conservative assumption that PM2.5 emissions and emission precursors will remain constant.

The constant emission assumption is a conservative assumption given that concentrations of NOx and VOCs, PM2.5 precursors, have decreased over the past decade (Figure 5-19 and Figure 5-20). Therefore, the actual PM2.5 design values in the future years are likely to be lower than the estimated design values with the assumption that emissions and chemistry involved in PM2.5 formation do not change in future years. A complete description of this technique and a sensitivity analysis is presented in Appendix V.

High PM2.5 Concentrations Measured During Wintertime in Compton is Heavily Influenced by Residential Wood Burning

Levoglucosan, a common tracer for wood combustion, was measured during MATES V. The measurements demonstrate that wood combustion is prevalent in the area surrounding Compton, particularly during winter. The average wintertime concentration measured at all MATES stations is presented in Figure 5-22. The levoglucosan concentration at Compton is 61% higher than the second highest station (West Long Beach) and 111% higher than the average of all other stations. This suggests that, during winter, PM2.5 in Compton is more influenced by wood burning compared to other locations in the South Coast Air Basin.

Residential wood burning is regulated by South Coast AQMD under Rule 445. When PM2.5 is forecast to exceed a threshold, which is currently 30 $\mu g/m^3$, a "no burn" day is declared. Since the U.S. EPA has recently finalized its determination on the South Coast Air Basin's failure to attain the 2006 24-hour PM2.5 standard by December 31, 2019, the threshold will be lowered to 29 ug/m^3. However, low income households or households that use wood burning as a sole source of heat are exempt under Rule 445. A large fraction of the neighborhoods surrounding Compton contain low income households. Thus, a significant amount of wood burning in Compton may occur even on "no burn" days.

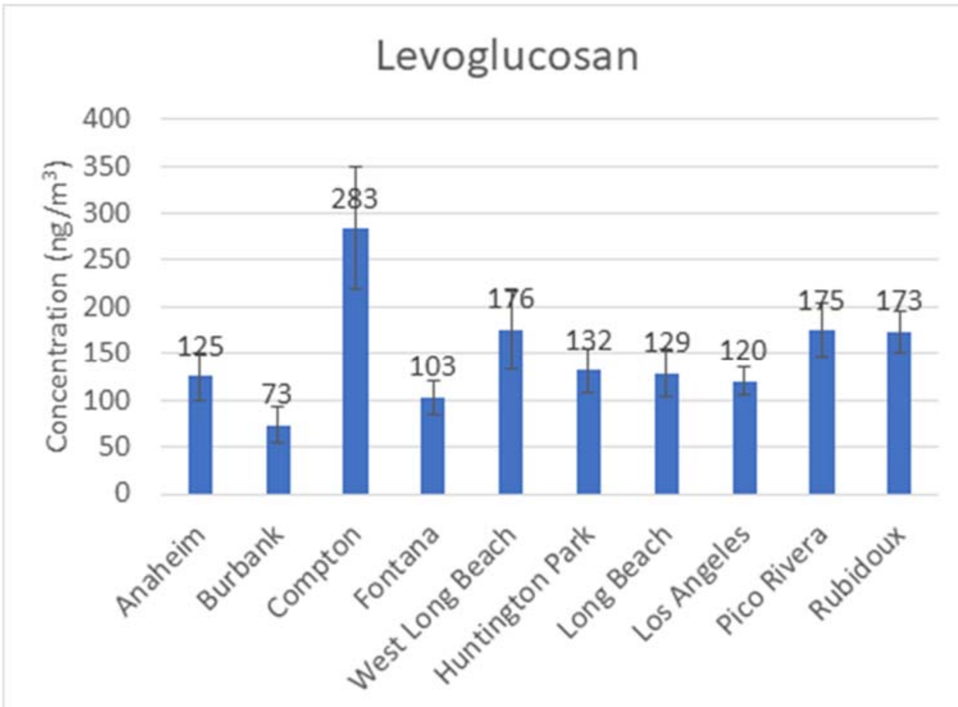

FIGURE 5-22

Average Levoglucosan Concentration Measured at Stations Across the South Coast Air Basin from Nov. 2018 – Feb. 2019[29]. Error bars represent the standard error of the measurements.

To better quantify the impact of residential wood burning on PM2.5 in Compton, a forecasting tool was created to predict PM2.5 from residential wood smoke based on levoglucosan observations during MATES V. The model relies on meteorological variables and seasonal parameters, which capture the influence of human behavior on wood smoke emissions, to estimate the PM2.5 concentrations due to wood smoke. This forecast tool can be used to estimate wood smoke concentrations on days without levoglucosan measurements.

[29] Levoglucosan data is preliminary

The fraction of PM2.5 from wood smoke was calculated using the wood smoke PM2.5 concentrations estimated by the levoglucosan model and the total PM2.5 concentration measured on corresponding days. The fraction of PM2.5 from wood smoke has a clear seasonal cycle, which peaks in winter months and is lowest in summer months. This analysis suggests that wood smoke substantially contributes to PM2.5 mass in Compton; however, the model-predicted business-as-usual wood smoke contribution does not completely account for the high PM levels in 2017. Therefore, this indicates the presence of an abnormally high and unusual amount of local emissions on the 2017 exceedance days. Details of the model configuration and additional analysis is presented in the Appendix IV.

Compton Attainment Demonstration Summary

A weight-of-evidence approach using supplemental analyses was employed to demonstrate future attainment of the 2006 24-hr PM2.5 NAAQS in Compton. Consistent with the U.S. EPA's guidance, the additional analyses included air quality and emissions trends, further reductions beyond the baseline emissions, and further technical analyses that estimated the impacts of woodsmoke, fireworks, and meteorology. Together, the analyses demonstrate attainment of the 2006 24-hour PM2.5 standard in Compton by 2023. Key findings are summarized below:

- Since PM2.5 FRM measurements began in 2008, all design values were below the 2006 24-hour PM2.5 standard of 35 $\mu g/m^3$ until 2017. The unusually high PM2.5 levels that caused the exceedances in 2017 did not recur. Ambient monitoring data from 2018 to the 1st half of 2020 indicates that Compton will highly likely attain the standard by December 31, 2020.

- The preliminary 2020 design value calculated with measurements in 2018, 2019, and the first two quarters of 2020 is well below the standard. This indicates that Compton will attain the standard by the end of 2020 if no more than seven days above 45 ug/m^3,without wildfire influence, are recorded in the last half of the 2020—a very unlikely scenario based on the historical record.

- While the high PM2.5 days in 2017 were influenced by a combination of woodsmoke, fireworks and adverse meteorology, custom-built tools using statistical algorithms indicated that the high PM2.5 levels could not be explained by business-as-usual emissions or meteorology. Therefore, the 2017 high PM2.5 days were likely driven by episodic and localized emissions, which have not recurred.

- The episodic and localized emissions are not reflected in the regulatory emissions inventory nor are they resolved with the spatial scale used in attainment modeling. Therefore, unrealistically aggressive emission reductions would be required to show attainment with the regional modeling system.

- In addition to Compton's likelihood of attainment by December 31, 2020, the continuation of precursor emissions reductions due to recently adopted regulations that are not reflected in the baseline emissions will further ensure attainment in Compton.

- Since the 2017 high PM2.5 days raised a concern, the FRM sampling frequency was changed from every 6th day to every day, which ensures that all poor air quality days are captured and the 98th percentile value will not be unduly influenced from an atypically high value that happens to fall on a one in three measurement day.

Overall Weight of Evidence

PM2.5 concentrations in the Basin have significantly decreased as shown in Figure 5-1 due to the impact of existing regulations, except from 2014-2016 when severe, persistent drought caused higher PM2.5 levels. Atypically high values were also observed in 2017, but only in Compton. The historical trend provides additional confidence that the downward trend over the last two decades will continue and the Basin will attain the PM2.5 standard in 2023, if not earlier. Moreover, additional emission controls that result from the implementation of the recently adopted regulations since the 2016 AQMP will further ensure timely attainment.[30]

Because emission projections in this Plan are consistent with the modeling set-up of the 2016 AQMP, the attainment demonstration presented here is also based on the same CMAQ version (version 5.0.2). The latest version of CMAQ (version 5.3.1, released in December 2019) includes several improvements with respect to version 5.0.2. Additional simulations using the latest version of CMAQ were conducted to determine the sensitivity of model versions on attainment demonstration results. CMAQ 5.3.1 produced very similar results compared with the ones obtained using CMAQ 5.0.2 and did not change the results in the attainment demonstration. With the latest version, the South Coast Air Basin is also expected to attain the 2006 24-hour PM2.5 standard, which provides additional weight of evidence for the attainment demonstration.

Conclusion

Figure 5-23 shows the observed baseline year (2018) and projected future 24-hour PM2.5 design values in 2023, the new attainment year of the 2006 24-hour PM2.5 NAAQS. The 24-hour PM2.5 design values in 2023 are expected to be lower than 35.4 μg/m^3 at all monitoring stations located within the Basin. The attainment was demonstrated with 2023 baseline emissions, which reflect on-going emission reductions from adopted regulations.

[30] South Coast AQMD (2017), 2016 Air Quality Management Plan, Appendix III, Base and future year emission inventory. Available at:http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-iii.pdf?sfvrsn=6

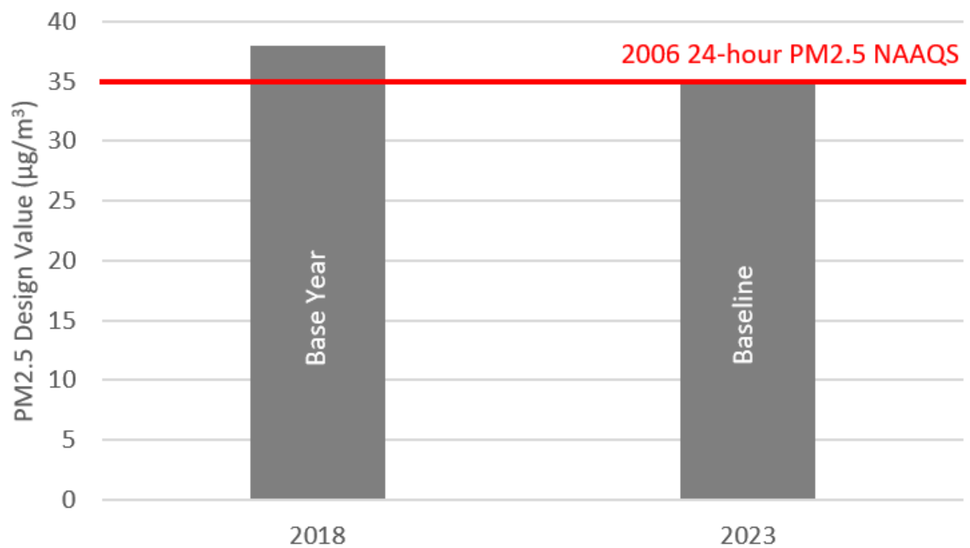

FIGURE 5-23

Projection of Future PM2.5 Air Quality in the Basin in Comparison with the 2006 24-Hour PM2.5 NAAQS

6. OTHER FEDERAL CLEAN AIR ACT REQUIREMENTS

This Plan addresses the Clean Air Act (CAA) requirements which were triggered because of the Basin's failure to attain the 2006 24-hour PM2.5 standard. Chapters 3 to 5 of this Plan fulfill the requirements related to the updated emission inventory, control strategy, and attainment demonstration. This chapter addresses the other CAA requirements.

Five Percent Annual Reduction

CAA Section 189(d) states that in the case of a Serious nonattainment area fails to attain the NAAQS by the applicable attainment date, the State in which such area is located shall, after notice and opportunity for public comment, submit within 12 months after the applicable attainment date, plan revisions which provide for attainment of the standard and, from the date of such submission until attainment, for an annual reduction in directly emitted PM or PM precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory prepared for such area.

To comply with the CAA Section 189(d) requirement of annual 5 percent reduction of PM or a PM precursor, this section demonstrates that the South Coast Air Basin meets this requirement for all the years required to be addressed in this Plan. South Coast Air Basin is expected to attain the 2006 24-hour PM2.5 standard at or before 2023. Given the Plan is due to the U.S. EPA by December 31, 2020, the first year to demonstrate the 5 percent reduction is 2021 and the last year is 2023, the new attainment date. NOx is used for this demonstration, given that NOx is an important precursor for both ozone and PM2.5 and the Basin's attainment strategy for PM2.5 and ozone NAAQSs heavily depend on NOx reductions. The baseline and future milestone years' emissions inventory are presented in Chapter 3 of this Plan. All years from 2021 to 2023 meet the requirement, as shown in Table 6-1, therefore, South Coast Air Basin meets the CAA 189(d) requirement of annual 5 percent reduction of PM or a PM precursor.

TABLE 6-1

5 Percent NOx Reductions per Year from 2020 to 2023

		% Reduction from 2018 base	5% Target (Tons per Day)	NOx baseline Emissions (Tons per Day)	Meets 5% (yes or no)
Base Year	2018			370.5	
		5 percent of 2018 Baseline Year Emission		18.5	
Year 1	2021	5%	352.0	321.7	YES
Year 2	2022	10%	333.5	297.9	YES
Year 3	2023	15%	314.9	276.6	YES

Control Strategy Analysis

The CAA Section 189(d) Plan must include a control strategy satisfying the requirements of 40 CFR 51.1003(c)(1)(iii) and 51.1010(c). This control strategy must be sufficient to achieve the emissions reductions necessary for the 5% annual emissions reduction demonstration and expeditious attainment. As described in the previous section in this Chapter, reductions in the baseline emissions provide for the required 5% annual emission reduction. This section includes an evaluation of emissions sources and emissions controls and demonstrates that all best available control measures (BACM) and feasible control measures are in place in the Basin for directly emitted PM2.5 and all PM2.5 precursors. This demonstration covers: 1) implementation of BACM as approved in the 2016 AQMP and 2016 State SIP Strategy and 2) evaluation of additional feasible measures, as described below.

I. Implementation of Best Available Control Measures as Approved in the 2016 AQMP and 2016 State SIP Strategy

The Basin was reclassified as Serious nonattainment for the 2006 24-hour standard effective February 12, 2016 with an attainment date of December 31, 2019. The Final Rule of "*Fine Particle Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*" (81 FR 58010) indicates that a Serious area attainment plan must include provisions to implement BACM on sources in a Serious nonattainment area no later than four years after reclassification. The 2016 AQMP included a comprehensive BACM demonstration for stationary, area, and mobile sources for the 2006 24-hour PM2.5 standard, which was subsequently approved by the U.S. EPA in March 2019 (84 FR 3305). Below is an update on the implementation of BACM as approved in the 2016 AQMP and the 2016 State SIP Strategy.

i. South Coast AQMD Stationary Sources

As a component of the 2016 AQMP, South Coast AQMD conducted a comprehensive BACM/BACT analysis for the 2006 PM2.5 standard. In addition to the BACT evaluation for stationary sources, potential control measures were identified for key stationary sources by comparing existing control measures to the requirements in federal and state regulations and guidance, as well as the analogous rules in other air districts. A 7-step analysis was conducted to identify candidate measures that were potentially feasible to be implemented in the Basin. The source of information included the Air Quality Technology Symposium, RACT/BACT Evaluation, U.S. EPA Technical Support Documents, other Districts' control measures, control measures beyond RACM in the 2012 AQMP, U.S. EPA menu of control measures, and U.S. EPA guidance document (details are found in the 2016 AQMP Appendix VI-A). In summary, the 2016 AQMP BACM evaluation concluded that South Coast AQMD's rules and regulations are generally as stringent as, or more stringent than, the analogous rules in other air districts / agencies, and are considered as BACM for applicable stationary sources. There were no additional cost effective and technologically feasible control measures identified in the 2016 AQMP that could qualify as BACM or additional feasible measures for the 2006 24-hr PM2.5 standard. Since the adoption of the 2016 AQMP, South Coast AQMD has continued to implement the existing rules and regulations as well as the control strategies described in the 2016 AQMP which provide emission reductions in PM2.5 and PM2.5 precursors toward attainment of the 2006 PM2.5 standard.

ii. CARB Mobile and Area Sources

On March 14, 2019, the U.S. EPA approved the South Coast 2016 PM2.5 SIP (2016 SIP) which demonstrated that BACM, including BACT, for the control of direct PM2.5 and PM2.5 precursors would be implemented no later than four years after the Basin was reclassified to Serious for the 24-hour PM2.5 NAAQS. While the 2020 24-hour PM2.5 SIP does not require another demonstration that the State has met BACM, CARB staff believes an affirmation that the State has met, and continues to meet, BACM requirements is appropriate.

California's long history of comprehensive and innovative emissions control has resulted in the strongest mobile source control program in the nation. The U.S. EPA has acknowledged the strength of these programs in their approval of CARB's regulations and through past waivers. In addition, the U.S. EPA has provided several past determinations that CARB's mobile source control programs meet BACM requirements, including within the approval of the 2016 SIP. Since approval of the 2016 SIP, CARB has continued to substantially enhance and accelerate reductions from its mobile source control programs through continued implementation of on-going programs such as the Truck and Bus Rule, and adoption of new regulations and more stringent engine emissions standards and in-use requirements. The continued implementation of the control strategy approved in the 2016 PM2.5 SIP provides emission reductions in PM2.5 and PM2.5 precursors toward attainment of the 2006 PM2.5 standard.

iii. Transportation Control Measures

As required by federal and state laws, the South California Association of Governments (SCAG) is responsible for developing a long-range regional transportation plan/sustainable communities strategy (RTP/SCS) every four years and a short-term federal transportation improvement program (FTIP) every two years. The RTP/SCS provides for the development and integrated management and operation of transportation systems and facilities that will function as an intermodal transportation network for the SCAG region, while the FTIP implements the programs and projects in the RTP/SCS. SCAG must ensure that the regional transportation plan, program, and projects are supportive of the goals and objectives of applicable AQMPs/SIPs. In addition, SCAG is required to develop demographic projections and regional transportation strategy and control measures for the South Coast AQMP/SIP based on the RTP/SCS and the FTIP.

Included within these regional transportation strategy and control measures are SIP-committed transportation programs and projects that reduce vehicle use or change traffic flow or congestion conditions, better known as Transportation Control Measures (TCMs).

Reclassified as a Serious nonattainment area under the 2006 PM2.5 NAAQS since February 12, 2016, the South Coast Air Basin is required to implement BACMs including TCMs for the control of direct PM2.5 and PM2.5 precursors from on-road mobile sources. SCAG prepared a TCM BACM analysis for the Serious 2006 PM2.5 SIP included in the 2016 South Coast AQMP.[31] Effective March 14, 2019, US EPA approved the BACM demonstration in the Serious 2006 PM2.5 SIP including the TCM BACM demonstration.

Since the adoption of the 2016 AQMP, SCAG has been implementing all the committed TCMs described in the 2016 AQMP, including those listed in the 2016 AQMP Appendix IV-C as well as new TCMs added through the TCM selection and rollover process via the subsequent FTIP development process. The continuing TCM implementation provides emission reductions in PM2.5 and PM2.5 precursors for the attainment of the 2006 PM2.5 standard.

II. Evaluation of Additional Feasible Measures

Since the adoption of the 2016 AQMP, several regulations and policies have been developed or updated for select source categories by other agencies. For example, several air districts have revised their wood-burning rules to incorporate more stringent requirements. In addition, California has passed a suite of bills that seek to reduce greenhouse gas emissions from various sectors including electricity generation as well as residential and commercial buildings. Hence, a further evaluation of feasible measures is warranted for these source categories. The following sections provide an update of these regulations and policies and an assessment of whether they could be considered additional feasible measures for theses source categories in the Basin. Finally, South Coast's recently adopted Reasonably Available Control Technology Demonstration is also presented here as an additional analysis for feasible measures.

i. Residential Fuel Combustion – Wood Combustion

Residential wood combustion is an area source category with significant PM2.5 emissions, accounting for an estimated 4.9 tons per day of PM2.5 and 7.4 tons per day of VOC in year 2018. Most wood-burning devices in the Basin are fireplaces or wood stoves (or wood-burning heaters). South Coast AQMD Rule 445 (Wood Burning Devices) regulates emissions from this source category. On February 12, 2019, the U.S. EPA approved Rule 445 as BACM for the 2006 24-hour PM2.5 standard (84 FR 3005). Since that time, two other California air districts and another state agency have revised their wood-burning rules to incorporate more stringent requirements. Hence, a further evaluation of feasible measures is warranted for this source category.

South Coast AQMD Rule 445 Wood-Burning Devices (Amended 6/5/2020) was adopted in March 2008 to implement the PM2.5 Control Measure BCM-03 of the 2007 AQMP to reduce PM2.5

[31] 2016 AQMP Appendix IV-C. http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-iv-c.pdf?sfvrsn=4.

emissions from wood-burning devices. Rule provisions apply to manufacturers, vendors, commercial firewood sellers, and persons owning or operating a wood-burning device. The rule prohibits burning of products not intended for use as fuel, the sale of unseasoned wood (currently from July 1 through the end of February), and mandates curtailment of wood-burning on "No-Burn" days. Wood-burning curtailment is mandatory on No-Burn days when ambient PM2.5 concentration is forecast to exceed a threshold limit. Exemptions are included for low income households, where the device is the sole source of heating or no natural gas service is available within 150 feet of the property line, geographic elevations 3,000 feet or higher above mean sea level, and ceremonial fires. The rule was amended in May 2013 to implement Control Measure BCM-01 in the 2012 AQMP. The 2013 amendments expanded the wood-burning curtailment or No-Burn day restrictions by lowering the curtailment threshold from 35 to 30 µg/m3, establishing criteria for Basin-wide curtailment, and also setting standards for commercially sold solid-fuel labeling. In June 2020, Rule 445 was amended to implement the backstop Contingency Control Measure BCM-09 in the 2016 AQMP and to address the CAA contingency measure requirements for the PM2.5 standards. The 2020 amendments extended the No-Burn day requirement Basin-wide when the daily PM2.5 air quality is forecast to exceed 30 $\mu g/m^3$ in any source receptor area, providing additional emission reduction benefits beyond those incorporated in the baseline reductions from this source category. In addition, the No-Burn day thresholds will automatically be lowered upon the EPA's finding of failure to fulfill specific requirements as set forth in 40 CFR § 51.1014(a).

The following is an evaluation of recently adopted rules and regulations by other agencies for residential wood burning:

San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters, Amended 6/20/2019)

SJVUAPCD Rule 4901 includes a tiered mandatory curtailment program that establishes different curtailment thresholds for each county based on the type of devices. During a level one episodic woodburning curtailment, operation of wood burning fireplaces and unregistered wood burning heaters is prohibited, but properly operated, registered wood burning devices may be used. During a level two episodic woodburning curtailment, operation of any wood burning device is prohibited. In the ''hot spot'' counties of Madera, Fresno, and Kern, the level one PM2.5 threshold is 12 micrograms per cubic meter, and the level two PM2.5 threshold is 35 micrograms per cubic meter. In the remaining counties in the District (San Joaquin, Stanislaus, Merced, Kings, and Tulare), the level one PM2.5 threshold is 20 micrograms per cubic meter, and the level two PM2.5 threshold is 65 micrograms per cubic meter. In addition, Rule 4901 prohibits the sale or transfer any real property which contains a wood burning heater without first assuring that each wood burning heater included in the real property is EPA Phase II Certified or has a more stringent certification for wood-burning devices under the NSPS at the time of purchase or installation, , as well as removal or installation of an EPA certified wood-burning heater that meets the requirements of

NSPS at the time of installation during a major fireplace remodel which also requires a building permit. South Coast AQMD Rule 445 prohibits remodeling of fireplaces. Existing fireplaces constructed prior the effective date of the rule may be repaired within the existing footprint where there is a health/safety issue.

Bay Area Air Quality Management District (BAAQMD) Regulation 6 Rule 3 (Wood-Burning Devices, Amended 11/20/2019)

Under BAAQMD Rule 6-3, the Air District can issue a Winter Spare the Air Alert and require a Mandatory Burn Ban when air quality is forecast to be unhealthy due to elevated levels of fine particulate matter with some exemptions that allow wood burning. The rule provides for limited exemptions in the following areas: (i) sole source of heat, (ii) non-functional, permanently installed heater, and (iii) loss of natural gas and/or electric power. In 2019, BAAQMD revised its wood-burning rule to provide for curtailments year-round with a curtailment threshold of 35 µg/m3.

Utah Administrative Code R307-302-3 (No-Burn Periods for Particulates, Effective 2/1/2017)

Under Utah Administrative Code R307-302-3, when the ambient concentration of PM2.5 measured by monitors in Box Elder, Cache, Davis, Salt Lake, Tooele, Utah or Weber counties are forecasted to reach or exceed 25 micrograms per cubic meter, a mandatory no-burn period for solid fuel burning devices goes into effect. The mandatory no-burn periods will only apply to those counties identified by the director. A person within the geographical boundaries is prohibited from using a solid fuel burning device unless it is the sole source of heat for an entire residence and registered with the director.

<u>*Analysis of Feasible Measures for Residential Fuel Combustion (South Coast AQMD Rule 445)*</u>

The following is an analysis of feasible measures for residential fuel combustion based on an evaluation of recently adopted rules and regulations by other air agencies.

Lowering Curtailment Thresholds

The 2006 standard for the 24-hour PM2.5 is set at 35 µg/m3. Under Rule 445, when ambient PM2.5 concentration is forecast to exceed 29 $\mu g/m^3$, wood burning is prohibited. Since the curtailment threshold is significantly lower than the 24-hour standard, a No-Burn day will be called when days are forecasted to be above the standard as well as on days when PM levels are close to the standard. As such, a lower curtailment threshold will not result in additional emission reduction benefits on days with PM2.5 levels exceeding 35 $\mu g/m^3$, and would not have quantifiable emission reductions for the 24-hour PM2.5 standard.

Removal or Replacement of Non-Certified Devices upon Property Transfer or Remodel

In South Coast AQMD, wood-burning curtailment is mandatory for all non-exempt households whenever ambient PM2.5 concentrations are forecast to exceed the curtailment threshold. Given all non-exempt households are prohibited from using both certified and non-certified devices on no-burn days, the removal or replacement of non-certified devices upon transfer or remodel would not result in additional emission reductions on days when the curtailment thresholds are exceeded.

EPA-Certified Devices in Exempt Households

Households currently exempt from South Coast Rule 445 curtailment requirements include the following: where there is no existing infrastructure for natural gas service within 150 feet of the property line; locations 3,000 feet or more above mean sea level; low-income households; sole source of heat, and ceremonial fires. Ceremonial fires are regulated pursuant to the provisions of Rule 444 – Open Burning.

As discussed in the Rule 445[32] staff report, certified wood-burning heaters can range in price anywhere from $2,000 to $8,000 per unit and require professional installation. This would be a significant financial hardship for low income households and also for those not within 150 feet of natural gas service or where the unit is the sole source of heat (which are generally located in more rural and economically disadvantaged areas in the Basin). Natural gas service is generally available in the more densely populated regions of the Basin, so that with the number of units required to switch over this will likely not be a cost-effective requirement or a significant source of emissions reductions. Also staff is exploring ways to expand the existing Fireplace and Wood Stove Change Out incentive program to include additional zip codes. The program currently provides qualified applicants between $200 to $1,600 towards the purchase and installation of an approved wood-burning or gaseous-fueled device that replaces an existing fireplace, providing an incentive to replace fireplaces with cleaner units. The only areas 3,000 ft or higher above mean sea level with large populations in the Basin are Idyllwild, Lake Arrowhead, and Big Bear. The only Federal Reference Method PM2.5 monitor located at 3,000 feet or higher above mean sea level in the South Coast Air Basin is in Big Bear. The recorded PM2.5 levels from this monitor are well below the 24-hour PM2.5 standard. On days when meteorology is favorable for high PM2.5 concentrations, these areas are all downwind of monitors that do not attain the 24-hour standards. Therefore, these areas are not expected to contribute to exceedances of the 24-hour standard.

Extend the Curtailment Season to Year-round

Climate in the Basin is typically more moderate than in the Bay Area and during the non-wood-burning season months, wood-burning devices are used mainly for ambience purposes. For example, based on NOAA data during the four-month wood-burning season from November 2019 through February 2020, the average ambient temperatures in the Los Angeles Downtown Area were 64.9, 59.4, 60.9 and 62.6 degrees Fahrenheit, respectively. In contrast, at San Francisco International Airport (BAAQMD) for the same time period temperatures were 56.4, 53.5, 52.1 and 55.3 degrees Fahrenheit, respectively. Similarly, for the same time period temperatures in the

[32] Table 4 of Rule 445 Final staff Report. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2020/2020-Jun5-026.pdf?sfvrsn=6

Fresno area (SJVUAPCD) were 57.9, 51.0, 49.0 and 55.0 degrees Fahrenheit, respectively. Both regions have significantly lower average temperatures than those typically experienced in the South Coast Air Basin. In addition, the exceedances outside the wood-burning season months are unlikely to affect the 24-hour design values. The past three Basin maximum 24-hour design values were not affected by the few exceedances occurring outside the wood-burning season.[33] In 2019, PM levels above the 24-hour standard were observed only during the existing curtailment season (i.e. in the months of November, December, January, and February), when meteorology is conducive to PM2.5 formation in the Basin. As such, extending the curtailment season to the entire year would not result in additional emission reductions for the 24-hour standard.

Conclusion

Based on the above analysis, for this source category, no other feasible measures would result in additional emission reductions for the 2006 24-hour standard. The requirements in Rule 445 – Wood-Burning Device will be further evaluated in future rule amendments.

ii. Residential and Commercial Buildings

The South Coast Air Basin is home to approximately 17 million residents, representing 44% of the population in California, who reside in about 6 million housing units and utilize commercial space for shopping, entertainment, and places of employment. The energy consumption in the residential and commercial buildings is a direct and indirect source of criteria pollutants and greenhouse gas emissions. Residential and commercial fuel combustion accounted for 21.4 tons per day of NOx and 7.3 tons per day of directly emitted PM2.5 in the Basin in 2018. The majority of NOx emissions within the residential and commercial buildings are from water heating and space heating with the residential sector responsible for the higher direct PM2.5 emissions from residential wood burning. In South Coast AQMD, Rule 1111 reduces NOx emissions from residential and commercial gas-fired fan-type residential space heating furnaces. The rule applies to manufacturers, distributors, sellers, and installers of such furnaces. Rule 1111 was amended in 2009 to require Ultra-Low NOx furnaces (14 nanograms per Joule (ng/J)) by 2014, and was subsequently amended to extend the compliance date with a mitigation fee option. The current NOx emission limit is set at 14 ng/J, which is the most stringent emission limit in California. NOx emissions from residential natural-gas fired water heaters are regulated by Rule 1121. The rule was amended in December 1999 to lower the emission limit from 40 ng/J to 20 ng/J on July 1, 2002 and 10 ng/J on January 1, 2005. In 2004, the implementation date of the final rule limit of 10 ng/J was delayed to 2006-2008 as more time was needed because a number of national safety, energy and environmental standards were delayed and must be met concurrently with the Rule 1121 final limit. The existing NOx limit of 10 ng/J is still the most stringent emission limit for natural gas fired water heaters in California.

[33] Events that would reasonably be considered exceptional events such as wildfire and July 4 were removed from this analysis.

For the residential and commercial buildings, there are potential opportunities to require and accelerate the replacement of existing equipment with cleaner zero- or near-zero emissions alternatives. The 2016 AQMP includes control measures for the applications of zero or near-zero NOx emissions appliances in the residential and commercial sectors (CMB-02), additional enhancement in reducing energy use in existing residential buildings (ECC-03), and co-benefits from existing residential and commercial building energy efficiency mandates (ECC-02). These three control measures combined are anticipated to achieve 2.6 tpd of NOx reductions by 2023. A key element of the 2016 AQMP is to use private and public funding to help further the development and deployment of the advanced cleaner technologies such as zero emission and near-zero emission technologies, and also identify co-benefits from existing programs (e.g., climate and energy efficiency). In January 2019, the South Coast AQMD Governing Board awarded 26 emission reduction incentive projects, totaling over $47 million from several South Coast AQMD mitigation and penalty funds, to support the 2016 AQMP's goals. Of the 26 projects, 15 were selected to implement commercially available zero or near-zero control technologies as well as to support infrastructure for implementation of cleaner fuels. These projects are anticipated to result in approximately 88 tons per year of NOx and 2 tons per year of PM2.5 emissions reductions in the Basin, with the majority of the projects implemented in environmental justice communities. Additionally, 11 stationary and mobile source technology demonstration projects were funded. Upon successful demonstration and deployment, these projects have the potential to provide additional long-term NOx and VOC emission reductions. The awarded projects are consistent with the commitments in various 2016 AQMP control measures including MOB-14, CMB-02, CMB-04, and ECC-03.

Since the adoption of the 2016 AQMP, California Legislature passed a suite of bills that seek to reduce greenhouse gas emissions from various sectors including electricity generation as well as residential and commercial buildings. In 2018, California passed SB 100 (California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases), which sets new standards to California's renewable portfolio by requiring the state to use 50% renewable electricity by 2026, 60% renewable electricity by 2030, and 100% carbon-free electricity by 2045. In addition, two new laws directed towards the state's building sector, AB 3232 (Zero-emissions Buildings and Sources of Heat Energy) and SB 1477 (Low-emissions Buildings and Sources of Heat Energy), were signed in 2018. AB 3232 requires the California Energy Commission (CEC) to assess, by January 1, 2021, the potential for reducing GHG emissions from California's residential and commercial buildings to 40% below 1990 levels by 2030. The assessment will identify key options and policies for increasing heating efficiency while reducing carbon emissions from the state's commercial and residential buildings. SB 1477 helps promote and implement clean heating technology in the state by providing $50 million per year through 2023 to encourage market-based development and adoption of low-emission, clean heating technologies for buildings. In 2018, Governor Brown also signed Executive Order B-55-18, committing California to total, economy-wide carbon neutrality by 2045.

Overall, California sets ambitious goals to promote clean technologies and decrease energy use in California's existing and new building stock. Reducing, managing, and changing the way energy is used in the commercial and residential sectors can provide additional emission reductions, reduce energy costs, and provide multiple environmental benefits. These state climate policies will result in NOx reduction co-benefits in the mid to long term time frame. An evaluation of the benefits of these existing and emerging energy programs to NOx reduction will be included in the 2022 AQMP. South Coast AQMD will continue to evaluate opportunities for additional feasible NOx reductions in existing and new residential and commercial buildings through regulatory or incentive-based programs.

Based on the above analysis, it is concluded that for this source category, no other feasible measures would result in additional emission reductions for the 2006 PM2.5 standard.

iii. *Farming Operations - Manure Management*

South Coast AQMD Rule 223 (Emission Reduction Permits for Large Confined Animal Facilities, Amended 6/2/06) reduces emissions of ammonia and VOCs, both of which are precursors of PM2.5. Rule 223 applies to Large Confined Animal Facilities (LCAFs) above certain size thresholds. Dairies with at least 1,000 milking cows, poultry facilities with at least 650,000 birds, and horse facilities with at least 2,500 horses qualify as LCAFs. Pertaining to manure management, the dairy provisions require that owners/operators implement at least six of 12 corral measures, two of seven solid manure or separated solids handling measures, one of eight liquid manure handling measures, and two of four land application measures. A Poultry LCAF owner/operator must implement at least one of seven solid manure or separated solids handling measures, and one of eight liquid manure handling measures. Rule 223 requires applicable facilities to obtain a South Coast AQMD permit including a mitigation plan with measures chosen from the mitigation menu. The menu option approach in Rule 223 provides the flexibility of selecting the more cost-effective measures.

South Coast AQMD Rule 1127 (Emission Reductions from Livestock Waste, Adopted 8/6/2004) reduces emissions of ammonia, VOC, and PM10 emissions from dairy livestock waste. Rule 1127 applies to dairy farms with 50 or more cows, heifers, and/or calves and to manure processing operations, such as composting operations and anaerobic digesters. The major requirements of Rule 1127 include Best Management Practices (BMPs) to minimize fugitive dust emissions, minimize excess water in corrals, pave feed lanes at least 8 feet on the corral side of the feed lane fence, clear corrals of accumulated manure, and timely remove on-dairy stockpiles. Manure disposal is permitted from the dairy only to a manure processing operation designed to reduce ammonia and VOC emissions from unprocessed manure; agricultural land within the SCAQMD approved for the spreading of manure; or a combination of the above options.

SJVUAPCD Rule 4570 (Confined Animal Facilities, Amended 10/21/2010)

SJVUAPCD Rule 4570 limits emissions of VOC and NH3 from Confined Animal Facilities. Rule 4570's regulatory thresholds include facilities with at least 500 milking cows, 3,500 beef cattle, 7,500 calves, heifers, or other cattle, 400,000 heads of chicken and ducks, 100,000 heads of turkey, 3,000 heads of swine and horses, and 15,000 heads of sheep, goats, or any combination of the two. Rule 4570 is more stringent regarding its applicability compared to South Coast AQMD Rule 223 for milk cows (1,000 milk cows in in South Coast AQMD vs 500 milk cows in SJVAPCD), and for chickens and ducks (650,000 birds in in South Coast AQMD vs. 400,000 birds in SJVAPCD). Rule 4570 also made certain feed and housing menu items mandatory for dairies and poultry facilities. However, South Coast AQMD Rule 1127 has lower applicability thresholds for cows, heifers and/or calves. Rule 223 also has a lower applicability for horse facilities (2,500 in South Coast AQMD vs. 3,000 in SJVUAPCD). In the 2016 AQMP, the feasibility of lowering the applicability threshold was evaluated. It was determined that lowering the applicability threshold would result in 0.20 tpd of NH3 reductions and 0.04 tpd of VOC reductions by 2025.

Other State Policies

California SB 1383, adopted in September 2016, establishes targets to reduce methane emissions from livestock manure management operations and dairy manure management operations. On March 24, 2017, ARB adopted its Short-Lived Climate Pollutant Reduction Strategy (SLCP Plan), outlining future steps for implementing SB 1383 and the need for cooperation. As the plan states, "the State will work to support improved manure management practices through financial incentives, collaboration to overcome barriers, and other market support." South Coast AQMD anticipates that the implementation of SB 1383 would result in co-benefits of VOC and NH3 reductions from livestock manure management operations and dairy manure management operations. The implementation of SB 1383 is expected to reduce the emissions from this source category.

Conclusion

Based on the above analysis, it is concluded that for this source category, no other feasible measures would result in additional emission reductions for the 2006 PM2.5 standard. Staff will continue to track the implementation of SB 1383 and the corresponding emissions benefits to determine whether future rule amendments may be warranted.

iv. *<u>Farming Operations - Greenwaste Composting</u>*

PM precursor emissions of VOC and NH3 are emitted from composting of organic waste materials including greenwaste and foodwaste which are regulated by South Coast AQMD Rule 1133.3 (Greenwaste Composting Operations). Although Rule 1133.3 covers foodwaste composting, the level of emissions from foodwaste composting has not been fully characterized, mainly due to the lack of related emissions test data. In the 2016 AQMP, BCM-10 (Emission Reductions from Greenwaste Composting) seeks to reduce VOC and NH3 emissions (1.5 tpd and 0.1 tpd by 2023, respectively) through emerging organic waste processing technology, restrictions on the direct land application of chipped and ground uncomposted greenwaste, and through increased diversion to anaerobic digestion.

In addition to emitting VOC and NH3, the decomposition of organic waste is a significant source of GHG emission. SB 1383, adopted in September 2016, establishes a 50 percent reduction target in the statewide disposal of organic waste from the 2014 level by 2020, and a 75 percent reduction target by 2025. Under SB 1383, CalRecycle has the regulatory authority to achieve the organic waste disposal reduction targets. It also established an additional target that not less than 20 percent of edible food that is currently disposed of is recovered for human consumption by 2025. South Coast AQMD anticipates that the implementation of SB 1383 would result in co-benefits of VOC and NH3 emission reductions from this source category.

Conclusion

Evaluation is underway to update the emission inventory, which will be used in conjunction with implementation of SB 1383 to assess the need of any potential rulemaking to further reduce emissions from this category.

v. <u>2020 Reasonably Available Control Technology Demonstration</u>

In 2020, a RACT Demonstration was conducted for the South Coast Air Basin based on its Extreme nonattainment classification of the 2015 8-hour ozone standard (herein refers as 2020 RACT[34]). The 2020 RACT Demonstration addressed both Control Techniques Guidelines (CTG) and non-CTG major [35] sources in the Basin emitting the 10 or more tons per year of VOC and NOx. The 2020 RACT Demonstration evaluated over 48 of the U.S. EPA's CTG sources as well as 70 rules, regulations or guidelines adopted from March 2014 to February 2020 by other air districts, state air agencies, and the U.S. EPA. These rules and regulations were compared with the corresponding South Coast AQMD rules and regulations. The 2020 RACT Demonstration concluded that, with the exception of Rule 1115 (Motor Vehicle Assembly Line Coating Operations), South Coast AQMD's current rules for the applicable sources of VOC and NOx meet or exceed the federal RACT requirements. South Coast AQMD Rule 1115 is currently not as stringent as the U.S. EPA's CTG (Automobile and Light-Duty Truck Assembly Coatings) for several coatings and products for facilities emitting greater than 15 pounds per day. In addition, the VOC emission limits in Rule 1115 for several coating types are less stringent than those in the corresponding Antelope Valley Air Quality Management District and San Joaquin Valley Air Pollution Control District's rules. Rule 1115 applies to both light-duty and heavy-duty vehicle assembly lines, whereas the U.S. EPA's CTG applies to automobiles and light-duty trucks. For heavy-duty vehicles, the CTG provides an option to satisfy the requirement through metals products or plastic parts coatings. In the 2014 RACT analysis, all facilities subject to Rule 1115

[34] Draft Final Staff Report for 2015 8-Hour Ozone Standard Reasonably Available Control Technology (RACT) Demonstration, South Coast AQMD, May 2020 (http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/ract-draft-final-staff-report.pdf?sfvrsn=23).

[35] Major sources that are not covered by the U.S. EPA CTGs are called non-CTG major sources.

were heavy-duty vehicles manufacturers, and RACT was fulfilled through South Coast AQMD Rule 1107 (Coatings of Metal Parts and Products). Since then, new light-duty motor vehicle manufacturing facilities are operating in the Basin that are subject to this CTG. Accordingly, light-duty motor vehicle manufacturing emission sources do not meet the U.S. EPA's CTG requirements and South Coast AQMD commits to amend Rule 1115 to meet the CTG requirements. Under South Coast AQMD New Source Review Program (Regulation XIII), the new light-duty motor vehicle manufacturing facilities are required to meet BACT for all emission sources, which by definition represents the "best available control technology." Thus, no additional feasible measure was identified for the Basin from the 2020 RACT Demonstration, which was submitted to the U.S. EPA in August 2020.

vi. *Mobile Sources*

Since approval of the 2016 SIP, CARB has continued to substantially enhance and accelerate reductions from our mobile source control programs through continued implementation of on-going programs such as the Truck and Bus Rule, and adoption of new regulations and more stringent engine emissions standards and in-use requirements such as the Heavy-Duty Low NOx Omnibus Regulation approved by the Board on August 27, 2020. Other rules that CARB has adopted since 2016 include: Low Carbon Fuel Standard and Alternative Diesel Fuels Regulation adopted in April 2018, amendments to the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program adopted in May 2018, Heavy-Duty Diesel Vehicle Emission Control System Warranty Regulation Amendments adopted in June 2018, the Innovative Clean Transit rule adopted in December 2018, the Zero Emission Airport Shuttle Bus Regulation adopted in June 2019, the Advanced Clean Trucks Regulation adopted in June 2020, and the Control Measure For Ocean-Going Vessels At Berth And At Anchor adopted in August 2020.

CARB also continues to lower emissions through the use of incentive funding, and other policies and initiatives. These efforts not only ensure that all mobile source sectors continue to achieve maximum emission reductions through implementation of the cleanest current technologies, but also promote the ongoing development of more advanced zero and near-zero technologies. As a result, California's mobile source control programs continue to be the most stringent emissions controls in the nation and provide the implementation of feasible control measures for mobile source sectors.

vii. *Transportation Control Measures*

The following analysis is an update to the TCM BACM Analysis in the recently approved 2016 South Coast AQMP/2006 PM2.5 Standard SIP, which aims to identify additional feasible measures since the 2016 AQMP.

Review of On-Going Implementation of TCMs in the South Coast Air Basin

In the South Coast Air Basin, TCMs are defined to include the following three main categories of transportation improvement projects and programs that have funding programmed for right-of-way and/or construction in the first two years of the prevailing FTIP per the applicable SIPs as documented in the SCAG's Final 2019 FTIP Guidelines:

- Transit, Intermodal Transfer, and Active Transportation Measures;
- High Occupancy Vehicle (HOV) Lanes, High Occupancy Toll (HOT) Lanes, and their pricing alternatives; and
- Information-based Transportation Strategies.

TCM Selection and TCM Rollover Process – TCMs in the South Coast Air Basin continue to be developed through a continuous and exhaustive process. Projects identified as TCMs in the RTP/SCS are tracked as they get programmed in the FTIP. Only projects that have money programmed for right-of-way and/or construction in the first two years of the FTIP are considered TCMs subject to the Clean Air Act timely implementation requirements. Approximately every two years, as the FTIP is updated, additional TCMs will be added to the South Coast AQMPs/SIPs based on the new FTIP and the FTIP Guidelines. The rollover of TCMs updates the AQMPs/SIPs to include new projects in addition to ongoing projects from previous FTIPs. The rollover is monitored for adherence to the schedule established in the FTIP at the time a project is identified as a committed TCM. The identification of TCMs from the FTIP is agreed upon by both SCAG and the appropriate CTCs. As the FTIP gets adopted every two years, new TCMs emerge and completed TCMs get removed. This rollover process was included in the 1994 SIP and approved by the U.S. EPA. The rollover process has been refined in the FTIP Guidelines adopted with every FTIP. The rollover process has worked remarkably well and has resulted in hundreds of TCMs being implemented/constructed. Thus, the rollover process produces more than RACM would produce and meets BACM. This ensures that RTP/SCS projects that are potential TCMs will, through the rollover process, eventually become committed TCMs.

TCM Funding – Funding for TCMs traditionally depended mostly on federal & state sources. But with gas tax revenues declining and both federal and state budgets tightly constrained, local agencies in California asked the state legislature for permission to go to the voters in each county for a ½ percent sales tax for transportation. This required a 2/3 voter approval in each county, and all four counties in the South Coast Air Basin won approval and extensions were also subsequently approved. While most counties impose a 0.5 percent sales tax to fund transportation projects, Los Angeles County effectively imposes a permanent two percent sales tax (a combination of four 0.5 percent sales taxes - Proposition A, Proposition C, Measure R, and Measure M) as Measure M increases from 0.5 to one percent upon the expiration of Measure R. Riverside County's Measure A will sunset in 2039, followed by San Bernardino County's Measure I in 2040, and Orange County's Measure M in 2041.

As a result of these local sales measures, the mix of revenues in the current 2019 FTIP is $19.8 billion local (57 percent), $8.9 billion state (26 percent), and $5.9 billion federal (17 percent); while in the recently adopted 2020 RTP/SCS (Connect SoCal), the mix is $297.2 billion local (60 percent) (of which 57 percent is local sales tax), $154.8 billion state (32 percent), and $41.1 billion federal (8 percent).

These local revenues fund mostly capital expenditures for TCM projects. For example, in the current 2019 FTIP, HOV projects receive $1.3 billion, transit $9.5 billion, ITS, transportation demand management (TDM), and bicycle/pedestrian combined $691 million; and in the 2020 RTP/SCS (Connect SoCal), HOV/Express Lane projects receive $13.4 billion, transit $66.8 billion, and TDM and active transportation combined $25.0 billion. HOV projects being funded include widening of SR-111 , I-710, SR-55, SR-91, I-405, SR-118, and adding Express Lanes to I-405, I-10, I-605, I-15, SR-71, I-215, and US-101. Transit projects include the BRT Connector, Gold Line extension, Green Line extension, Redline extension, and West Valley Connector.

Extraordinary efforts have been undertaken to pass or extend local sales taxes for transportation in the South Coast region and continued to be successful. The effort to organize and pass or extend these local sales taxes goes well beyond what could have been expected and provides funding for TCMs which could not have been built without these local efforts. These efforts are certainly BACM, not just in revenue raised but without which, none of the major TCMs in transit rail, HOV, etc. could have been financed and constructed.

Review of TCMs Implemented in All Serious PM2.5 Nonattainment Areas

There are five Serious PM2.5 nonattainment areas in this country:

- South Coast Air Basin, California
- San Joaquin Valley, California
- Fairbanks, Alaska
- Provo, Utah
- Salt Lake City, Utah

SCAG performed an updated review of all new PM2.5 SIPs in these areas for available TCMs. SCAG also considered TCMs discussed and reviewed at numerous SCAG's Transportation Conformity Working Group (TCWG) meetings as part of the 2019 FTIP, 2020 RTP/SCS (Connect SoCal), and 2021 FTIP development. The review found that no new TCMs were identified for consideration from control programs both within and outside of the South Coast Air Basin. In addition, the review continued to find that TCM commitments are rarely made in other Serious PM2.5 nonattainment areas; Compared to the other Serious nonattainment area under the 2006 PM2.5 standard, the South Coast region continued to commit much greater level of funding for TCMs.

Conclusion

The above updated analysis demonstrates that the TCM projects being implemented in the South Coast Air Basin continue to constitute BACM, and no additional feasible TCM could be identified.

- The South Coast region continues to implement a much more robust TCM selection process, commit a much greater level of funding for TCMs, has increased and will continue to increase the TCM infrastructure than other PM2.5 nonattainment areas.
- No new TCMs were identified for consideration from TCM programs both within and outside of the South Coast region.
- The exclusion justifications for those measures referenced in the previous BACM analysis continue to be valid because those measures cannot be implemented due to lack of implementation authority, no or non-quantifiable emission reduction benefits, not feasible, or not cost-effective.

Reasonable Further Progress

The CAA requires that SIPs for most nonattainment areas demonstrate reasonable further progress (RFP) towards attainment through emission reductions phased in from the time of the SIP submission until the attainment date. The RFP requirements in the CAA are intended to ensure that there are sufficient emission reductions in each nonattainment area to attain the NAAQS by the applicable attainment date. Per CAA Section 171(1), RFP is defined as:

> "*such annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date.*"

As stated in subsequent federal regulation, the goal of the RFP requirements is for areas to achieve generally linear progress toward attainment. To determine RFP for the attainment date, the U.S. EPA guidance states that the plan should rely only on emission reductions achieved from sources within the nonattainment area. Section 172(c)(2) of the CAA requires that nonattainment area plans show ongoing annual incremental emissions reductions toward attainment, which is commonly expressed in terms of benchmark emissions levels or air quality targets to be achieved by certain interim milestone years.

For PM2.5 nonattainment areas, in addition to the CAA Title I, Part D, Subpart 1 (*General Requirements*) RFP requirements, Subpart 4 (*Provisions for PM*) Section189(c)(1) introduces the requirement for states to submit quantitative milestones for both "moderate" and "serious" areas. Milestones are to be achieved every three years until the area is re-designated attainment and demonstrate RFP. As stated in the U.S. EPA's final rule for "*Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*" (81 FR 58010), the statutory Serious area attainment plan must contain quantitative milestones to be achieved by 7.5 years from the area's date of designation of nonattainment. In the case of the 2006 24-hour PM2.5, the effective date of designation is December 14, 2009, and thus the first milestone year is 2017. The final rule (81 FR 58010) also requires that all Serious area attainment plans to contain one additional quantitative milestone to be met in the 3-year period beyond the attainment date. The 2016 AQMP included the RFP and quantitative milestone analysis for the 2006 PM2.5 standard for the Basin as a Serious nonattainment area. Following U.S. EPA guidance, the milestone years included in the 2016 AQMP RFP demonstration were 2017 (7.5 years from designation) and 2020 (post-attainment milestone).

Since the 2016 AQMP already addressed the RFP requirements for the 2006 PM2.5 standard up to 2017, this RFP demonstration continues from the last RFP milestone year of 2017 to the new attainment year of 2023 and post attainment milestone year of 2026. Emission reductions required under an RFP plan for PM2.5 are directly emitted PM2.5 and applicable precursor air pollutants. As describe in Chapter 3 – Base-Year and Future Emissions, the base year of this Plan is 2018, which also serves as the base year for purposes of tracking RFP. Table 6-2 presents the PM2.5 and PM2.5 precursors emissions for the base year and the RFP milestones years. A more detailed breakdown of the emissions inventory by major source category can be found in Appendix I of this Plan.

TABLE 6-2
Baseline Emissions for Base Year and Milestone Years
(Annual Average – Tons per Day)

	VOC	NOx	SOx	PM2.5	NH3
2018	369.2	370.5	14.0	62.4	73.0
2020	357.0	338.6	14.9	62.4	72.0
2023	344.8	276.6	15.2	61.9	71.6
2026	337.6	265.5	15.5	62.0	71.7

As previously stated, RFP means the annual incremental reductions in emissions of direct PM2.5 and PM2.5 precursors which are necessary to ensure attainment of the applicable PM2.5 NAAQS as expeditiously as practicable. RFP should demonstrate that by the end of the calendar year for each milestone date for the area, pollutant emissions will be at levels that reflect either generally linear progress or stepwise progress in reducing emissions on an annual basis between the base year and the attainment year. Based on the modeling analysis as presented in Chapter 5 of this Plan, attainment of the 2006 PM2.5 standard is expected in 2023 relying on reductions in baseline emissions. As such, the required annual percent reduction needed to show linear progress is determined from the difference between baseline emissions in the 2018 base year and the 2023 attainment year. Table 6-3 summarizes the RFP calculations.

TABLE 6-3

Summary of 24-Hour PM2.5 Reasonable Further Progress Calculation

ROW	CALCULATION STEP	VOC	NOx	SOx	PM2.5	NH3
1	2018 Base Year Emissions (tpd)	369.2	370.5	14.0	62.4	73.0
2	2023 Baseline Emissions (tpd)	344.8	276.6	15.2	61.9	71.6
3	Annual Reduction Needed to Show Linear Progress (tpd)	4.9	18.8	-0.2	0.1	0.3
4	2020 Target Needed to Show Linear Progress (tpd)	359.4	332.9	14.5	62.2	72.4
5	2020 Baseline Emissions (tpd)	357.0	338.6	14.9	62.4	72.0
6	2020 Projected Shortfall (tpd)	0	5.68	0.39	0.20	0

Row Description

Row 1: The 2018 base year emissions taking into account existing rules and projected growth
Row 2: The 2023 attainment year baseline emissions taking into account existing rules and projected growth
Row 3: [(Row 1 – Row 2) /5]
Row 4: Row 1 – (Row 3 x 2)
Row 5: Projected 2020 milestone baseline emissions taking into account existing rules and projected growth
Row 6: Row 5 – Row 4; Negative numbers are denoted as zeros, representing no shortfall

As demonstrated in Table 6-3, the annual reduction needed to demonstrate linear progress is determined based on the difference between baseline emissions in 2018 and 2023. For the milestone year of 2020, the emission targets needed to show linear progress are compared with the 2020 baseline emissions.

For VOC and NH3, 2020 baseline emissions (row 5) are below the 2020 target levels (row 4). Therefore, linear progress is achieved for the two PM precursors.

SOx emissions show a marginal increase from 2018 to 2023. However, the small marginal increase in SOx would likely result in only a small increase in sulfate mass. Ambient PM2.5 chemical composition data confirms marginal contribution of sulfate mass to the ambient PM2.5 mass. For the high PM days during winter where PM2.5 levels exceed the 24-hour PM2.5 standard, high fractions of nitrate and organic carbon but small amount of sulfate are observed.[36] Therefore, SOx are expected to have de minimis impacts on ambient 24-hour PM2.5 concentrations in the Basin.

As for NOx, emissions reduce from 370.5 tons per day in 2018 to 276.6 tons per day in 2023. In 2020, baseline NOx emission is 338.6 tons per day, which is 5.68 tons per day above the 2020

[36] 2016 AQMP, Appendix V, Figures V-7-2 through V-7-5. Available at https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-v.pdf?sfvrsn=10

target level. Nonetheless, NOx has been reduced by 31.9 tons per day between 2018 and 2020, achieving 85% of the linear progress target in 2020, demonstrating significant progress towards attainment. Mobile source accounts for over 80% of NOx emissions in the Basin. CARB's existing regulations will provide considerable amount of NOx reductions from mobile sources in the next few years. Specifically, CARB's On-Road Heavy-Duty Diesel Vehicles Regulation (Truck and Bus regulation) and In-Use Off-Road Diesel-Fueled Fleets Regulation will provide significant NOx reductions from the heavy-duty trucks and off-road equipment by 2023. Existing regulations as well as recently adopted regulations, described in Chapter 4 of this Plan, will provide sufficient and surplus NOx reductions for attainment in 2023.

Emissions of directly emitted PM2.5 decrease from 62.4 tons per day in 2018 to 61.9 tons per day in 2023. In 2020, PM2.5 emissions stayed at the same level as 2018. Majority of the PM2.5 reductions in 2023 come from the Truck and Bus regulation, in which significant reductions are assumed to occur in the last year of its implementation schedule. Nonetheless, some rules and regulations have been adopted / amended recently which provide additional PM2.5 reductions beyond the 2020 baseline emissions. In May 2018, CARB adopted "Amendments To The Heavy-Duty Vehicle Inspection Program And Periodic Smoke Inspection Program"[37](hereafter, HDVIP and PSIP amendments) which became effective on July 1, 2019. These amendments are expected to achieve additional PM2.5 emission reductions of 0.203 tons per day[38] in 2020. In addition, South Coast AQMD Rule 445 (Wood-Burning Devices) was amended in June 2020 to address the CAA contingency measure requirements for the PM2.5 standards. The 2020 amendments extended the No-Burn day Basin-wide requirement when the daily PM2.5 air quality is forecast to exceed 30 $\mu g/m^3$ in any source receptor area, providing additional PM2.5 reduction benefits of 0.035 tons per day beyond those incorporated in the 2020 baseline (only half of the reductions are counted given the 2020 curtailment season begins in November 2020). The curtailment threshold will automatically be lowered upon the EPA's finding of failure to fulfill specific requirements as set forth in 40 CFR § 51.1014(a). Given U.S. EPA's determination of the Basin's failure to attain the 2006 PM2.5 standard, the curtailment threshold is lowered from 30 $\mu g/m^3$ to 29 $\mu g/m^3$ for the upcoming curtailment season in 2020, resulting in 0.029 tons per day of reductions in PM2.5. As such, the amendments of Rule 445 and the HDVIP and PSIP yield approximately 0.27 tons per day of PM2.5 reductions, exceeding the required reduction of 0.2 tpd in 2020.

Note that newly adopted rules and regulations, described in greater detail in Chapter 4 under *South Coast AQMD Adopted Rules and Programs Since 2016 AQMP But Not Yet Reflected in the Inventory* and *CARB Recent Regulations Adopted But Not Yet Reflected in the Inventory,* will

[37] Amendments to the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program https://ww2.arb.ca.gov/rulemaking/2018/heavy-duty-vehicle-inspection-program-and-periodic-smoke-inspection-program

[38] Staff Report: Initial Statement of Reasons, p. 33, Table 6: Projected Annual PM Emissions Benefits (TPD) for San Joaquin Valley and South Coast Air Basin

provide additional emission reduction benefits beyond the baseline emissions, hence providing "surplus" reductions in the milestone year of 2020 and beyond.

Quantitative Milestones

Pursuant to CAA Section 189(c)(1), an attainment Plan must include specific quantitative milestones that demonstrate RFP toward attainment of the applicable PM2.5 NAAQS in the area. Quantitative milestones are designed to track RFP, to track progress in achieving the minimum 5 percent annual emission reductions as well as control measures needed for expeditious attainment. Accordingly, this Plan must include milestones to be achieved by no later than a milestone date of 13.5 years from the date of designation of the area, and every three years thereafter, until the milestone date that falls within three years after the applicable attainment date.[39] At a minimum, each quantitative milestone Plan must include a milestone for tracking progress achieved in implementing the SIP control measures by each milestone date. Since the 2016 AQMP already addressed the quantitative milestone planning requirements for the 2006 PM2.5 standard up to 2020[40], this quantitative milestone plan continues from the last milestone year of 2020 to the new attainment year of 2023 and the post attainment milestone year of 2026. Table 6-2 provides the baseline emissions for the milestone years of 2023 and 2026.

Based on the modeling analysis described in Chapter 5 of this Plan, attainment of the 2006 PM2.5 standard is expected in 2023 relying on reductions in baseline emissions. As presented earlier in this Chapter, the 5% annual reductions will be achieved from NOx reductions in baseline emissions. As such, baseline emissions are used to track RFP and to track progress in achieving the minimum 5 percent annual emission reductions requirements.

Quantitative Milestones for South Coast AQMD Stationary Source Regulations

Baseline emissions, as shown in Table 6-3, incorporate emission reductions achieved from control measures that are already adopted as regulations. For example, the 2023 baseline emission is the projection from 2018 and it incorporates population and economic growth as well as all adopted control measures that will be implemented (partially or fully) by December 31, 2023. Table 6-5 provides a list of the South Coast AQMD's adopted rules and regulations for stationary sources that are scheduled to be implemented beyond 2018, accounting for the reductions in the baseline emissions of the future milestone/attainment years. South Coast AQMD will be reporting on the implementation of the rules listed in Table 6-5 as part of the 2023 and 2026 quantitative milestones.

[39] 40 CFR 51.1013 Quantitative Milestone Requirements.
[40] The quantitative milestone report for 2020 is due March 31, 2021.

TABLE 6-5
Implementation Schedule of South Coast AQMD Adopted Rules and Regulations for Reasonable Further Progress per Milestone Year

	2023 Attainment Year	2026 Quantitative Milestone Year
NOx	Rule 1146.2 [a]	
	Rule 1147 [b]	
	RECLAIM [b]	
	Rule 1111[c]	Rule 1111[c]
SOx	RECLAIM [d]	

[a] Full implementation achieved in 2020
[b] Full implementation achieved in 2022
[c] Reductions achieved annually with full implementation in 2035
[d] Full implementation achieved in 2019

Quantitative Milestones for State Mobile Source Regulations

The RFP and quantitative milestone demonstrations in this Plan rely, in part, on NOx reductions from California mobile source regulations. The most significant of these regulations are included as quantitative milestones in 2023 and 2026.

For the 2023 milestone year, CARB will demonstrate the progress achieved in implementing the following control measures:

1. Implementation of the On-Road Heavy-Duty Diesel Vehicles Regulation through 2023
2. Implementation of the In-Use Off-Road Diesel-Fueled Fleets Regulation through 2023

For the 2026 milestone year, CARB will demonstrate the progress achieved in implementing the following control measures:

1. Implementation of In-Use Off-Road Diesel-Fueled Fleets Regulation between 2023 and 2026. By 2023, the requirements for large and medium fleets in this regulation will be implemented, but deadlines for small fleets continue through 2028. A small fleet is defined as a fleet of off-road diesel vehicles belonging to a municipality whose fleet cumulatively produces less than or equal to 1,500 horsepower (hp), a small business whose fleet produces less than or equal to 1,500 hp, or a municipality fleet in a low-population county; and

2. Implementation of the Innovative Clean Transit (ICT) regulation. Beginning in 2026, the ICT requires that 50 percent of new buses purchased by large transit agencies are zero-

emission buses (ZEBs), and 25 percent of new buses purchased by small transit agencies are ZEBs.

CARB will work closely with South Coast AQMD to report on the milestones identified in this Plan for the applicable milestone years.

Transportation Conformity

Section 176(c) of the Federal CAA establishes transportation conformity requirements which are intended to ensure that transportation activities do not interfere with air quality progress. The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals *conform to* applicable state implementation plans (SIP) before being approved by a Metropolitan Planning Organization (MPO). Conformity to a SIP means that proposed activities must not:

(1) Cause or contribute to any new violation of any standard,
(2) Increase the frequency or severity of any existing violation of any standard in any area, or
(3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

A SIP that analyzes the region's total emissions inventory from all sources is necessary for purposes of demonstrating reasonable further progress (RFP)[41], and attainment[42]. The portion of the total emissions inventory from on-road highway and transit vehicles in these analyses becomes the "motor vehicle emissions budget."[43] Budgets are set for each criteria pollutant or its precursor(s), for all RFP milestone years and the attainment year. Subsequent transportation plans and programs produced by transportation planning agencies are required to conform to the SIP by demonstrating that the emissions from the proposed plan, program, or project do not exceed the budget levels established in the applicable SIP.

PM2.5 Requirements for Conformity

The U.S. EPA has promulgated separate rule makings addressing the PM2.5 emission categories and precursors that must be considered in PM2.5 transportation conformity determinations.

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[41] RFP is defined as annual incremental reductions in emissions of the relevant air pollutant for ensuring attainment of the applicable National Ambient Air Quality Standard by the region's attainment year.
[42] Areas with concentrations of criteria pollutants that are below the levels established by the National Ambient Air Quality Standards (i.e., 24-hr: 35 $\mu g/m^3$) are considered attainment.
[43] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.

PM2.5 Motor Vehicle Emission Category Requirements

Guidance on the motor vehicle emission categories that must be considered in transportation conformity determinations can be found in the July 1, 2004, Final Rule amending the Transportation Conformity Rule to implement criteria and procedures for the 8-hour ozone and PM2.5 standards[44]:

> [A]ll regional emissions analyses in PM2.5 nonattainment and maintenance areas [must] consider directly emitted PM2.5 motor vehicle emissions from the tailpipe, brake wear, and tire wear…Sections IX. and X. [of the Final Rule] provide information on when re-entrained road dust and construction-related dust must also be included in PM2.5 conformity analyses…[T]he analysis for direct PM2.5 must include:
>
> - tailpipe exhaust particles,
> - brake and tire wear particles,
> - re-entrained road dust, if before a SIP is submitted to U.S. EPA or the state air agency has made a finding of significance or if the applicable or submitted SIP includes re-entrained road dust in the approved or adequate budget, and
> - fugitive dust from transportation-related construction activities, if the SIP has identified construction emissions as a significant contributor to the PM2.5 problem.[45]

PM2.5 Motor Vehicle Emission Precursor Requirements

Following the July 1, 2004, Final Rule identifying the motor vehicle emission categories that must be considered in transportation conformity determinations, U.S. EPA issued the May 6, 2005, Final Rule[46] amending the Transportation Conformity Regulation. In this Final Rule, U.S. EPA identifies four transportation-related precursors that result in PM2.5 formation—nitrogen oxides (NO_X), volatile organic compounds (VOCs), sulfur oxides (SO_X)[47], and ammonia (NH_3)—for consideration in the conformity process in PM2.5 nonattainment and maintenance areas[48]. Of these PM2.5 precursors, the Final Rule indicates NO_X must be included in the regional transportation conformity determination unless it is found to be an insignificant contributor to the formation of PM2.5 in the region, per Section 93.102(f) of the Conformity Regulation[49]. Conversely, VOCs, SO_2, and NH_3 are not required unless these precursors are found to be significant contributors to the formation of PM2.5 in the region. If it is determined through the SIP process that the on-road contribution of a precursor is a significant contributor to the formation of PM2.5 in the region, then an emissions budget must be prepared for that precursor in the SIP

[44] 69 FR 40004.
[45] 69 FR 40331-40333. Codified in Sections 93.102(b)(1) and (3) and Section 93.122(f) of the Conformity Regulation.
[46] 70 FR 24280.
[47] U.S. EPA revised the transportation conformity rule to revise PM2.5 precursors from SO_X to SO_2 for consistency with the broader PM2.5 implementation strategy. (73 FR 4435)
[48] 70 FR 24282. Codified in Sections 93.102(b)(2)(iv) and (v) of the Conformity Regulation.
[49] 70 FR 24282. Codified in § 93.119(f)(9) and (10) of the Conformity Regulation.

and MPOs are required to provide a conformity determination for each precursor for which there is an adequate or approved budget in the SIP.[50]

Conformity Budgets

The South Coast AQMD Section 189(d) Plan establishes motor vehicle emission budgets for primary emissions of PM2.5 from vehicle exhaust, tire and brake wear, and the precursors of VOC and NOx. Based on the criteria from Section 93.109(f), SO_2 and NH_3 are not found to be significant. In addition, re-entrained road dust from paved and unpaved road travel and road construction dust are determined to be significant. This section discusses transportation conformity emissions budgets and an emissions trading mechanism for the 24-hour PM2.5 NAAQS in the South Coast Air Basin. Annual average daily emissions are used in the Plan consistent with the progress and attainment demonstration for the 24-hour PM2.5 standard. Consequently, conformity budgets have been set for annual average daily emissions in the analysis years 2023 and 2026. The emissions budgets presented below use EMFAC2017 (V.1.0.3) with Southern California Association of Governments (SCAG) activity data (VMT and speed distributions). The activity data are from SCAG's 2016 RTP (adopted by the SCAG Board on April 7, 2016), and are consistent with the RFP and attainment demonstration for the SIP.

The California Air Resources Board (CARB) staff released a revised emission rate program, EMFAC2017, which updates the emission rates and planning assumptions used in calculating conformity budgets. EMFAC2017 was approved for use in SIPs and transportation conformity by U.S. EPA on August 15, 2019[51]. The recently approved Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks[52], effective June 29, 2020, has impacted some of the underlying assumptions in the EMFAC2017 model. Hence, the emissions output from the EMFAC2017 model were adjusted to account for the emissions impact of the SAFE rule. Emissions for re-entrained paved road dust, re-entrained unpaved road dust, and road construction dust are based on California Emissions Projection Analysis Model (CEPAM)[53].

The transportation conformity budgets presented below were developed in consultation with SCAG, South Coast AQMD, and U.S. EPA. Budgets use emissions for an average annual day, consistent with the on-road emissions inventory and attainment demonstration, using the following method:

[50] 70 FR 24287.
[51] U.S. EPA approved EMFAC2017 for use in transportation conformity and SIPs on August 15, 2019. https://www.govinfo.gov/content/pkg/FR-2019-08-15/pdf/2019-17476.pdf
[52] U.S. EPA, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks on April 30, 2020 https://www.epa.gov/regulations-emissions-vehicles-and-engines/safer-affordable-fuel-efficient-safe-vehicles-final-rule
[53] CARB, California Emissions Projection Analysis Model. https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php?_ga=2.3640688.1164753250.1599289357-1384337407.1582433658

1) Calculate the on-road motor vehicle emissions totals for the appropriate pollutants (VOC, NOx and PM2.5) from EMFAC2017 and apply adjustments to account for SAFE vehicle rule.
2) Combine on-road vehicle emissions with re-entrained paved road dust, re-entrained unpaved road dust, and road construction dust emissions from CEPAM 1.05 and round each total up to the nearest ton

The emission budgets under this Plan for VOC, NOx, and PM2.5 for the attainment year (2023) and the post-attainment year (2026) are summarized in Table 6-6.

TABLE 6-6

Draft Transportation Conformity Budgets* for the 2006 24-hour PM2.5 Standard in the South Coast Air Basin (Annual average tons per day)

DRAFT SCAB PM2.5 Transportation Conformity Budget (annual average tons per day)						
	2023			2026		
	VOC	NOx	PM2.5	VOC	NOx	PM2.5
On-Road Emissions*	57.61	99.90	9.97	49.73	92.64	9.90
Paved Road Dust			7.95			8.06
Unpaved Road Dust			0.59			0.58
Road Construction Dust			0.27			0.28
Total	57.61	99.90	18.78	49.73	92.64	18.83
Conformity Budget^	**58**	**100**	**19**	**50**	**93**	**19**

* Includes SAFE Vehicle Rule Adjustments, ^ Rounded to nearest whole integer
Activity data source: SCAG 2016 RTP, adopted by the SCAG Board on April 7, 2016.

Section 93.124(b) of the federal conformity rule allows for the SIP to establish emissions trading mechanisms between budgets for pollutants or precursors, or among budgets allocated to mobile and other sources. The emissions trading mechanism for the 24-hour standard is not being revised from that submitted for the 2016 South Coast AQMP. The trading mechanism established the approximate weighting ratios of the precursor emissions for 24-hour PM2.5 formation in equivalent tons per day of NOx as 0.3 for VOC and 14.8 for PM2.5 as summarized in Table 6-7. In other words, reducing one ton of VOC is equivalent to reducing 0.3 tons of NOx and reducing one ton of PM2.5 is equivalent to reducing 14.8 tons of NOx. This mechanism allows emissions below the budget for one pollutant to be used to supplement another pollutant exceeding the budget based on the ratios established above. All calculations should be clearly documented when using this trading mechanism to demonstrate a transportation plan, transportation improvement program, or project conforms with the SIP's motor emissions budget.

As outlined in the 2016 AQMP, the trading ratios are defined by the 24-hour PM2.5 regional modeling attainment demonstration. Briefly, NOx emissions reductions are scaled to the reduction of Basin ammonium nitrate (including water bonding). Similarly, reductions of VOC are scaled to changes in the organic carbon species while reductions in directly emitted particulates are scaled to the projected changes in the elemental carbon and "others" portions of the PM2.5 mass. Table 6-7 summarizes the trading equivalencies in tons per day (tpd).

TABLE 6-7

Trading Equivalencies for 24-hour PM2.5 Motor Vehicle Emissions Budgets*

ONE TON OF	IS EQUIVALENT IN TERMS OF PM2.5 FORMATION TO THIS MANY TONS OF		
	NOx:	**VOC:**	**PM2.5:**
NOx	1	3.151	0.067
VOC	0.317	1	0.021
PM2.5	14.833	46.792	1

*Table is from Table VI-D-5 in the 2016 AQMP

An example of how the trading mechanism would work follows; if the amount of NOx calculated exceeds the budget by 0.75 tpd, then that overage could be offset by trading 2.36 tpd of excess VOC emissions reductions (e.g. 3.151 VOC/1 ton of NOx x 0.75 tpd NOx required = 2.36 tpd VOC). In this case, "excess" VOC emission reductions would be those beyond what are needed to meet the VOC budget. Similarly 0.050 tpd of directly emitted PM2.5 emissions below the budgeted amount could also be traded to the NOx emissions category and subtracted from the NOx total to allow NOx to meet its budget. In other words, the trading mechanism can be multi-pollutant and multi-directional. It should be noted that the trading calculations are performed prior to the final rounding to demonstrate conformity with the budgets.

Fulfillment of New Source Review Requirements

The CAA requires permits for the construction and operation of new or modified major stationary sources (Title 1, Part D, Subpart 1, Section 172(c)). New Source Review (NSR) for major and in some cases minor sources of PM2.5 and its precursors is presently addressed through the South Coast AQMD's NSR and RECLAIM programs (Regulations XIII and XX, respectively). Both programs are applicable to sources located in the South Coast AQMD jurisdiction, including the South Coast Air Basin and the Coachella Valley. Regulation XIII establishes the federal and State mandated pre-construction review program for new, modified, or relocated sources. The NSR program is a critical component of the South Coast AQMD's attainment strategy and ensures that all new and modified sources install BACT and their emission increases are fully offset with creditable emission reductions. Rule 1302 specifies the definitions used in Regulation XIII. Rule 1325 was adopted June 3, 2011 to incorporate the U.S. EPA's requirements for PM2.5 into Regulation XIII. The rule mirrors federal requirements which include the definition of major source, significant emissions rate, offset ratios, and the applicability requirements of Lowest Achievable Emission Rate (LAER), facility compliance, offsets, and control of PM2.5 precursors. Under existing NSR and RECLAIM programs, major stationary sources of NOx and SOx are already subject to emission offsets. Both VOC and ammonia emissions are subject to BACT under the existing NSR at a zero threshold. VOC emissions are also required to be offset when a new or modified source has the potential to emit 4 tons per year or more of VOC. Ammonia emission sources have not historically been subject to NSR offset requirements. However, for permitted ammonia sources, South Coast Rule 1303 (NSR Requirements) requires denial of "the Permit to Construct for any relocation, or for any new or modified source which results in an emission increase of any nonattainment air contaminant, any ozone depleting compound, or ammonia, unless BACT is employed for the new or relocated source or for the actual modification to an existing source." BACT shall be at least as stringent as LAER as defined in the federal Clean Air Act Section 171(3) [42 U.S.C. Section 7501(3)]).

Major Source Threshold

The NSR permitting program relies on emissions thresholds to determine when certain requirements apply to new stationary sources and to modifications of existing stationary sources. If a new or modified facility will emit PM2.5 or PM2.5 precursor emissions greater than the major source threshold, the facility is considered a major source. Under a Serious nonattainment classification, the major source threshold is defined as a potential to emit 70 or more tons per year of PM2.5 or PM2.5 precursors. To comply with federal requirements for Serious nonattainment areas, Rule 1325 has been amended on November 4, 2016 to update the Major Polluting Facility definition to align the associated major source emission threshold at 70 tons per year for PM2.5 and PM2.5 precursors. VOC and ammonia were added to the Rule 1325 definition of Precursors and a VOC and ammonia threshold at 40 tons per year was added as part the definition of Significant. The SOx Major Polluting Facility threshold identified in Rule 1302 was also lowered from 100 to 70 tons per year.

PM Precursor Requirement in Nonattainment NSR

CAA Subpart 4 Section 189(e) states that control requirements applicable to plans in effect for major stationary PM sources shall also apply to major stationary sources of PM precursors, except where such sources do not contribute significantly to PM levels which exceed the standard in the area. In August 2016, the U.S. EPA issued the Final Rule of "*Fine Particle Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*" (81 FR 58010) that requires states to evaluate and adopt control measures for direct PM2.5 and all four PM2.5 precursors from stationary, mobile and area sources, unless states could make the appropriate precursor demonstration to demonstrate that contribution of a precursor insignificant. Specifically, a "nonattainment new source review (NNSR) demonstration" is required in order to establish that sources of the particular precursors need not be regulated for the purpose of the NNSR permitting program. As discussed previously, Rule 1325 was amended to address all precursors of PM2.5 including NOx, VOC, ammonia and SOx.

As such, it is concluded that South Coast AQMD's New Source Review Regulations already addressed the NSR requirements for a Serious nonattainment area, and no additional action is needed.

Contingency Measures

Clean Air Act Section 172(c)(9) requires a State Implementation Plan (SIP) to provide for the implementation of specific measures to be undertaken if the nonattainment area fails to make RFP, or to attain the NAAQS by the applicable attainment date. Such contingency measures need to take effect in any such case without further action by the State or the Administrator. The U.S. EPA provides further details in the Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements[54] (81 Fed. Reg. 58010, Aug 24, 2016; hereafter referred as "PM2.5 Implementation Rule"). According to the PM2.5 Implementation Rule, contingency measures should provide for emission reductions approximately equivalent to either one (1) year's worth of air quality improvement or 1 year's worth of reductions needed for RFP. The following sections describe how South Coast Air Basin satisfies the contingency measure requirements for attainment of the 2006 24-hour PM2.5 standard. The current demonstration has two parts: 1) a contingency measure that satisfies a 'triggering mechanism' requirement set by the U.S. EPA based on the *Bahr* case, and 2) an evaluation of the emission reductions equivalent to 1 year's worth of progress.

Rule 445 (Wood-Burning Devices)

To comply with the attainment contingency requirements, South Coast AQMD amended Rule 445 (Wood-Burning Devices) on June 5, 2020. The recent amendment requires the residential wood burning curtailment to be expanded to the entire Basin, compared to the previous rule which mandates a curtailment in a specific Source Receptor Area (SRA) where the SRA is forecast to exceed 30 µg/m3 of PM2.5, or requires a mandatory winter burning curtailment in the entire South Coast Air Basin where PM2.5 is forecast to be higher than 30 µg/m3 at a SRA which has recorded a violation of the federal 24-hour PM2.5 NAAQS for either of the two previous three-year design value (DV) periods. The DV is the three-year average of the annual 98th percentile of the 24-hour values of monitored ambient PM2.5 data. The amendment also contains four contingency measures, each of which will impose lower curtailment thresholds to comply with the requirements listed in 40 CFR §51.1014(a). The estimated PM2.5 emission reductions anticipated from the expansion of the curtailment to the entire Basin is 25.4 tons per year (tpy). The reductions by imposing thresholds of 29, 28, 27 and 26 ug/m3 are expected to be 20.9, 20.9, 13.9 and 19.1 tpy,

[54] Document available at https://www.govinfo.gov/content/pkg/FR-2016-08-24/pdf/2016-18768.pdf

respectively. Each subsequent finding by the U.S. EPA will trigger increasingly stringent requirements by lowering the threshold in the rule that will lead to additional emission reductions. Since the U.S. EPA has recently finalized its finding of the South Coast Air Basin's failure to attain the 2006 24-hour PM2.5 standard in 2019, the curtailment threshold will be lowered to 29 ug/m3.

One Year's Worth of Emission Reductions

While Rule 445 satisfies a 'triggering mechanism' requirement set by the U.S. EPA based on the *Bahr* case, the reductions from the rule alone are not adequate to satisfy the 1-year's worth of progress, which is defined as the total emission reductions to occur from 2018 to 2023 divided by 5 years, as shown in Table 6-8. However, additional surplus reductions available through other regulations and programs in place will ensure that the 1-year's worth of progress is achieved. Table 6-9 presents the emission reductions from recently adopted regulations and programs by CARB and South Coast AQMD, as well as the baseline reductions from 2023 to 2024 which are discussed in this section. The 1-year's worth of reductions applies to PM2.5 precursors as well as directly emitted PM2.5.

TABLE 6-8

PM2.5 and its Precursor Emissions in 2018 and 2023 Baseline and 1-Year's Worth of Emission Reductions. Unit is tons per day (tpd).

	PM2.5	VOC	NOx	SOx	NH3
2018 Baseline	62.38	369.19	370.47	14.01	72.95
2023 Baseline	61.85	344.80	276.57	15.19	71.57
1-year worth of progress	0.11	4.88	18.78	-0.24	0.28

TABLE 6-9

Baseline Emission Reductions and Reductions from Newly Adopted Regulations and Programs by South Coast AQMD and CARB. Unit is tons per day (tpd).

	PM2.5	VOC	NOx	SOx	NH3
1-year worth of progress	0.110	4.88	18.78	-0.24	0.28
Baseline Reductions from 2023 to 2024	-0.050	2.67	4.28	-0.08	-0.01
South Coast AQMD's Rule 445	0.130	-	-	-	-
South Coast AQMD's Existing Incentive Programs (2014 to 2018)[1]			5.90		
South Coast AQMD's Existing Incentive Programs (2019 to 2023)[1]			11.40		
South Coast AQMD's Metrolink (Tier 4 Locomotives conversions)[1]			3.00		
South Coast AQMD's Facility-Based Mobile Source Measure for Commercial Airport[2]			0.50		
CARB Low Carbon Fuel Standard and Alternative Diesel Fuels Regulation[1]			1.70		
CARB ATCM for Portable Engines, and the Statewide Portable Equipment Registration Program Regulation[1]			0.25		
CARB Innovative Clean Transit[3]			0.04		
CARB South Coast Incentive Measure[4]			1.00		
CARB Ocean-Going Vessel At-Berth[5]	0.017		1.12		
CARB Advanced Clean Truck (ACT)[6]			0.01		
CARB HD Smoke Inspection Program [7]	0.105	-	-	-	-
Total Reductions	0.202	2.67	29.2	-0.08	-0.01

1. Contingency Measure Plan for Attainment of the 1997 80 ppb Ozone Standard
Document available at https://www.aqmd.gov/docs/default-source/planning/1997-ozone-contingency-measure-plan/1997-8-hour-ozone-draft-contingency-measure-plan---120619.pdf?sfvrsn=6
2. Final Staff Report for the Facility Based Mobile Source Measure for Commercial Airports
Document available at
http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-staff-report.pdf?sfvrsn=6
3. Attachment C: Updates to the Emissions Inventory Methods and Results for the Proposed Innovative Clean Transit Regulation. Document available at
https://ww3.arb.ca.gov/regact/2018/ict2018/15dayattc.pdf?_ga=2.1623985.1029523510.1599774299-498140714.1590087534
4. South Coast On-Road Heavy-Duty Vehicle Incentive Measure
Document available at https://ww3.arb.ca.gov/planning/sip/imp2016sip/finalreport.pdf

5. Attachment C: Second 15-Day Updates to Appendix H: 2019 Update to Inventory for Ocean-Going Vessels At Berth: Methodology and Results
   Document available at https://ww3.arb.ca.gov/regact/2019/ogvatberth2019/2nd15dayattc.pdf
6. Attachment D: Emissions Inventory Methods and Results for the Proposed Advanced Clean Trucks Regulation Proposed Modifications.
   Document available at https://ww3.arb.ca.gov/regact/2019/act2019/30dayattd.pdf
7. Amendments to the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program https://ww2.arb.ca.gov/rulemaking/2018/heavy-duty-vehicle-inspection-program-and-periodic-smoke-inspection-program

The baseline reductions demonstrate continuous reductions due to the on-going implementation of existing regulations and continuous turnover of old vehicles to newer and cleaner vehicles. The PM2.5 emission reductions expected from the recent amendment of Rule 445 and lowering a curtailment threshold to 29 ug/m3 is estimated at 46.3 tons per year or 0.13 tons per day. Since the adoption of the 2016 SIP strategy, the CARB has adopted "Amendments To The Heavy-Duty Vehicle Inspection Program And Periodic Smoke Inspection Program"[55](hereafter, HD Smoke Inspection Program) which became effective on July 1, 2019. These amendments are expected to achieve additional PM2.5 emission reductions of 0.105 tpd[56] in 2024. Small PM2.5 reductions are also expected from CARB's recently adopted Ocean-Going Vessels (OGV) At-Berth and Advanced Clean Truck (ACT) regulations. The PM2.5 emission reductions from the baseline measures combined with the HD Inspection Program and Rule 445 yield PM2.5 reductions exceeding the 1-year's worth of progress.

As for NOx, while baseline reductions in 2024 are only 4.28 tpd, additional surplus reductions are expected from the South Coast AQMD's overall control strategy to meet the 8-hour ozone NAAQSs. The 2016 AQMP includes commitments to reduce NOx emissions by 45% and 55% to attain the 1997 and 2008 8-hour ozone standards in 2023 and 2031, respectively. The emission reductions from incentive programs as well as from recently adopted regulations and programs are provided in Table 6-9. While the additional reductions will occur in 2023, the reductions are permanent and surplus to the baseline level, therefore, they are accounted for as 1-year's progress in 2024. With the combined baseline measures and newly adopted regulations and programs, the amount of NOx emission reductions expected in 2024 are larger than the required 1-year's worth of reduction. The surplus portion of NOx is enough to make up the shortfall in VOC based on inter-pollutant precursor trading ratios approved by the U.S. EPA for use in transportation conformity analyses[57]. The PM2.5 precursor trading ratios, submitted in the 2015 revision to the

[55] Amendments to the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program https://ww2.arb.ca.gov/rulemaking/2018/heavy-duty-vehicle-inspection-program-and-periodic-smoke-inspection-program

[56] Staff Report: Initial Statement of Reasons, p. 33, Table 6: Projected Annual PM Emissions Benefits (TPD) for San Joaquin Valley and South Coast Air Basin

[57] 84 FR 3305 (February 12, 2019)

South Coast 2012 $PM_{2.5}$ SIP[58], show that 1 ton of VOC emissions is approximately equal to 0.3 ton of NOx emissions in terms of the potential to form 24-hour average PM2.5.

NH3 can contribute to ambient PM2.5 concentrations, especially in the areas close to large sources such as dairy farms. There are dairy farm operations in inland valley area near Mira Loma, which has the Basin's highest 24-hour PM2.5, except Compton which showed the highest design values in 2017-2019 due to anomalously high PM levels in 2017. However, high PM2.5 days especially during winter have larger contribution of nitrate and organic carbon, but smaller NH3 contribution - only about 10 % of the total PM2.5 mass near Mira Loma area, indicating that other precursors such as NOx and VOC and their associated chemical reactions leading to secondary PM2.5 formation are dominating the mechanisms to drive the high PM episodes in Mira Loma. Details of PM2.5 chemical composition are discussed in Chapter 5 of this Plan. In terms of NH3 emissions sources, a single source category, "Domestic Activity" representing sources such as human perspiration, human and pet wastes accounts for 38% of the total NH3 inventory in 2024. These domestic activities grow with time due to population growth and outweigh emission reductions from other regulated sources such as on-road mobile sources. Therefore, even if NH3 emissions have a marginal increase, the increase will be mostly occur in highly populated area such as downtown Los Angeles would not contribute to the high DVs in inland Mira Loma area significantly. In all, considering the nature of NH3 emissions and atmospheric chemistry attributing to Basin's PM2.5 design values, the slow progress in NH3 reductions will have de minimis impacts on ambient 24-hour PM2.5 concentrations in the Basin.

SOx emissions show a marginal increase at the rate of 0.24 tpd per year from 2018 to 2024 reflecting growth in point sources and ocean going vessels. The SOx emissions increase from 2023 to 2024 is 0.08 tpd. Since SOx emissions are marginally increasing and there is no progress in reducing emissions (i.e., reductions from existing regulations are offset by expected growth), the 1-year worth of progress required for contingency measures does not apply to SOx emissions. Nevertheless, ambient PM2.5 chemical composition data shows marginal contribution of sulfate mass to the ambient PM2.5 mass, especially on high PM2.5 days during winter which likely caused by nitrate and organic carbon but contain smaller amount of sulfate. Therefore, even if SOx emissions increase, the impact is expected to be de minimis on ambient 24-hour PM2.5 concentrations in the Basin.

In summary, South Coast Air Basin satisfies the contingency requirement set in Clean Air Act Section 172(c)(9) and the U.S. EPA's PM Implementation Rule[59]. South Coast AQMD's Rule 445, Wood Burning Devices, provides a contingency measure to be undertaken if the Basin fails to

[58] CARB, 2015. Supplement to 24-hour PM2.5 State Implementation Plan for South Coast Air Basin. Page C-3. Available at http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2015/2015-feb6-022.pdf?sfvrsn=2

[59] 81 Fed. Reg. 58010, Aug 24, 2016. Document available at https://www.govinfo.gov/content/pkg/FR-2016-08-24/pdf/2016-18768.pdf

attain the 2006 PM2.5 24-hour standard by the new attainment date of 2023. The emission reductions anticipated from Rule 445, in conjunction with reductions from existing and newly adopted regulations, are expected to achieve the reductions of directly emitted PM2.5 and its precursors approximately equivalent to 1-year's worth of progress.

7. CALIFORNIA ENVIRONMENTAL QUALITY ACT

Pursuant to the California Environmental Quality Act (CEQA) Guidelines Sections 15002(k) and 15061, the South Coast Air Basin Attainment Plan for 2006 24-Hour PM2.5 Standard is exempt from CEQA pursuant to CEQA Guidelines Sections 15061(b)(3) and 15308. Further, there is no substantial evidence indicating that any of the exceptions in CEQA Guidelines Section 15300.2 apply to the proposed project. A Notice of Exemption will be prepared pursuant to CEQA Guidelines Section 15062. If the proposed project is approved, the Notice of Exemption will be filed with the county clerks of Los Angeles, Orange, Riverside, and San Bernardino counties. In addition, the Notice of Exemption will be electronically filed with the State Clearinghouse to be posted on their CEQAnet Web Portal, which may be accessed via the following weblink: https://ceqanet.opr.ca.gov/search/recent

8. PUBLIC PROCESS

Development of the Draft South Coast Air Basin Attainment Plan for the 2006 24-hour PM2.5 Standard is conducted through a public process. The Plan was presented to South Coast AQMD Mobile Source Committee on August 21, 2020 and AQMP Advisory Group on September 3, 2020. The updated emissions inventory and modeling was also discussed and presented at the Scientific, Technical, and Modeling Peer Review Group on August 20, 2020. South Coast AQMD staff will hold a Regional Public Hearing on October 7, 2020 to solicit information, comments, and suggestions from the public, affected businesses and stakeholders. A Public hearing is scheduled at the South Coast AQMD Governing Board Meeting on December 5, 2020. Following approval by the South Coast AQMD Governing Board, the Plan will be submitted for approval by the CARB Board at their Board meeting to be held on December 10-11, 2020, which will then be submitted to the U.S. EPA for inclusion into the SIP.

Appendix I – Emissions Inventory

Condensable and Filterable Portions of PM2.5 Emissions

Base and Future Years Emissions Inventory

Table A. PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

1. 2018 Annual Average Emissions
2. 2020 Annual Average Emissions
3. 2023 Annual Average Emissions
4. 2026 Annual Average Emissions

Table B. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

Table C. Primary, Condensable and Filterable $PM_{2.5}$ emissions by Major Source Category (Tons per Day)

1. 2018 Annual Average Emissions
2. 2020 Annual Average Emissions
3. 2023 Annual Average Emissions
4. 2026 Annual Average Emissions

Condensable and Filterable Portions of PM2.5 Emissions

Introduction

Per PM2.5 NAAQS final implementation rule[60], the SIP emissions inventory is required to identify the condensable and filterable portions of PM2.5 separately, in addition to primary PM2.5 emissions. Primary PM emissions consist of condensable and filterable portions. Condensable PM is the material that is in vapor phase in stack conditions, which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack. All condensable PM, if present from a source, is typically in the PM2.5 size fraction. The U.S. EPA's Air Emissions Reporting Requirements (AERR) requires states to report annual emissions of filterable and condensable components of PM2.5 and PM10, "as applicable," for large sources for every inventory year and for all sources every third inventory year, beginning with 2011.[61] Subsequent emissions inventory guidance[62] from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR." These source types are stationary point and area combustion sources that are expected to generate condensable PM and include sources such as commercial cooking, fuel combustion at electric generating utilities, industrial processes like cement or chemical manufacturing, and flares or incinerators associated with waste disposal. The condensable PM2.5 from stationary and area sources are estimated using the methodology described below.

Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions."[63] Primary PM2.5 is the sum of condensable and filterable PM2.5 emissions. Mobile sources emit PM in both filterable and condensable form; however, the AERR does not require states to report filterable and condensable PM separately for mobile sources. Therefore, the condensable and filterable PM2.5 emissions submitted here include only those from stationary point and area sources.

Methodology

Category specific conversion factors developed by CARB and used in the Imperial County 2018 SIP[64] were applied in the current analysis to estimate condensable PM and then filterable PM was calculated by subtracting the condensable from the total PM2.5 primary emissions. The baseline

[60] 40 CFR 51.1008(a)(1)(iv)
[61] 40 CFR §51.15(a)(1) and §51.30(b)(1)
[62] USEPA. 2017. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Available at: https://www.epa.gov/sites/production/files/2017-7/documents/ei_guidance_may_2017_final_rev.pdf.
[63] ibidem
[64] Imperial County 2018 Annual Particulate Matter less than 2.5 microns in Diameter State Implementation Plan, April 2018. Available at https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf

2018, future attainment year 2023, and the RFP milestone years 2020 and 2026 are included in the analysis. Selected list of conversion factors are presented in Table B of this Appendix. The factors are developed for point and area source categories, which were classified by Source Classification Code (SCC). Primary emissions are from all source categories including on-road and off-road mobile sources, while condensable and filterable emissions are only for point and area sources, as described above.

Base and Future Year Emissions Inventory of Condensable and Filterable Portions of PM2.5

Figure I-1 shows the annual average emissions of primary (or direct) PM2.5, condensable PM2.5 and filterable PM2.5 for 2018 and 2023. As shown on Figure I-1, total primary PM2.5 emissions from stationary point and area sources will increase from 44.7 to 46.5 tpd from 2018 to 2023, respectively. The increase appears in both condensable (approximately 0.5 tpd) and filterable (approximately 1.2 tpd) portions of primary PM2.5 emissions in the Basin. This is consistent with the primary PM2.5 trend, reflecting fast growth in population and economic activities in the Basin.

Table I-1 presents top five source categories for condensable PM2.5 for 2018 and 2023. The majority of condensable PM2.5 is emitted from 'Cooking' category, which accounts for 75.5% and 76.6% of the total condensable PM2.5 in 2018 and 2023, respectively. The sum of the top five condensable PM2.5 categories represents 95.7% of the total condensable PM2.5 both in 2018 and 2023.

Tables I-2 shows top five categories for filterable PM2.5. "Paved Road Dust" source category is the top emitter of filterable PM2.5. Among top five categories, only "Residential Fuel Combustion" category, which ranks as the 2^{nd} both in 2018 and 2023, slightly decreases in the future year 2023; all other four categories increased. The top five filterable PM2.5 emissions categories account for approximately 71.9% (2018) and 72.4% (2023) of the total filterable PM2.5 emissions. This points to a marginal increase in contribution of top 5 filterable categories to total filterable PM2.5 emissions in future years.

Detailed emissions by major source category are included in Table C of this Appendix.

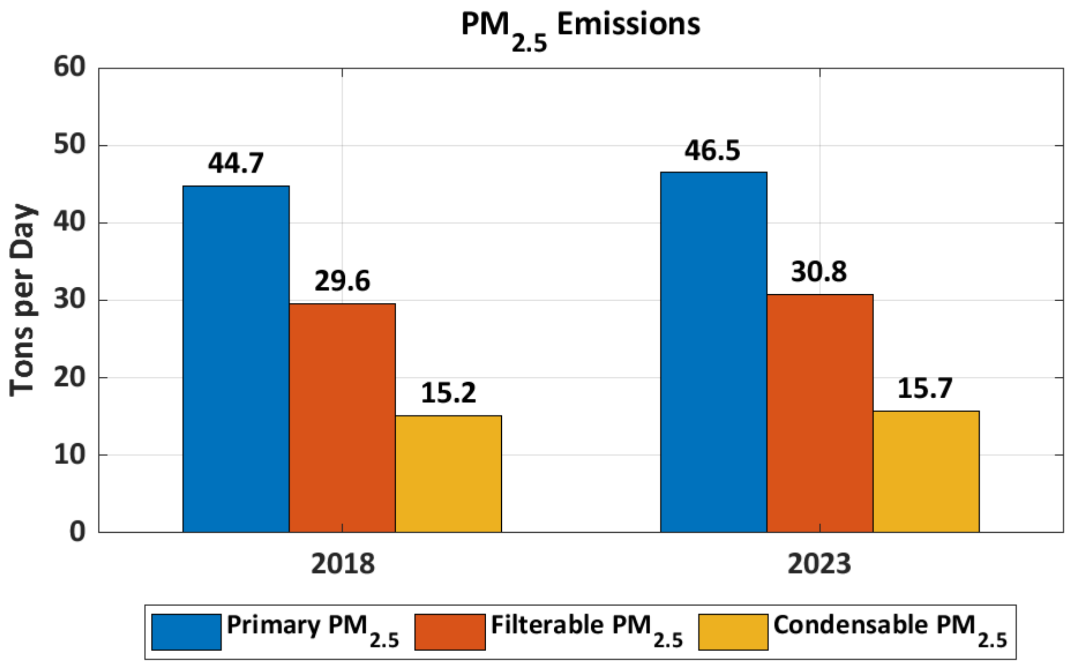

FIGURE I-1

Primary, Filterable and Condensable PM2.5 emissions (Annual Average)

TABLE I-1

Top 5 Condensable PM2.5 (TPD) Emitter Categories for Year 2018 And Year 2023

Category	2018	2023
Cooking	11.41	12.03
Petroleum Refining (Combustion)	1.00	1.00
Residential Fuel Combustion	0.85	0.83
Manufacturing and Industrial	0.61	0.59
Service and Commercial	0.60	0.59

TABLE I-2

Top 5 Filterable PM2.5 (TPD) Emitter Categories for Year 2018 And Year 2023

Category	2018	2023
Paved Road Dust	8.13	8.51
Residential Fuel Combustion	5.75	5.70
Wood and Paper	2.70	3.02
Mineral Processes	2.49	2.51
Construction and Demolition	2.27	2.55

Table A-1. 2018 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons p

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Fuel Combustion										
10	Electric Utilities	2.69	0.31	0.59	4.25	0.22	0.51	0.51	0.51	0.68
20	Cogeneration	0.05	0.02	0.02	0.12	0.00	0.02	0.02	0.01	0.18
30	Oil and Gas Production (Combustion)	1.11	0.12	0.71	0.61	0.01	0.10	0.09	0.09	0.22
40	Petroleum Refining (Combustion)	6.48	1.33	0.00	4.87	0.01	1.78	1.77	1.77	1.50
50	Manufacturing and Industrial	25.94	4.19	10.01	15.30	0.21	1.25	1.16	1.12	2.26
52	Food and Agricultural Processing	0.07	0.03	0.11	0.34	0.00	0.03	0.03	0.03	0.04
60	Service and Commercial	10.64	4.16	9.25	13.58	0.79	1.16	1.16	1.16	2.70
99	Other (Fuel Combustion)	0.58	0.27	2.54	1.31	0.07	0.18	0.16	0.15	0.05
Total Fuel Combustion		**47.56**	**10.43**	**23.23**	**40.38**	**1.31**	**5.03**	**4.90**	**4.84**	**7.63**
Waste Disposal										
110	Sewage Treatment	0.37	0.27	0.00	0.00	0.00	0.02	0.00	0.00	0.23
120	Landfills	640.10	8.88	0.45	0.39	0.37	0.20	0.20	0.20	3.97
130	Incineration	0.19	0.04	0.98	0.25	0.07	0.12	0.06	0.05	0.22
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Water Disposal)	57.94	4.67	0.01	0.01	0.00	0.00	0.00	0.00	1.08
Total Waste Disposal		**698.60**	**13.86**	**1.44**	**0.65**	**0.44**	**0.34**	**0.26**	**0.25**	**5.50**
Cleaning and Surface Coatings										
210	Laundering	3.41	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	66.07	12.12	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	19.08	18.57	0.00	0.00	0.00	1.67	1.60	1.54	0.09
240	Printing	1.17	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.06
250	Adhesives and Sealants	4.82	4.21	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	1.42	1.08	0.01	0.11	0.00	0.02	0.02	0.02	0.00
Total Cleaning and Surface Coatings		**95.97**	**37.29**	**0.01**	**0.11**	**0.00**	**1.73**	**1.66**	**1.60**	**0.16**
Petroleum Production and Marketing										
310	Oil and Gas Production	4.86	2.18	0.01	0.02	0.06	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.23	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	54.79	13.80	0.00	0.23	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.60	0.58	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production and Marketing		**66.60**	**20.99**	**0.25**	**2.65**	**0.30**	**1.92**	**1.28**	**0.90**	**0.07**
Industrial Processes										
410	Chemical	5.20	3.88	0.03	0.12	0.05	0.59	0.49	0.44	0.01
420	Food and Agriculture	0.58	0.56	0.00	0.01	0.00	0.16	0.07	0.03	0.00
430	Mineral Processes	0.35	0.31	0.02	0.29	0.04	8.22	4.49	2.51	0.08
440	Metal Processes	0.11	0.09	0.04	0.25	0.03	0.38	0.30	0.22	0.00
450	Wood and Paper	0.19	0.19	0.00	0.00	0.00	6.43	4.50	2.70	0.00
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
499	Other (Industrial Processes)	7.01	5.30	0.05	0.13	0.00	1.81	1.12	0.80	9.29
Total Industrial Processes		**13.45**	**10.34**	**0.14**	**0.80**	**0.12**	**17.60**	**10.97**	**6.70**	**9.38**
Solvent Evaporation										
510	Consumer Products	105.32	87.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	12.23	11.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00

530	Pesticides/Fertilizers	1.34	1.34	0.00	0.00	0.00	0.00	0.00	0.00	1.20
540	Asphalt Paving/Roofing	1.06	0.98	0.00	0.00	0.00	0.03	0.02	0.02	0.00
Total Solvent Evaporation		**119.95**	**101.42**	**0.00**	**0.00**	**0.00**	**0.03**	**0.02**	**0.02**	**1.20**

(Continued)

Table A-1. 2018 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.29	8.43	14.56	46.75	0.48	7.15	6.79	6.60	0.11
620	Farming Operations	25.38	1.43	0.00	0.00	0.00	1.60	0.78	0.16	8.52
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	46.32	22.65	2.27	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	117.88	53.87	8.13	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	9.87	5.86	0.58	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	3.20	1.62	0.23	0.00
660	Fires	0.34	0.23	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.81	0.47	0.19	6.31	0.05	0.72	0.70	0.63	0.03
690	Cooking	2.76	1.93	0.00	0.00	0.01	11.46	11.46	11.46	0.00
699	Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.98
	RECLAIM (with Shaves)			17.77		5.47				
Total Miscellaneous Processes		**48.58**	**12.49**	**32.60**	**56.08**	**6.01**	**198.65**	**104.17**	**30.47**	**34.64**
On-Road Motor Vehicles (EMFAC2017 PC version using SCAG's link data)										
710	Light Duty Passenger Auto (LDA)	32.59	29.39	23.88	316.46	0.74	11.75	11.52	4.85	6.19
722	Light Duty Trucks 1 (T1)	8.50	7.71	6.01	62.10	0.08	1.18	1.16	0.51	0.77
723	Light Duty Trucks 2 (T2)	16.28	14.71	15.60	145.50	0.31	3.83	3.75	1.58	3.06
724	Medium Duty Trucks (T3)	14.48	13.03	14.14	126.75	0.27	2.70	2.65	1.12	3.30
732	Light Heavy Duty Gas Trucks 1 (T4)	2.85	2.69	2.46	10.28	0.04	0.41	0.39	0.17	0.23
733	Light Heavy Duty Gas Trucks 2 (T5)	0.41	0.39	0.39	1.35	0.01	0.08	0.07	0.03	0.04
734	Medium Heavy Duty Gas Trucks (T6)	0.62	0.54	1.06	6.17	0.02	0.17	0.17	0.07	0.05
736	Heavy Heavy Duty Gas Trucks (HHD)	0.02	0.01	0.06	0.41	0.00	0.00	0.00	0.00	0.00
742	Light Heavy Duty Diesel Trucks 1 (T4)	0.32	0.28	8.40	1.69	0.01	0.31	0.30	0.16	0.01
743	Light Heavy Duty Diesel Trucks 2 (T5)	0.11	0.10	2.77	0.58	0.01	0.13	0.13	0.06	0.00
744	Medium Heavy Duty Diesels Truck (T6)	1.53	1.34	26.27	4.65	0.06	1.69	1.67	1.12	0.17
746	Heavy Heavy Duty Diesel Trucks (HHD)	4.04	2.75	67.46	14.84	0.17	2.14	2.12	1.39	0.30
750	Motorcycles (MCY)	9.19	8.08	2.19	41.60	0.00	0.04	0.03	0.02	0.02
760	Diesel Urban Buses (UB)	5.08	0.24	1.99	24.37	0.00	0.07	0.07	0.03	0.02
762	Gas Urban Buses (UB)	0.01	0.01	0.03	0.06	0.00	0.01	0.01	0.01	0.00
771	Gas School Buses (SB)	0.06	0.04	0.06	0.48	0.00	0.07	0.07	0.03	0.00
772	Diesel School Buses (SB)	0.04	0.03	2.23	0.12	0.00	0.18	0.18	0.08	0.01
777	Gas Other Buses (OB)	0.12	0.11	0.25	1.23	0.01	0.05	0.04	0.02	0.01
778	Motor Coaches	0.05	0.05	0.89	0.20	0.00	0.04	0.04	0.02	0.00
779	Diesel Other Buses (OB)	0.06	0.06	0.95	0.18	0.00	0.06	0.06	0.04	0.01
780	Motor Homes (MH)	0.09	0.07	0.77	1.32	0.01	0.09	0.09	0.04	0.02
Total On-Road Motor Vehicles		**96.44**	**81.62**	**177.86**	**760.34**	**1.74**	**24.98**	**24.51**	**11.35**	**14.21**
Other Mobile Sources										
810	Aircraft	3.68	3.63	15.51	37.66	1.77	0.75	0.73	0.66	0.00
820	Trains	1.02	0.85	17.66	3.98	0.01	0.32	0.32	0.30	0.01
833	Ocean Going Vessels	2.61	2.18	33.35	3.45	2.21	0.69	0.69	0.64	0.03
835	Commercial Harbor Crafts	1.27	1.07	11.45	6.47	0.00	0.48	0.48	0.44	0.00
840	Recreational Boats	26.02	22.45	4.88	86.44	0.01	1.54	1.39	1.05	0.01
850	Off-Road Recreation Vehicles	2.63	2.54	0.07	3.68	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	47.83	42.09	49.95	544.65	0.09	3.75	3.57	3.03	0.11
870	Farm Equipment	0.56	0.48	2.07	4.92	0.00	0.14	0.14	0.12	0.00

890	Fuel Storage and Handling	5.48	5.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Other Mobile Sources		**91.10**	**80.75**	**134.94**	**691.25**	**4.09**	**7.68**	**7.33**	**6.25**	**0.16**
Total Stationary and Area Sources		1090.71	206.82	57.67	100.67	8.18	225.30	123.26	44.78	58.58
Total On-Road Vehicles		96.44	81.62	177.86	760.34	1.74	24.98	24.51	11.35	14.21
Total Other Mobile		91.10	80.75	134.94	691.25	4.09	7.68	7.33	6.25	0.16
Total		**1278.25**	**369.19**	**370.47**	**1552.26**	**14.01**	**257.96**	**155.10**	**62.38**	**72.95**

Table A-2. 2020 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Fuel Combustion										
10	Electric Utilities	2.68	0.31	0.58	4.24	0.22	0.51	0.51	0.51	0.67
20	Cogeneration	0.05	0.02	0.02	0.12	0.00	0.02	0.02	0.01	0.18
30	Oil and Gas Production (Combustion)	1.13	0.12	0.71	0.61	0.01	0.10	0.10	0.09	0.22
40	Petroleum Refining (Combustion)	6.48	1.33	0.00	4.87	0.01	1.78	1.77	1.77	1.50
50	Manufacturing and Industrial	25.02	4.17	9.74	15.33	0.22	1.23	1.15	1.10	2.26
52	Food and Agricultural Processing	0.07	0.03	0.11	0.34	0.00	0.04	0.04	0.04	0.04
60	Service and Commercial	10.55	4.11	9.12	13.47	0.83	1.16	1.16	1.16	2.63
99	Other (Fuel Combustion)	0.55	0.24	2.15	1.20	0.08	0.17	0.15	0.14	0.05
Total	**Fuel Combustion**	**46.52**	**10.33**	**22.45**	**40.19**	**1.38**	**4.99**	**4.88**	**4.82**	**7.55**
Waste Disposal										
110	Sewage Treatment	0.38	0.27	0.00	0.00	0.00	0.02	0.00	0.00	0.23
120	Landfills	648.80	9.01	0.46	0.40	0.38	0.21	0.20	0.20	4.02
130	Incinerators	0.20	0.04	1.01	0.25	0.07	0.12	0.06	0.05	0.23
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	60.87	4.90	0.01	0.01	0.00	0.00	0.00	0.00	1.12
Total	**Waste Disposal**	**710.25**	**14.22**	**1.48**	**0.67**	**0.45**	**0.35**	**0.27**	**0.25**	**5.60**
Cleaning and Surface Coatings										
210	Laundering	3.51	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	70.52	12.86	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Process Solvents	19.96	19.42	0.00	0.00	0.00	1.74	1.67	1.60	0.10
240	Printing	1.19	1.19	0.00	0.00	0.00	0.00	0.00	0.00	0.06
250	Sealants & Adhesives	5.15	4.49	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	1.46	1.12	0.01	0.11	0.00	0.02	0.02	0.02	0.00
Total	**Cleaning and Surface Coatings**	**101.80**	**39.23**	**0.01**	**0.12**	**0.00**	**1.80**	**1.73**	**1.66**	**0.17**
Petroleum Production and Marketing										
310	Oil and Gas Production	4.91	2.21	0.01	0.02	0.06	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.23	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	53.13	13.26	0.00	0.23	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.60	0.58	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Total	**Petroleum Production and Marketing**	**64.99**	**20.48**	**0.25**	**2.65**	**0.30**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	5.42	4.03	0.03	0.12	0.05	0.61	0.51	0.45	0.01
420	Food and Agriculture	0.60	0.58	0.00	0.01	0.00	0.16	0.07	0.03	0.00
430	Mineral Processes	0.35	0.31	0.02	0.30	0.04	8.26	4.51	2.52	0.08
440	Metal Processes	0.11	0.09	0.04	0.25	0.03	0.39	0.31	0.22	0.00
450	Wood and Paper	0.19	0.19	0.00	0.00	0.00	6.78	4.74	2.85	0.00
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00

499	Other (Industrial Processes)	7.07	5.37	0.05	0.13	0.00	1.82	1.13	0.80	9.29
Total	**Industrial Processes**	**13.76**	**10.59**	**0.14**	**0.81**	**0.13**	**18.03**	**11.27**	**6.88**	**9.39**
Solvent Evaporation										
510	Consumer Products	106.49	88.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvents	12.47	11.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.35	1.35	0.00	0.00	0.00	0.00	0.00	0.00	1.16
540	Asphalt Paving/Roofing	1.16	1.06	0.00	0.00	0.00	0.03	0.03	0.03	0.00
Total	**Solvent Evaporation**	**121.47**	**102.72**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.03**	**1.16**

(Continued)

Table A-2. 2020 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.24	8.41	13.84	46.58	0.48	7.12	6.76	6.57	0.11
620	Farming Operations	23.71	1.36	0.00	0.00	0.00	1.51	0.73	0.15	7.99
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	50.04	24.47	2.45	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	119.81	54.75	8.27	0.00
645	Unpaved Road and Travel Dust	0.00	0.00	0.00	0.00	0.00	9.86	5.86	0.58	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	3.05	1.55	0.22	0.00
660	Fires	0.34	0.23	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.81	0.47	0.19	6.31	0.05	0.72	0.70	0.63	0.03
690	Cooking	2.84	1.99	0.00	0.00	0.01	11.80	11.80	11.80	0.00
699	Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.31
	RECLAIM (with Shaves)			20.52		6.08				
Total	**Miscellaneous Processes**	**46.94**	**12.46**	**34.63**	**55.91**	**6.62**	**204.36**	**107.06**	**31.08**	**34.44**
On-Road Motor Vehicles										
710	Light Duty Passenger	26.80	24.46	18.30	262.74	0.70	11.71	11.48	4.83	5.88
722	Light Duty Trucks-1 (up to 3750 lb.)	7.14	6.53	4.71	50.79	0.08	1.22	1.19	0.52	0.75
723	Light Duty Trucks-2 (3751 to 5750 lb.)	13.90	12.69	11.77	119.97	0.29	3.83	3.75	1.58	2.88
724	Medium Duty Trucks (5751-8500 lb.)	12.37	11.24	10.93	105.32	0.25	2.65	2.59	1.10	3.06
732	Light Heavy Duty Gas Trucks-1 (8501-10000 lb.)	2.32	2.20	1.94	7.65	0.03	0.36	0.35	0.15	0.20
733	Light Heavy Duty Gas Trucks-2 (10001-14000 lb.)	0.35	0.33	0.32	1.05	0.01	0.07	0.06	0.03	0.03
734	Medium Heavy Duty Gas Trucks (14001-33000 lb.)	0.50	0.44	0.80	4.76	0.02	0.17	0.16	0.07	0.05
736	Heavy Heavy Duty Gas Trucks (>33000 lb.)	0.01	0.01	0.04	0.29	0.00	0.00	0.00	0.00	0.00
742	Light Heavy Duty Diesel Trucks-1 (8501-10000 lb.)	0.28	0.25	6.54	1.45	0.01	0.31	0.31	0.15	0.01
743	Light Heavy Duty Diesel Trucks-2 (10001-14000 lb.)	0.10	0.09	2.17	0.50	0.01	0.14	0.13	0.06	0.00
744	Medium Heavy Duty Diesel Trucks (14001-33000 lb.)	1.13	0.99	22.44	3.65	0.06	1.56	1.55	0.96	0.18
746	Heavy Heavy Duty Diesel Trucks (>33001 lb.)	3.47	2.17	61.49	14.39	0.18	1.95	1.93	1.16	0.33
750	Motorcycles	9.35	8.17	2.26	41.31	0.00	0.04	0.04	0.02	0.02
760	Heavy Duty Diesel Urban Buses	4.54	0.10	1.10	28.04	0.00	0.07	0.07	0.03	0.02
762	Heavy Duty Gas Urban Buses	0.01	0.01	0.03	0.06	0.00	0.01	0.01	0.01	0.00
771	School Buses - Gas	0.06	0.04	0.06	0.46	0.00	0.08	0.08	0.03	0.00
772	School Buses - Diesel	0.04	0.03	2.11	0.12	0.00	0.18	0.18	0.08	0.01
777	Other Buses - Gas	0.11	0.10	0.20	1.01	0.00	0.04	0.04	0.02	0.01
778	Other Buses - Motor Coach - Diesel	0.04	0.04	0.73	0.17	0.00	0.03	0.03	0.02	0.00
779	All Other Buses - Diesel	0.04	0.04	0.76	0.12	0.00	0.05	0.05	0.03	0.01
780	Motor Homes	0.07	0.05	0.68	0.87	0.01	0.08	0.08	0.04	0.02
Total	**On-Road Motor Vehicles**	**82.62**	**69.97**	**149.37**	**644.70**	**1.67**	**24.55**	**24.09**	**10.88**	**13.46**

		TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Other Mobile Sources										
810	Aircraft	3.82	3.78	16.16	39.21	1.88	0.77	0.75	0.68	0.00
820	Trains	0.89	0.75	16.52	4.07	0.01	0.29	0.29	0.26	0.01
833	Ocean Going Vessels	2.77	2.32	34.72	3.66	2.32	0.73	0.73	0.67	0.03
835	Commercial Harbor Craft	1.26	1.06	10.92	6.66	0.00	0.45	0.45	0.42	0.00
840	Recreational Boats	23.38	20.21	4.67	84.14	0.01	1.39	1.25	0.95	0.01
850	Off-Road Recreational Vehicles	2.58	2.49	0.08	3.87	0.00	0.01	0.01	0.01	0.00
860	Commercial/Industrial Mobile Equipment	46.54	40.89	45.30	555.80	0.09	3.46	3.28	2.75	0.11
870	Farm Equipment	0.50	0.43	1.89	4.89	0.00	0.13	0.13	0.11	0.00
890	Fuel Storage and Handling	5.09	5.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**Other Mobile Sources**	**86.84**	**76.99**	**130.26**	**702.29**	**4.31**	**7.23**	**6.88**	**5.85**	**0.16**
Total	Stationary and Area Sources	**1105.73**	**210.03**	**58.96**	**100.35**	**8.88**	**231.48**	**126.52**	**45.63**	**58.38**
Total	On-Road Vehicles	**82.62**	**69.97**	**149.37**	**644.70**	**1.67**	**24.55**	**24.09**	**10.88**	**13.46**
Total	Other Mobile	**86.84**	**77.00**	**130.26**	**702.29**	**4.32**	**7.23**	**6.88**	**5.86**	**0.16**
Total - All Sources		**1275.19**	**357.00**	**338.59**	**1447.34**	**14.87**	**263.26**	**157.49**	**62.37**	**72.00**

Table A-3. 2023 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Fuel Combustion										
10	Electric Utilities	2.90	0.33	0.63	4.55	0.24	0.55	0.55	0.55	0.73
20	Cogeneration	0.05	0.02	0.02	0.13	0.00	0.02	0.02	0.01	0.20
30	Oil and Gas Production (Combustion)	1.15	0.12	0.73	0.62	0.01	0.10	0.10	0.10	0.22
40	Petroleum Refining (Combustion)	6.48	1.33	0.00	4.87	0.01	1.78	1.77	1.77	1.50
50	Manufacturing and Industrial	24.36	4.20	9.69	15.53	0.23	1.22	1.14	1.09	2.21
52	Food and Agricultural Processing	0.08	0.03	0.11	0.35	0.00	0.04	0.04	0.04	0.04
60	Service and Commercial	10.44	4.05	9.04	13.35	0.87	1.16	1.15	1.15	2.58
99	Other (Fuel Combustion)	0.55	0.24	2.15	1.21	0.08	0.17	0.15	0.14	0.05
Total Fuel Combustion		**46.00**	**10.33**	**22.38**	**40.61**	**1.45**	**5.03**	**4.92**	**4.85**	**7.52**
Waste Disposal										
110	Sewage Treatment	0.39	0.28	0.00	0.00	0.00	0.02	0.00	0.00	0.24
120	Landfills	662.26	9.20	0.47	0.41	0.39	0.21	0.21	0.21	4.09
130	Incineration	0.20	0.04	1.03	0.26	0.08	0.12	0.06	0.05	0.24
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Water Disposal)	69.63	5.61	0.01	0.01	0.00	0.00	0.00	0.00	1.22
Total Waste Disposal		**732.48**	**15.12**	**1.52**	**0.68**	**0.47**	**0.36**	**0.27**	**0.26**	**5.79**
Cleaning and Surface Coatings										
210	Laundering	3.60	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	76.05	13.77	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Processes	20.82	20.26	0.00	0.00	0.00	1.80	1.73	1.67	0.10
240	Printing	1.22	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.06
250	Adhesives and Sealants	5.56	4.85	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	1.51	1.17	0.01	0.12	0.00	0.02	0.02	0.02	0.00
Total Cleaning and Surface Coatings		**108.77**	**41.42**	**0.01**	**0.12**	**0.00**	**1.87**	**1.79**	**1.73**	**0.17**
Petroleum Production and Marketing										
310	Oil and Gas Production	5.01	2.25	0.01	0.02	0.06	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.23	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	51.31	12.55	0.00	0.23	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.60	0.58	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production and Marketing		**63.27**	**19.80**	**0.25**	**2.65**	**0.30**	**1.92**	**1.28**	**0.91**	**0.07**

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
	Industrial Processes									
410	Chemical	5.67	4.21	0.03	0.12	0.05	0.64	0.53	0.47	0.01
420	Food and Agriculture	0.62	0.60	0.00	0.01	0.00	0.16	0.07	0.03	0.00
430	Mineral Processes	0.35	0.31	0.02	0.31	0.04	8.30	4.53	2.53	0.09
440	Metal Processes	0.11	0.09	0.04	0.26	0.03	0.40	0.32	0.23	0.00
450	Wood and Paper	0.19	0.19	0.00	0.00	0.00	7.19	5.03	3.02	0.00
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
499	Other (Industrial Processes)	7.17	5.45	0.05	0.13	0.00	1.84	1.14	0.81	9.29
Total Industrial Processes		**14.13**	**10.88**	**0.14**	**0.83**	**0.13**	**18.53**	**11.63**	**7.09**	**9.40**
	Solvent Evaporation									
510	Consumer Products	108.33	90.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	12.75	12.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	1.13
540	Asphalt Paving/Roofing	1.21	1.11	0.00	0.00	0.00	0.03	0.03	0.03	0.00
Total Solvent Evaporation		**123.66**	**104.61**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.03**	**1.13**

(Continued)

Table A-3. 2023 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
	Miscellaneous Processes									
610	Residential Fuel Combustion	19.19	8.38	12.91	46.40	0.48	7.08	6.72	6.53	0.11
620	Farming Operations	21.57	1.27	0.00	0.00	0.00	1.43	0.70	0.15	7.31
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	52.06	25.46	2.55	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	123.29	56.34	8.51	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	9.85	5.85	0.58	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	2.87	1.47	0.21	0.00
660	Fires	0.34	0.23	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.81	0.47	0.19	6.31	0.05	0.72	0.70	0.63	0.03
690	Cooking	2.91	2.03	0.00	0.00	0.01	12.08	12.08	12.08	0.00
699	Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.82
	RECLAIM (with Shaves)			14.52		6.08				
Total Miscellaneous Processes		**44.82**	**12.38**	**27.70**	**55.73**	**6.62**	**209.83**	**109.76**	**31.65**	**34.27**
	On-Road Motor Vehicles (EMFAC2017 PC version using SCAG's link data)									
710	Light Duty Passenger Auto (LDA)	21.75	20.15	13.55	219.35	0.65	11.85	11.61	4.84	5.79
722	Light Duty Trucks 1 (T1)	5.78	5.35	3.43	40.00	0.08	1.28	1.25	0.53	0.73
723	Light Duty Trucks 2 (T2)	11.87	10.99	8.32	98.74	0.27	3.89	3.82	1.59	2.78
724	Medium Duty Trucks (T3)	9.85	9.08	7.22	76.71	0.22	2.61	2.56	1.07	2.84
732	Light Heavy Duty Gas Trucks 1 (T4)	1.78	1.70	1.40	5.44	0.03	0.32	0.31	0.13	0.16
733	Light Heavy Duty Gas Trucks 2 (T5)	0.27	0.26	0.24	0.77	0.01	0.06	0.06	0.02	0.03
734	Medium Heavy Duty Gas Trucks (T6)	0.41	0.37	0.55	3.51	0.02	0.17	0.17	0.07	0.05
736	Heavy Heavy Duty Gas Trucks (HHD)	0.01	0.01	0.03	0.26	0.00	0.00	0.00	0.00	0.00
742	Light Heavy Duty Diesel Trucks 1 (T4)	0.24	0.21	4.43	1.17	0.01	0.31	0.30	0.15	0.01
743	Light Heavy Duty Diesel Trucks 2 (T5)	0.09	0.08	1.50	0.42	0.01	0.14	0.13	0.06	0.00
744	Medium Heavy Duty Diesels Truck (T6)	0.07	0.06	11.20	0.78	0.06	1.11	1.10	0.49	0.20
746	Heavy Heavy Duty Diesel Trucks (HHD)	2.07	0.82	42.42	13.11	0.18	1.58	1.57	0.73	0.36
750	Motorcycles (MCY)	9.70	8.44	2.36	41.77	0.00	0.04	0.04	0.02	0.02
760	Diesel Urban Buses (UB)	4.14	0.06	0.31	31.52	0.00	0.07	0.07	0.03	0.02
762	Gas Urban Buses (UB)	0.01	0.00	0.02	0.05	0.00	0.01	0.01	0.01	0.00

771	Gas School Buses (SB)	0.07	0.05	0.06	0.48	0.00	0.09	0.09	0.04	0.01
772	Diesel School Buses (SB)	0.03	0.03	1.91	0.12	0.00	0.18	0.18	0.08	0.01
777	Gas Other Buses (OB)	0.10	0.09	0.15	0.79	0.00	0.04	0.04	0.02	0.01
778	Motor Coaches	0.01	0.01	0.35	0.08	0.00	0.02	0.02	0.01	0.00
779	Diesel Other Buses (OB)	0.00	0.00	0.37	0.02	0.00	0.03	0.03	0.01	0.01
780	Motor Homes (MH)	0.05	0.04	0.58	0.48	0.01	0.08	0.08	0.04	0.02
Total On-Road Motor Vehicles		**68.29**	**57.77**	**100.42**	**535.59**	**1.56**	**23.89**	**23.43**	**9.94**	**13.05**
Other Mobile Sources										
810	Aircraft	4.05	4.01	17.31	41.33	2.04	0.80	0.78	0.71	0.00
820	Trains	0.84	0.70	15.27	4.20	0.01	0.27	0.27	0.25	0.01
833	Ocean Going Vessels	3.05	2.55	37.11	4.02	2.50	0.80	0.80	0.73	0.03
835	Commercial Harbor Crafts	1.25	1.05	10.33	6.85	0.00	0.42	0.42	0.39	0.00
840	Recreational Boats	19.75	17.12	4.41	81.02	0.01	1.19	1.07	0.81	0.01
850	Off-Road Recreation Vehicles	2.46	2.37	0.09	4.12	0.00	0.01	0.01	0.01	0.00
860	Off-Road Equipment	45.30	39.71	38.03	573.47	0.09	3.08	2.89	2.40	0.12
870	Farm Equipment	0.44	0.38	1.60	4.94	0.00	0.11	0.11	0.10	0.00
890	Fuel Storage and Handling	4.62	4.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Other Mobile Sources		**81.76**	**72.49**	**124.15**	**719.95**	**4.65**	**6.68**	**6.35**	**5.40**	**0.17**
Total Stationary and Area Sources		**1133.13**	**214.54**	**52.00**	**100.62**	**8.97**	**237.57**	**129.68**	**46.52**	**58.35**
Total On-Road Vehicles		**68.29**	**57.77**	**100.42**	**535.59**	**1.56**	**23.89**	**23.43**	**9.94**	**13.05**
Total Other Mobile		**81.76**	**72.49**	**124.15**	**719.95**	**4.65**	**6.68**	**6.35**	**5.40**	**0.17**
Total		**1283.17**	**344.80**	**276.57**	**1356.17**	**15.19**	**268.14**	**159.46**	**61.85**	**71.57**

Table A-4. 2026 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Fuel Combustion										
10	Electric Utilities	2.96	0.34	0.64	4.63	0.24	0.56	0.56	0.56	0.75
20	Cogeneration	0.05	0.02	0.03	0.13	0.00	0.02	0.02	0.01	0.20
30	Oil and Gas Production (Combustion)	1.15	0.12	0.73	0.62	0.01	0.10	0.10	0.10	0.22
40	Petroleum Refining (Combustion)	6.48	1.33	0.00	4.87	0.01	1.78	1.77	1.77	1.50
50	Manufacturing and Industrial	23.84	4.19	9.62	15.59	0.23	1.21	1.13	1.09	2.17
52	Food and Agricultural Processing	0.08	0.03	0.11	0.35	0.00	0.04	0.04	0.04	0.04
60	Service and Commercial	10.37	4.01	9.01	13.28	0.90	1.15	1.15	1.15	2.55
99	Other (Fuel Combustion)	0.55	0.24	2.15	1.21	0.08	0.17	0.16	0.14	0.05
Total	**Fuel Combustion**	**45.48**	**10.29**	**22.30**	**40.68**	**1.49**	**5.03**	**4.92**	**4.85**	**7.47**
Waste Disposal										
110	Sewage Treatment	0.40	0.29	0.00	0.00	0.00	0.02	0.00	0.00	0.24
120	Landfills	675.57	9.39	0.48	0.42	0.39	0.22	0.21	0.21	4.16
130	Incinerators	0.21	0.04	1.06	0.26	0.08	0.13	0.06	0.05	0.25
140	Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	76.33	6.14	0.01	0.01	0.00	0.00	0.00	0.00	1.30
Total	**Waste Disposal**	**752.51**	**15.85**	**1.55**	**0.70**	**0.48**	**0.36**	**0.28**	**0.27**	**5.95**
Cleaning and Surface Coatings										
210	Laundering	3.69	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	79.08	14.27	0.00	0.00	0.00	0.02	0.02	0.02	0.01
230	Coatings and Related Process Solvents	21.42	20.84	0.00	0.00	0.00	1.84	1.76	1.70	0.10
240	Printing	1.23	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.06
250	Sealants & Adhesives	5.79	5.05	0.00	0.00	0.00	0.02	0.02	0.02	0.00
299	Other (Cleaning and Surface Coatings)	1.54	1.20	0.01	0.12	0.00	0.02	0.02	0.02	0.00

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Total	**Cleaning and Surface Coatings**	**112.75**	**42.75**	**0.01**	**0.12**	**0.00**	**1.91**	**1.83**	**1.76**	**0.18**
Petroleum Production and Marketing										
310	Oil and Gas Production	5.00	2.24	0.01	0.02	0.06	0.04	0.03	0.02	0.00
320	Petroleum Refining	6.35	4.43	0.23	2.39	0.24	1.87	1.25	0.88	0.07
330	Petroleum Marketing	49.88	11.85	0.00	0.23	0.00	0.01	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.60	0.58	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Total	**Petroleum Production and Marketing**	**61.83**	**19.10**	**0.25**	**2.65**	**0.30**	**1.92**	**1.28**	**0.91**	**0.07**
Industrial Processes										
410	Chemical	5.78	4.29	0.03	0.12	0.05	0.65	0.54	0.48	0.01
420	Food and Agriculture	0.62	0.61	0.00	0.01	0.00	0.16	0.07	0.03	0.00
430	Mineral Processes	0.35	0.31	0.02	0.31	0.04	8.32	4.54	2.54	0.09
440	Metal Processes	0.11	0.09	0.04	0.27	0.03	0.41	0.33	0.24	0.00
450	Wood and Paper	0.19	0.19	0.00	0.00	0.00	7.37	5.16	3.10	0.00
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
499	Other (Industrial Processes)	7.24	5.52	0.05	0.13	0.00	1.84	1.15	0.81	9.29
Total	**Industrial Processes**	**14.32**	**11.03**	**0.14**	**0.84**	**0.13**	**18.77**	**11.79**	**7.19**	**9.40**
Solvent Evaporation										
510	Consumer Products	110.16	91.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvents	13.02	12.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	1.38	1.38	0.00	0.00	0.00	0.00	0.00	0.00	1.11
540	Asphalt Paving/Roofing	1.27	1.16	0.00	0.00	0.00	0.03	0.03	0.03	0.00
Total	**Solvent Evaporation**	**125.83**	**106.48**	**0.00**	**0.00**	**0.00**	**0.03**	**0.03**	**0.03**	**1.11**

(Continued)

Table A-4. 2026 PM2.5 and PM2.5 Precursor Emissions by Major Source Category in South Coast Air Basin (Tons per Day)

CODE	Source Category	TOG	VOC	NOx	CO	SOx	TSP	PM10	PM2.5	NH3
Miscellaneous Processes										
610	Residential Fuel Combustion	19.16	8.37	12.06	46.29	0.48	7.06	6.70	6.51	0.11
620	Farming Operations	21.57	1.27	0.00	0.00	0.00	1.39	0.68	0.14	7.31
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	54.13	26.47	2.65	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	124.79	57.03	8.61	0.00
645	Unpaved Road and Travel Dust	0.00	0.00	0.00	0.00	0.00	9.84	5.85	0.58	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	2.70	1.39	0.20	0.00
660	Fires	0.34	0.23	0.08	3.02	0.00	0.45	0.44	0.41	0.00
670	Waste Burning and Disposal	0.81	0.47	0.19	6.31	0.05	0.72	0.70	0.63	0.03
690	Cooking	2.98	2.08	0.00	0.00	0.01	12.37	12.37	12.37	0.00
699	Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.34
	RECLAIM (with Shaves)			14.52		6.08				
Total	**Miscellaneous Processes**	**44.86**	**12.42**	**26.85**	**55.62**	**6.62**	**213.45**	**111.63**	**32.10**	**34.79**
On-Road Motor Vehicles										
710	Light Duty Passenger	18.00	16.86	10.56	186.07	0.58	11.64	11.41	4.73	5.61
722	Light Duty Trucks-1 (up to 3750 lb.)	4.64	4.34	2.51	31.87	0.08	1.29	1.27	0.53	0.70
723	Light Duty Trucks-2 (3751 to 5750 lb.)	10.17	9.52	6.15	83.89	0.24	3.85	3.78	1.57	2.67
724	Medium Duty Trucks (5751-8500 lb.)	7.99	7.47	4.89	59.98	0.19	2.52	2.47	1.03	2.62
732	Light Heavy Duty Gas Trucks-1 (8501-10000 lb.)	1.47	1.41	1.06	4.22	0.03	0.29	0.28	0.12	0.14
733	Light Heavy Duty Gas Trucks-2 (10001-14000 lb.)	0.21	0.20	0.18	0.62	0.00	0.06	0.05	0.02	0.02

734	Medium Heavy Duty Gas Trucks (14001-33000 lb.)	0.36	0.33	0.41	2.82	0.02	0.17	0.17	0.07	0.05
736	Heavy Heavy Duty Gas Trucks (>33000 lb.)	0.01	0.00	0.03	0.28	0.00	0.00	0.00	0.00	0.00
742	Light Heavy Duty Diesel Trucks-1 (8501-10000 lb.)	0.21	0.19	3.03	1.00	0.01	0.31	0.30	0.14	0.01
743	Light Heavy Duty Diesel Trucks-2 (10001-14000 lb.)	0.08	0.07	1.05	0.37	0.01	0.14	0.14	0.07	0.00
744	Medium Heavy Duty Diesel Trucks (14001-33000 lb.)	0.08	0.07	12.49	0.88	0.06	1.20	1.19	0.53	0.21
746	Heavy Heavy Duty Diesel Trucks (>33001 lb.)	2.27	0.89	46.02	14.92	0.19	1.74	1.72	0.80	0.40
750	Motorcycles	9.72	8.42	2.37	41.08	0.00	0.04	0.04	0.02	0.02
760	Heavy Duty Diesel Urban Buses	4.22	0.06	0.32	32.12	0.00	0.07	0.07	0.03	0.02
762	Heavy Duty Gas Urban Buses	0.00	0.00	0.02	0.05	0.00	0.01	0.01	0.01	0.00
771	School Buses - Gas	0.08	0.06	0.06	0.52	0.00	0.10	0.10	0.04	0.01
772	School Buses - Diesel	0.03	0.02	1.68	0.12	0.00	0.18	0.18	0.08	0.01
777	Other Buses - Gas	0.09	0.08	0.12	0.65	0.00	0.04	0.04	0.01	0.01
778	Other Buses - Motor Coach - Diesel	0.01	0.01	0.38	0.09	0.00	0.02	0.02	0.01	0.00
779	All Other Buses - Diesel	0.00	0.00	0.41	0.03	0.00	0.04	0.04	0.02	0.01
780	Motor Homes	0.03	0.03	0.52	0.30	0.01	0.08	0.08	0.04	0.02
Total	**On-Road Motor Vehicles**	**59.68**	**50.03**	**94.25**	**461.87**	**1.44**	**23.80**	**23.35**	**9.86**	**12.54**
Other Mobile Sources										
810	Aircraft	4.26	4.22	18.60	43.46	2.22	0.84	0.81	0.75	0.00
820	Trains	0.75	0.63	13.30	4.33	0.02	0.24	0.24	0.22	0.01
833	Ocean Going Vessels	3.36	2.81	39.29	4.43	2.69	0.87	0.87	0.80	0.04
835	Commercial Harbor Craft	1.25	1.05	9.96	6.97	0.00	0.40	0.40	0.37	0.00
840	Recreational Boats	16.61	14.44	4.19	78.61	0.01	1.01	0.91	0.68	0.01
850	Off-Road Recreational Vehicles	2.34	2.26	0.09	4.32	0.00	0.01	0.01	0.01	0.00
860	Commercial/Industrial Mobile Equipment	45.29	39.67	33.37	588.80	0.09	2.83	2.64	2.16	0.12
870	Farm Equipment	0.39	0.34	1.36	4.98	0.00	0.09	0.09	0.08	0.00
890	Fuel Storage and Handling	4.27	4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**Other Mobile Sources**	**78.51**	**69.66**	**120.16**	**735.90**	**5.03**	**6.29**	**5.98**	**5.07**	**0.17**
Total	Stationary and Area Sources	**1157.58**	**217.92**	**51.10**	**100.61**	**9.02**	**241.47**	**131.76**	**47.11**	**58.97**
Total	On-Road Vehicles	**59.68**	**50.03**	**94.25**	**461.87**	**1.44**	**23.80**	**23.35**	**9.86**	**12.54**
Total	Other Mobile	**78.52**	**69.66**	**120.16**	**735.90**	**5.03**	**6.30**	**5.98**	**5.07**	**0.18**
Total - All Sources		**1295.78**	**337.61**	**265.51**	**1298.38**	**15.49**	**271.57**	**161.09**	**62.04**	**71.69**

Table B. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

SCC	SCC_LEVEL_ONE	SCC_LEVEL_TWO	SCC_LEVEL_THREE	SCC_LEVEL_FOUR	Conversion Factor
20100101	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine	0.070272896
20100102	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating	0.070272896
20100105	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	0.07063197
20100106	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20100107	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Reciprocating: Exhaust	0.07063197
20100109	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)	Turbine: Exhaust	0.07063197
20100201	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine	0.450549451
20100202	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating	0.450549451
20100205	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Crankcase Blowby	0.450549451
20100206	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	0.450549451
20100207	Internal Combustion Engines	Electric Generation	Natural Gas	Reciprocating: Exhaust	0.450549451
20100209	Internal Combustion Engines	Electric Generation	Natural Gas	Turbine: Exhaust	0.450549451
20100301	Internal Combustion Engines	Electric Generation	Gasified Coal	Turbine	0.450549451
20100702	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating	0.450549451
20100707	Internal Combustion Engines	Electric Generation	Process Gas	Reciprocating: Exhaust	0.450549451
20100801	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine	0.450549451
20100802	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating	0.450549451
20100805	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Crankcase Blowby	0.450549451
20100807	Internal Combustion Engines	Electric Generation	Landfill Gas	Reciprocating: Exhaust	0.450549451
20100809	Internal Combustion Engines	Electric Generation	Landfill Gas	Turbine: Exhaust	0.450549451
20100901	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine	0.056603774
20100902	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating	0.058789987
20100907	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Reciprocating: Exhaust	0.056603774
20100909	Internal Combustion Engines	Electric Generation	Kerosene/Naphtha (Jet Fuel)	Turbine: Exhaust	0.056603774
20101001	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Steam Turbine	0.450549451
20101020	Internal Combustion Engines	Electric Generation	Geysers/Geothermal	Well Pad Fugitives: Blowdown	0
20101302	Internal Combustion Engines	Electric Generation	Liquid Waste	Waste Oil - Turbine	0.07063197
20182599	Internal Combustion Engines	Electric Generation	Wastewater, Points of Generation	Specify Point of Generation	0
20200101	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Turbine	0.022698613
20200102	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating	0.022698613
20200103	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Turbine: Cogeneration	0.022698613
20200104	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Cogeneration	0.022698613
20200105	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	0.022698613
20200106	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20200107	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Reciprocating: Exhaust	0.022698613
20200109	Internal Combustion Engines	Industrial	Distillate Oil (Diesel)	Turbine: Exhaust	0.022698613
20200201	Internal Combustion Engines	Industrial	Natural Gas	Turbine	0.450549451
20200202	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating	0.450549451
20200203	Internal Combustion Engines	Industrial	Natural Gas	Turbine: Cogeneration	0.450549451
20200204	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating: Cogeneration	0.450549451
20200205	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating: Crankcase Blowby	0.450549451
20200207	Internal Combustion Engines	Industrial	Natural Gas	Reciprocating: Exhaust	0.450549451
20200209	Internal Combustion Engines	Industrial	Natural Gas	Turbine: Exhaust	0.450549451
20200252	Internal Combustion Engines	Industrial	Natural Gas	2-cycle Lean Burn	0.450549451
20200253	Internal Combustion Engines	Industrial	Natural Gas	4-cycle Rich Burn	0.450549451
20200254	Internal Combustion Engines	Industrial	Natural Gas	4-cycle Lean Burn	0.450549451
20200255	Internal Combustion Engines	Industrial	Natural Gas	2-cycle Clean Burn	0.450549451
20200256	Internal Combustion Engines	Industrial	Natural Gas	4-cycle Clean Burn	0.450549451
20200401	Internal Combustion Engines	Industrial	Large Bore Engine	Diesel	0.134380454
20200402	Internal Combustion Engines	Industrial	Large Bore Engine	Dual Fuel (Oil/Gas)	0.134380454
20200403	Internal Combustion Engines	Industrial	Large Bore Engine	Cogeneration: Dual Fuel	0.134380454
20200406	Internal Combustion Engines	Industrial	Large Bore Engine	Evaporative Losses (Fuel Storage and Delivery System)	0
20200407	Internal Combustion Engines	Industrial	Large Bore Engine	Exhaust	0.134199134
20200501	Internal Combustion Engines	Industrial	Residual/Crude Oil	Reciprocating	0.08296754
20200701	Internal Combustion Engines	Industrial	Process Gas	Turbine	0.450549451

(Continued)
Table B. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

SCC	SCC_LEVEL_ONE	SCC_LEVEL_TWO	SCC_LEVEL_THREE	SCC_LEVEL_FOUR	Conversion Factor
20200702	Internal Combustion Engines	Industrial	Process Gas	Reciprocating Engine	0.450549451
20200705	Internal Combustion Engines	Industrial	Process Gas	Refinery Gas: Turbine	0.450549451
20200706	Internal Combustion Engines	Industrial	Process Gas	Refinery Gas: Reciprocating Engine	0.450549451
20200711	Internal Combustion Engines	Industrial	Process Gas	Reciprocating: Evaporative Losses (Fuel Delivery System)	0.450549451
20200712	Internal Combustion Engines	Industrial	Process Gas	Reciprocating: Exhaust	0.450549451
20200714	Internal Combustion Engines	Industrial	Process Gas	Turbine: Exhaust	0.450549451
20200901	Internal Combustion Engines	Industrial	Kerosene/Naphtha (Jet Fuel)	Turbine	0.022698613
20200902	Internal Combustion Engines	Industrial	Kerosene/Naphtha (Jet Fuel)	Reciprocating	0.022698613
20200909	Internal Combustion Engines	Industrial	Kerosene/Naphtha (Jet Fuel)	Turbine: Exhaust	0.022698613
20201001	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Propane: Reciprocating	0.450549451
20201002	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Butane: Reciprocating	0.450549451
20201005	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Reciprocating: Crankcase Blowby	0.450549451
20201012	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Reciprocating Engine	0.450549451
20201013	Internal Combustion Engines	Industrial	Liquified Petroleum Gas (LPG)	Turbine: Cogeneration	0.450549451
20201602	Internal Combustion Engines	Industrial	Methanol	Reciprocating Engine	0.450549451
20201607	Internal Combustion Engines	Industrial	Methanol	Reciprocating: Exhaust	0.450549451
20201609	Internal Combustion Engines	Industrial	Methanol	Turbine: Exhaust	0.450549451
20201701	Internal Combustion Engines	Industrial	Gasoline	Turbine	0.450549451
20201702	Internal Combustion Engines	Industrial	Gasoline	Reciprocating Engine	0.450549451
20201707	Internal Combustion Engines	Industrial	Gasoline	Reciprocating: Exhaust	0.450549451
20280001	Internal Combustion Engines	Industrial	Equipment Leaks	Equipment Leaks	0.450549451
20282599	Internal Combustion Engines	Industrial	Wastewater, Points of Generation	Specify Point of Generation	0
20300101	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating	0.022698613
20300102	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Turbine	0.022698613
20300105	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating: Crankcase Blowby	0.022698613
20300106	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20300107	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Reciprocating: Exhaust	0.022698613
20300108	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Turbine: Evaporative Losses (Fuel Storage and Delivery System)	0
20300109	Internal Combustion Engines	Commercial/Institutional	Distillate Oil (Diesel)	Turbine: Exhaust	0.022698613
20300201	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Reciprocating	0.450549451
20300202	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Turbine	0.450549451
20300203	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Turbine: Cogeneration	0.450549451
20300204	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Reciprocating: Cogeneration	0.450549451
20300207	Internal Combustion Engines	Commercial/Institutional	Natural Gas	Reciprocating: Exhaust	0.450549451
20300301	Internal Combustion Engines	Commercial/Institutional	Gasoline	Reciprocating	0.067164179
20300307	Internal Combustion Engines	Commercial/Institutional	Gasoline	Reciprocating: Exhaust	0.067164179
20300701	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Turbine	0.375
20300702	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Reciprocating: POTW Digester Gas	0.450549451
20300706	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)	0
20300707	Internal Combustion Engines	Commercial/Institutional	Digester Gas	Reciprocating: Exhaust	0.450549451
20300801	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Turbine	0.450549451
20300802	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Reciprocating	0.450549451
20300805	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Reciprocating: Crankcase Blowby	0.450549451
20300809	Internal Combustion Engines	Commercial/Institutional	Landfill Gas	Turbine: Exhaust	0.450549451
20300901	Internal Combustion Engines	Commercial/Institutional	Kerosene/Naphtha (Jet Fuel)	Turbine: JP-4	0.450549451

20301001	Internal Combustion Engines	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Propane: Reciprocating	0.450549451

(Continued)

Table B. List of Category Specific Conversion Factors (Developed by CARB and Used in the Imperial County 2018 SIP) to Estimate Condensable PM2.5 from Primary PM2.5

SCC	SCC_LEVEL_ONE	SCC_LEVEL_TWO	SCC_LEVEL_THREE	SCC_LEVEL_FOUR	Conversion Factor
20301002	Internal Combustion Engines	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Butane: Reciprocating	0.450549451
20301007	Internal Combustion Engines	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Reciprocating: Exhaust	0.450549451
20400101	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	Turbojet	0.071204135
20400102	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	Turboshaft	0.450549451
20400111	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	JP-5 Fuel	0.450549451
20400112	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	JP-4 Fuel	0.071204135
20400199	Internal Combustion Engines	Engine Testing	Aircraft Engine Testing	Other Not Classified	0
20400201	Internal Combustion Engines	Engine Testing	Rocket Engine Testing	Rocket Motor: Solid Propellant	0.450549451
20400202	Internal Combustion Engines	Engine Testing	Rocket Engine Testing	Liquid Propellant	0.450549451
20400299	Internal Combustion Engines	Engine Testing	Rocket Engine Testing	Other Not Classified	0
20400301	Internal Combustion Engines	Engine Testing	Turbine	Natural Gas	0.450549451
20400302	Internal Combustion Engines	Engine Testing	Turbine	Diesel/Kerosene	0.071204135
20400303	Internal Combustion Engines	Engine Testing	Turbine	Distillate Oil	0.071204135
20400305	Internal Combustion Engines	Engine Testing	Turbine	Kerosene/Naphtha	0.071204135
20400399	Internal Combustion Engines	Engine Testing	Turbine	Other Not Classified	0
20400401	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Gasoline	0.071204135
20400402	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Diesel/Kerosene	0.071204135
20400403	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Distillate Oil	0.071204135
20400404	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Process Gas	0.450549451
20400406	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Kerosene/Naphtha (Jet Fuel)	0.071204135
20400407	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Dual Fuel (Gas/Oil)	0.071204135
20400408	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Residual Oil/Crude Oil	0.071204135
20400409	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Liquified Petroleum Gas (LPG)	0.450549451
20400499	Internal Combustion Engines	Engine Testing	Reciprocating Engine	Other Not Classified	0
26000320	Internal Combustion Engines	Off-highway 2-stroke Gasoline Engines	Industrial Equipment	Industrial Fork Lift: Gasoline Engine (2-stroke)	0.071204135
26500320	Internal Combustion Engines	Off-highway 4-stroke Gasoline Engines	Industrial Equipment	Industrial Fork Lift: Gasoline Engine (4-stroke)	0.071204135
27000320	Internal Combustion Engines	Off-highway Diesel Engines	Industrial Equipment	Industrial Fork Lift: Diesel	0.071204135
27300320	Internal Combustion Engines	Off-highway LPG-fueled Engines	Industrial Equipment	Industrial Fork Lift: Liquified Petroleum Gas (LPG)	0.450549451
28500201	Internal Combustion Engines	Railroad Equipment	Diesel	Yard Locomotives	0.071204135
28888801	Internal Combustion Engines	Fugitive Emissions	Other Not Classified	Specify in Comments	0

Table C-1. 2018 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.51	0.24	0.27
	20	Cogeneration	0.01	0.00	0.01
	30	Oil and Gas Production (Combustion)	0.09	0.03	0.06
	40	Petroleum Refining (Combustion)	1.77	1.00	0.77
	50	Manufacturing and Industrial	1.12	0.61	0.51
	52	Food and Agricultural Processing	0.03	0.02	0.01
	60	Service and Commercial	1.16	0.60	0.56
	99	Other (Fuel Combustion)	0.15	0.01	0.13
Total Fuel Combustion			**4.84**	**2.52**	**2.33**
Waste Disposal					
	110	Sewage Treatment	0.00	0.00	0.00
	120	Landfills	0.20	0.02	0.18
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0.00	0.00	0.00
	199	Other (Water Disposal)	0.00	0.00	0.00
Total Waste Disposal			**0.25**	**0.04**	**0.21**
Cleaning and Surface Coatings					
	210	Laundering	0.00	0.00	0.00
	220	Degreasing	0.02	0.00	0.02
	230	Coatings and Related Processes	1.54	0.00	1.54
	240	Printing	0.00	0.00	0.00
	250	Adhesives and Sealants	0.02	0.00	0.02
	299	Other (Cleaning and Surface Coatings)	0.02	0.00	0.02
Total Cleaning and Surface Coatings			**1.60**	**0.00**	**1.60**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0.00	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0.00	0.00	0.00
	399	Other (Petroleum Production and Marketing)	0.00	0.00	0.00
Total Petroleum Production and Marketing			**0.90**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.44	0.01	0.43
	420	Food and Agriculture	0.03	0.01	0.02
	430	Mineral Processes	2.51	0.02	2.49
	440	Metal Processes	0.22	0.09	0.13
	450	Wood and Paper	2.70	0.00	2.70
	460	Glass and Related Products	0.00	0.00	0.00
	470	Electronics	0.00	0.00	0.00
	499	Other (Industrial Processes)	0.80	0.04	0.76
Total Industrial Processes			**6.70**	**0.16**	**6.53**
Solvent Evaporation					
	510	Consumer Products	0.00	0.00	0.00
	520	Architectural Coatings and Related Solvent	0.00	0.00	0.00
	530	Pesticides/Fertilizers	0.00	0.00	0.00
	540	Asphalt Paving/Roofing	0.02	0.00	0.02
Total Solvent Evaporation			**0.02**	**0.00**	**0.02**

(Continued)
Table C-1. 2018 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes					
	610	Residential Fuel Combustion	6.60	0.85	5.75
	620	Farming Operations	0.16	0.00	0.16
	630	Construction and Demolition	2.27	0.00	2.27
	640	Paved Road Dust	8.13	0.00	8.13
	645	Unpaved Road Dust	0.58	0.00	0.58
	650	Fugitive Windblown Dust	0.23	0.00	0.23
	660	Fires	0.41	0.00	0.41
	670	Waste Burning and Disposal	0.63	0.00	0.63
	690	Cooking	11.46	11.41	0.04
	699	Other (Miscellaneous Processes)	0.00	0.00	0.00
Total Miscellaneous Processes			**30.47**	**12.27**	**18.21**
On-Road Motor Vehicles (EMFAC2017 PC version using SCAG's link data)					
	710	Light Duty Passenger Auto (LDA)	4.85	--	--
	722	Light Duty Trucks 1 (T1)	0.51	--	--
	723	Light Duty Trucks 2 (T2)	1.58	--	--
	724	Medium Duty Trucks (T3)	1.12	--	--
	732	Light Heavy Duty Gas Trucks 1 (T4)	0.17	--	--
	733	Light Heavy Duty Gas Trucks 2 (T5)	0.03	--	--
	734	Medium Heavy Duty Gas Trucks (T6)	0.07	--	--
	736	Heavy Heavy Duty Gas Trucks (HHD)	0.00	--	--
	742	Light Heavy Duty Diesel Trucks 1 (T4)	0.16	--	--
	743	Light Heavy Duty Diesel Trucks 2 (T5)	0.06	--	--
	744	Medium Heavy Duty Diesels Truck (T6)	1.12	--	--
	746	Heavy Heavy Duty Diesel Trucks (HHD)	1.39	--	--
	750	Motorcycles (MCY)	0.02	--	--
	760	Diesel Urban Buses (UB)	0.03	--	--
	762	Gas Urban Buses (UB)	0.01	--	--
	771	Gas School Buses (SB)	0.03	--	--
	772	Diesel School Buses (SB)	0.08	--	--
	777	Gas Other Buses (OB)	0.02	--	--
	778/779	Motor Coaches / Diesel Other Buses (OB)	0.06	--	--
	780	Motor Homes (MH)	0.04	--	--
Total On-Road Motor Vehicles			**11.35**	**--**	**--**
Other Mobile Sources					
	810	Aircraft	0.66	--	--
	820	Trains	0.30	--	--
	833	Ocean Going Vessels	0.64	--	--
	835	Commercial Harbor Crafts	0.45	--	--
	840	Recreational Boats	1.05	--	--
	850	Off-Road Recreation Vehicles	0.01	--	--
	860	Off-Road Equipment	3.03	--	--
	870	Farm Equipment	0.12	--	--
	890	Fuel Storage and Handling	0.00	--	--
Total Other Mobile Sources			**6.25**	**--**	**--**
Total Stationary and Area Sources			**44.78**	**15.12**	**29.66**
Total On-Road Vehicles			11.35	--	--
Total Other Mobile			6.25	--	--

Total		**62.38**	**--**	**--**

Table C-2. 2020 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion				
10	Electric Utilities	0.51	0.24	0.27
20	Cogeneration	0.01	0.00	0.01
30	Oil and Gas Production (Combustion)	0.09	0.03	0.06
40	Petroleum Refining (Combustion)	1.77	1.00	0.77
50	Manufacturing and Industrial	1.10	0.60	0.50
52	Food and Agricultural Processing	0.04	0.02	0.01
60	Service and Commercial	1.15	0.60	0.56
99	Other (Fuel Combustion)	0.15	0.02	0.12
Total Fuel Combustion		**4.82**	**2.50**	**2.32**
Waste Disposal				
110	Sewage Treatment	0.00	0.00	0.00
120	Landfills	0.20	0.02	0.18
130	Incineration	0.05	0.02	0.03
140	Soil Remediation	0.00	0.00	0.00
199	Other (Water Disposal)	0.00	0.00	0.00
Total Waste Disposal		**0.25**	**0.04**	**0.21**
Cleaning and Surface Coatings				
210	Laundering	0.00	0.00	0.00
220	Degreasing	0.02	0.00	0.02
230	Coatings and Related Processes	1.60	0.00	1.60
240	Printing	0.00	0.00	0.00
250	Adhesives and Sealants	0.02	0.00	0.02
299	Other (Cleaning and Surface Coatings)	0.02	0.00	0.02
Total Cleaning and Surface Coatings		**1.66**	**0.00**	**1.66**
Petroleum Production and Marketing				
310	Oil and Gas Production	0.02	0.00	0.02
320	Petroleum Refining	0.88	0.14	0.74
330	Petroleum Marketing	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.00	0.00	0.00
Total Petroleum Production and Marketing		**0.91**	**0.14**	**0.77**
Industrial Processes				
410	Chemical	0.45	0.01	0.45
420	Food and Agriculture	0.03	0.01	0.02
430	Mineral Processes	2.52	0.02	2.50
440	Metal Processes	0.22	0.09	0.13
450	Wood and Paper	2.85	0.00	2.84
460	Glass and Related Products	0.00	0.00	0.00
470	Electronics	0.00	0.00	0.00
499	Other (Industrial Processes)	0.80	0.04	0.76
Total Industrial Processes		**6.87**	**0.16**	**6.71**
Solvent Evaporation				
510	Consumer Products	0.00	0.00	0.00

	520	Architectural Coatings and Related Solvent	0.00	0.00	0.00
	530	Pesticides/Fertilizers	0.00	0.00	0.00
	540	Asphalt Paving/Roofing	0.03	0.00	0.03
Total Solvent Evaporation			**0.03**	**0.00**	**0.03**

(Continued)
Table C-2. 2020 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.57	0.84	5.73
620	Farming Operations	0.15	0.00	0.15
630	Construction and Demolition	2.45	0.00	2.45
640	Paved Road Dust	8.27	0.00	8.27
645	Unpaved Road Dust	0.58	0.00	0.58
650	Fugitive Windblown Dust	0.22	0.00	0.22
660	Fires	0.41	0.00	0.41
670	Waste Burning and Disposal	0.63	0.00	0.63
690	Cooking	11.80	11.75	0.05
699	Other (Miscellaneous Processes)	0.00	0.00	0.00
Total Miscellaneous Processes		**31.08**	**12.59**	**18.48**
On-Road Motor Vehicles (EMFAC2017 PC version using SCAG's link data)				
710	Light Duty Passenger Auto (LDA)	4.83	--	--
722	Light Duty Trucks 1 (T1)	0.52	--	--
723	Light Duty Trucks 2 (T2)	1.58	--	--
724	Medium Duty Trucks (T3)	1.10	--	--
732	Light Heavy Duty Gas Trucks 1 (T4)	0.15	--	--
733	Light Heavy Duty Gas Trucks 2 (T5)	0.03	--	--
734	Medium Heavy Duty Gas Trucks (T6)	0.07	--	--
736	Heavy Heavy Duty Gas Trucks (HHD)	0.00	--	--
742	Light Heavy Duty Diesel Trucks 1 (T4)	0.15	--	--
743	Light Heavy Duty Diesel Trucks 2 (T5)	0.06	--	--
744	Medium Heavy Duty Diesels Truck (T6)	0.96	--	--
746	Heavy Heavy Duty Diesel Trucks (HHD)	1.16	--	--
750	Motorcycles (MCY)	0.02	--	--
760	Diesel Urban Buses (UB)	0.03	--	--
762	Gas Urban Buses (UB)	0.01	--	--
771	Gas School Buses (SB)	0.03	--	--
772	Diesel School Buses (SB)	0.08	--	--
777	Gas Other Buses (OB)	0.02	--	--
778/779	Motor Coaches / Diesel Other Buses (OB)	0.05	--	--
780	Motor Homes (MH)	0.04	--	--
Total On-Road Motor Vehicles		**10.88**	**--**	**--**
Other Mobile Sources				
810	Aircraft	0.68	--	--
820	Trains	0.26	--	--
833	Ocean Going Vessels	0.67	--	--
835	Commercial Harbor Crafts	0.42	--	--
840	Recreational Boats	0.95	--	--
850	Off-Road Recreation Vehicles	0.01	--	--
860	Off-Road Equipment	2.75	--	--
870	Farm Equipment	0.11	--	--
890	Fuel Storage and Handling	0.00	--	--
Total Other Mobile Sources		**5.85**	**--**	**--**
Total Stationary and Area Sources		**45.63**	**15.44**	**30.19**
Total On-Road Vehicles		10.88	**--**	**--**
Total Other Mobile		5.86	**--**	**--**
Total		**62.37**	**--**	**--**

Table C-3. 2023 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.55	0.25	0.29
	20	Cogeneration	0.01	0.00	0.01
	30	Oil and Gas Production (Combustion)	0.10	0.03	0.06
	40	Petroleum Refining (Combustion)	1.77	1.00	0.77
	50	Manufacturing and Industrial	1.09	0.59	0.50
	52	Food and Agricultural Processing	0.04	0.02	0.01
	60	Service and Commercial	1.15	0.59	0.56
	99	Other (Fuel Combustion)	0.14	0.02	0.12
Total Fuel Combustion			**4.85**	**2.51**	**2.34**
Waste Disposal					
	110	Sewage Treatment	0.00	0.00	0.00
	120	Landfills	0.21	0.02	0.19
	130	Incineration	0.05	0.02	0.03
	140	Soil Remediation	0.00	0.00	0.00
	199	Other (Water Disposal)	0.00	0.00	0.00
Total Waste Disposal			**0.26**	**0.04**	**0.22**
Cleaning and Surface Coatings					
	210	Laundering	0.00	0.00	0.00
	220	Degreasing	0.02	0.00	0.02
	230	Coatings and Related Processes	1.67	0.00	1.66
	240	Printing	0.00	0.00	0.00
	250	Adhesives and Sealants	0.02	0.00	0.02
	299	Other (Cleaning and Surface Coatings)	0.02	0.00	0.02
Total Cleaning and Surface Coatings			**1.73**	**0.00**	**1.72**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0.00	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0.00	0.00	0.00
	399	Other (Petroleum Production and Marketing)	0.00	0.00	0.00
Total Petroleum Production and Marketing			**0.91**	**0.14**	**0.77**
Industrial Processes					
	410	Chemical	0.47	0.01	0.47
	420	Food and Agriculture	0.03	0.01	0.02
	430	Mineral Processes	2.53	0.02	2.51
	440	Metal Processes	0.23	0.09	0.14
	450	Wood and Paper	3.02	0.00	3.02
	460	Glass and Related Products	0.00	0.00	0.00
	470	Electronics	0.00	0.00	0.00
	499	Other (Industrial Processes)	0.81	0.04	0.77
Total Industrial Processes			**7.09**	**0.16**	**6.93**
Solvent Evaporation					
	510	Consumer Products	0.00	0.00	0.00
	520	Architectural Coatings and Related Solvent	0.00	0.00	0.00
	530	Pesticides/Fertilizers	0.00	0.00	0.00
	540	Asphalt Paving/Roofing	0.03	0.00	0.03

		PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Total Solvent Evaporation		**0.03**	**0.00**	**0.03**

(Continued)
Table C-3. 2023 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE	Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes				
610	Residential Fuel Combustion	6.53	0.83	5.70
620	Farming Operations	0.15	0.00	0.15
630	Construction and Demolition	2.55	0.00	2.55
640	Paved Road Dust	8.51	0.00	8.51
645	Unpaved Road Dust	0.58	0.00	0.58
650	Fugitive Windblown Dust	0.21	0.00	0.21
660	Fires	0.41	0.00	0.41
670	Waste Burning and Disposal	0.63	0.00	0.63
690	Cooking	12.08	12.03	0.05
699	Other (Miscellaneous Processes)	0.00	0.00	0.00
Total Miscellaneous Processes		**31.65**	**12.86**	**18.79**
On-Road Motor Vehicles (EMFAC2017 PC version using SCAG's link data)				
710	Light Duty Passenger Auto (LDA)	4.84	--	--
722	Light Duty Trucks 1 (T1)	0.53	--	--
723	Light Duty Trucks 2 (T2)	1.59	--	--
724	Medium Duty Trucks (T3)	1.07	--	--
732	Light Heavy Duty Gas Trucks 1 (T4)	0.13	--	--
733	Light Heavy Duty Gas Trucks 2 (T5)	0.02	--	--
734	Medium Heavy Duty Gas Trucks (T6)	0.07	--	--
736	Heavy Heavy Duty Gas Trucks (HHD)	0.00	--	--
742	Light Heavy Duty Diesel Trucks 1 (T4)	0.15	--	--
743	Light Heavy Duty Diesel Trucks 2 (T5)	0.06	--	--
744	Medium Heavy Duty Diesels Truck (T6)	0.49	--	--
746	Heavy Heavy Duty Diesel Trucks (HHD)	0.73	--	--
750	Motorcycles (MCY)	0.02	--	--
760	Diesel Urban Buses (UB)	0.03	--	--
762	Gas Urban Buses (UB)	0.01	--	--
771	Gas School Buses (SB)	0.04	--	--
772	Diesel School Buses (SB)	0.08	--	--
777	Gas Other Buses (OB)	0.02	--	--
778/779	Motor Coaches / Diesel Other Buses (OB)	0.02	--	--
780	Motor Homes (MH)	0.04	--	--
Total On-Road Motor Vehicles		**9.94**	--	--
Other Mobile Sources				
810	Aircraft	0.71	--	--
820	Trains	0.25	--	--
833	Ocean Going Vessels	0.73	--	--
835	Commercial Harbor Crafts	0.39	--	--
840	Recreational Boats	0.81	--	--
850	Off-Road Recreation Vehicles	0.01	--	--
860	Off-Road Equipment	2.40	--	--
870	Farm Equipment	0.10	--	--
890	Fuel Storage and Handling	0.00	--	--
Total Other Mobile Sources		**5.40**	--	--
Total Stationary and Area Sources		**46.52**	**15.72**	**30.80**

Total On-Road Vehicles	9.94	--	--
Total Other Mobile	5.40	--	--
Total	**61.85**	--	--

Table C-4. 2026 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Fuel Combustion					
	10	Electric Utilities	0.56	0.26	0.30
	20	Cogeneration	0.02	0.00	0.01
	30	Oil and Gas Production (Combustion)	0.10	0.03	0.06
	40	Petroleum Refining (Combustion)	1.77	1.00	0.77
	50	Manufacturing and Industrial	1.08	0.59	0.50
	52	Food and Agricultural Processing	0.04	0.02	0.01
	60	Service and Commercial	1.15	0.59	0.56
	99	Other (Fuel Combustion)	0.14	0.02	0.12
Total Fuel Combustion			**4.85**	**2.50**	**2.34**
Waste Disposal					
	110	Sewage Treatment	0.00	0.00	0.00
	120	Landfills	0.21	0.02	0.19
	130	Incineration	0.06	0.02	0.04
	140	Soil Remediation	0.00	0.00	0.00
	199	Other (Water Disposal)	0.00	0.00	0.00
Total Waste Disposal			**0.27**	**0.04**	**0.22**
Cleaning and Surface Coatings					
	210	Laundering	0.00	0.00	0.00
	220	Degreasing	0.02	0.00	0.02
	230	Coatings and Related Processes	1.70	0.00	1.70
	240	Printing	0.00	0.00	0.00
	250	Adhesives and Sealants	0.02	0.00	0.02
	299	Other (Cleaning and Surface Coatings)	0.02	0.00	0.02
Total Cleaning and Surface Coatings			**1.76**	**0.00**	**1.76**
Petroleum Production and Marketing					
	310	Oil and Gas Production	0.02	0.00	0.02
	320	Petroleum Refining	0.88	0.14	0.74
	330	Petroleum Marketing	0.00	0.00	0.00
	399	Other (Petroleum Production and Marketing)	0.00	0.00	0.00
Total Petroleum Production and Marketing			**0.91**	0.14	**0.77**
Industrial Processes					
	410	Chemical	0.48	0.01	0.48
	420	Food and Agriculture	0.03	0.01	0.02
	430	Mineral Processes	2.54	0.02	2.52
	440	Metal Processes	0.24	0.10	0.14
	450	Wood and Paper	3.10	0.00	3.09
	460	Glass and Related Products	0.00	0.00	0.00
	470	Electronics	0.00	0.00	0.00
	499	Other (Industrial Processes)	0.81	0.04	0.77
Total Industrial Processes			**7.19**	**0.17**	**7.02**
Solvent Evaporation					
	510	Consumer Products	0.00	0.00	0.00

	520	Architectural Coatings and Related Solvent	0.00	0.00	0.00
	530	Pesticides/Fertilizers	0.00	0.00	0.00
	540	Asphalt Paving/Roofing	0.03	0.00	0.03
Total Solvent Evaporation			**0.03**	**0.00**	**0.03**

(Continued)
Table C-4. 2026 Primary, Condensable and Filterable PM2.5 Emissions by Major Source Category (Tons per Day)

CODE		Source Category (tmf0316)	PM2.5 Total	PM2.5 Condensable	PM2.5 Filterable
Miscellaneous Processes					
	610	Residential Fuel Combustion	6.51	0.82	5.69
	620	Farming Operations	0.14	0.00	0.14
	630	Construction and Demolition	2.65	0.00	2.65
	640	Paved Road Dust	8.61	0.00	8.61
	645	Unpaved Road Dust	0.58	0.00	0.58
	650	Fugitive Windblown Dust	0.20	0.00	0.20
	660	Fires	0.41	0.00	0.41
	670	Waste Burning and Disposal	0.63	0.00	0.63
	690	Cooking	12.37	12.32	0.05
	699	Other (Miscellaneous Processes)	0.00	0.00	0.00
Total Miscellaneous Processes			**32.10**	**13.14**	**18.96**
On-Road Motor Vehicles (EMFAC2017 PC version using SCAG's link data)					
	710	Light Duty Passenger Auto (LDA)	4.73	--	--
	722	Light Duty Trucks 1 (T1)	0.53	--	--
	723	Light Duty Trucks 2 (T2)	1.57	--	--
	724	Medium Duty Trucks (T3)	1.03	--	--
	732	Light Heavy Duty Gas Trucks 1 (T4)	0.12	--	--
	733	Light Heavy Duty Gas Trucks 2 (T5)	0.02	--	--
	734	Medium Heavy Duty Gas Trucks (T6)	0.07	--	--
	736	Heavy Heavy Duty Gas Trucks (HHD)	0.00	--	--
	742	Light Heavy Duty Diesel Trucks 1 (T4)	0.14	--	--
	743	Light Heavy Duty Diesel Trucks 2 (T5)	0.07	--	--
	744	Medium Heavy Duty Diesels Truck (T6)	0.53	--	--
	746	Heavy Heavy Duty Diesel Trucks (HHD)	0.80	--	--
	750	Motorcycles (MCY)	0.02	--	--
	760	Diesel Urban Buses (UB)	0.03	--	--
	762	Gas Urban Buses (UB)	0.01	--	--
	771	Gas School Buses (SB)	0.04	--	--
	772	Diesel School Buses (SB)	0.08	--	--
	777	Gas Other Buses (OB)	0.01	--	--
	778/779	Motor Coaches / Diesel Other Buses (OB)	0.03	--	--
	780	Motor Homes (MH)	0.04	--	--
Total On-Road Motor Vehicles			**9.86**	**--**	**--**
Other Mobile Sources					
	810	Aircraft	0.75	--	--
	820	Trains	0.22	--	--
	833	Ocean Going Vessels	0.80	--	--
	835	Commercial Harbor Crafts	0.37	--	--
	840	Recreational Boats	0.68	--	--
	850	Off-Road Recreation Vehicles	0.01	--	--
	860	Off-Road Equipment	2.16	--	--

	870	Farm Equipment	0.08	--	--
	890	Fuel Storage and Handling	0.00	--	--
Total Other Mobile Sources			**5.07**	**--**	**--**
Total Stationary and Area Sources			**47.11**	**16.00**	**31.11**
Total On-Road Vehicles			9.86	--	--
Total Other Mobile			5.07	--	--
Total			**62.04**	--	--

Appendix II

South Coast AQMD Existing Rules and Regulations

TABLE II-1

South Coast AQMD Regulation IV (Prohibitions) Rules

Rule Number	Rule Title	Adoption or Amendment Date
Rule 401	Visible Emission	11/09/01
Rule 402	Nuisance	05/07/76
Rule 403	Fugitive Dust	06/03/05
Rule 403.1	Supplemental Fugitive Dust Control Requirements for Coachella Valley Sources	04/02/04
Rule 404	Particulate Matter- Concentration	02/07/86
Rule 405	Solid Particulate Matter- Weight	02/07/86
Rule 407	Liquid and Gaseous Air Contaminants	04/02/82
Rule 408	Circumvention	05/04/18
Rule 409	Combustion Contaminants	08/07/81
Rule 410	Odors from Transfer Stations and Material Recovery Facilities	10/06/06
Rule 415	Odors from Rendering Facilities	11/03/17
Rule 429	Start-Up and Shutdown Exemption Provisions for Oxides of Nitrogen	12/20/90
Rule 430	Breakdown Provisions	07/12/96
Rule 431	Sulfur Content of Fuels	12/02/77
Rule 431.1	Sulfur Content of Gaseous Fuels	06/12/98
Rule 431.2	Sulfur Content of Liquid Fuels	09/15/00
Rule 431.3	Sulfur Content of Fossil Fuels	05/07/76
Rule 432	Gasoline Specifications	07/10/98
Rule 433	Natural Gas Quality	06/05/09
Rule 441	Research Operations	05/07/76
Rule 442	Usage of Solvents	12/15/00
Rule 443	Labeling of Solvents	05/07/76
Rule 443.1	Labeling of Materials Containing Organic Solvents	12/05/86
Rule 444	Open Burning	07/12/13
Rule 445	Wood Burning Devices	05/03/13
Rule 461	Gasoline Transfer and Dispensing	04/06/12
Rule 462	Organic Liquid Loading	05/14/99
Rule 463	Organic Liquid Storage	11/04/11
Rule 464	Wastewater Separators	12/07/90
Rule 465	Refinery Vacuum-Producing Devices or Systems	08/13/99
Rule 466	Pumps and Compressors	10/07/83
Rule 466.1	Valves and Flanges	03/16/84
Rule 467	Pressure Relief Devices	03/05/82
Rule 468	Sulfur Recovery Units	10/08/76
Rule 469	Sulfuric Acid Units	02/13/81
Rule 470	Asphalt Air Blowing	05/07/76
Rule 471	Asphalt or Coal Tar Equipment	09/07/79
Rule 472	Reduction of Animal Matter	05/07/76
Rule 473	Disposal of Solid and Liquid Wastes	05/07/76
Rule 474	Fuel Burning Equipment - Oxides of Nitrogen	12/04/81
Rule 475	Electric Power Generating Equipment	08/07/78
Rule 476	Steam Generating Equipment	10/08/76
Rule 477	Coke Ovens	04/03/81
Rule 480	Natural Gas Fired Control Devices	10/07/77
Rule 481	Spray Coating Operations	01/11/02

TABLE II-2

South Coast AQMD Regulation XI (Source Specific Standards) Rules

Rule Number	Rule Title	Adoption or Amendment Date
Rule 1100	Implementation Schedule for NOx Facilities	01/10/20
Rule 1101	Secondary Lead Smelters/Sulfur Oxides	10/07/77
Rule 1102	Dry Cleaners Using Solvent Other Than Perchloroethylene	11/17/00
Rule 1103	Pharmaceutical and Cosmetics Manufacturing Operations	03/12/19
Rule 1104	Wood Flat Stock Coating Operations	08/13/99
Rule 1105	Fluid Catalytic Cracking Units- Oxides of Sulfur	09/01/84
Rule 1105.1	Reduction of PM10 and Ammonia Emissions from Fluid Catalytic Cracking Units	11/07/03
Rule 1106	Marine and Pleasure Craft Coatings	05/13/19
Rule 1107	Coating of Metal Parts and Products	02/07/20
Rule 1108	Cutback Asphalt	02/01/85
Rule 1108.1	Emulsified Asphalt	11/04/83
Rule 1109	Emissions of Oxides of Nitrogen from Boilers and Process Heaters in Petroleum Refineries	08/05/88
Rule 1110.2	Emissions from Gaseous - and Liquid-Fueled Engines	11/01/19
Rule 1111	Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces	12/06/19
Rule 1112	Emissions of Oxides of Nitrogen from Cement Kilns	06/06/86
Rule 1112.1	Emissions of Particulate Matter and Carbon Monoxide from Cement Kilns	12/04/09
Rule 1113	Architectural Coatings	02/05/16
Rule 1114	Petroleum Refinery Coking Operations	05/03/13
Rule 1115	Motor Vehicle Assembly Line Coating Operations	05/02/95
Rule 1116.1	Lightering Vessel Operations- Sulfur Content of Bunker Fuel	10/20/78
Rule 1117	Emissions of Oxides of Nitrogen from Glass Melting Furnaces	01/06/84
Rule 1118	Control of Emissions from Refinery Flares	07/07/17
Rule 1118.1	Control of Emissions from Non-Refinery Flares	01/04/19
Rule 1119	Petroleum Coke Calcining Operations- Oxides of Sulfur	03/02/79
Rule 1120	Asphalt Pavement Heaters	08/04/78
Rule 1121	Control of Nitrogen Oxides from Residential Type, Natural-Gas-Fired Water Heaters	09/03/04
Rule 1122	Solvent Degreasers	05/01/09
Rule 1123	Refinery Process Turnarounds	12/07/90
Rule 1124	Aerospace Assembly and Component Manufacturing Operations	09/21/01
Rule 1125	Metal Container, Closure, and Coil Coating Operations	03/07/08
Rule 1126	Magnet Wire Coating Operations	01/13/95
Rule 1127	Emission Reductions from Livestock Waste	08/06/04
Rule 1128	Paper, Fabric, and Film Coating Operations	03/08/96
Rule 1129	Aerosol Coatings	03/08/96
Rule 1130	Graphic Arts	05/02/14
Rule 1130.1	Screen Printing Operations	12/13/96
Rule 1131	Food Product Manufacturing and Processing Operations	06/06/03
Rule 1132	Further Control of VOC Emissions from High-Emitting Spray Booth Facilities	05/05/06
Rule 1133	Composting and Related Operations- General Administrative Requirements	01/10/03
Rule 1133.1	Chipping and Grinding Activities	07/08/11
Rule 1133.2	Emission Reductions from Co-Composting Operations	01/10/03
Rule 1133.3	Emission Reductions from Greenwaste Composting Operations	07/08/11
Rule 1134	Emissions of Oxides of Nitrogen from Stationary Gas Turbines	04/05/19
Rule 1135	Emissions of Oxides of Nitrogen from Electricity Generating Facilities	11/02/18
Rule 1135.1	Controlling of Emission of Oxides of Nitrogen from Electric Power Generating Equipment	03/10/82
Rule 1136	Wood Products Coatings	06/14/96
Rule 1137	PM10 Emission Reductions from Woodworking Operations	02/01/02
Rule 1138	Control of Emissions from Restaurant Operations	11/14/97
Rule 1140	Abrasive Blasting	08/02/85
Rule 1141	Control of Volatile Organic Compound Emissions from Resin Manufacturing	11/17/00
Rule 1141.1	Coatings and Ink Manufacturing	11/17/00
Rule 1141.2	Surfactant Manufacturing	01/11/02
Rule 1142	Marine Tank Vessel Operations	07/19/91
Rule 1143	Consumer Paint Thinners and Multi-Purpose Solvents	12/03/10
Rule 1144	Metalworking Fluids and Direct-Contact Lubricants	07/09/10

TABLE II-2 (Continued)

South Coast AQMD Existing Regulation XI (Source Specific Standards) Rules

Rule Number	Rule Title	Adoption or Amendment Date
Rule 1145	Plastic, Rubber, Leather, and Glass Coatings	12/04/09
Rule 1146	Emissions of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators, and Process Heaters	12/07/18
Rule 1146.1	Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	12/07/18
Rule 1146.2	Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters	12/07/18
Rule 1147	NOx Reductions from Miscellaneous Sources	07/07/17
Rule 1148	Thermally Enhanced Oil Recovery Wells	11/05/82
Rule 1148.1	Oil and Gas Production Wells	09/04/15
Rule 1148.2	Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers	09/04/15
Rule 1149	Storage Tank and Pipeline Cleaning and Degassing	05/02/08
Rule 1150	Excavation of Landfill Sites	10/15/82
Rule 1150.1	Control of Gaseous Emissions from Municipal Solid Waste Landfills	04/01/11
Rule 1151	Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations	09/05/14
Rule 1153	Commercial Bakery Ovens	01/13/95
Rule 1153.1	Emissions of Oxides of Nitrogen from Commercial Food Ovens	11/07/14
Rule 1155	Particle Matter (PM) Control Devices	05/02/14
Rule 1156	Further Reductions of Particulate Emissions from Cement Manufacturing Facilities	11/06/15
Rule 1157	PM10 Emission Reductions from Aggregate and Related Operations	09/08/06
Rule 1158	Storage, Handling, and Transport of Coke, Coal, and Sulfur	07/11/08
Rule 1159	Nitric Acid Units – Oxides of Nitrogen	12/06/85
Rule 1162	Polyester Resin Operations	07/08/05
Rule 1163	Control of Vinyl Chloride Emissions	06/07/85
Rule 1164	Semiconductor Manufacturing	01/13/95
Rule 1166	Volatile Organic Compound Emissions from Decontamination of Soil	05/11/01
Rule 1168	Adhesive and Sealant Applications	10/06/17
Rule 1170	Methanol Compatible Fuel Storage and Transfer	05/06/88
Rule 1171	Solvent Cleaning Operations	05/01/09
Rule 1173	Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants	02/06/09
Rule 1174	Control of Volatile Organic Compound Emissions from the Ignition of Barbecue Charcoal	10/05/90
Rule 1175	Control of Emissions from the Manufacture of Polymeric Cellular (Foam) Products	11/05/10
Rule 1176	VOC Emissions from Wastewater Systems	09/13/96
Rule 1177	Liquefied Petroleum Gas Transfer and Dispensing	06/01/12
Rule 1178	Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities	04/06/18
Rule 1179	Publicly Owned Treatment Works Operations	03/06/92
Rule 1180	Refinery Fenceline and Community Air Monitoring	12/01/17
Rule 1183	Outer Continental Shelf (OCS) Air Regulations	03/12/93
Rule 1186	PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations	07/11/08
Rule 1186.1	Less-Polluting Sweepers	01/09/09
Rule 1189	Emission from Hydrogen Plant Process Vents	01/21/00
Rule 1191	Clean On-Road and Light- and Medium-Duty Public Fleet Vehicles	06/16/00
Rule 1192	Clean On-Road Transit Buses	06/16/00
Rule 1193	Clean On-Road Residential and Commercial Refuse Collection Vehicles	07/09/10
Rule 1194	Commercial Airport Ground Access	10/20/00
Rule 1195	Clean On-Road School Buses	05/05/06
Rule 1196	Clean On-Road Heavy-Duty Public Fleet Vehicles	06/06/08

TABLE II-3

South Coast AQMD Regulation XX (REgional CLean Air Incentives Market (RECLAIM)) Rules

Rule Number	Rule Title	Adoption or Amendment Date
Rule 2000	General	05/06/05
Rule 2001	Applicability	07/12/19
Rule 2002	Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx)	10/05/18
Rule 2004	Requirements	04/06/07
Rule 2005	New Source Review for RECLAIM	12/04/15
Rule 2006	Permits	05/11/01
Rule 2007	Trading Requirements	04/06/07
Rule 2008	Mobile Source Credits	10/05/93
Rule 2009	Compliance Plan for Power Producing Facilities	01/07/05
Rule 2009.1	Compliance Plan for Forecast Reports for Non Power Producing Facilities	05/11/01
Rule 2010	Administrative Remedies and Sanctions	04/06/07
Rule 2011	Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SOx) Emissions	05/06/05
Rule 2012	Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NOx) Emissions	05/06/05
Rule 2015	Backstop Provisions	06/04/04
Rule 2020	RECLAIM Reserve	05/11/01

Appendix III

CARB Existing Regulations

Appendix III

CARB Existing Regulations

Board Action	Hearing Date
Omnibus Low-NOx Regulation: The Omnibus Regulation establishes new exhaust emission standards, test procedures, and other emission-related requirements for 2024 and subsequent model year California-certified on-road heavy-duty engines.	8/27/20
Control Measure for Ocean-Going Vessels At Berth: The Regulation would take effect in 2021 and is designed to achieve further emissions from vessels at berth to reduce adverse health impacts to communities surrounding ports and terminals throughout California. These benefits would be achieved by including new vessel categories (such as vehicle carriers and tanker vessels), new ports, and independent marine terminals.	8/27/20
Procedures for the Exemption of Add-On and Modified Part(s) for On-Road Vehicles/Engines: The updated aftermarket part procedures incorporate language reflecting current vehicle and engine emissions related technologies and standards. It also clarifies the requirements to improve review, testing, and approval timing to get products to market sooner.	7/23/20
Advanced Clean Trucks Regulation: The requirements for truck manufacturers sell zero-emission trucks in California and a one time requirement for large entities to report about their facilities, types of truck services used, and fleet of vehicles.	6/25/20
Updates to the 2019 Architectural Coatings Suggested Control Measure: The amended 2019 Architectural Coatings Suggested Control Measure to add a new coating category for Photovoltaic Coatings and establish a limit on the volatile organic content of the coatings.	5/28/20
Amendments to the Regulation on the Commercialization of Alternative Diesel Fuels: The amendments to the ADF Regulation to reinforce the emissions certification testing requirements and require biodiesel additives and ADF formulations to be certified according to new certification procedures. The amendments reinforce the originally intended efficacy of additives or alternative diesel formulations certified to mitigate potential oxides of nitrogen (NOx) emissions increases from the use of biodiesel.	4/23/20
San Joaquin Valley Agricultural Equipment Incentive Measure: The San Joaquin Valley Agricultural Equipment Incentive Measure for submission to the United States Environmental Protection Agency as a revision to the California State Implementation Plan (SIP). The measure achieves SIP creditable emission reductions from agricultural equipment incentive projects.	12/13/19
Amendments to the Regulation for Limiting Ozone Emissions from Indoor Air Cleaning Devices: The amendments to the air cleaner regulation, which limits ozone emissions from air cleaning devices.	12/12/19
Amendments to the Low Carbon Fuel Standard: The amendments to the Low Carbon Fuel Standard (LCFS) Regulation, focusing on strengthening the program's cost containment provisions and ensuring that LCFS residential charging credit revenue value benefits disadvantaged and low-income communities.	11/21/19
Zero-Emission Airport Shuttle Regulation: The regulation will transition combustion powered airport shuttles to zero-emission vehicles and will apply to private and public fixed destination shuttles that serve California's commercial airports.	6/27/19
Updates to the Architectural Coatings Suggested Control Measure: The updates to the SCM would reduce volatile organic compound (VOC) limits for several coating categories, create two new coatings categories, and set limits for colorants (tints) added to architectural coatings at the point of sale. The updated SCM would serve as a model rule and assist air districts in their efforts to further reduce VOC emissions to meet ambient air quality standards for ozone.	5/23/19
Amendments to the Regulation for the Certification of Vapor Recovery Systems for Cargo Tanks: The amendments to the Certification of Vapor Recovery Systems on Cargo Tanks Regulation that establish a regulatory mechanism to periodically evaluate program costs and subsequently adjust the certification fee to recover these costs, per the authority under the Health and Safety Code section 41962. In addition, the amendments will establish: (1) a requirement for a public meeting prior to adjusting fees, (2) an effective date of January 1 following a fee revision, (3) the cost of replacement decals, and (4) procedures to request a certification fee refund.	4/25/19
Amendments to the Red Sticker Program for Off-Highway Recreational Vehicles: The amendments to the Red Sticker Program for Off-Highway Recreation Vehicles (OHRV). OHRV are primarily used in public State parks and federally designated lands, as well as on private tracks. The goal of the amendments is to end the current red sticker program which allows for CARB certification of OHRV that do not meet emissions standards. The amendments include provisions that end the certification of new red sticker vehicles, end riding restrictions on public lands for existing red sticker vehicles, establish new OHRV emissions standards, and increase incentives for fleet emissions averaging and zero emission OHRV. The amendments are intended to cause emissions reductions from OHRV in California while ensuring availability for California dealers and riders.	4/25/19

Board Action	Hearing Date
Amendments to the On-Road Heavy-Duty Diesel-Fueled Residential and Commercial Solid Waste Collection Vehicles Regulation to Include Heavy Cranes: The amendments include two distinct changes to the regulation, (1) to ensure that compliant SWCVs do not experience registration delays at the California Department of Motor Vehicles due to recent changes in California law; (2) to provide a more cost-effective compliance option for specialized heavy cranes.	1/24/19
Innovative Clean Transit Regulation, a Replacement of the Fleet Rule for Transit Agencies: The Innovative Clean Transit (ICT) Regulation that requires California transit agencies to gradually transition their buses to zero-emission technologies. The ICT regulation is structured to allow transit agencies to take advantage of incentive programs by acting early and in a manner to implement plans that are best suited for their own situations.	12/14/18
California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation: The Cap-and-Trade Regulation amendments are intended to conform with the requirements in AB 398, respond to Board direction in Resolution 17-21, and enhance program implementation and oversight. The amendments include changes to provisions relating to free allocation for minimizing leakage and transition assistance, offsets usage limits and criteria related to direct environmental benefits in the State, and cost containment.	12/13/18
Amendments to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions: The Mandatory Reporting of Greenhouse Gas Emissions amendments are targeted revisions to clarify the existing regulation related to how entities report their greenhouse gas emissions to support the Cap-and-Trade Program, and to ensure the data that are collected for CARB's climate change programs are complete and accurate.	12/13/18
Revisions to On Board Diagnostic System Requirements, Including the Introduction of Real Emissions Assessment Logging, for Heavy Duty Engines, Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engine: The amendments to the heavy-duty (HD) On Board Diagnostic (OBD) and medium-duty OBD II requirements update the monitoring requirements for gasoline and diesel vehicles, to require more data parameters to be tracked and reported by the engine/vehicle, and to clarify and improve the regulation where necessary.	11/15/18
California Certification Procedures for Light-Duty Engine Packages for Use in New Light-Duty Specially-Produced Motor Vehicles for 2019 and Subsequent Model Years: The California Regulation and Certification Procedures for Light-Duty Engine Packages for Use In New Light-Duty Specially-Produced Motor Vehicles for 2019 And Subsequent Model Years.	10/25/18
Amendments to California Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks: The amendments to Vehicle Fill Pipe Specifications to help ensure new motor vehicle fill pipes are compatible and form a good seal with Phase II recovery nozzles that are certified for use at California gasoline stations as a means to reduce overpressure.	10/25/18
Amendments to Enhanced Vapor Recovery Regulations to Standardize Gas Station Nozzle Spout Dimensions to Help Address Storage Tank Overpressure: The amendments to Enhanced Vapor Recovery Regulations to standardize gas station nozzle spout dimensions to improve compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce storage tank overpressure conditions.	10/25/18
Amendments to the Low-Emission Vehicle III Greenhouse Gas Emission Regulation: The amendments to the Low-Emission Vehicle III greenhouse gas emission regulation to clarify that the "deemed to comply" option for model years 2021 through 2025 is applicable only if the currently adopted federal regulations remain in effect.	9/27/18
Amendments to the Low Carbon Fuel Standard Regulation and to the Regulation on Commercialization of Alternative Diesel Fuels: The amendments designed to strengthen the Low Carbon Fuel Standard (LCFS) regulation through 2030 in line with the Senate Bill 32 greenhouse gas reduction goals. The amendments would enhance LCFS credit for zero-emission vehicle fueling infrastructure per Governor Brown's Executive Order B-48-18, a protocol to enable credit generation for carbon capture and sequestration projects, expand fuel types and vehicle applications to which the LCFS regulation applies (including adding alternative jet fuel), improve crediting for innovative actions at petroleum refineries, and establish an independent third-party verification and verifier accreditation system to ensure accuracy of LCFS reported data. The amendments also include a number of technical changes to improve, simplify, streamline, and clarify the regulation	9/27/18
Amendments to California Emission Control System Warranty Regulations and Maintenance Provisions for 2022 and Subsequent Model Year On-Road Heavy-Duty Diesel Vehicles with Gross Vehicle Weight Rating Greater Than 14,000 Pounds and Heavy-Duty Diesel Engines in Such Vehicles: The amendments to the California warranty and maintenance provisions for on-road heavy-duty (HD) diesel vehicles, and the engines used in such vehicles. Currently, because the warranty mileage period is disproportionate to the actual service lives of many modern HD vehicles and engines, vehicle owners have no incentive to pay for repairs of emissions-related problems that do not adversely affect fuel economy or performance, which results in additional emissions. The amendments lengthen both the existing warranty periods and minimum maintenance intervals so as to reduce emissions by incentivizing vehicle owners to perform required maintenance and to seek more timely repairs, and to encourage manufacturers to design and produce more durable parts.	6/28/18

Board Action	Hearing Date
Amendments to the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program: The amendments lower the allowable opacity limit for HD vehicles operating in California for both the HDVIP and PSIP, establish reporting requirements for the PSIP and smoke tester training requirements, and allow 2013 model year and newer engines to report on-board diagnostic data in lieu of performing the annual PSIP smoke test.	5/25/18
Amendments to the Consumer Products Regulation and Method 310: The amendments to the consumer products regulation established an alternate compliance option for multi-purpose lubricant (MPL) products.	5/25/18
Regulation for Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration and Foam End-Uses: The regulation provides prohibitions on the use of certain high-global warming potential hydrofluorocarbons (HFC) in stationary refrigeration and foam end-uses. The objective is to preserve HFC emissions reductions expected from the federal Significant New Alternatives Policy (SNAP) Rules for certain end-uses for which compliance dates have either already passed or are imminent.	3/23/18
Funding Agricultural Replacement Measures for Emission Reductions Program Guidelines: The Guidelines outline the California Air Resources Board's plans for expending these funds in a manner consistent with the legislative direction from two bills, existing statutes, and regulations. The Guidelines describe district funding allocations, eligible project categories and criteria, program implementation details, and the justification for these investments.	3/23/18
California Greenhouse Gas Emissions Standards for Medium- and Heavy-Duty Engines and Vehicles, and Proposed Amendments to the Tractor-Trailer Greenhouse Gas Regulation: The new, more stringent California Phase 2 GHG emission standards are largely harmonize with the federal Phase 2 standards, and proposed amendments to the Tractor-Trailer GHG regulation to harmonize California's Tractor-Trailer GHG regulation with the proposed Phase 2 trailer standards. The California Phase 2 GHG standards are needed to meet the mandates of both AB 32 and of SB 32, and the California HSC.	2/8/18
Amendments to the Airborne Toxic Control Measure For Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater – and to the Statewide Portable Equipment Registration Program Regulation: The amendments provide more time for cleaner engine replacement while preserving the expected emission reductions, and make other improvements to the ATCM. PERP will have corresponding amendments and make other improvements to the program.	11/16/17
Amendments to California's Evaluation Procedures for New Aftermarket Catalytic Converters: The amendments are for procedures used to evaluate and approve aftermarket catalytic converters designed for use on California passenger cars and trucks to allow them to be used for Low Emission Vehicle III emission standards.	9/28/17
Amendments to the Market-Based Compliance Mechanism Regulation (Cap-and-Trade Regulation): The amendments to the Cap-and-Trade Program extend major provisions of the Program beyond 2020, to broaden the Program through linkage with Ontario, Canada, to prevent emissions leakage in the most cost-effective manner through appropriate allocation to entities, to clarify compliance obligations for certain sectors, and to enhance ARB's ability to implement and oversee the Cap-and-Trade Program.	7/27/17
Amendments to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions: The amendments to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions are to ensure the reported GHG data are accurate and fully support the California Cap-and-Trade Regulation.	6/29/17
Revisions to the Carl Moyer Memorial Air Quality Standards Attainment Program Guidelines: The updated Carl Moyer Memorial Air Quality Standards Attainment Program 2017 Guidelines implement changes directed by Senate Bill 513 and redesign the Program to meet California's need to transition to the very low and zero-emission technologies of the future.	4/27/17
Amendments to the Evaporative Emission Requirements for Small Off-Road Engines: The amendments address to non-compliance of small off-road engines (SORE) with existing evaporative emission standards, as well as amendments to streamline the certification process by harmonizing where feasible with federal requirements.	11/17/16
Regulation to Provide Certification Flexibility for Innovative Heavy-Duty Engine and California Certification and Installation Procedures for Medium and Heavy-Duty Vehicle Hybrid Conversion Systems: This regulation's certification flexibility is tailored to encourage development and market launch of heavy-duty engines meeting California's optional low oxides of oxides of nitrogen emission standards, robust heavy-duty hybrid engines, and high-efficiency heavy-duty engines.	10/20/16
Amendments to the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulations: The amendments would extend major provisions of the Regulation beyond 2020; link the Regulation with Ontario, Canada; continue cost-effective prevention of emission leakage through allowance allocations to entities; and enhance Program implementation and oversight.	9/22/16
Amendments to the Mandatory Reporting of Greenhouse Gas Emissions: The amendments are to ensure reported GHG data are accurate and fully support the California Cap on Greenhouse Gas Emissions and Market Based Compliance Mechanisms and comply with the U.S. EPA Clean Power Plan.	9/22/16

Board Action	Hearing Date
Amendments to the Large Spark-Ignition Engine Fleet Requirements Regulation: The amendment establish new reporting and labeling requirements and extend existing recordkeeping requirements. The regulatory amendments are expected to improve the reliability of the emission reductions projected for the existing LSI Fleet Regulation by increasing enforcement effectiveness and compliance rates.	7/21/16
Evaluation Procedure for New Aftermarket Diesel Particulate Filters Intended as Modified Parts for 2007 through 2009 Model Year On-Road Heavy-Duty Diesel Engines: The amendment would establish a path for exempting aftermarket modified part DPFs intended for 2007 through 2009 on-road heavy-duty diesel engines from the prohibitions of the current vehicle code. Also, incorporate a new procedure for the evaluation of such DPFs.	4/22/16
Amendments to the Regulation for Small Containers of Automotive Refrigerant: The amendments to the Regulation for Small Containers of Automotive Refrigerant clarify any existing requirement that retailers must transfer the unclaimed consumer deposits to the manufacturers, clarify how the manufacturers spend the money, set the refundable consumer deposit at $10, and require additional language on the container label.	4/22/16
Amendments to the Portable Fuel Container Regulation: Amendments to the Portable Fuel Container (PFC) regulation, which include requiring certification fuel to contain 10 percent ethanol, harmonizing aspects of the Board's PFC certification and test procedures with those of the U.S. EPA, revising the ARB's certification process, and streamlining, clarifying, and increasing the robustness of ARB's certification and test procedures.	2/18/16
Technical Status and Proposed Revisions to On-Board Diagnostic System Requirements and Associated Enforcement Provisions for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines (OBD II): Amendments to the OBD II regulations that update requirements to account for LEV III applications and monitoring requirements for gasoline and diesel vehicles, and clarify and improve the regulation; also, updates to the associated OBD II enforcement regulation to align it with the proposed amendments to the OBD II regulations and a minor amendment to the definition of "emissions-related part" in title 13, CCR section 1900.	9/25/15
2015 Low Carbon Fuel Standard (LCFS) Amendments (2 of 2): The Low Carbon Fuel Standard, which includes updates and revisions to the regulation now in effect. The regulation was first presented to the Board at its February 2015 public hearing, at which the Board directed staff to make modifications to the proposal.	9/24/15
Regulation on the Commercialization of Alternative Diesel Fuels (2 of 2): Regulation governing the introduction of alternative diesel fuels into the California commercial market, including special provisions for biodiesel.	9/24/15
CA Cap on GHG Emissions and Market-Based Compliance Mechanisms (2 of 2): Amendments to the Cap and Trade Regulation to include a new Rice Cultivation Compliance Offset Protocol and an update to the United States Forest Compliance Offset Protocol that would include project eligibility in parts of Alaska.	6/25/15
Intermediate Volume Manufacturer Amendments to the Zero Emission Vehicle Regulation (2 of 2): Amendments regarding intermediate volume manufacturer compliance obligations under the Zero Emission Vehicle regulation.	5/21/15
2015 Amendments to Certification Procedures for Vapor Recovery Systems at Gasoline Dispensing Facilities—Aboveground Storage Tanks and Enhanced Conventional Nozzles: Amendments would establish new performance standards and specifications for nozzles used at fleet facilities that exclusively refuel vehicles equipped with onboard vapor recovery systems, would provide regulatory relief for owners of certain existing aboveground storage tanks, and would ensure that mass-produced vapor recovery equipment matches the specifications of equipment evaluated during the ARB certification process.	4/23/15
Proposed Regulation for the Commercialization of Alternative Diesel Fuels (1 of 2): Regulation governing the introduction of alternative diesel fuels into the California commercial market, including special provisions for biodiesel. This is the first of two hearings on the item, and the Board will not take action to approve the proposed regulation.	2/19/15
Evaporative Emission Control Requirements for Spark-Ignition Marine Watercraft: Regulation for controlling evaporative emissions from spark-ignition marine watercraft. The proposed regulation will harmonize, to the extent feasible, with similar federal requirements, while adding specific provisions needed to support California's air quality needs.	2/19/15
2015 Low Carbon Fuel Standard (LCFS) Amendments (1 of 2): The amendments for the Low Carbon Fuel Standard includes a re-adoption of the existing Low Carbon Fuel Standard with updates and revisions. This is the first of two hearings on the item, and the Board will not take action to approve the proposed regulation.	2/19/15
CA Cap on GHG Emissions and Market-Based Compliance Mechanisms to Add the Rice Cultivation Projects and Updated U.S. Forest Projects Protocols (1 of 2): Updates to the Cap and Trade Regulation to include a new Rice Cultivation Compliance Offset Protocol and an update to the United States Forest Compliance Offset Protocol that would include project eligibility in parts of Alaska.	12/18/14
2014 Amendments to ZEV Regulation: Additional compliance flexibility to ZEV manufacturers working to bring advanced technologies to market.	10/23/14

Board Action	Hearing Date
LEV III Criteria Pollutant Requirements for Light- and Medium-Duty Vehicles the Hybrid Electric Vehicle Test Procedures, and the HD Otto-Cycle and HD Diesel Test Procedures: Applies to the 2017 and subsequent model years.	10/23/14
Amendments to Mandatory Reporting Regulation for Greenhouse Gases: Further align reporting methods with USEPA methods and factors, and modify reporting requirements to fully support implementation of California's Cap and Trade program.	9/19/14
Amendments to the California Cap on Greenhouse Gas Emissions and Market Based Compliance Mechanisms: Technical revisions to Mandatory Reporting of Greenhouse Gas Emissions Regulation to further align reporting methods with U.S.EPA update methods and factors, and modify reporting requirements to fully support implementation of California's Cap and Trade program.	9/18/14
Amendments to the AB 32 Cost of Implementation Fee Regulation: Amendments to the regulation to make it consistent with the revised mandatory reporting regulation, to add potential reporting requirements, and to incorporate requirements within the mandatory reporting regulation to streamline reporting.	9/18/14
Revisions to the Carl Moyer Memorial Air Quality Standards Attainment Program Guidelines for On-Road Heavy-Duty Trucks: Revisions to 1) reduce surplus emission reduction period, 2) reduce minimum CA usage requirement, 3) prioritize on-road funding to small fleets, 4) include light HD vehicles 14000-19500 libs, and 5) clarify program specifications.	7/24/14
Amendments to Enhanced Fleet Modernization (Car Scrap) Program: Amendments consistent with SB 459 which requires ARB to increase benefits for low-income California residents, promote cleaner replacement vehicles, and enhance emissions reductions.	6/26/14
Proposed Approval of Amendments to CA Cap on GHG Emissions and Market-Based Compliance Mechanisms : Second hearing of two, continued from October 2013.	4/24/14
Truck and Bus Rule Update: Amendments to the Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen, and Other Criteria Pollutants From In-Use On-Road Diesel-Fueled Vehicles: increasing low-use vehicle thresholds, allowing owners to newly opt-in to existing flexibility provisions, adjusting "NOx exempt" vehicle provisions, and granting additional time for fleets in certain areas to meet PM filter requirements.	4/24/14
Heavy-Duty GHG Phase I: On-Road Heavy-Duty GHG Emissions Rule, Tractor-Trailer Rule, Commercial Motor Vehicle Idling Rule, Optional Reduced Emission Standards, Heavy-Duty Hybrid-Electric Vehicles Certification Procedure: New GHG standards for MD and HD engines and vehicles identical to those adopted by the USEPA in 2011 for MYs 2014-18.	12/12/13
Agricultural equipment SIP credit rule: Incentive-funded projects must be implemented using Carl Moyer Program Guidelines; must be surplus, quantifiable, enforceable, and permanent, and result in emission reductions that are eligible for SIP credit.	10/25/13
Mandatory Report of Greenhouse Gas Emissions: Approved a regulation that establishes detailed specifications for emissions calculations, reporting, and verification of GHG emission estimates from significant sources.	10/25/13
CA Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms: Technical revisions to the Mandatory Reporting of Greenhouse Gas Emissions Regulation to further align reporting methods with U.S.EPA, update factors, and modify definitions to maintain consistency with the Cap and Trade program.	10/25/13
Zero emission vehicle test procedures: Existing certification test procedures for plug-in hybrid vehicles need to be updated to reflect technology developments. The ZEV regulation will require minor modifications to address clarity and implementation issues.	10/24/13
Consumer Products: Antiperspirants, Deodorants, Test Method 310, Aerosol Coatings, Proposed Repeal of Hairspray Credit): Amendments to require various consumer products to reformulate to reduce VOC or reactivity content to meet specified limits, and to clarify various regulatory provisions, improve enforcement, and add analytical procedures.	9/26/13
Alternative fuel certification procedures: Amendments to current alternative fuel conversion certification procedures for motor vehicles and engines that will allow small volume conversion manufacturers to reduce the upfront demonstration requirements and allow systems to be sold sooner with lower certification costs than with the current process, beginning with MY 2018.	9/26/13
Vapor Recovery for Gasoline Dispensing Facilities: Amendments to certification and test procedures for vapor recovery equipment used on cargo tanks and at gasoline dispensing facilities.	7/25/13
Off-highway recreational vehicle evaporative emission control: Set evaporative emission standards to control hydrocarbon emissions from Off-Highway Recreational Vehicles. The running loss, hot soak, and diurnal performance standards can be met by using proven automobile type control technology.	7/25/13
Gasoline and diesel fuel test standards: The amendments add test standards for the measurement of prohibited oxygenates at trace levels specified in existing regulations.	1/25/13
LEV III and ZEV Programs for Federal Compliance Option: The amendments deem compliance with national GHG new vehicle standards in 2017-2025 as compliance with California GHG standards for the same model years.	11/15/12 12/6/12 EO

Board Action	Hearing Date
Consumer products (automotive windshield washing fluid): The amendments add portions of 14 California counties to the list of areas with freezing temperatures where 25% VOC content windshield washing fluid could be sold.	10/18/2012 EO 03/15/13
GHG mandatory reporting, Fee Regulation, and Cap and Trade 2012: The amendments eliminate emission verification for facilities emitting less than 25,000 MTCO2e and make minor changes in definitions and requirements.	9/20/12 11/2/12 EO
Amendments to Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines: Approved amendments to the verification procedure used to evaluate diesel retrofits through emissions, durability, and field testing. Amendments will lower costs associated with required in-use compliance testing, streamline the in-use compliance process, and will extend time allowed to complete verifications.	8/23/2012 EO 07/02/13
Amendments to On-Board Diagnostics (OBD I and II) Regulations: Approved amendments to the light- and medium-duty vehicle and heavy-duty engine OBD regulations.	8/23/2012 EO 06/26/13
Cap and Trade: Amendments to CA Cap on GHG Emissions and Market-Based Compliance Mechanisms, and Amendments Allowing Use of Compliance Instruments Issued by Linked Jurisdictions: Amends Cap-and-Trade and compliance mechanisms to add security to the market system and to aid in implementation. Amendments include first auction rules, offset registry, market monitoring provisions, and information gathering necessary for the financial services operator.	6/28/12 7/31/12 EO
Vapor recovery defect list: The amendments add defects and verification procedures for equipment approved since 2004, and make minor changes to provide clarity	6/11/12 EO
Tractor-Trailer GHG Regulation: Emergency Amendment: The emergency amendment to correct a drafting error and delay the registration date for participation in the phased compliance option	2/29/2012 2/29/12 EO
Advanced Clean Cars (ACC) Regulation: Low-Emission Vehicles and GHG: The more stringent criteria emission standards for MY 2015-2025 light and medium duty vehicles (LEV III), amended GHG emission standards for model year 2017-2025 light and medium duty vehicles (LEV GHG), amended ZEV Regulation to ensure the successful market penetration of ZEVs in commercial volumes, amended hydrogen fueling infrastructure mandate of the Clean Fuels Outlet regulation, and amended cert fuel for light duty vehicles from an MTBE-containing fuel to an E10 certification fuel.	1/26/12
Zero Emission Vehicle (ZEV): The amendments increase compliance flexibility, add two new vehicle categori credits, increase credits for 300 mile FCVs, increase requirements for ZEVs and TZEVs, eliminate credit for PZ expand applicability to smaller manufacturers, base ZEV credits on range, and make other minor changes in cr	1/26/12
Amendments to Low Carbon Fuel Standard Regulation: The amendments address several aspects of the regulation, including: reporting requirements, credit trading, regulated parties, opt-in and opt-out provisions, definitions, and other clarifying language.	12/16/11 10/10/12 EO
Amendments to Small Off-Road Engine and Tier 4 Off-Road Compression-Ignition Engine Regulations And Test Procedures; also "Recreational Marine" Spark-Ignition Marine Engine Amendments (Recreational Boats): Aligns California test procedures with U.S. EPA test procedures and requires off-road CI engine manufacturers to conduct in-use testing of their entire product lines to confirm compliance with previously established Not-To-Exceed emission thresholds.	12/16/2011 10/25/12 EO
Regulations and Certification Procedures for Engine Packages used in Light-Duty Specially Constructed Vehicles (Kit Cars): Ensures that certified engine packages, when placed into any Kit Car, would meet new vehicle emission standards, and be able to meet Smog Check requirements.	11/17/11 9/21/12 EO
Amendments to the California Reformulated Gasoline Regulations: Corrects drafting errors in the predictive model, deletes outdated regulatory provisions, updates the notification requirements, and changes the restrictions on blending CARBOB with other liquids.	10/21/11 8/24/12 EO
Amendments to the In-Use Diesel Transport Refrigeration Units (TRU) ATCM: Mechanisms to improve compliance rates and enforceability.	10/21/11 8/31/12 EO
Amendments to the AB 32 Cost of Implementation Fee Regulation: Clarifies requirements and regulatory language, revises definitions.	10/20/11 8/21/12 EO
Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Including Compliance Offset Protocols: Greenhouse Gas Emissions Cap-and-Trade Program, including compliance offset protocols and multiple pathways for compliance.	10/21/11 8/21/12 EO
Amendments to the Regulation for Cargo Handling Equipment (CHE) at Ports and Intermodal Rail Yards (Port Yard Trucks Regulation): Provides additional compliance flexibility, and maintains anticipated emissions reductions. As applicable to yard trucks and two-engine sweepers.	9/22/11 8/2/12 EO
Amendments to the Enhanced Vapor Recovery Regulation for Gasoline Dispensing Facilities: New requirement for low permeation hoses at gasoline dispensing facilities.	9/22/11 7/26/12 EO
Amendments to Cleaner Main Ship Engines and Fuel for Ocean-Going Vessels: Adjusts the offshore regulatory boundary. Aligns very low sulfur fuel implementation deadlines with new federal requirements.	6/23/11 9/13/12 EO
Particulate Matter Emissions Measurement Allowance For Heavy-Duty Diesel In-Use Compliance Regulation: Emission measurement allowances provide for variability associated with the field testing required in the regulation.	6/23/11

Board Action	Hearing Date
Low Carbon Fuel Standard Carbon Intensity Lookup Table Amendments: Adds new pathways for vegetation-based fuels	2/24/11
Amendments to Cleaner In-Use Heavy-Duty On-Road Diesel Trucks and LSI Fleets Regulations: Amends five regulations to provide relief to fleets adversely affected by the economy, and take into account the fact that emissions are lower than previously predicted.	12/16/10 9/19/11 EO
Tractor-Trailer GHG Regulation Amendment: Enacts administrative changes to increase compliance flexibility and reduce costs	12/16/10
Amendments to Cleaner In-Use Off-Road Diesel-Fueled Fleets Regulation: Amendments provide relief to fleets adversely affected by the economy, and take into account the fact that emissions are lower than previously predicted.	12/16/10 10/28/11 EO
In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities: Amendments add flexibility to fleets' compliance schedules, mitigate the use of noncompliant trucks outside port and rail properties, and provide transition to the Truck and Bus regulation.	12/16/10 9/19/11 EO
Amendments to the Regulation for Mandatory Reporting of Greenhouse Gas Emissions: Changes requirements to align with federal greenhouse gas reporting requirements adopted by US EPA.	12/16/10 10/28/11 EO
Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation: Establishes framework and requirements for Greenhouse Gas Emissions Cap-and-Trade Program, including compliance offset protocols.	12/16/10 10/26/11 EO
Amendments to the Consumer Products Regulation: The amendments set new or lower VOC limits for some categories, prohibit certain toxic air contaminants, high GWP compounds, and surfactants toxic to aquatic species. Also changes Method 310, used to determine aromatic content of certain products.	11/18/10 9/29/11 EO
Amendment of the ATCM for Diesel Transportation Refrigeration Units (TRU): Amendments expand the compliance options and clarify the operational life of various types of TRUs.	11/18/10 2/2/11 EO
Amendments to the ATCM for Stationary Compression Ignition Engines: The amendments closely align the emission limits for new emergency standby engines in the ATCM with the emission standards required by the federal Standards of Performance.	10/21/10 3/25/11 EO
Diesel Vehicle Periodic Smoke Inspection Program: The amendments exempt medium duty diesel vehicles from smoke inspection requirements if complying with Smog Check requirements.	10/21/10 8/23/11 EO
Renewable Electricity Standard Regulation: The regulation requires electricity providers to obtain at least 33% of their retail electricity sales from renewable energy resources by 2020.	9/23/10
Energy Efficiency at Industrial Facilities: The standards for the reporting of GHG emissions and the feasibility of emissions controls by the largest GHG-emitting stationary sources.	7/22/10 5/9/11 EO
Amendments to Commercial Harbor Craft Regulation: The amendments require the use of cleaner engines in diesel-fueled crew and supply, barge, and dredge vessels.	6/24/10 4/11/11 EO
Accelerated Introduction of Cleaner Line-Haul Locomotives: Agreement with railroads sets prescribed reductions in diesel risk and target years through 2020 at four major railyards.	6/24/10
Amendments to New Passenger Motor Vehicle Greenhouse Gas Emission Standards: The amendments deeming compliance with EPA's GHG standards as compliance with California's standards in 2012 through 2016 model years.	2/25/2010 03/29/10
Sulfur Hexafluoride (SF6) Regulation: The regulation reduces emissions of sulfur hexafluoride (SF6), a high-GWP GHG, from high-voltage gas-insulated electrical switchgear.	2/25/10 12/15/10 EO
Amendments to the Statewide Portable Equipment Registration Regulation and Portable Engine ATCM: The amendments extend the deadline for removal of certain uncertified portable engines for one year.	1/28/10 8/27/10 EO 12/8/10 EO
Diesel Engine Retrofit Control Verification, Warranty, and Compliance Regulation Amendments: The amendments require per-installation compatibility assessment, performance data collection, and reporting of additional information, and enhance enforceability.	1/28/10 12/6/10 EO
Stationary Equipment High-GWP Refrigerant Regulation: The regulation reduces emissions of high-GWP refrigerants from stationary non-residential equipment.	12/1/09 9/14/10 EO
Amendments to Limit Ozone Emissions from Indoor Air Cleaning Devices: The amendments delay the labeling compliance deadlines by one to two years and to make minor changes in testing protocols.	12/9/09
Emission Warranty Information Reporting Regulation Amendments: Repealed the 2007 regulation and readopted the 1988 regulation with amendments to implement adverse court decision.	11/19/09 9/27/10 EO
Amendments to Maximum Incremental Reactivity Tables: Added many new compounds and modified reactivity values for many existing compounds in the tables to reflect new research data.	11/3/09 7/23/10 EO
AB 32 Cost of Implementation Fee Regulation: AB 32 authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions regulated pursuant to AB 32. Also, a fee regulation to support the administrative costs of AB 32 implementation.	9/24/2009 05/06/10 EO
Passenger Motor Vehicle Greenhouse Gas Limits Amendments: The amendments grant credits to manufacturers for compliant vehicles sold in other states that have adopted California regulations.	9/24/09 2/22/10 EO
Consumer Products Amendments: The amendments set new VOC limits for multi-purpose solvent and paint thinner products and lower the existing VOC limit for double phase aerosol air fresheners.	9/24/09 8/6/10 EO

Board Action	Hearing Date
Amendments to In-Use Off-Road Diesel-Fueled Fleets Regulation: The amendments implement legislatively directed changes and provide additional incentives for early action.	7/23/09 12/2/09 EO 6/3/10 EO
Methane Emissions from Municipal Solid Waste Landfills: The regulation requires smaller and other uncontrolled landfills to install gas collection and control systems, and also requires existing and newly installed systems to operate optimally.	6/25/09 5/5/10 EO
Cool Car Standards: The regulation requires the use of solar management window glass in vehicles up to 10,000 lb GVWR.	6/25/09
Enhanced Fleet Modernization (Car Scrap): The guidelines for a program to scrap up to 15,000 light duty vehicles statewide.	6/25/09 7/30/10 EO
Amendments to Heavy-Duty On-Board Diagnostics Regulations: The amendments to the light and medium-duty vehicle and heavy duty engine OBD regulations.	5/28/2009 4/6/10 EO
Smog Check Improvements: The amendments implement changes in state law and SIP commitments adopted by ARB between 1996 and 2007.	5/7/09 by BAR 6/9/09 EO
AB 118 Air Quality Improvement Program Guidelines: The Air Quality Improvement Program provides for up to $50 million per year for seven years beginning in 2009-10 for vehicle and equipment projects that reduce criteria pollutants, air quality research, and advanced technology workforce training. The AQIP Guidelines describe minimum administrative, reporting, and oversight requirements for the program, and provide general criteria for how the program shall be implemented.	04/23/09 08/28/09 EO
Pesticide Element: Reduce volatile organic compound (VOC) emissions from the application of agricultural field fumigants in the South Coast, Southeast Desert, Ventura County, San Joaquin Valley, and Sacramento Metro federal ozone nonattainment areas.	4/20/09 10/12/09 EO (2) 8/2/11 EO
Low Carbon Fuel Standard: Approved new standards to lower the carbon content of fuels.	4/20/09 11/25/09 EO
Pesticide Element for San Joaquin Valley: DPR Director approved pesticide ROG emission limit of 18.1 tpd and committed to implement restrictions on non-fumigant pesticide use by 2014 in the San Joaquin Valley.	4/7/09 DPR
Tire Pressure Inflation Regulation: The regulation requires automotive service providers to perform tire pressure checks as part of every service.	3/26/09 2/4/10 EO
Sulfur Hexafluoride from Non-Utility and Non-Semiconductor Applications: The regulation phases out use of Sulfur Hexafluoride over the next several years.	2/26/09 11/12/09 EO
Semiconductor Operations: The regulation to set standards to reduce fluorinated gas emissions from the semiconductor and related devices industry.	2/26/09 10/23/09 EO
Plug-In Hybrid Electric Vehicles Test Procedure Amendments: Amendments to test procedures to address plug-in-hybrid electric vehicles.	1/23/09 12/2/09 EO
In-Use Off-Road Diesel-Fueled Fleets Amendments: Makes administrative changes to recognize delays in the supply of retrofit control devices.	1/22/09
Small Containers of Automotive Refrigerant: The regulation reduces leakage from small containers, a container deposit and return program, and require additional container labeling and consumer education requirements.	1/22/09 1/5/10 EO
Aftermarket Critical Emission Parts on Highway Motorcycles: Allows for the sale of certified critical emission parts by aftermarket manufacturers.	1/22/09 6/19/09 EO
Heavy-Duty Tractor-Trailer Greenhouse Gas (GHG) Reduction: The regulation reduces greenhouse gas emissions by improving long haul tractor and trailer efficiency through use of aerodynamic fairings and low rolling resistance tires.	12/11/08 10/23/09 EO
Cleaner In-Use Heavy-Duty Diesel Trucks (Truck and Bus Regulation): The regulation reduces diesel particulate matter and oxides of nitrogen through fleet modernization and exhaust retrofits. Makes enforceability changes to public fleet, off-road equipment, and portable equipment regulations.	12/11/08 10/19/09 EO 10/23/09 EO
Large Spark-Ignition Engine Amendments: The amendments reduce evaporative, permeation, and exhaust emissions from large spark-ignition (LSI) engines equal to or below 1 liter in displacement.	11/1/08 3/12/09 EO
Small Off-Road Engine (SORE) Amendments: The amendments address the excessive accumulation of emission credits.	11/21/08 2/24/10 EO
Proposed AB 118 Air Quality Guidelines for the Air Quality Improvement Program and the Alternative and Renewable Fuel and Vehicle and Technology Program: The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (AB 118) requires ARB to develop guidelines for both the Alternative and Renewable Fuel and Vehicle Technology Program and the Air Quality Improvement Program to ensure that both programs do not adversely impact air quality.	09/25/08 EO 05/20/09
Portable Outboard Marine Tanks and Components (part of Additional Evaporative Emission Standards): The regulation establishes permeation and emission standards for new portable outboard marine tanks and components.	9/25/08 7/20/09 EO

Board Action	Hearing Date
Cleaner Fuel in Ocean Going Vessels: The regulation requires use of low sulfur fuel in ocean-going ship main engines, and auxiliary engines and boilers.	7/24/08 4/16/09 EO
Spark-Ignition Marine Engine and Boat Amendments: Provides optional compliance path for > 500 hp sterndrive/inboard marine engines.	7/24/08 6/5/09 EO
Consumer Products Amendments: The amendments add volatile organic compound (VOC) limits for seven additional categories and lower limits for twelve previously regulated categories.	6/26/08 5/5/09 EO
Zero emission vehicles: Updated California's ZEV requirements to provide greater flexibility with respect to fuels, technologies, and simplifying compliance pathways. Amendments give manufacturers increased flexibility to comply with ZEV requirements by giving credit to plug-in hybrid electric vehicles and establishing additional ZEV categories in recognition of new developments in fuel cell vehicles and battery electric vehicles.	3/27/08 12/17/08 EO
Amendments to the Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines: Adds verification requirements for control technologies that only reduce NOx emissions, new reduction classifications for NOx reducing technologies, new testing requirements, and conditional extensions for verified technologies.	1/24/08 12/4/08 EO
Mandatory Report of Greenhouse Gas Emissions: The regulation establishes detailed specifications for emissions calculations, reporting, and verification of GHG emission estimates from significant sources.	12/6/07 10/12/08 EO
Gaseous Pollutant Measurement Allowances for In-Use Heavy-Duty Diesel Compliance: Measurement accuracy margins are to be determined through an ongoing comprehensive testing program performed by an independent contractor. Amendments include these measurement accuracy margins into the regulation.	12/6/07 10/14/08 EO
Ocean-Going Vessels While at Berth (aka Ship Hoteling) - Auxiliary Engine Cold Ironing and Clean Technology: The regulation reduces emissions from auxiliary engines on ocean-going ships while at-berth.	12/6/07 10/16/08 EO
In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities: The regulation establishes emission standards for in-use, heavy-duty diesel-fueled vehicles that transport cargo to and from California's ports and intermodal rail facilities.	12/6/07 10/12/08 EO
Commercial Harbor Craft: The regulation establishes in-use and new engine emission limits for both auxiliary and propulsion diesel engines on ferries, excursion vessels, tugboats, and towboats.	11/15/07 9/2/08 EO
Suggested Control Measure for Architectural Coatings Amendments: The amendments reduce the recommended VOC content of 19 categories of architectural coatings.	10/26/07
Aftermarket Catalytic Converter Requirements: The amendments establish more stringent emission performance and durability requirements for used and new aftermarket catalytic converters offered for sale in California.	10/25/07 2/21/08 NOD
Limiting Ozone Emissions from Indoor Air Cleaning Devices: The ozone emission limit of 0.050 ppm for portable indoor air cleaning devices in response to requirements of AB 2276 (2006).	9/27/07 8/7/08 EO
Pesticide Commitment for Ventura County in 1994 SIP: The substitution of excess ROG emission reductions from state motor vehicle program for 1994 SIP reduction commitment from pesticide application in Ventura County.	9/27/07 11/30/07 EO
In-Use Off-Road Diesel Equipment: The regulation requires off-road diesel fleet owners to modernize their fleets and install exhaust retrofits.	7/26/07 4/4/08 EO
Emission Control and Environmental Performance Label Regulations: The amendments add a Global Index Label and modify the formal of the Smog Index Label on new cars.	6/21/07 5/2/08 EO
Vapor Recovery from Aboveground Storage Tanks: The regulation establish new performance standards and specifications for the vapor recovery systems and components used with aboveground storage tanks.	6/21/07 5/2/08 EO
CaRFG Phase 3 amendments: The amendments mitigate the increases in evaporative emissions from on-road motor vehicles resulting from the addition of ethanol to gasoline.	6/14/07 4/25/08 EO 8/7/08 EO
Formaldehyde from Composite Wood Products: The ATCM limit formaldehyde emissions from hardwood plywood, particleboard, and medium density fiberboard to the maximum amount feasible.	4/26/07 3/5/08 EO
Portable equipment registration program (PERP) and airborne toxic control measure for diesel-fueled portable engines: The amendment allow permitting of Tier 0 portable equipment engines used in emergency or low use duty and to extend permitting of certain Tier 1 and 2 "resident" engines to 1/1/10.	3/22/07 7/31/07 EO
Perchloroethylene Control Measure Amendments: The amendments to the Perchloroethylene ATCM to prohibit new Perc dry cleaning machines beginning 2008 and phase out all Perc machines by 2023.	1/25/07 11/7/07 EO
Amendments to Emission Warranty Information Reporting & Recall Regulations: The amendments tighten the provisions for recalling vehicles for emissions-related failures, helping ensure that corrective action is taken to vehicles with defective emission control devices or systems.	12/7/06 3/22/07 10/17/07 EO
Voluntary accelerated vehicle retirement regulations: The amendments authorize the use of remote sensing to identify light-duty high emitters and that establish protocols for quantifying emissions reductions from high emitters proposed for retirement.	12/7/06
Emergency regulation for portable equipment registration program (PERP), airborne toxic control measures for portable and stationary diesel-fueled engines	12/7/06

Board Action	Hearing Date
Amendments to the Hexavalent Chromium ATCM: The amendments require use of best available control technology on all chrome plating and anodizing facilities.	12/7/06
Consumer Products Regulation Amendments: The amendments set lower emission limits in 15 product categories.	11/17/06 9/25/07 EO
Requirements for Stationary Diesel In-Use Agricultural Engines: The amendments to the stationary diesel engine ATCM which set emissions standards for in-use diesel agricultural engines.	11/16/06 7/3/07 NOD
Ships - Onboard Incineration: The amendments to cruise ship incineration ATCM to include all oceangoing ships of 300 gross registered tons or more.	11/16/06 9/11/07 EO
Zero Emission Bus: The amendments postpone the 15 percent purchase requirement three years for transit agencies in the diesel path and one to two years for transit agencies in the alternative fuel path, in order to keep pace with developments in zero emission bus technology, and adding an Advanced Demonstration requirement to offset emission losses.	10/19/06 8/27/07 EO
Distributed generation certification: The amendments improve the emissions durability and testing requirements, adding waste gas emission standards, and eliminating a redundant PM standard in the current 2007 emission standards.	10/19/06 5/17/07 NOD
Heavy-Duty Diesel In-Use Compliance Regulation: The amendments to the heavy-duty diesel engine regulations and test procedures create a new in-use compliance program conducted by engine manufacturers. The amendments would help ensure compliance with applicable certification standards throughout an engine's useful life.	9/28/06 7/19/07 NOD
Revisions to OBD II and the Emission Warranty Regulations: The amendments to the OBD II regulation provide for improved emission control monitoring including air-fuel cylinder imbalance monitoring, oxygen sensor monitoring, catalyst monitoring, permanent fault codes for gasoline vehicles and new thresholds for diesel vehicles.	9/28/06 8/9/07 EO
Off-Highway Recreational Vehicle Amendments: The amendments to the Off-Highway Recreational Vehicle Regulations including harmonizing evaporative emission standards with federal regulations, expanding the definition of ATVs, modifying labeling requirements, and adjusting riding seasons.	7/20/06 6/1/07 EO
Portable Equipment Registration Program (PERP) Amendments: The amendments to the Statewide Portable Equipment Registration program include installation of hour meters on equipment, and revisions to recordkeeping, reporting, and fees.	6/22/06 11/13/06 NOD
Heavy Duty Vehicle Service Information: The amendments to the Service Information Rule require manufacturers to make available diagnostic equipment and information for sale to the aftermarket.	6/22/06 5/3/07 EO
LEV II technical amendments: The amendments to evaporative emission test procedures, four-wheel drive dynamometer provisions, and vehicle label requirements.	6/22/06 9/27/06 NOD
Dry Cleaning ATCM Amendments: The amendments to the Dry Cleaning ATCM limit siting of new dry cleaners, phase out use of Perc at co-residential facilities, phase out higher emitting Perc sources at other facilities, and require enhanced ventilation at existing and new Perc facilities.	5/25/06
Forklifts and other Large Spark Ignition (LSI) Equipment: The regulation reduces emissions from forklifts and other off-road spark-ignition equipment by establishing more stringent standards for new equipment, and requiring retrofits or engine replacement on existing equipment. Aligns EPA's standards for 2007 and more stringent standards for 2010.	5/25/06 3/2/07 EO
Enhanced Vapor Recovery Amendments: The amendments to the vapor recovery system regulation and revised test procedures.	5/25/06
Diesel Retrofit Technology Verification Procedure: The amendments to the Diesel Emission In-use Control Strategy Verification Procedure to substitute a 30% increase limit in NOx concentration for an 80% reduction requirement from PM retrofit devices.	3/23/06 12/21/06 NOD
Heavy duty vehicle smoke inspection program amendments: The amendments impose a fine on trucks not displaying a current compliance certification sticker.	1/26/06 12/4/06 EO
Ocean-going Ship Auxiliary Engine Fuel: The regulation requires ships to use cleaner marine gas oil or diesel to power auxiliary engines within 24 nautical miles of the California coast.	12/8/05 10/20/06 EO
Diesel Cargo Handling Equipment: The regulation requires new and in-use cargo handling equipment at ports and intermodal rail yards to reduce emissions by utilizing best available control technology.	12/8/05 6/2/06 EO
Public and Utility Diesel Truck Fleets: The regulation reduces diesel particulate matter emissions from heavy duty diesel trucks in government and private utility fleets.	12/8/05 10/4/06 EO
Cruise ships – Onboard Incineration: The Air Toxic Control Measure prohibits cruise ships from conducting onboard incineration within three nautical miles of the California coast.	11/17/05 2/1/06 NOD
Inboard Marine Engine Rule Amendments: The amendments to the 2001 regulation include additional compliance options for manufacturers.	11/17/05 9/26/06 EO
Heavy-Duty Diesel Truck Idling Technology: The regulation limits sleeper truck idling to 5 minutes. Allows alternate technologies to provide cab heating/cooling and power.	10/20/05 9/1/06 EO
Automotive Coating Suggested Control Measure: The SCM for automotive coatings for adoption by air districts. The measure will reduce the VOC content of 11 categories of surface protective coatings.	10/20/05

Board Action	Hearing Date
2007-09 Model-year heavy duty urban bus engines and the fleet rule for transit agencies: The amendments to align urban bus emission limits with on-road heavy duty truck emission limits and allow for the purchase of non- complying buses under the condition that bus turnover increase to offset NOx increases.	10/20/05 10/27/05 7/28/06 EO
Portable fuel containers (part 2 of 2): The amendments revise spout and automatic shutoff design.	9/15/05 7/28/06 EO
Portable Fuel Containers (part 1 of 2): The amendments include kerosene containers in the definition of portable fuel containers.	9/15/05 11/9/05 NOD
2007-09 Model-year heavy duty urban bus engines and the fleet rule for transit agencies: The amendments require all transit agencies in SCAQMD to purchase only alternate fuel versions of new buses.	9/15/05 Superceded by 10/20/05
Reid vapor pressure limit emergency rule: The amendments relax Reid vapor pressure limit to accelerate fuel production for Hurricane Katrina victims.	9/8/05 Operative for September and October 2005 only
Heavy-Duty Truck OBD: The regulation requires on-board diagnostic (OBD) systems for new gas and diesel trucks, similar to the systems on passenger cars.	7/21/05 12/28/05 EO
Definition of Large Confined Animal Facility: The regulation defines the size of a large CAF for the purposes of air quality permitting and reduction of ROG emissions to the extent feasible.	6/23/05 4/13/06 EO
ATCM for stationary compression ignition engines: The emergency amendments (3/17/05) and permanent amendments (5/26/05) relax the diesel PM emission limits on new stationary diesel engines to current off-road engine standards to respond to the lack of availability of engines meeting the original ATCM standard.	3/17/05 5/26/05 7/29/05 EO
Transit Fleet Rule: The amendments add emission limits for non-urban bus transit agency vehicles, require lower bus and truck fleet-average NOx and PM emission limits, and clarify emission limits for CO, NMHC, and formaldehyde.	2/24/05 10/19/05 NOD
Thermal Spraying ATCM: The regulation reduces emissions of hexavalent chromium and nickel from thermal spraying operations.	12/9/04 7/20/05 EO
Tier 4 Standards for Small Off-Road Diesel Engines (SORE): The new emission standards for off-road diesel engines are phased in between 2008 and 2015.	12/9/04 10/21/05 EO
Emergency Regulatory Amendment Delaying the January 1, 2005 Implementation Date for the Diesel Fuel Lubricity Standard: The emergency regulation delays the lubricity standard compliance deadline by five months to respond to fuel pipeline contamination problems.	11/24/04 12/10/04 EO
Enhanced vapor recovery compliance extension: The amendments to the EVR regulation extend the compliance date for onboard refueling vapor recovery compatibility to the date of EVR compliance.	11/18/04 2/11/05 EO
CaRFG Phase 3 amendments: The amendments correcting errors and streamlining requirements for compliance and enforcement of CaRFG Phase 3 regulations from 1999.	11/18/04
Clean diesel fuel for harbor craft and intrastate locomotives: The regulation requires harbor craft and locomotives operating solely within California to use clean diesel fuel.	11/18/04 3/16/05 EO
Nonvehicular Source, Consumer Product, and Architectural Coating Fee Regulation Amendment: The amendments to fee regulations to collect supplemental fees when authorized by the Legislature.	11/18/04
Greenhouse gas limits for motor vehicles: The regulation sets the first ever greenhouse gas emission standards on light and medium duty vehicles starting with the 2009 model year.	9/24/04 8/4/05 EO
Gasoline vapor recovery system equipment defects list: The addition of defects to the VRED list for use by compliance inspectors.	8/24/04 6/22/05 EO
Unihose gasoline vapor recovery systems: The emergency regulation and an amendment delay the compliance date for unihose installation to the date of dispenser replacement.	7/22/04 11/24/04 EO
General Idling Limits for Diesel Trucks: The regulation limits idling of heavy-duty diesel trucks operating in California to five minutes, with exceptions for sleeper cabs.	7/22/04
Consumer Products: The regulation reduces ROG emissions from 15 consumer products categories, prohibit the use of 3 toxic compounds in consumer products, ban the use of PDCB in certain products, allow for the use of Alternative Control Plans, and revise Test Method 310.	6/24/04 5/6/05 EO
Urban bus engines/fleet rule for transit agencies: The amendments allow for the purchase of hybrid diesel buses and revise the zero emission bus demonstration and purchase timelines.	6/24/04
Engine Manufacturer Diagnostics: The regulation would require model year 2007 and later heavy duty truck engines to be equipped with engine diagnostic systems to detect malfunctions of the emission control system.	5/20/04
Chip Reflash: The voluntary program and a backstop regulation reduce heavy duty truck NOx emissions through the installation of new software in the engine's electronic control module.	3/25/04 3/21/05 EO
Portable equipment registration program (PERP): The amendments allow uncertified engines to be registered until December 31, 2005, to increase fees, and to modify administrative requirements.	2/26/04 1/7/05 EO 6/21/05 EO

Board Action	Hearing Date
Portable Diesel Engine ATCM: The regulation reduces diesel PM emissions from portable engines through a series of emission standards that increase in stringency through 2020.	2/26/04 1/4/05 EO
California motor vehicle service information rule: The amendments allow for the purchase of heavy duty engine emission-related service information and diagnostic tools by independent service facilities and aftermarket parts manufacturers.	1/22/04 5/20/04
Transportation Refrigeration Unit ATCM: The regulation reduces diesel PM emissions from transport refrigeration units by establishing emission standards and facility reporting requirements to streamline inspections.	12/11/03 2/26/04 11/10/04 EO
Diesel engine verification procedures: The amendments reduced warranty coverage to the engine only, delayed the NOx reduction compliance date to 2007, added requirements for proof-of-concept testing for new technology, and harmonized durability requirements with those of U.S. EPA.	12/11/03 2/26/04 10/17/04
Chip Reflash: The voluntary program and a backstop regulation reduce heavy duty truck NOx emissions through the installation of new software in the engine's electronic control module.	12/11/03 3/27/04 3/21/05 EO
Revised tables of maximum incremental reactivity values: The addition of 102 more chemicals with associated maximum incremental reactivity values to existing regulation allowing these chemicals to be used in aerosol coating formulations.	12/3/03
Stationary Diesel Engines ATCM: The regulation reduces diesel PM emissions from stationary diesel engines through the use of clean fuel, lower emission standards, operational practices.	11/20/03 12/11/03 2/26/2004 9/27/04 EO
Solid waste collection vehicles: The regulation reduces toxic diesel particulate emissions from solid waste collection vehicles by over 80 percent by 2010. This measure is part of ARB's plan to reduce the risk from a wide range of diesel engines throughout California.	9/25/03 5/17/04 EO
Small off-road engines (SORE): The more stringent emission standards for the engines used in lawn and garden and industrial equipment, such as string trimmers, leaf blowers, walk-behind lawn mowers, generators, and lawn tractors.	9/25/03 7/26/04 EO
Off-highway recreational vehicles: Changes to riding season restrictions.	7/24/03
Clean diesel fuel: The regulation reduces sulfur levels and set a minimum lubricity standard in diesel fuel used in vehicles and off-road equipment in California, beginning in 2006.	7/24/03 5/28/04 EO
Ozone Transport Mitigation Amendments: The amendments require upwind districts to (1) have the same no-net-increase permitting thresholds as downwind districts, and (2) Implement "all feasible measures."	5/22/03 10/2/03 NOD
Zero emission vehicles: The Updated California's ZEV requirements support the fuel cell car development and expand sales of advanced technology partial ZEVs (like gasoline-electric hybrids) in the near-term, while retaining a role for battery electric vehicles.	3/27/03 12/19/03 EO
Heavy duty gasoline truck standards: Aligned its existing rules with new, lower federal emission standards for gasoline-powered heavy-duty vehicles starting in 2008.	12/12/02 9/23/03 EO
Low emission vehicles II: Minor administrative changes.	12/12/02 9/24/03 EO
Gasoline vapor recovery systems test procedures: The amendments add advanced vapor recovery technology certification and testing standards.	12/12/02 7/1/03 EO 10/21/03 EO
CaRFG Phase 3 amendments: The amendments allow for small residual levels of MTBE in gasoline while MTBE is being phased out and replaced by ethanol.	12/12/02 3/20/03 EO
School bus Idling: The measure requires school bus drivers to turn off the bus or vehicle engine upon arriving at a school and restart it no more than 30 seconds before departure in order to limit children's exposure to toxic diesel particulate exhaust.	12/12/02 5/15/03 EO
California Interim Certification Procedures for 2004 and Subsequent Model Year Hybrid-Electric Vehicles in the Urban Transit Bus and Heavy-Duty Vehicle Classes Regulation Amendment: The amendments allow diesel-path transit agencies to purchase alternate fuel buses with higher NOx limits, establish certification procedures for hybrid buses, and require lower fleet-average PM emission limits.	10/24/02 9/2/03 EO
CaRFG Phase 3 amendments: The amendments delay removal of MTBE from gasoline by one year to 12/31/03.	7/25/02 11/8/02 EO
Diesel retrofit verification procedures, warranty, and in-use compliance requirements: The regulations specify test procedures, warranty, and in-use compliance of diesel engine PM retrofit control devices.	5/16/02 3/28/03 EO
On-board diagnostics for cars: The changes to the On-Board Diagnostic Systems (OBD II) regulation to improve the effectiveness of OBD II systems in detecting motor vehicle emission-related problems.	4/25/02 3/7/03 EO
Voluntary accelerated light duty vehicle retirement regulations: Establishes standards for a voluntary accelerated retirement program.	2/21/02 11/18/02 EO

Board Action	Hearing Date
Residential burning: The measure reduces emissions of toxic air contaminants from outdoor residential waste burning by eliminating the use of burn barrels and the outdoor burning of residential waste materials other than natural vegetation.	2/21/02 12/18/02 EO
California motor vehicle service information rule: The regulation requires light- and medium-duty vehicle manufacturers to offer for sale emission-related service information and diagnostic tools to independent service facilities and aftermarket parts manufacturers.	12/13/01 7/31/02 EO
Vapor recovery regulation amendments: The amendments expand the list of specified defects requiring equipment to be removed from service.	11/15/01 9/27/02 EO
Distributed generation guidelines and regulations: The regulations require the permitting by ARB of distributed generation sources that are exempt from air district permitting and approved guidelines for use by air districts in permitting non-exempt units.	11/15/01 7/23/02 EO
Low emission vehicle regulations (LEV II): The amendments apply PM emission limits to all new gasoline vehicles, extend gasoline PZEV emission limits to all fuel types, and streamline the manufacturer certification process.	11/15/01 8/6/02 EO
Gasoline vapor recovery systems test methods and compliance procedures: The amendments add test methods for new technology components, streamline test methods for liquid removal equipment, and***.	10/25/01 7/9/02 EO
Heavy-duty diesel trucks: The amendments to emissions standards harmonize with EPA regulations for 2007 and subsequent model year new heavy-duty diesel engines.	10/25/01
Automotive coatings: The Air Toxic Control Measure which prohibits the sale and use in California of automotive coatings containing hexavalent chromium or cadmium.	9/20/01 9/2/02 EO
Inboard and sterndrive marine engines: The lower emission standards for 2003 and subsequent model year inboard and sterndrive gasoline-powered engines in recreational marine vessels.	7/26/01 6/6/02 EO
Asbestos from construction, grading, quarrying, and surface mining: The Airborne Toxic Control Measure for construction, grading, quarrying, and surface mining operations requiring dust mitigation for construction and grading operations, road construction and maintenance activities, and quarries and surface mines to minimize emissions of asbestos-laden dust.	7/26/01 6/7/02 EO
Zero emission vehicle infrastructure and standardization of electric vehicle charging equipment: The amendments to the ZEV regulation alter the method of quantifying production volumes at joint-owned facilities and to add specifications for standardized charging equipment.	6/28/01 5/10/02 EO
Pollutant transport designation: The amendments add two transport couples to the list of air basins in which upwind areas are required to permit thresholds no less stringent than those in downwind areas.	4/26/01
Zero emission vehicle regulation amendments: The amendments reduce the numbers of ZEVs required in future years, add a PZEV category and grant partial ZEV credit, modify the ZEV range credit, allow hybrid-electric vehicles partial ZEV credit, grant ZEV credit to advanced technology vehicles, and grant partial ZEV credit for several other minor new programs.	1/25/01 12/7/01 EO 4/12/02 EO
Heavy duty diesel engines supplemental test procedures: The amendments extend "Not-To-Exceed" and EURO III supplemental test procedure requirements through 2007 when federal requirements will include these tests.	12/7/00
Light and medium duty low emission vehicle alignment with federal standards: The amendments require light and medium duty vehicles sold in California to meet the more restrictive of state or federal emission standards.	12/7/00 12/27/00 EO
Exhaust emission standards for heavy duty gas engines: The amendments establish 2005 emission limits for heavy duty gas engines that are equivalent to federal limits.	12/7/00 12/27/00 EO
CaRFG Phase 3 amendments: The amendments regulate the replacement of MTBE in gasoline with ethanol.	11/16/00 4/25/01 EO
CaRFG Phase 3 test methods: The amendments to gasoline test procedures quantify the olefin content and gasoline distillation temperatures.	11/16/00 7/11/01 EO 8/28/01 EO
Antiperspirant and deodorant regulations: The amendments relax a 0% VOC limit to 40% VOC limit for aerosol antiperspirants.	10/26/00
Diesel risk reduction plan: The plan to reduce toxic particulate from diesel engines through retrofits on existing engines, tighter standards for new engines, and cleaner diesel fuel.	9/28/00
Conditional rice straw burning regulations: The regulations limit rice straw burning to fields with demonstrated disease rates reducing production by more than 5 percent.	9/28/00
Asbestos from unpaved roads: Tightened an existing Air Toxic Control Measure to prohibit the use of rock containing more than 0.25% asbestos on unsurfaced roads.	7/20/00
Aerosol Coatings: The amendments replace mass-based VOC limits with reactivity-based limits, add a table of Maximum Incremental Reactivity values, add limits for polyolefin adhesion promoters, prohibit use of certain toxic solvents, and make other minor changes.	6/22/00 5/1/01 EO
Consumer products aerosol adhesives: The amendments delete a 25% VOC limit by 2002, add new VOC limits for six categories of adhesives, prohibit the use of toxic solvents, and add new labeling and reporting requirements.	5/25/00 3/14/01 EO

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Automotive care products: The Air Toxic Control Measure eliminate use of perchloroethylene, methylene chloride, and trichloroethylene in automotive products such as brake cleaners and degreasers.	4/27/00 2/28/01 EO
Enhanced vapor recovery emergency regulation: A four-year term for equipment certifications.	5/22/01 EO
Enhanced vapor recovery: The amendments require the addition of components to reduce spills and leakage, adapt to onboard vapor recovery systems, and continuously monitor system operation and report equipment leaks immediately.	3/23/00 7/25/01 EO
Agricultural burning smoke management: The amendments add marginal burn day designations, require day-specific burn authorizations by districts, and smoke management plans for larger prescribed burn projects.	3/23/00 1/22/01 EO
Urban transit buses: The public transit bus fleet rule and emissions standards for new urban buses that mandates a lower fleet-average NOx emission limit, PM retrofits, lower sulfur fuel use, and purchase of specified percentages of zero emission buses in future years.	1/27/00 2/24/00 11/22/00 EO 5/29/01 EO
Small Off-Road (diesel) Equipment (SORE): The amendments conform with new federal requirements for lower and engine power-specific emission limits, and for the averaging, banking, and trading of emissions among SORE manufacturers.	1/28/00
CaRFG Phase 3 MTBE phase out: The regulations enable refiners to produce gasoline without MTBE while preserving the emissions benefits of Phase 2 cleaner burning gasoline.	12/9/99 6/16/00 EO
Consumer products – mid-term measures II: The regulation which adds emission limits for 2 new categories and tightens emission limits for 15 categories of consumer products.	10/28/99
Portable fuel cans: The regulation requiring that new portable fuel containers, used to refuel lawn and garden equipment, motorcycles, and watercraft, be spill-proof beginning in 2001.	9/23/99 7/6/00 EO
Clean fuels at service stations: The amendments rescinding requirements applicable to SCAB in 1994-1995, modifying the formula for triggering requirements, and allowing the Executive Officer to make adjustments to the numbers of service stations required to provide clean fuels.	7/22/99
Gasoline vapor recovery: The amendments certification and test methods.	6/24/99
Reformulated gasoline oxygenate: The amendments rescind the requirement for wintertime oxygenate in gasoline sold in the Lake Tahoe Air Basin and requiring the statewide labeling of pumps dispensing gasoline containing MTBE.	6/24/99
Marine pleasurecraft: The regulation controls emissions from spark-ignition marine engines, specifically, outboard marine engines and personal watercraft.	12/11/98 2/17/00 EO 6/14/00 EO
Voluntary accelerated light duty vehicle retirement: The regulation sets standards for voluntary accelerated retirement program.	12/10/98 10/22/99 EO
Off-highway recreational vehicles and engines: The amendments allow non-complying vehicles to operate in certain seasons and in certain ORV-designated areas.	12/10/98 10/22/99 EO
On-road motorcycles: Amended on-road motorcycle regulations, to lower the tailpipe emission standards for ROG and NOx.	12/10/98
Portable equipment registration program (PERP): The amendments exclude non-dredging equipment operating in OCS areas and equipment emitting hazardous pollutants, include NSPS Part OOO rock crushers, require SCR emission limits and onshore emission offsets from dredging equipment operating in OCS areas, set catalyst emission limits for gasoline engines, and relieve certain retrofitted engines from periodic source testing.	12/10/98
Liquid petroleum gas motor fuel specifications: The amendment rescinds 5% propene limit and extending 10% limit indefinitely.	12/11/98
Reformulated gasoline: The amendments rescind the RVP exemption for fuel with 10% ethanol and allow for oxygen contents up to 3.7% if the Predictive Model weighted emissions to not exceed original standards.	12/11/98
Consumer products: The amendments add new VOC test methods, to modify Method 310 to quantify low vapor pressure VOC (LVP-VOC) constituents, and to exempt LVP-VOC from VOC content limits	11/19/98
Consumer products: The amendments extend the 1999 VOC compliance deadline for several aerosol coatings, antiperspirants and deodorants, and other consumer products categories to 2002, to exempt methyl acetate from the VOC definition, and make other minor changes.	11/19/98
Low-emission vehicle program (LEV II): The regulations add exhaust emission standards for most sport utility vehicles, pick-up trucks and mini-vans, lowering tailpipe standards for cars, further reducing evaporative emission standards, and providing additional means for generating zero-emission vehicle credits.	11/5/98 9/17/99 EO
Off-road engine aftermarket parts: The implementation of a new program to test and certify aftermarket parts in gasoline and diesel, light-duty through heavy duty, engines used in off-road vehicles and equipment.	11/19/98 10/1/99 EO 7/18/00 EO
Off-road spark ignition engines: The new emission standards for small and large spark ignition engines for off-road equipment, a new engine certification program, an in-use compliance testing program, and a three-year phase-in for large LSI.	10/22/98

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Gasoline deposit control additives: The amendments decertify pre-RFG additives, tighten the inlet valve deposit limits, add a combustion chamber deposit limit, and modify the test procedures to align with the characteristics of reformulated gasoline formulations.	9/24/98 4/5/99 EO
Stationary source test methods: The amendments to stationary source test methods align better with federal methods.	8/27/98 7/2/99 EO
Locomotive MOA for South Coast: The Memorandum of agreement (MOA) signed by ARB, U.S. EPA and major railroads to concentrate cleaner locomotives in the South Coast by 2010 and fulfill 1994 ozone SIP commitment.	7/2/98
Gasoline vapor recovery: The amendments to certification and test methods add methods for onboard refueling vapor recovery, airport refuelers, and underground tank interconnections, and make minor changes to existing methods.	5/21/98 8/27/98
Reformulated gasoline: The amendments rescind the wintertime oxygenate requirement, allow for sulfur content averaging, and make other minor technical amendments.	8/27/98
Ethylene oxide sterilizers: The amendments to the ATCM streamline source testing requirements, add EtO limits in water effluent from control devices, and make other minor changes.	5/21/98
Chrome platers: The amendments to ATCM harmonize with requirements of federal NESHAP standards for chrome plating and chromic acid anodizing facilities.	5/21/98
On-road heavy-duty vehicles: The amendments align on-road heavy duty vehicle engine emission standards with EPA's 2004 standards and align certification, testing, maintenance, and durability requirements with those of U.S. EPA.	4/23/98 2/26/99 EO
Small off-road engines (SORE): The amendments grant a one-year delay in implementation, relaxation of emissions standards for non-handheld engines, emissions durability requirements, averaging/banking/trading, harmonization with the federal diesel engine regulation, and modifications to the production line testing requirements.	3/26/98
Heavy duty vehicle smoke inspection program: The amendments require annual smoke testing, set opacity limits, and exempt new vehicles from testing for the first four years.	12/11/97 3/2/98 EO
Consumer products (hairspray credit program): The standards for the granting of tradable emission reduction credits achieved by sales of hairspray products having VOC contents less than required limits.	11/13/97
Light-duty vehicle off-cycle emissions: The standards to control excess emissions from aggressive driving and air conditioner use in light duty vehicles and added two light duty vehicle test methods for certification of new vehicles under these standards.	7/24/97 3/19/98 EO
Consumer products: The amendments add VOC limits to 18 categories of consumer products used in residential and industrial cleaning, automobile maintenance, and commercial poisons.	7/24/97
Enhanced evaporative emissions standards: The amendments extend the compliance date for ultra-small volume vehicle manufacturers by one year.	5/22/97
Emission reduction credit program: The standards for District establishment of ERC programs including certification, banking, use limitation, and reporting requirements.	5/22/97
Lead as a toxic air contaminant: The amendment designates inorganic lead as a toxic air contaminant.	4/24/97
Consumer products (hair spray): The amendments (1) delay a January 1, 1998, compliance deadline to June 1, 1999, (2) require progress plans from manufacturers, and (3) authorize the Executive Officer to require VOC mitigation when granting variances from the June 1, 1999 deadline.	3/27/97
Portable engine registration program (PERP): The standards for (1) the permitting of portable engines by ARB and (2) District recognition and enforcement of permits.	3/27/97
Liquefied petroleum gas: The amendments extend the compliance deadline from January 1, 1997, to January 1, 1999, for the 5% propene limit in liquefied petroleum gas used in motor vehicles.	3/27/97
Onboard diagnostics, phase II: The amendments extend the phase-in of enhanced catalyst monitoring, modify misfire detection requirements, add PVC system and thermostat monitoring requirements, and require manufacturers to sell diagnostic tools and service information to repair shops.	12/12/96
Consumer products: The amendments delay 25% VOC compliance date for aerosol adhesives, clarify portions of the regulation, exempt perchloroethylene from VOC definition, extend the sell-through time to three years, and add perchloroethylene reporting requirements.	11/21/96
Consumer products (test method): The amendment adds Method 310 for the testing of VOC content in consumer products.	11/21/96
Pollutant transport designation: The amendments modify transport couples from the Broader Sacramento area and add couples to the newly formed Mojave Desert and Salton Sea Air Basins.	11/21/96
Diesel fuel certification test methods: The amendments specify the test methods used for quantifying the constituents of diesel fuel.	10/24/96 6/4/97 EO
Wintertime requirements for utility engines & off-highway vehicles : The Optional hydrocarbon and NOx standards for snow throwers and ice augers, raising CO standard for specialty vehicles under 25hp.	9/26/96
Large off-road diesel Statement of Principles: National agreement between ARB, U.S. EPA, and engine manufacturers to reduce emissions from heavy-duty off-road diesel equipment four years earlier than expected in the 1994 SIP for ozone.	9/13/96

Board Action	Hearing Date
Regulatory improvement initiative: Rescinded two regulations relating to fuel testing in response to Executive Order W-127-95.	5/30/96
Zero emission vehicles: The amendments eliminate zero emission vehicle quotas between 1998 and 2002, and approved MOUs with seven automobile manufacturers to accelerate release of lower emission "49 state" vehicles.	3/28/96 7/24/96 EO
CaRFG variance requirements: The amendments add a per gallon fee on non-compliant gasoline covered by a variance and to made administrative changes in variance processing and extension.	1/25/96 2/5/96 EO 4/2/96 EO
Utility and lawn and garden equipment engines: The amendment relaxes the CO standard from 300 to 350 ppm for Class I and II utility engines.	1/25/96
National security exemption of military tactical vehicles: Such vehicles would not be required to adhere to exhaust emission standards.	12/14/95
CaRFG regulation amendments: The amendments allow for downstream addition of oxygenates and expansion of compliance options for gasoline formulation.	12/14/95
Required additives in gasoline (deposit control additives): Terms, definitions, reporting requirements, and test procedures for compliance are to be clarified.	11/16/95
CaRFG test method amendments: The amendments designate new test methods for benzene, aromatic hydrocarbon, olefin, and sulfur content of gasoline.	10/26/95
Motor vehicle inspection and maintenance program: Handled by BAR.	10/19/95 by BAR
Antiperspirants and deodorants, consumer products, and aerosol coating products: Ethanol exemption for all products, modifications to aerosol special requirements, modifications for regulatory language consistency, modifications to VOC definition.	9/28/95
Low emission vehicle (LEV III) standards: Reactivity adjustment factors, introduction of medium-duty ULEVs, window labels, and certification requirements and test procedures for LEVs.	9/28/95
Medium- and heavy-duty gasoline trucks: Expedited introduction of ultra-low emission medium-duty vehicles and lower NOx emission standards for heavy-duty gasoline trucks to fulfill a 1994 ozone SIP commitment.	9/1/95
Retrofit emission standards: all vehicle classes to be included in the alternate durability test plan, kit manufacturers to be allowed two years to validate deterioration factors under the test plan, update retrofit procedures allowing manufacturers to disable specific OBDs if justified by law.	7/27/95
Gasoline vapor recovery systems: Revised certification and test procedures.	6/29/95
Onboard refueling vapor recovery standards: 1998 and subsequent MY engine cars, LD trucks, and MD trucks less than 8500 GVWR.	6/29/1995 4/24/96 EO
Heavy duty vehicle exhaust emission standards for NOx: Amendments to standards and test procedures for 1985 and subsequent MY HD engines, amendments to emission control labels, amendments to Useful Life definition and HD engines and in-use vehicle recalls.	6/29/95
Aerosol coatings regulation: The regulation meets California Clean Air Act requirements and a 1994 ozone SIP commitment.	3/23/95
Periodic smoke inspection program: Delays start of PSIP from 1995 to 1996.	12/8/94
Onboard diagnostics phase II: The Amendments clarify regulation language, ensure maximum effectiveness, and address manufacturer concerns regarding implementation.	12/8/94
Alternative control plan (ACP) for consumer products: A voluntary, market-based VOC emissions cap upon a grouping of consumer products, flexible by manufacturer that will minimize overall costs of emission reduction methods and programs.	9/22/94
Diesel fuel certification: new specifications for diesel engine certification fuel, amended oxygen specification for CNG certification fuel, and amended commercial motor vehicle liquefied petroleum gas regulations.	9/22/94
Utility and lawn and garden equipment (UGLE) engines: Modification to emission test procedures, ECLs, defects warranty, quality-audit testing, and new engine compliance testing.	7/28/94
Evaporative emissions standards and test procedures: The evaporative emissions standards for medium-duty vehicles.	2/10/94
Off-road recreational vehicles: The emission control regulations for off-road motorcycles, all-terrain vehicles, go-karts, golf carts, and specialty vehicles.	1/1/94
Perchloroethylene from dry cleaners: The measure to control perchloroethylene emissions from dry cleaning operations.	10/1/93
Wintertime oxygenate program: The Amendments to the control time period for San Luis Obispo County, exemption for small retailers bordering Nevada, flexibility in gasoline delivery time, calibration of ethanol blending equipment, gasoline oxygen content test method.	9/9/93
Onboard diagnostic phase II	7/9/93
Urban transit buses: The amended regulation to tighten state NOx and particulate matter (PM) standards for urban transit buses beyond federal standards beginning in 1996.	6/10/93

Board Action	Hearing Date
1-year implementation delay in emission standards for utility engines	4/8/93
Non-ferrous metal melting: The Air Toxic Control Measure for emissions of cadmium, arsenic, and nickel from non-ferrous metal melting operations.	1/1/93
Certifications requirements for low emission passenger cars, light-duty trucks & medium duty vehicles	1/14/93
Airborne toxic control measure for emissions of toxic metals from non-ferrous metal melting	12/10/92
Periodic self-inspection program: Implemented state law establishing a periodic smoke self-inspection program for fleets operating heavy-duty diesel-powered vehicles.	12/10/92
Notice of general public interest for consumer products	11/30/92
Substitute fuel or clean fuel incorporated test procedures	11/12/92
New vehicle testing using CaRFG Phase 2 gasoline: The amendments require the use of CaRFG Phase 2 gasoline in the certification of exhaust emissions in new vehicle testing.	8/13/92
Standards and test procedures for alternative fuel retrofit systems	5/14/92
Alternative motor vehicle fuel certification fuel specification	3/12/92
Heavy-duty off-road diesel engines: The first exhaust emission standards and test procedures for heavy-duty off-road diesel engines beginning in 1996.	1/9/92
Consumer Products - Tier II: Tier II of regulations to reduce emissions from consumer products.	1/9/92
Wintertime oxygen content of gasoline: The regulation requiring the addition of oxygenates to gasoline during winter to satisfy federal Clean Air Act mandates for CO nonattainment areas.	12/1/91
CaRFG Phase 2: The CaRFG phase 2 specifications including lowering vapor pressure, reducing the sulfur, olefin, aromatic, and benzene content, and requiring the year-round addition of oxygenates to achieve reductions in ROG, NOx, CO, oxides of sulfur (SOx) and toxics.	11/1/91
Low emissions vehicles amendments revising reactivity adjust factor (RAF) provisions and a RAF for M85 transitional low emission vehicles	11/14/91
Onboard diagnostic, phase II	11/12/91
Onboard diagnostics for light-duty trucks and light & medium-duty motor vehicles	9/12/91
Utility and lawn & garden equipment: The first off-road mobile source controls under the California Clean Air Act regulating utility, lawn and garden equipment.	12/1/90
Control for abrasive blasting	11/8/90
Roadside smoke inspections of heavy-duty vehicles: The regulations implementing state law requiring a roadside smoke inspection program for heavy-duty vehicles.	11/8/90
Consumer Products Tier I: Tier I of standards to reduce emissions from consumer products.	10/11/90
CaRFG Phase I: CaRFG Phase I reformulated gasoline regulations to phase-out leaded gasoline, reduce vapor pressure, and require deposit control additives.	9/1/90
Low-emission vehicle (LEV) and clean fuels: The landmark LEV/clean fuel regulations which called for the gradual introduction of cleaner cars in California. The regulations also provided a mechanism to ensure the availability of alternative fuels when a certain number of alternative fuel vehicles are sold.	9/1/90
Evaporative emissions from vehicles: Modified test procedure to include high temperatures (up to 105 F) and ensure that evaporative emission control systems function properly on hot days.	8/9/90
Dioxins from medical waste incinerators: The Airborne Toxic Control Measure to reduce dioxin emissions from medical waste incinerators.	7/1/90
CA Clean Air Act guidance for permitting: Approved California Clean Air Act permitting program guidance for new and modified stationary sources in nonattainment areas.	7/1/90
Consumer products BAAQMD	6/14/90
Medium duty vehicle emission standards: The three new categories of low emission MDVs, required minimum percentages of production, and established production credit and trading.	6/14/90
Medium-duty vehicles: The test procedures for medium-duty vehicles to require whole-vehicle testing instead of engine testing. This modification allowed enforcement of medium-duty vehicle standards through testing and recall.	6/14/90
Ethylene oxide sterilizers: Airborne Toxic Control Measure to reduce ethylene oxide emissions from sterilizers and aerators.	5/10/90
Asbestos in serpentine rock: Airborne Toxic Control Measure for asbestos-containing serpentine rock in surfacing applications.	4/1/90
Certification procedure for aftermarket parts	2/8/90
Antiperspirants and deodorants: First consumer products regulation, setting standards for antiperspirants and deodorants.	11/1/89
Residential woodstoves: Suggested control measure for the control of emissions from residential wood combustion.	11/1/89
On-Board Diagnostic Systems II: The regulations implement the second phase of on-board diagnostic requirements which alert drivers of cars, light-trucks and medium-duty vehicles when the emission control system is not functioning properly.	9/1/89

Board Action	Hearing Date
Cars and light-duty trucks: The regulations reduce ROG and CO emissions from cars and light trucks by 35 percent.	6/1/89
Architectural coatings: Suggested control measure to reduce ROG emissions from architectural coatings.	5/1/89
Chrome from cooling towers: Airborne Toxic Control Measure to reduce hexavalent chromium emissions from cooling towers.	3/1/89
Reformulated Diesel Fuel: Regulations requiring the use of clean diesel fuel with lower sulfur and aromatic hydrocarbons beginning in 1993.	11/1/88
Vehicle Recall: The regulations implement a recall program which requires auto manufacturers to recall and fix vehicles with inadequate emission control systems (Vehicles are identified through in-use testing conducted by the ARB).	9/1/88
Suggested control measure for oil sumps: Suggested control measure to reduce emissions from sumps used in oil production operations.	8/1/88
Chrome platers: Airborne Toxic Control Measure to reduce emissions of hexavalent chromium emissions from chrome plating and chromic acid anodizing facilities.	2/1/88
Suggested control measure for boilers: Suggested control measure to reduce NOx emissions from industrial, institutional, and commercial boilers, steam generators and process heaters.	9/1/87
Benzene from service stations: The Airborne Toxic Control Measure to reduce benzene emissions from retail gasoline service stations (Also known as Phase II vapor recovery).	7/1/87
Agricultural burning guidelines: Amended existing guidelines to add provisions addressing wildland vegetation management.	11/1/86
Heavy-duty vehicle certification: Amended certification of heavy-duty diesel and gasoline-powered engines and vehicles to align with federal standards.	4/1/86
Cars and light-duty trucks: The regulations reduce NOx emissions from passenger cars and light-duty trucks by 40 percent.	4/1/86
Sulfur in diesel fuel: Removed exemption for small volume diesel fuel refiners.	6/1/85
On-Board Diagnostics I: The regulations require the use of on-board diagnostic systems on gasoline-powered vehicles to alert the driver when the emission control system is not functioning properly.	4/1/85
Suggested control measure for wood coatings: Suggested control measure to reduce emissions from wood furniture and cabinet coating operations.	3/1/85
Suggested control measure for resin manufacturing: Suggested control measure to reduce ROG emissions from resin manufacturing.	1/1/85

Appendix IV

Future Air Quality: PM2.5 Composition and Unmonitored Area Analysis

Introduction

This appendix contains supporting information for Chapter 5, including: 1) details on the method used to determine PM2.5 composition, and 2) the unmonitored area analysis. PM2.5 chemical speciation measurements were adjusted based on the U.S. EPA's recommended method, Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid (SANDWICH). The details of this and the resulting speciation profiles for Chemical Speciation Network (CSN) sites are presented below. Also presented is a thorough analysis of the future air quality at all locations in the Basin. This unmonitored area analysis is needed due to the relatively sparse PM2.5 measurement network and the U.S. EPA's requirement that attainment must be demonstrated across the entire Basin.

PM2.5 Composition

When determining PM2.5 composition, a significant source of uncertainty lies in the measurement of Organic Carbon (OC). OC as measured by a Speciation Air Sampling System (SASS) is believed to be highly uncertain with a mostly positive sampling artifact. The 6.7 Liter Per Minute (LPM) flow rate of the SASS used to collect OC is approximately 2.5 times lower than that of the FRM sampling system (16.7 LPM), which provides the official PM2.5 mass measurement. The slower flow rate in the SASS reduces the pressure drop across the filter and increases the adsorption of organic vapor on the quartz filter. The FRM sampler uses a Teflon filter for mass measurements which is much less subject to organic vapor adsorption. Therefore, for the same air mass, more OC can be collected by the SASS than the FRM sampler, often leading to an overbalance in the sum of the PM2.5 species relative to FRM mass. There are uncertainties in the measurements and the speciation analyses for all species; however, the greatest uncertainty in species concentration is generally associated with the measurement and analysis of OC.

The U.S. EPA recommends estimating uncertain OC concentrations through the SANDWICH material balance method (Frank, 2006).[65] According to the SANDWICH method, OC is estimated by mass balance, defined as the difference between the measured mass and the sum of all inorganic species, water and a filter blank of 0.2 $\mu g/m^3$. The OC derived by mass balance is further constrained by a floor and a ceiling. The floor value is equal to the measured OC mass, except when the speciation mass exceeds FRM mass. In this case, the measured OC is scaled by the ratio of the FRM to speciation mass; this value then defines the OC floor. While the U.S. EPA's guidance recommends setting the ceiling to 0.8 times the FRM mass, this resulted in large OC

[65] Frank, N.H., 2006. Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities. *Journal of Air & Waste Management Association*, 56:4, 500-511.

fractions that were not supported by the literature (Hayes et al., 2013).[66] Thus, the OC ceiling was lowered to 0.5 times the FRM mass, which is consistent with a previous study (Hayes et al., 2013). Figures IV-1 through IV-6 depict the species fractional splits for the 6 primary components and water vapor for the CSN sites, except Rubidoux, in 2018 after SANDWICH was applied. The corresponding figures for Rubidoux are presented in Chapter 5.

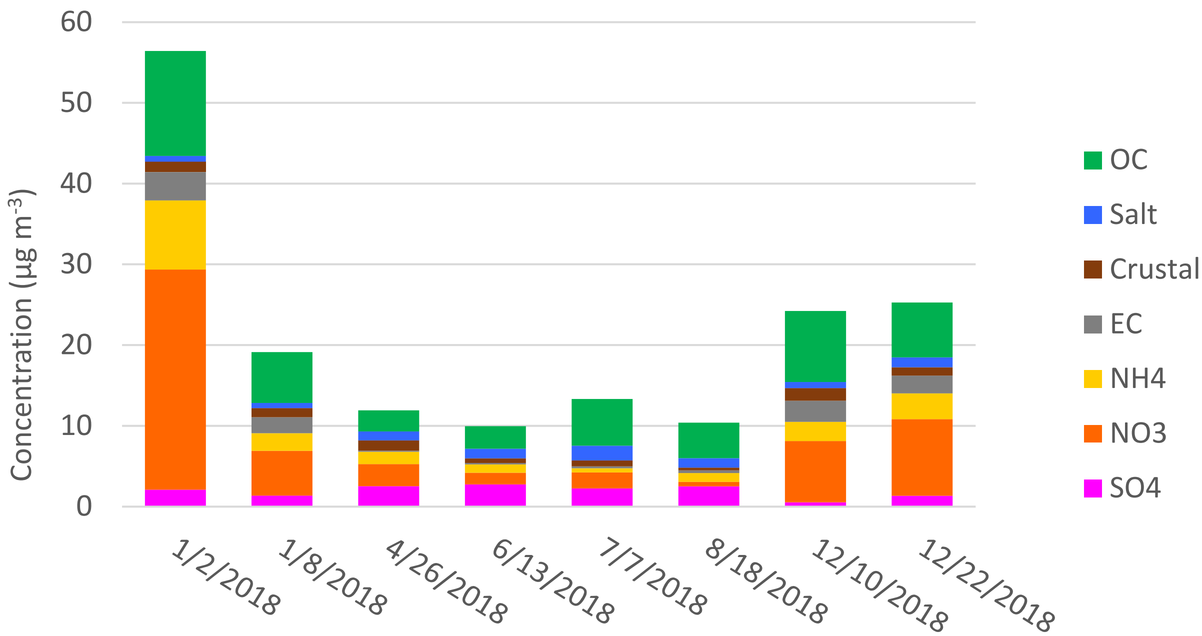


FIGURE IV-1
Anaheim Quarterly Top Two-Day 24-hour PM2.5 Mass and Chemical Components Concentrations in 2018

[66] Hayes, P.L., et al., (2013). Organic aerosol composition and sources in Pasadena, California, during the 2010 CalNex campaign. *Journal of Geophysical Research: Atmospheres*, 118:16, 9233-9257.

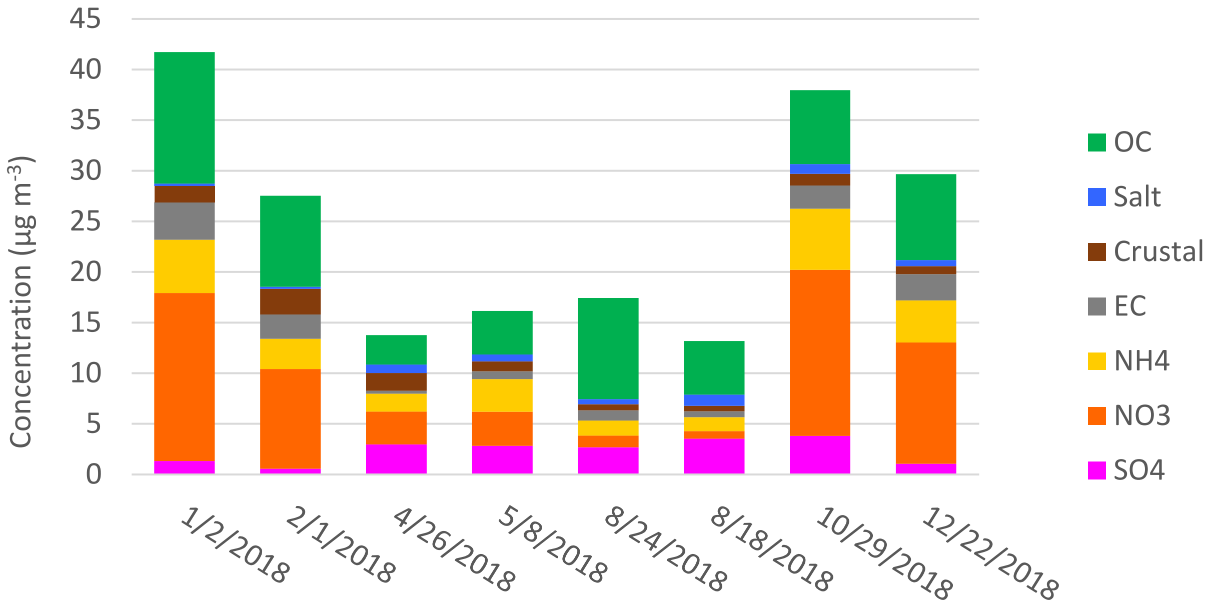


FIGURE IV-2

Los Angeles Quarterly Top Two-Day 24-Hour PM2.5 Mass and Chemical Components Concentrations in 2018

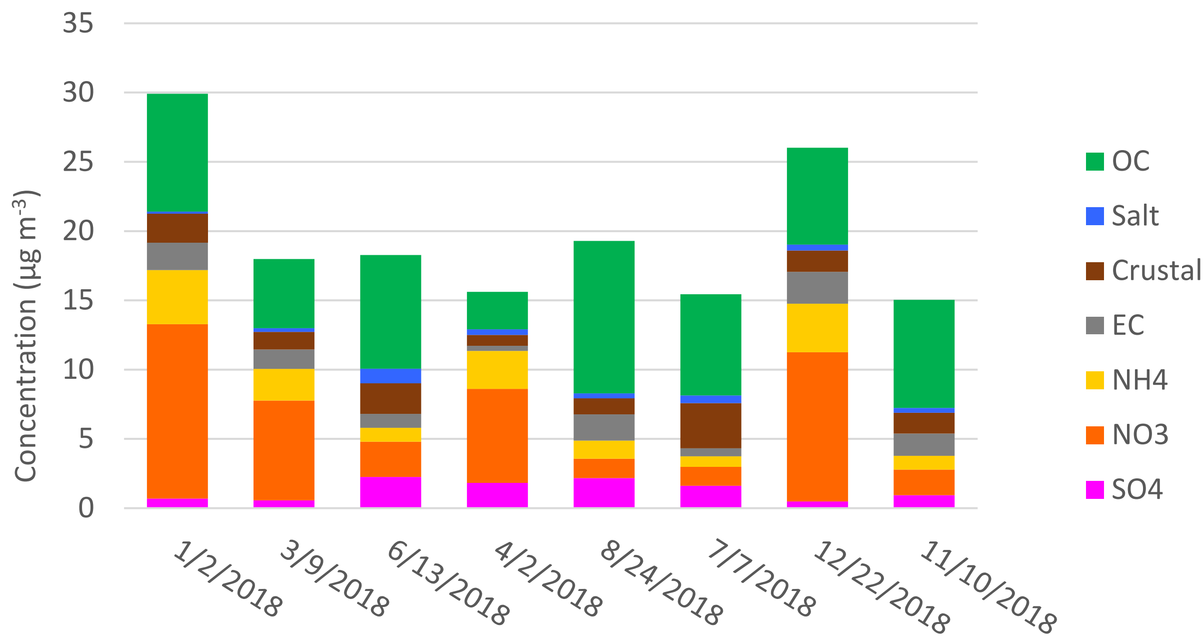


FIGURE IV-3

Fontana Quarterly Top Two-Day 24-Hour PM2.5 Mass and Chemical Components Concentrations in 2018

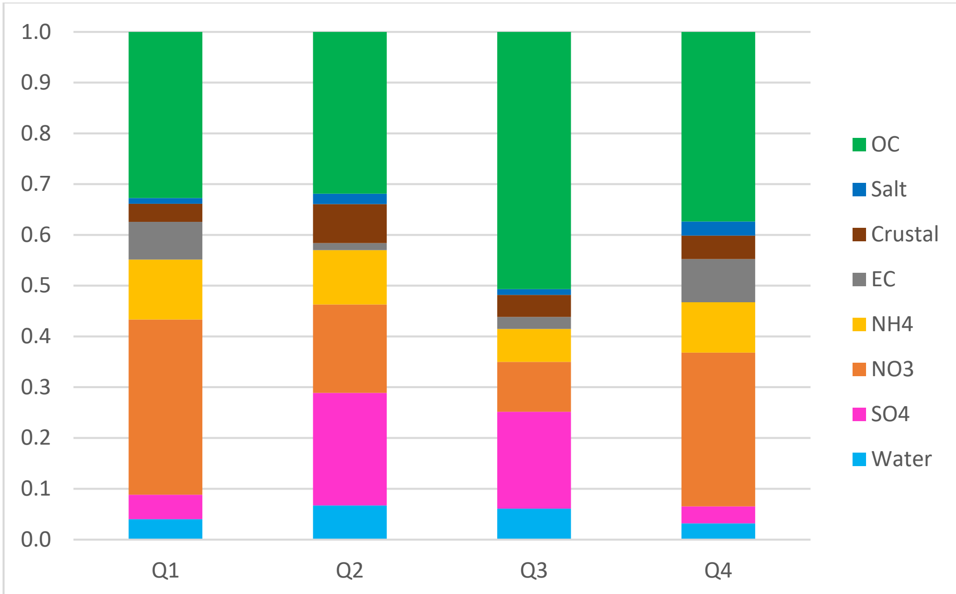


FIGURE IV-4

2018 Anaheim Top Two-Day Averaged PM2.5 Fraction After SANDWICH

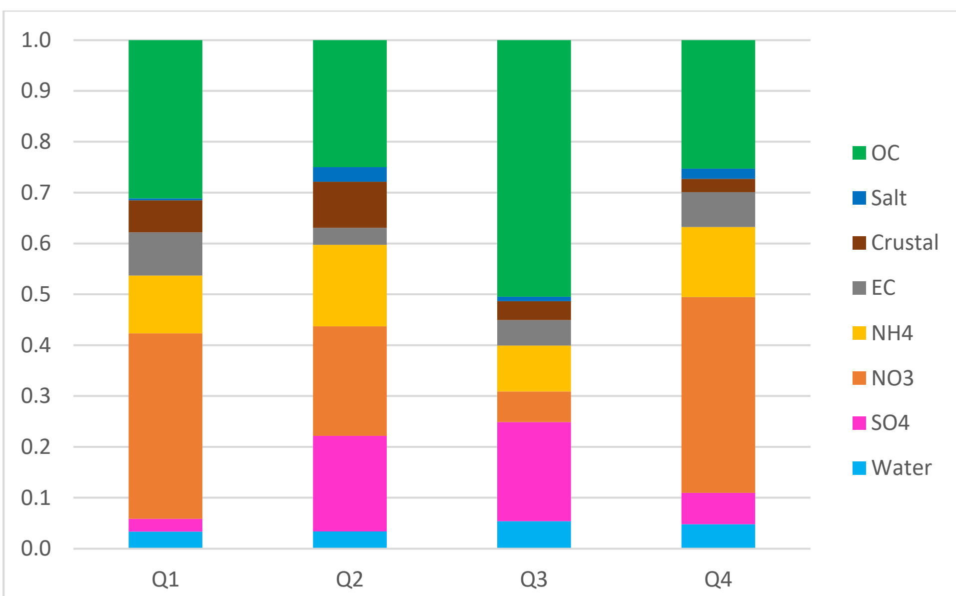


FIGURE IV-5

2018 Los Angeles Top Two-Day Averaged PM2.5 Fraction After SANDWICH

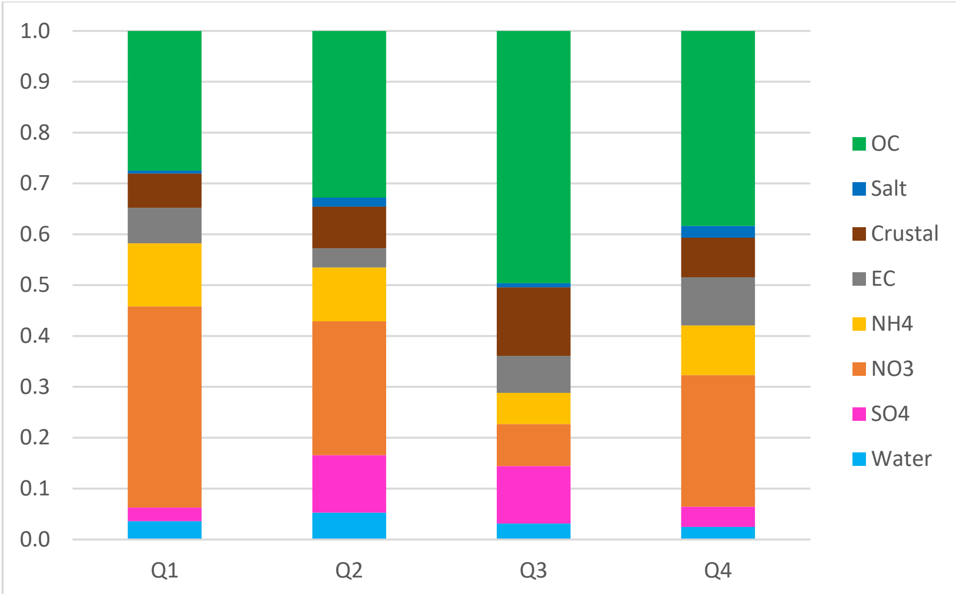


FIGURE IV-6

2018 Fontana Top Two-Day Averaged PM2.5 Fraction After SANDWICH

Unmonitored Area Analysis

The U.S. EPA modeling guidance recommends that the attainment demonstration include a formal analysis to confirm that all grid cells in the modeling domain meet the federal standard. Figure IV-7 presents the 24-hour PM2.5 base year design values interpolated to the spatial extent of the Basin. Monitoring sites are denoted by black dots. Several areas around Compton, the northwestern portion of Riverside County, and the southwestern portion of San Bernardino County depict grid cells exceeding 35 $\mu g/m^3$. Figure IV-8 shows an interpolated spatial representation of future model-predicted 24-hour design values in 2023. By 2023, Mira Loma, the PM2.5 24-hour design station, will attain the federal standard. Attainment of the standard in other areas, however, cannot be ascertained simply by examining these interpolated fields.

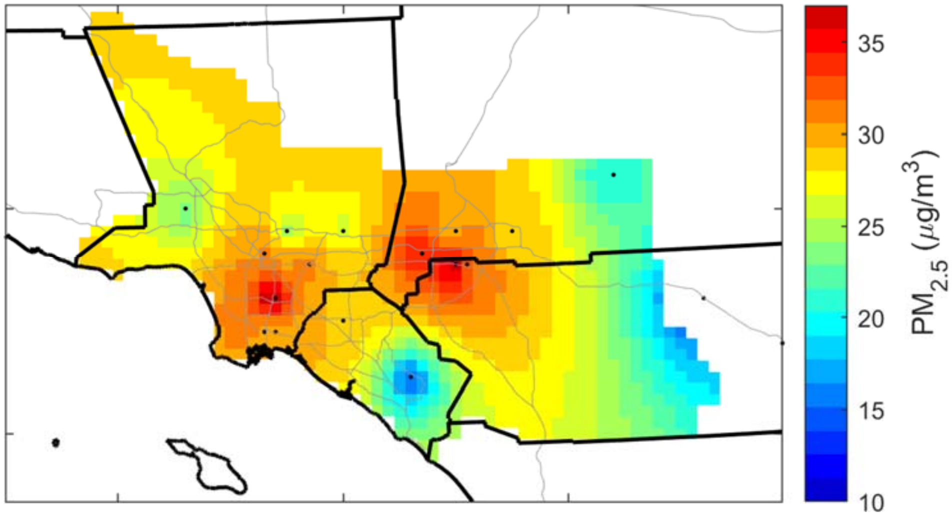


FIGURE IV-7
2018 Baseline 24-Hour PM2.5 Design Concentrations (μg/m^3)

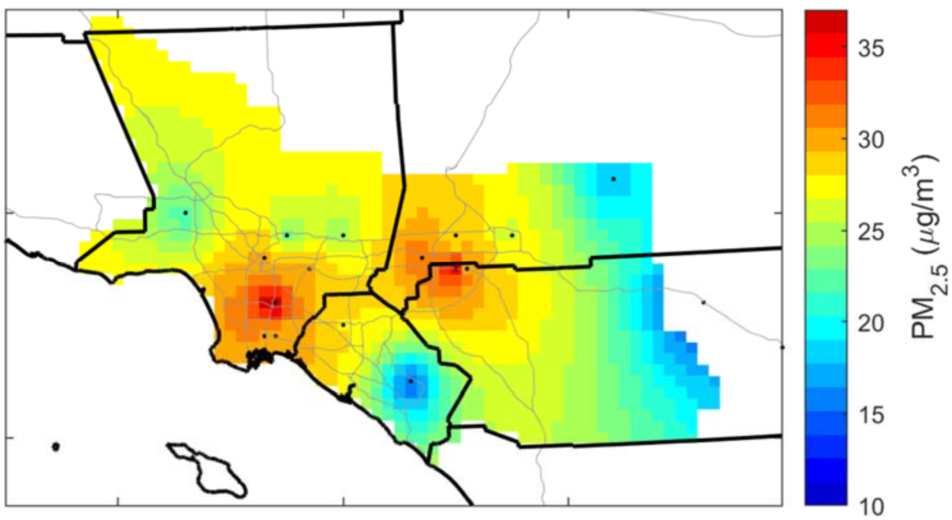


FIGURE IV-8
2023 Baseline 24-Hour PM2.5 Design Concentrations (μg/m^3)

The unmonitored area attainment test requires assessing the impacts for 32 days per year, for five years, at each unmonitored grid cell, following the RRF method described in the U.S. EPA guidance (U.S. EPA, 2018).[67] The methodology used to assess the unmonitored grid cell impact is as follows. The speciation fractions throughout the Basin for each relevant species, except particle bound water, were estimated with a natural neighbor interpolation for each quarter based on the 2016-2018 speciation period. Natural neighbor is an interpolation method based on Voronoi

[67] U.S. EPA, (2018). Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

tessellation.[68] While the four CSN sites encompass all areas of high PM concentrations in the Basin, it was necessary to create "pseudo stations" at the corners of the modelling domain to aid in extrapolation. Pseudo stations are fake monitoring stations placed outside the analysis boundary to reduce extrapolation uncertainties in the areas without monitoring stations. The species fractions at these pseudo stations were equivalent to the average fraction for each species. Speciation within the Basin was not appreciably affected by the pseudo stations, due to the CSN sites carrying greater weight in the natural neighbor interpolation. This interpolation method was selected as it has been shown to reproduce ozone concentrations in the Basin more accurately than an inverse distance weighted, inverse distance weight squared, nearest neighbor, or linear interpolation scheme (see Appendix 5, Chapter 5 of the 2016 AQMP, South Coast AQMD, 2017).[69] Figure IV-9 depicts the interpolated nitrate species fractions in quarters 1-4. The same interpolation method was applied to other PM components as well (not shown).

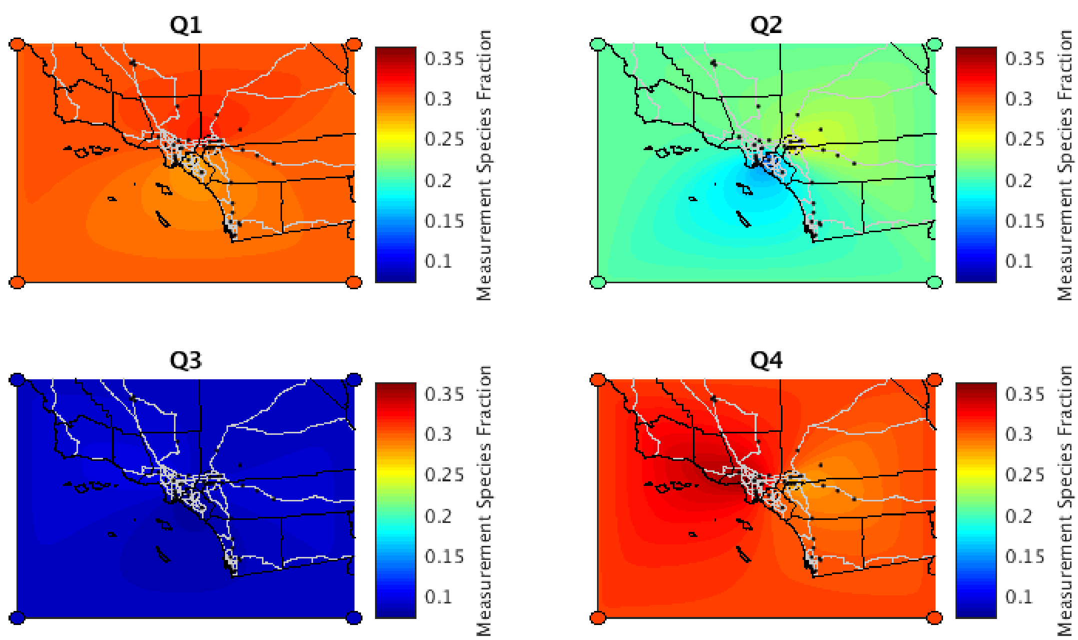


FIGURE IV-9

Interpolated Measurement Species Fractions for Nitrate (FRM Locations are Illustrated with Black Dots. CSN and Pseudo Stations are Illustrated with Circles)

[68] Sibson, R. (1981). "A brief description of natural neighbor interpolation (Chapter 2)". In V. Barnett (ed.). *Interpreting Multivariate Data*. Chichester: John Wiley. pp. 21–36.

[69] South Coast AQMD (2017), 2016 Air Quality Management Plan, Appendix V, Modeling and Attainment Demonstration. Available at:http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-v.pdf?sfvrsn=10

FRM data from 33 monitoring sites within the modeling domain were extracted from the U.S. EPA's AQS database for each year of the 5-year period. Data from stations without daily sampling were adjusted to simulate a daily sampling rate by filling in missing days with the nearest measured value. Therefore, the 8th highest value in each year represented the 98th percentile measurement for each station, regardless of the sampling frequency. The highest eight concentrations sampled in each quarter in each of the five years were selected to generate the data set. This resulted in 8 x 4 x 5 = 160 days of data for each of the 33 FRM stations. The quarterly interpolated species fractions were then applied to these days.

RRFs were calculated from the model output at each cell in the Basin using the same strategy employed for the station-specific analysis. However, the absence of measurement data between the stations did not allow for the use of selection criteria to filter out days where model performance was inadequate. Quarterly RRFs for nitrate are presented in Figure IV-10. RRFs for all other species are presented in Attachment 1. Future 24-hr PM2.5 species concentrations for each of the five years were derived by multiplying the interpolated species concentrations by the quarterly RRFs.

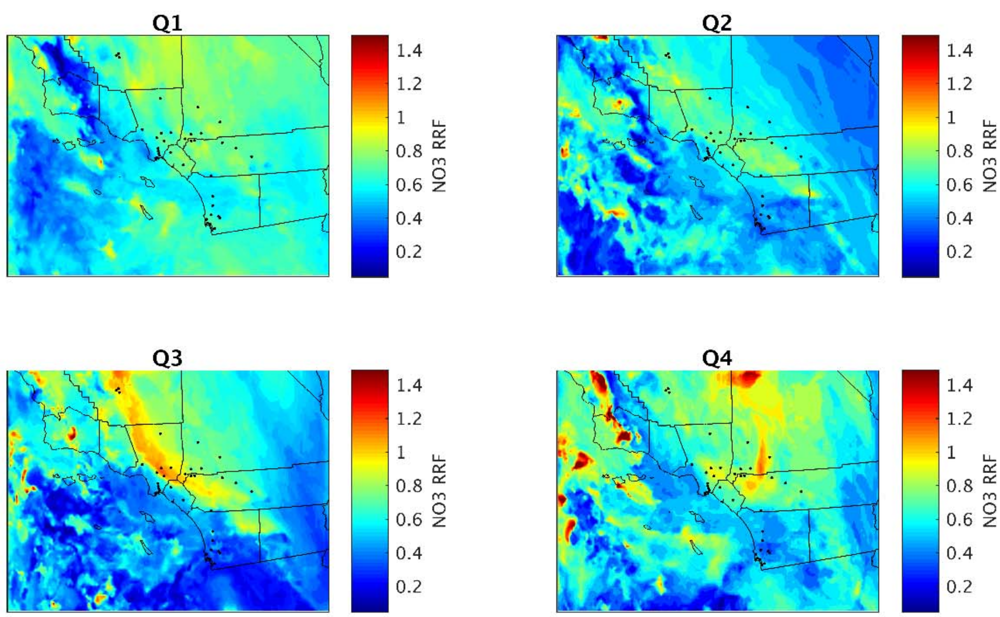


FIGURE IV-10
2023 RRFs for Nitrate

Particle-bound water was calculated and then summed along with all species concentrations and a filter blank to generate total PM2.5 mass for each of the 160 days. The eighth-highest value at each grid cell was then selected for each year and a 5-year weighted-average was applied to generate a projected 24-hour design value at each grid-cell within the Basin. The projected 24-hour design values for 2023 are presented in Figure IV-11. Figure IV-12 presents the 2018 base-year design values for comparison. As expected, the design concentrations in 2023 are much lower across the Basin. Excluding the area surrounding Compton, the highest 24-hour PM2.5 design concentration is predicted in the grid cell immediately north of the Mira Loma monitoring station. Thus, the entire Basin is anticipated to achieve attainment in 2023 except for Compton using a regional photochemical modeling and unmonitored area analysis. The attainment of Compton is addressed in Chapter 5 and Appendix V using the supplemental weight of evidence approach. Therefore, the entire Basin including Compton is expected to attain the 2006 24-hour PM2.5 standard in 2023.

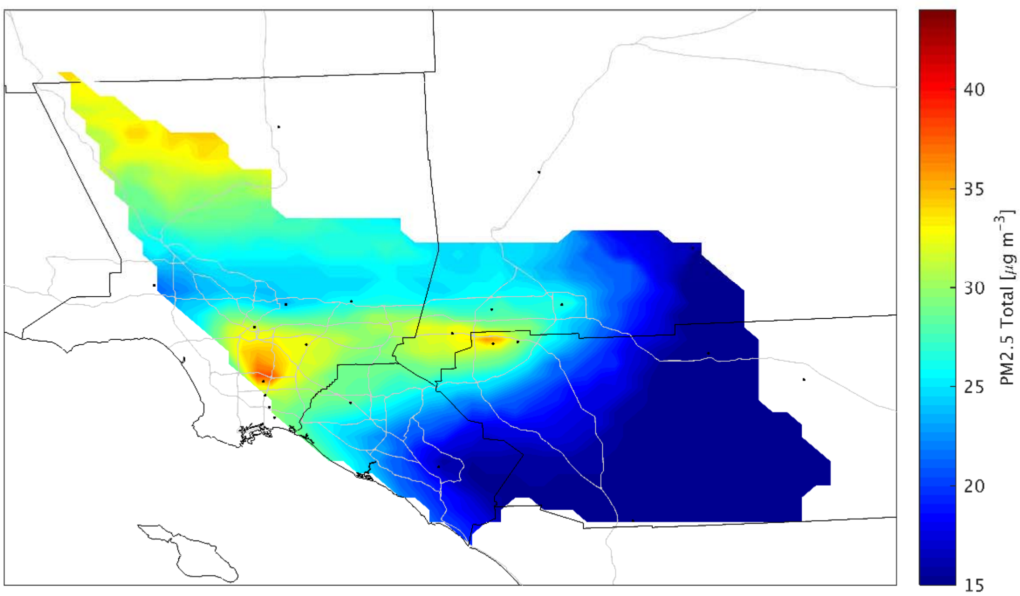


FIGURE IV-11
2023 Projected 24-Hour Design Values

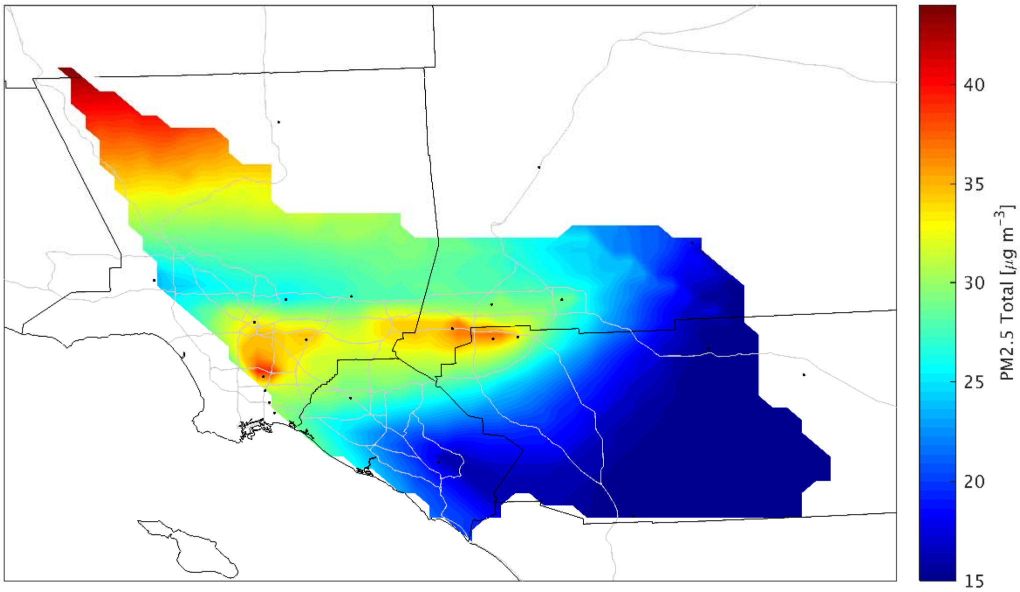


FIGURE IV-12
2018 Baseline 24-Hour Design Values

Appendix V

Compton PM2.5 Attainment Demonstration

Introduction

As detailed in Chapter 5, Compton does not show attainment in 2023 with the chemical transport modeling-based attainment demonstration. However, a suite of technical analyses using ambient measurements strongly suggests that Compton will attain in 2023, if not earlier. In such instances, where the model and prevailing evidence do not align, U.S. EPA guidance allows for a "weight of evidence" assessment in order to project attainment (U.S. EPA, 2018).[70] Several analyses are presented herein which demonstrate that Compton's base year design value was anomalous and that attainment by 2023 is highly probable. Consistent with U.S. EPA guidance for attainment dates in the near future, ambient data and emissions trends carry the most weight in the analysis. Additional analyses, focusing on meteorological factors and localized emission sources, are presented. Chapter V provides a high-level summary of the results of these analyses whereas Appendix V provides a more comprehensive description of the established methodologies, results, and supplementary details.

PM2.5 trends measured at Compton

The FRM PM2.5 measurements at Compton began on Dec. 23, 2008. All PM2.5 three-year design values recorded at Compton are shown in Figure V-1. All design values recorded before 2017 were below the PM2.5 24-hour federal standard, while PM2.5 design values in 2017, 2018, and 2019 exceed the PM2.5 24-hour federal standard.

The PM2.5 exceedances during 2017-2019 were caused by the remarkably high annual 98th percentile daily FRM PM2.5 measured in 2017. The annual 98th percentile daily FRM PM2.5 data during 2009-2019 are presented in Figure V-2. For all years except 2017, the value ranges from between 24.0 to 37.7 µg/m^3, either below or very close to the 24-hour federal standard. The annual 98th percentile daily FRM PM2.5 in 2017 was 53.4 µg/m^3, which is 69% higher than the average of the 98th percentile values in all other years.

The high value for the annual 98th percentile daily FRM PM2.5 in 2017 was driven by three unusually high daily FRM PM2.5 concentrations. All daily FRM PM2.5 concentrations measured in Dec. 2008-Jun. 2020 are shown in Figure V-3. The overall 98th percentile of these data is 32.7 µg/m^3, which is below the 24-hour federal PM2.5 standard. In April 2019, the FRM PM2.5 at Compton changed from a one-in-three-days sampling schedule to a daily sampling schedule. Therefore, in 2017, the annual 98th percentile daily FRM PM2.5 relies on the third highest value recorded in that year. The three highest daily PM2.5 concentrations measured in 2017 are highlighted with red circles in the figure. They were recorded on Dec. 24th, Dec. 27th, and Jan. 1st, 2017 with values of 66.7, 57.6, and 53.4 µg/m^3, respectively. With the exception of the FRM PM2.5 measured on Jan 1st, 2009, these three values are the three highest daily FRM PM2.5

[70] [1] U.S. EPA, (2018). Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze. https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf

concentrations ever recorded at the Compton station—66 to 103% higher than the overall 98th percentile of all PM2.5 concentrations measured at the Compton station.

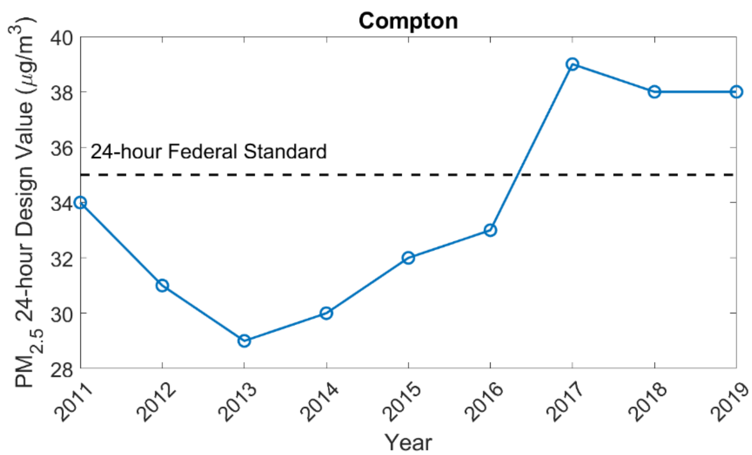


FIGURE V-1

PM2.5 Design Values Measured at the Compton Station

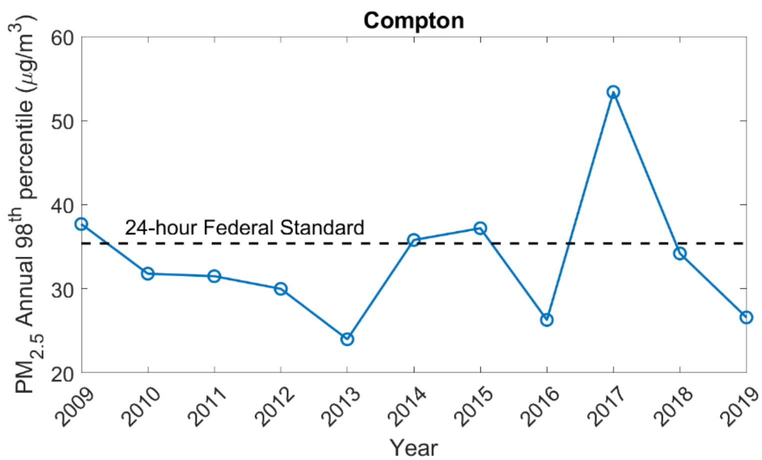


FIGURE V-2

Annual 98th Percentile Daily FRM PM2.5 Concentrations Measured at the Compton Station

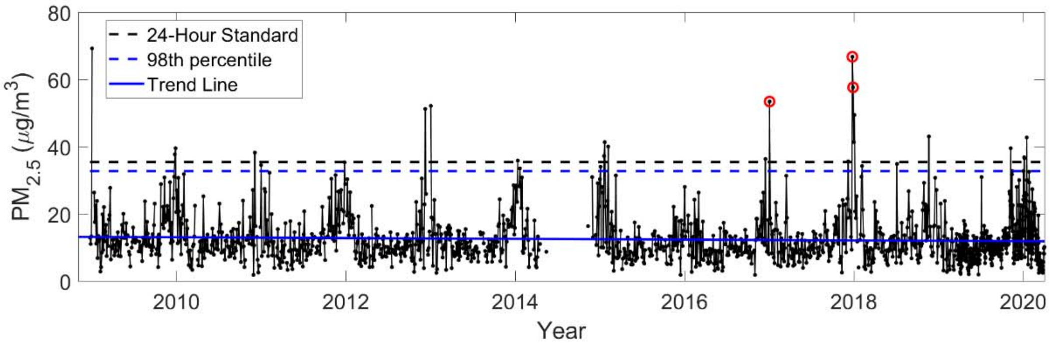
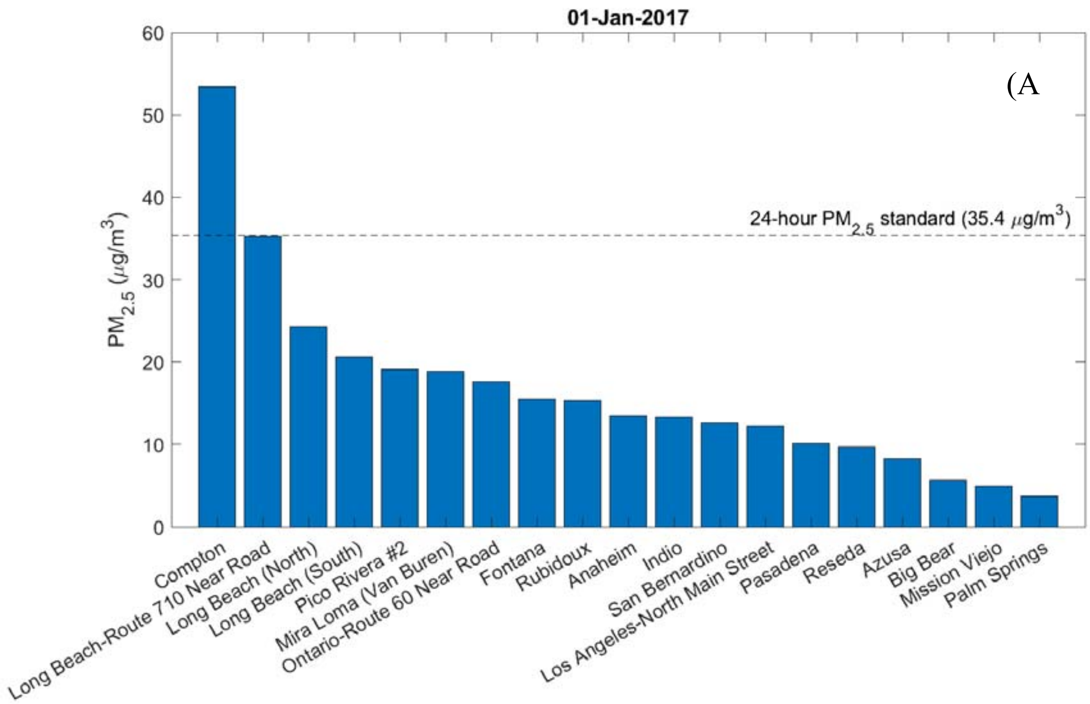
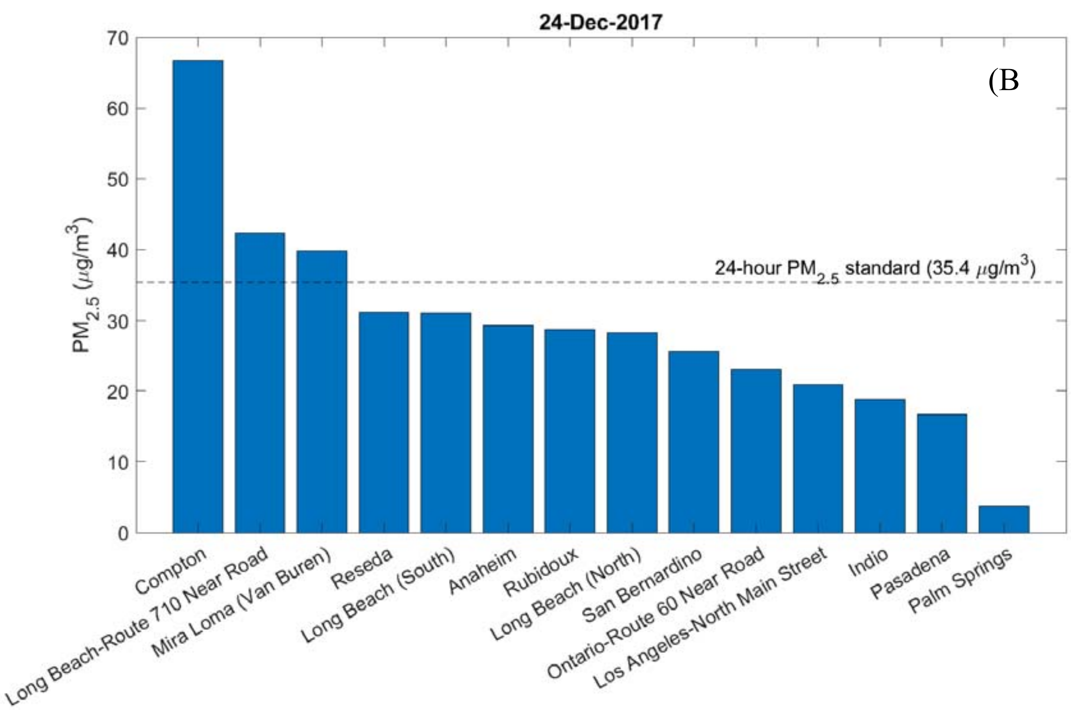


FIGURE V-3

Daily FRM PM2.5 Concentrations Measured at the Compton Station. The three highest PM2.5 concentrations in 2017 are highlighted with red circles. The 98th percentile of all historical PM2.5 measurements at Compton is shown on the plot.

FRM PM2.5 concentrations measured at all stations in the South Coast AQMD's jurisdiction on Jan. 1st, Dec. 24th, and Dec. 27th, 2017 are presented in Figure V-4. Since daily sampling is not conducted at every station, the number of stations that have FRM PM2.5 measurements available vary by date. On Jan. 1st, 2017, as shown in Figure V-4(a), the highest PM2.5 concentration was shown in Compton, which is about 51% higher than the second highest PM2.5 concentration measured in the Basin (at the Long Beach – Route 710 Near Road station). Except for these two stations, PM2.5 concentrations at all other stations in the South Coast AQMD jurisdiction were below 25 μg/m^3. This indicates that the high PM2.5 concentration at Compton on Jan 1st, 2017 was likely caused by a local emission source. On Dec 24th, concentrations in Compton were significantly higher than any other stations in the region, indicating the presence of a localized PM2.5 event. The high PM2.5 concentrations at Compton on Dec. 27th, 2017 was likely caused by regional events, such as unfavorable meteorological conditions or widespread residential wood burning as concentrations in Compton were similar to recorded values in nearby Long Beach stations. Subsequent analyses presented in this document provide additional evidence to support these assertions.


01-Jan-2017
(A
24-hour $PM_{2.5}$ standard (35.4 $\mu g/m^3$)
$PM_{2.5}$ ($\mu g/m^3$)
60
50
40
30
20
10
0
Compton
Long Beach-Route 710 Near Road
Long Beach (North)
Long Beach (South)
Pico Rivera #2
Mira Loma (Van Buren)
Ontario-Route 60 Near Road
Fontana
Rubidoux
Anaheim
Indio
San Bernardino
Los Angeles-North Main Street
Pasadena
Reseda
Azusa
Big Bear
Mission Viejo
Palm Springs


24-Dec-2017
(B
24-hour $PM_{2.5}$ standard (35.4 $\mu g/m^3$)
$PM_{2.5}$ ($\mu g/m^3$)
70
60
50
40
30
20
10
0
Compton
Long Beach-Route 710 Near Road
Mira Loma (Van Buren)
Reseda
Long Beach (South)
Anaheim
Rubidoux
Long Beach (North)
San Bernardino
Ontario-Route 60 Near Road
Los Angeles-North Main Street
Indio
Pasadena
Palm Springs

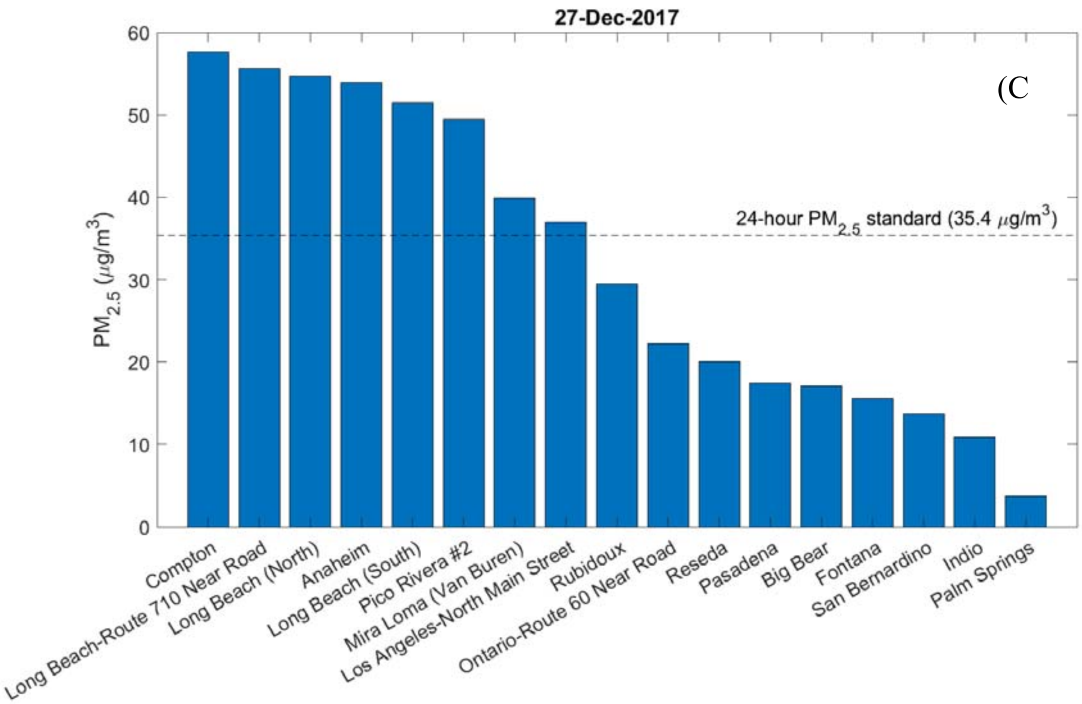


FIGURE V -4

FRM PM2.5 Concentrations Measured at All Stations in the South Coast AQMD's Jurisdiction on (A) Jan. 1st, 2017, (B) Dec. 24th, 2017, And (C) Dec. 27th, 2017

Meteorology on Dec. 24th and Dec. 27th, 2017 was unusual and highly favorable for accumulating PM2.5

The meteorological potential to accumulate PM2.5 was evaluated using North American Mesoscale (NAM) forecast products. (National Centers for Environmental Information, 2020) 12 Universal Time Coordinate (UTC) forecast cycle with 12 km grid resolution forecasts were coupled with PM2.5 measurements at Compton between 2009-2020. Only cold months (October through March) were employed in the analysis. The goal of this effort is to evaluate the typicality of the meteorology associated with the three highest PM days in 2017. In addition to the three 2017 days of interest, December 16, 2018 is included as a benchmark case for wood smoke influence, since the day had an anomalously high wood smoke presence as marked by high levels of levoglucosan, a by-product of wood burning.

Table V-1 shows the meteorological variables that were analyzed. We used correlations between PM2.5 measurements at Compton and each meteorological variable and percentile calculations to define a weather influence 'wxInfluence' score. This score indicates the extent to which the set of meteorological conditions is favorable for the accumulation of PM2.5, with higher numbers indicating more favorable conditions. Since the NAM model has a 12 km resolution, this analysis will not capture any micrometeorological effects, but the relationship between the weather variables and PM2.5 is specific to patterns at Compton. Note that 'SameDay' in the variable name indicates that the variable represents the day of the observations and 'PreviousEve' represents the weather the evening before the observation. Weather data was aggregated this way because weather and PM2.5 concentrations from one day can influence the PM2.5 concentrations on the following day. Similarly, 'ThreeDay' variables are aggregations of weather variables for the day of the observation and the two prior days.

TABLE V-1

Weather variables initially included in analysis

Aggregated Variable	Units	Aggregation	Hours	NAM Variable
PreviousEve10mWindspeed (Windspeed at 10 m height)	m/s	mean	16 to 23	UGRD_10maboveground, VGRD_10maboveground
SameDay10mWindspeed (Windspeed of 10 m height)	m/s	mean	0 to 23	UGRD_10maboveground, VGRD_10maboveground
PreviousEveWindspeed850mb (Windspeed at 850 mb)	m/s	mean	16 to 23	UGRD_850mb,VGRD_850 mb
SameDayWindspeed850mb (Windspeed at 850 mb)	m/s	mean	0 to 23	UGRD_850mb,VGRD_850 mb
PreviousEveMinTemp (Temperature)	K	min	16 to 23	TMP_2maboveground
PreviousEveMaxTemp (Temperature)	K	max	16 to 23	TMP_2maboveground
SameDayMinTemp (Temperature)	K	min	0 to 23	TMP_2maboveground
SameDayMaxTemp (Temperature)	K	max	0 to 23	TMP_2maboveground
PreviousEvePrecip (Precipitation)	kg/m^2	sum	16 to 23	APCP_surface
SameDayPrecip (Precipitation)	kg/m^2	sum	0 to 23	APCP_surface
PreviousEveVent (Ventilation)	m^2/s	mean	16 to 23	VRATE_planetaryboundar ylayer
SameDayVent (Ventilation)	m^2/s	mean	0 to 23	VRATE_planetaryboundar ylayer

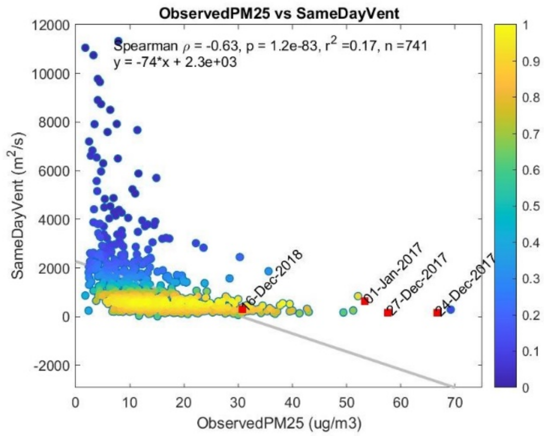
ThreeDayVent (Ventilation)	m^2/s	mean	0 to 23	VRATE_planetaryboundarylayer
PreviousEvePBH (Planetary Boundary Height)	m	max	16 to 23	HPBL_surface
SameDayPBH (Planetary Boundary Height)	m	max	0 to 23	HPBL_surface
PreviousEveUwind (East-west component of wind at 10 m height)	m/s	mean	16 to 23	UGRD_10maboveground
SameDayUwind (East-west component of wind at 10 m height)	m/s	mean	0 to 23	UGRD_10maboveground
PreviousEveVwind (North-sound component of wind at 10 m height)	m/s	mean	16 to 23	VGRD_10maboveground
SameDayVwind (North-sound component of wind at 10 m height)	m/s	mean	0 to 23	VGRD_10maboveground
PreviousEveRH (Relative humidity)	%	mean	16 to 23	RH_2maboveground
SameDayRH (Relative humidity)	%	mean	0 to 23	RH_2maboveground
PreviousEveDSWRF (Downwelling shortwave radiation flux)	W/m^2	mean	16 to 23	DSWRF_surface
SameDayDSWRF (Downwelling shortwave radiation flux)	W/m^2	mean	0 to 23	DSWRF_surface
PreviousEveVwind850mb (North-south component of wind at 850 mb)	m/s	mean	16 to 23	VGRD_850mb
SameDayVwind850mb (North-south component of wind at 850 mb)	m/s	mean	0 to 23	VGRD_850mb
PreviousEveUwind850mb (East-west component of wind at 850 mb)	m/s	mean	16 to 23	GRD_850mb
SameDayUwind850mb (East-west component of wind at 850 mb)	m/s	mean	0 to 23	GRD_850mb

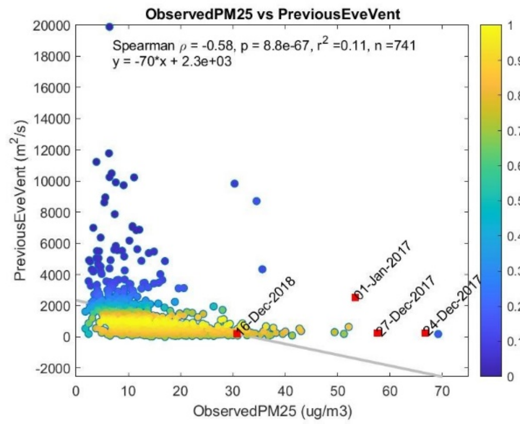
The Spearman rho (a non-parametric measure of correlation) was calculated between PM2.5 at Compton and each of the variables in Table V-1. The Spearman rho is the Pearson correlation coefficient computed using the ranks of the data instead of the numerical values. The Spearman rho reflects the strength of monotonic relationships, including linear and non-linear relationships (Wilks, 2011). The variables were ranked by the absolute value of the Spearman rho. The ten most-correlated weather variables from Table V-1 are shown in Table V-2. Figure V-7 show scatter density plots of each of these variables with PM2.5.

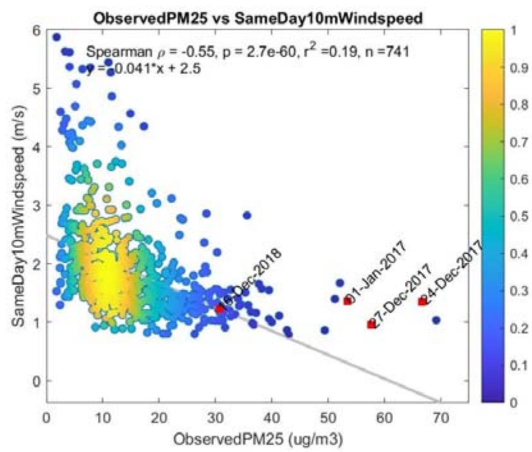
TABLE V-2

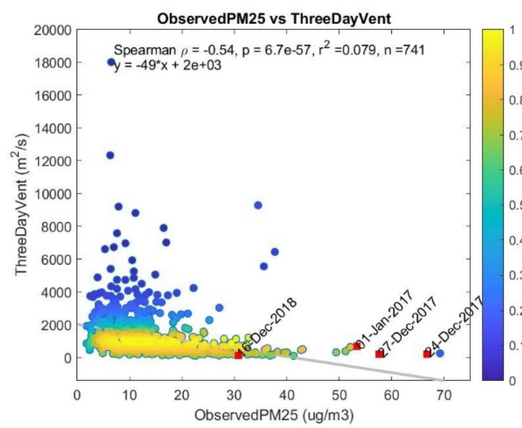
Ten weather variables most strongly correlated with PM2.5 (sample size of 741 observations). See Table V-1 for more detailed descriptions of the variables.

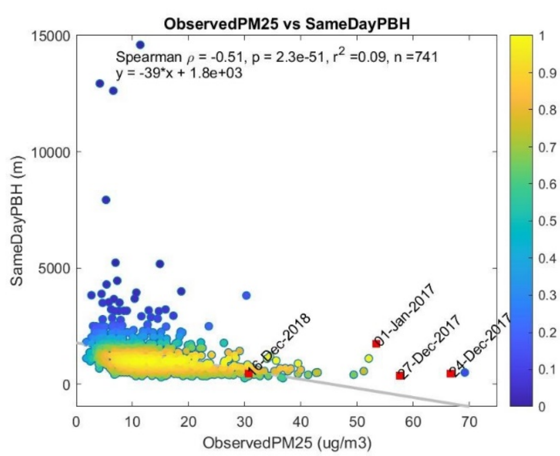
Weather Variable	Abs(Spearman rho)	Spearman rho	Spearmans P value	r^2	slope	intercept
SameDayVent	0.63	-0.63	0.00	0.17	-74.17	2269.62
PreviousEveVent	0.58	-0.58	0.00	0.11	-69.97	2342.84
SameDay10mWindspeed	0.55	-0.55	0.00	0.19	-0.04	2.49
ThreeDayVent	0.54	-0.54	0.00	0.08	-49.13	2024.39
SameDayPBH	0.51	-0.51	0.00	0.09	-39.18	1773.73
PreviousEve10mWindspeed	0.50	-0.50	0.00	0.16	-0.04	2.64
PreviousEvePBH	0.44	-0.44	0.00	0.08	-24.18	1290.06
PreviousEveUwind850mb	0.36	-0.36	0.00	0.08	-0.16	2.74
SameDayWindspeed850mb	0.32	-0.32	0.00	0.07	-0.09	6.92
PreviousEveWindspeed850mb	0.31	-0.31	0.00	0.05	-0.09	6.78

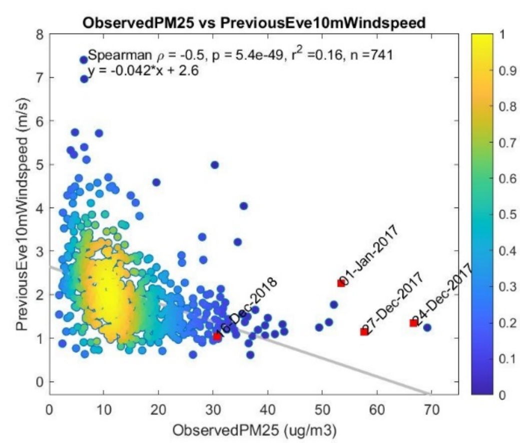

ObservedPM25 vs SameDayVent
Spearman ρ = -0.63, p = 1.2e-83, r² =0.17, n =741
y = -74*x + 2.3e+03
SameDayVent (m²/s)
ObservedPM25 (ug/m3)
16-Dec-2018
01-Jan-2017
27-Dec-2017
24-Dec-2017


ObservedPM25 vs PreviousEveVent
Spearman ρ = -0.58, p = 8.8e-67, r² =0.11, n =741
y = -70*x + 2.3e+03
PreviousEveVent (m²/s)
ObservedPM25 (ug/m3)
16-Dec-2018
01-Jan-2017
27-Dec-2017
24-Dec-2017


ObservedPM25 vs SameDay10mWindspeed
Spearman ρ = -0.55, p = 2.7e-60, r² =0.19, n =741
y = -0.041*x + 2.5
SameDay10mWindspeed (m/s)
ObservedPM25 (ug/m3)
16-Dec-2018
01-Jan-2017
27-Dec-2017
24-Dec-2017


ObservedPM25 vs ThreeDayVent
Spearman ρ = -0.54, p = 6.7e-57, r² =0.079, n =741
y = -49*x + 2e+03
ThreeDayVent (m²/s)
ObservedPM25 (ug/m3)
16-Dec-2018
01-Jan-2017
27-Dec-2017
24-Dec-2017


ObservedPM25 vs SameDayPBH
Spearman ρ = -0.51, p = 2.3e-51, r² =0.09, n =741
y = -39*x + 1.8e+03
SameDayPBH (m)
ObservedPM25 (ug/m3)
16-Dec-2018
01-Jan-2017
27-Dec-2017
24-Dec-2017


ObservedPM25 vs PreviousEve10mWindspeed
Spearman ρ = -0.5, p = 5.4e-49, r² =0.16, n =741
y = -0.042*x + 2.6
PreviousEve10mWindspeed (m/s)
ObservedPM25 (ug/m3)
16-Dec-2018
01-Jan-2017
27-Dec-2017
24-Dec-2017

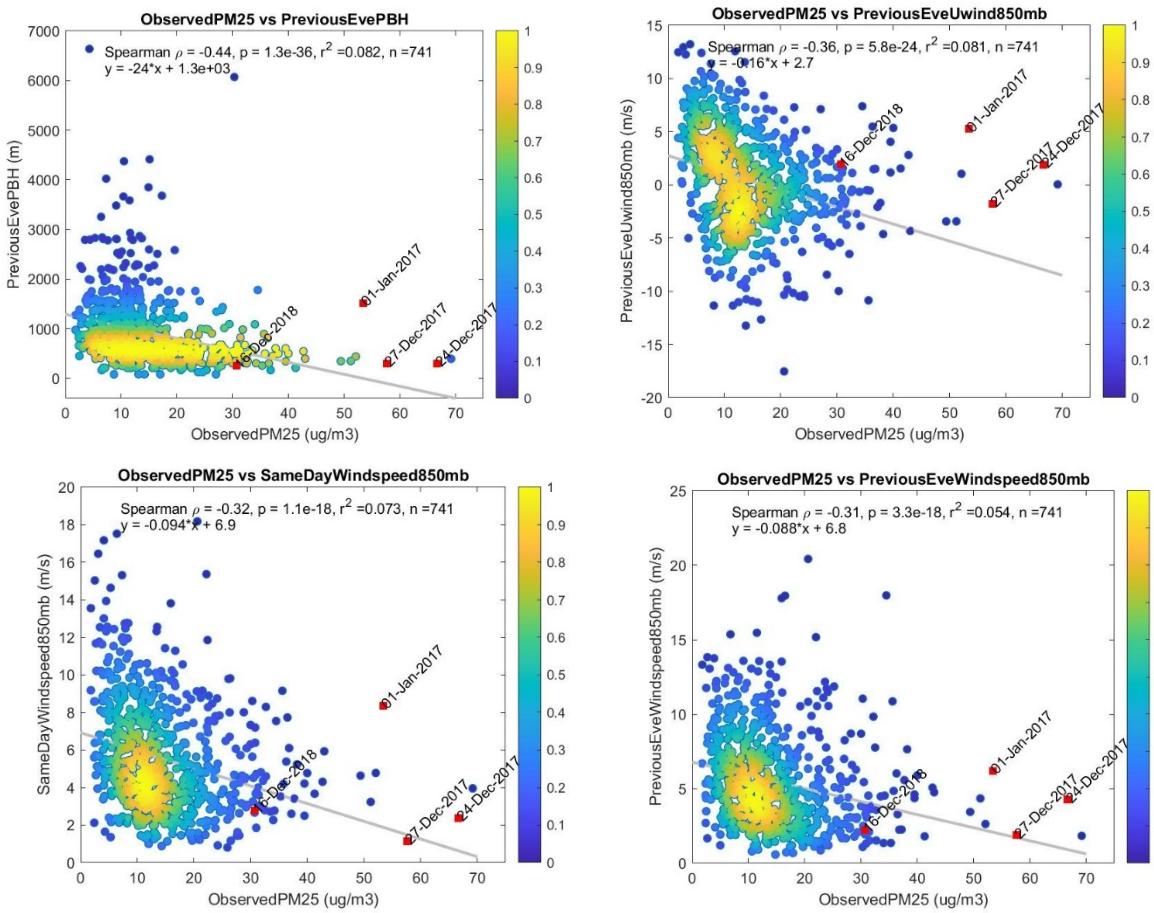


FIGURE V-7

Density Scatter Plots of PM2.5 and the Weather Variables in Table V-2. The color bars indicate the relative density of data points next to each other, as data can be plotted on top of each other in scatter plots.

A weighted score representing the favorability for high PM2.5 ($Favorability_{date\ i, weather\ variable\ j}$) was created for each variable for each day during October-March from 2009 through March of 2020. A total of 741 days were included in this analysis, since scores were not able to be calculated for 42 days that had missing NAM data. For variables with a positive Spearman rho ($\rho_{weather\ variable\ j}$), we multiplied the percentile of the weather variable within its distribution for all days (excluding the three dates of interest and December 16th, 2018) by the Spearman rho. For variables with a negative Spearman rho, the score of favorability for high PM2.5 was created by multiplying 100 minus the percentile by the absolute value of the Spearman rho.

For $\rho_{weather\ variable\ j} \geq 0$:

$$Favorability_{date\ i, weather\ variable\ j} = \rho_{weather\ variable\ j} * percentile_{date\ i, weather\ variable\ j}$$

For $\rho_{weather\ variable\ j} < 0$:

$$Favorability_{date\ i,weather\ variable\ j} = abs(\rho_{weather\ variable\ j}) * (100 - percentile_{date\ i,weather\ variable\ j})$$

The variables with negative Spearman rho were calculated with this method so that a larger score of favorability consistently indicates that PM2.5 is more likely to be higher, regardless of the sign of the correlation. An overall favorability score variable 'wxInfluence' for a given day was calculated by adding up the favorability score for each variable in Table V-2 for that day. The hypothetical upper bound of the wxInfluence value on any given day is 1000 and would only happen if all variables in Table V-2 had Spearman rho's with an absolute value of 1 and each weather variable in Table V-2 was at its extreme percentile that favored PM2.5 accumulation.

$$wxInfluence_{date\_i} = \sum_{weather\ variable\ j=1}^{10} Favorability_{date\ i,weather\ variable\ j}$$

December 27, 2017, December 16, 2018, and December 24, 2017 have percentile values of 99.81, 97.91, and 94.98, respectively, indicating that meteorological conditions on these days were unusually favorable for the accumulation of high concentrations of PM2.5. In other words, the weather influence score was higher on December 27, 2017 than 99.81% of days between 2009 and 2020.

Figure V-5 shows the density scatter plot of wxInfluence versus PM2.5 concentration (including only the days that have PM2.5 observations). Note that the weather influence score was calculated for days even without PM2.5 observations. The Spearman rho correlation of wxInfluence and PM2.5 is 0.69 and is statistically significant.

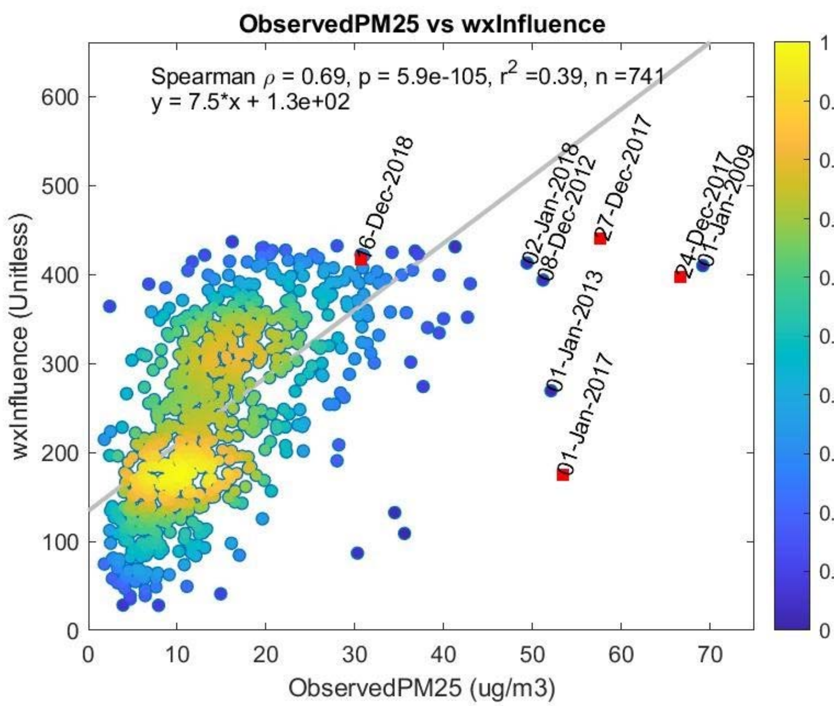


FIGURE V -5

Density Scatter Plot of Observed PM2.5 and Wxinfluence Score. The red squares indicate the values for the dates of interest. The dates of interest and all dates with PM2.5 concentrations above 45 µg/m^3 are individually labeled. The color bar indicates the relative density of data points next to each other, as data can be plotted on top of each other in scatter plots.

Figure V-6 shows the distribution of the wxInfluence variable with the four dates of interest overlaid on the distribution. This figure indicates that the high PM on December 27, 2017 was likely driven by meteorology, but the high PM on Jan. 1 was not likely to be driven by meteorology. High concentrations recorded on December 24th were likely partially driven by meteorology, as indicated by its weather influence score being in the top 5%. However, the contribution from local emissions on December 24th was also significant, as it was the second highest PM2.5 value ever recorded at Compton.

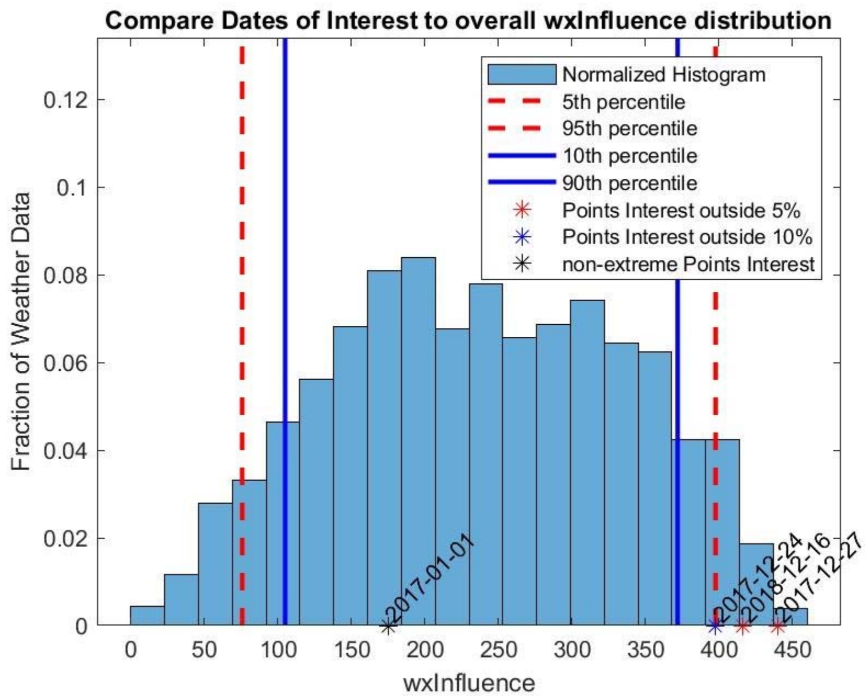


FIGURE V -6

Distribution of Wxinfluence Score with Dates of Interest Overlaid.

A model developed to predict PM2.5 at Compton suggests that remarkably high PM2.5 concentrations in Compton on Jan 1st, Dec. 24th, and Dec 27th, 2017 were caused by unusual or atypical sources

Machine learning techniques were used to create a backcasting model for PM2.5 at Compton using the record of Compton PM2.5 observations during 2009-2020 as training data, with meteorological and calendar parameters along with traffic flow data as predictor variables. The model was restricted to the months of October through March. The influence of meteorology on PM2.5 concentrations is represented in the model by meteorological forecast data from the North American Mesoscale (NAM) model (National Centers for Environmental Information, 2020). The influence of human behavior on PM2.5 concentrations is represented in the model by calendar-based patterns such as day of week and proximity to holidays. We used the Matlab Regression

Learner® software to train the machine learning model. This software allows many predictor variables to be included and removed to allow the user to find combinations of predictor variables that improve the model performance and provides a comprehensive set of machine learning model techniques.

A list of all dates from January 1, 2009 through March 31, 2020 occurring during the months of October through March define the period of interest for this model (2095 dates). The three dates of interest in 2017 and December 16th, 2018 were removed, leaving 2091 dates. Of the remaining dates, 20% (418 dates) were randomly selected as the validation set, i.e., held out. All remaining dates (1673 dates) were designated as potential training dates. Dates with either missing NAM or PM2.5 data or indications of wildfire smoke (via the Hazard Mapping System and South Coast AQMD wildfire smoke advisory records) were removed, leaving a training data set of 584 dates. The Spearman rho correlation was calculated between observed PM2.5 in the training data and each of the variables in Table V-1. Of the 27 weather variables considered for training the machine learning model, 21 had a statistically significant Spearman rho correlation coefficients. For each of these 21 variables, an additional 'Favorability' variable was calculated for each day, which was the absolute value of the Spearman rho multiplied by the percentile of the weather variable value within the distribution of the training data. For variables with a negative Spearman rho, 100 minus the percentile was used instead of the percentile so that larger values always indicate conditions that are more favorable for higher PM2.5 concentrations. Several calendar parameters were used as predictor variables, such as year, month name (categorical variable), holidays, etc. CalTrans Performance measurement system (PeMS) traffic data for a monitor on the I-710 freeway near the Compton site for November 15, 2019 through February 14, 2020 were used to calculate day-of-week average truck flow and non-truck vehicle flow values. Vehicle flow values for each day of week during non-holiday periods, on holidays, and near holidays were calculated separately. These vehicle flow averages were then assigned by day of week and near-holiday status for the full time period of the training data.

Several machine learning algorithms were initially tested, and the Exponential Gaussian Process Regression algorithm consistently performed best for both the Compton PM2.5 model and the levoglucosan model (detailed below). An Exponential Gaussian Process Regression model was tested using several combinations of predictor variables. The final model includes the variables listed in Table V-3.

The model was used to predict PM2.5 for the 418 held-out dates as well as the three 2017 dates of interest and December 16, 2018, the day with the extremely high levoglucosan concentration. A scatter plot of observations versus predictions is given in Figure V-8. For the held-out dates (excluding the dates of interest), the RMSE is 4.76 with an r^2 of 0.70. These held-out dates were not used to train the model so they are an independent dataset for validation purposes. Figure V-9 is a plot of the residuals as a function of measured PM2.5 concentration. Figure V-9 indicates that the residual generally increases with concentration and the residuals for the 2017 dates of interest are larger than any of the held-out data. The model performed well in predicting the PM2.5 concentration on December 16, 2018—the day with extremely high levoglucosan concentration; the residual for this date was relatively small , while the residuals are quite large for the three 2017 dates of interest. All of the December dates of interest had similar weather in terms of favorability for high PM2.5 accumulation. This suggests that even if we take meteorology and calendar parameters into account, the model still underpredicts these high values, which suggests that unusual or unaccounted emission sources are influencing concentrations on exceedance days.

In conclusion, the machine learning model predicts PM levels that are in reasonable agreement with measurements (Figure V-8), however, it failed to reproduce the three high PM days in question. This indicates that typical meteorology and seasonality represented by day of a year did not drive the exceptionally high concentrations recorded in Compton, and it is likely that local episodic emissions contributed to the high PM levels in Compton on the three highest days in 2017.

TABLE V-3

Final variables included in model

Variable	Description
SameDay10mWindspeed	Average windspeed at a height of 10 m on the date of the observation.
PreviousEveWindspeed850mb	Average windspeed at 850 mb the evening before the date of the observation.
SameDayWindspeed850mb	Average windspeed at 850 mb on the date of the observation.
PreviousEveMinTemp	Minimum temperature the evening before the date of the observation.
PreviousEveVwind	Average north/south component of the wind the evening before the date of the observation.
SameDayVwind	Average north/south component of the wind on the date of the observation.
SameDayRH	Average relative humidity on the date of the observation.
SameDayDSWRF	Average downwelling shortwave radiation flux on the date of the observation.
PreviousEveUwind850mb	Average east/west component of the wind at 850 mb the evening before the date of the observation.
PreviousEve10mWindspeedFavorability	Average ‘favorability’ of windspeed at a height of 10 m the evening before the date of the observation.

	See text for explanation of 'favorability' calculation.
SameDayWindspeed850mbFavorability	Average 'favorability' of windspeed at 850 mb on the date of the observation.
SameDayPrecipFavorability	Average 'favorability' of precipitation on the date of the observation.
SameDayVentFavorability	Average 'favorability' of ventilation on the date of the observation.
ThreeDayVentFavorability	Average 'favorability' of ventilation on the date of the observation and the two prior days.
PreviousEvePBHFavorability	Average 'favorability' of planetary boundary height the evening before the observation.
SameDayPBHFavorability	Average 'favorability' of planetary boundary height on the date of the observation.
SameDayVwindFavorability	Average 'favorability' of north/south component of wind at a height of 10 m on the date of the observation.
Year	Year
Weekend	1 on Saturday and Sundays; 0 otherwise.
HolidayTypeCode	0 on non-holidays, 2 on Thanksgiving, December 25, and January first. 1 on all other holidays.
ProximityToMajorHoliday	0 on holidays, -4 if 4 or more days before or after major holidays. -1 if the day before or after a major holiday, and so on.
Eve	Binary variable = 1 for December 24 and December 31, 0 otherwise.
TruckFlow	Truck Flow from PEMS data for a monitor near Compton Site. Averages calculated by day-of-week and near-holiday status.
NonTruckFlow	Non-Truck Vehicle Flow from PEMS data for a monitor near Compton Site. Averages calculated by day-of-week and near-holiday status.

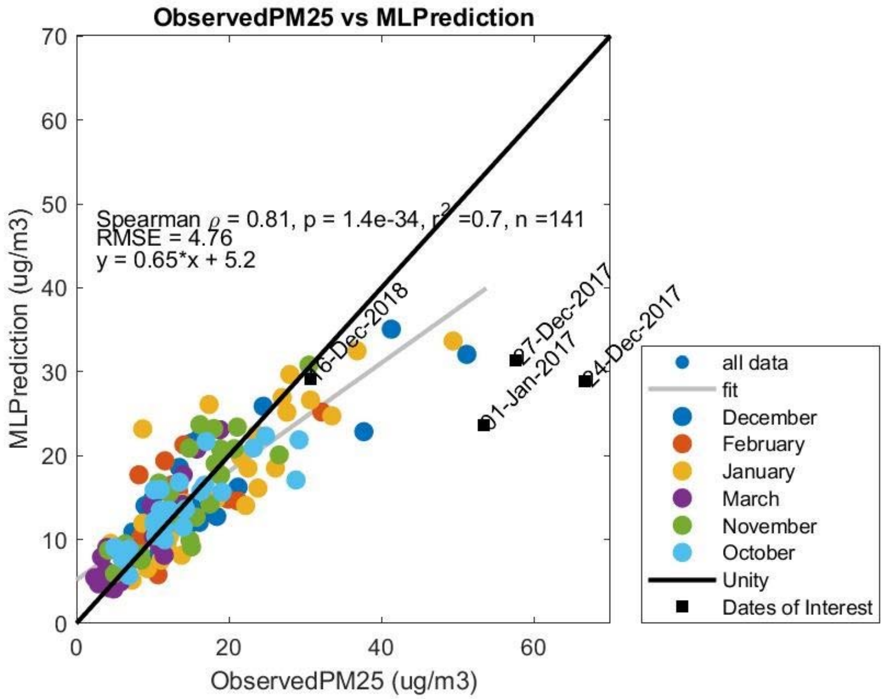


FIGURE V -7

Comparison of Observations and Model Predictions for PM2.5 at Compton. The dates of interest were not used to determine the fit and statistical values in the figure.

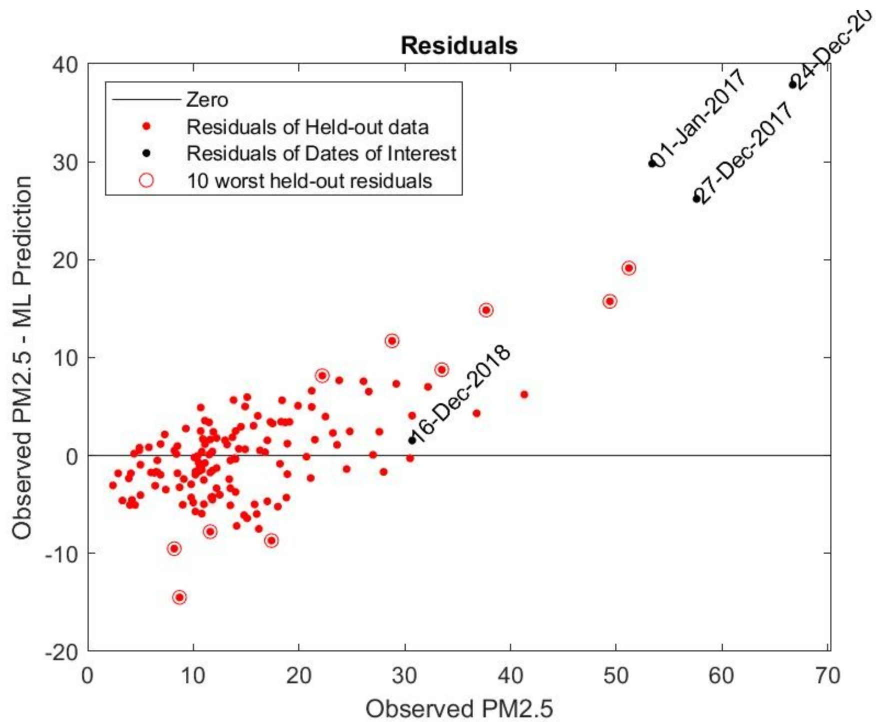


FIGURE V -8

Residuals of Model Predictions as A Function of Observations of PM2.5 at Compton.

Fireworks contributed to the high PM2.5 concentration on Jan 1st, 2017

To show the potential impact of fireworks on high PM2.5 in Compton on Jan 1st, 2017, we analyzed PM2.5 FRM filter samples using X-Ray Fluorescence (XRF) for concentrations of 50 inorganic and metal species. All species analyzed by the XRF are listed in Table V-5. We analyzed PM2.5 FRM filters collected during July 4th and 5th, 2017 and 2018, and the PM2.5 FRM filter collected at Compton on Jan 1st, 2017. A complete list of sampling dates and stations of all FRM filters analyzed with XRF can be found in Table V-4.

TABLE V-4

List of sampling dates and stations of all FRM filters analyzed with XRF.

Sample Date	Sample Date	Events
7/4/2017	Anaheim	Independence Day
7/4/2017	Ontario-Route 60 Near Road	Independence Day
7/4/2017	Los Angeles-North Main Street	Independence Day
7/5/2017	Ontario-Route 60 Near Road	Independence Day
7/5/2017	Mira Loma	Independence Day
7/5/2017	Rubidoux	Independence Day
7/4/2018	Anaheim	Independence Day
7/4/2018	Azusa	Independence Day
7/4/2018	Compton	Independence Day
7/4/2018	Pico Rivera #2	Independence Day
7/5/2018	Ontario-Route 60 Near Road	Independence Day
7/5/2018	Anaheim	Independence Day
7/5/2018	Mira Loma	Independence Day
1/1/2017	Compton	New Year

TABLE V-5
List of inorganic and metal species analyzed by XRF.

Species	CAS Number
Na	7440-23-5
Mg	7439-95-4
Al	7429-90-5
Si	7440-21-3
P	7723-14-0
S	7704-34-9
Cl	7782-50-5
K	7440-09-7
Ca	7440-70-2
Ti	7440-32-6
V	7440-62-2
Cr	7440-47-3
Mn	7439-96-5
Fe	7439-89-6
Co	7440-48-4
Ni	7440-02-0
Cu	7440-50-8
Zn	7440-66-6
Ga	7440-55-3
Ge	7440-56-4
As	7440-38-2
Se	7782-49-2
Br	7726-95-6
Rb	7440-17-7
Sr	7440-24-6

Species	CAS Number
Y	7440-65-5
Zr	7440-67-7
Nb	7440-03-1
Mo	7439-98-7
Rh	7440-18-8
Pd	7440-05-3
Ag	7440-22-4
Cd	7440-43-9
In	7440-74-6
Sn	7440-31-5
Sb	7440-36-0
Te	13494-80-9
Cs	7440-46-2
Ba	7440-39-3
La	7439-91-0
Ce	7440-45-1
Nd	7440-00-8
Sm	7440-19-9
Gd	7440-54-2
Pt	7440-06-4
Au	7440-57-5
Tl	7440-28-0
Pb	7439-92-1
Bi	7440-69-9
U	7440-61-1

Metals are a major chemical component of firework smoke. For example, potassium nitrate, a major component in fireworks, is mixed with sulfur and charcoal to create an explosion. Also, metals such as copper, barium, strontium, titanium, and aluminum are often added to fireworks to produce distinct colors upon detonation. In the South Coast Air Basin, the highest PM2.5 concentrations in the summer months have always been recorded on July 4th and 5th because of Independence Day fireworks celebrations. There are also some fireworks events on New Year's Eve and widespread use of consumer-grade fireworks. However, fireworks activities on New Year's Eve are usually less intensive than the fireworks activities on Independence Day.

To quantify the contribution of fireworks on PM2.5 in Compton on Jan. 1st, 2017, We define the following ratio "R" as:

$$R = \frac{\Delta XRF}{\Delta PM25}$$

Where ΔXRF is the increased metallic PM2.5 concentrations on fireworks days measured by the XRF. $\Delta PM25$ is the PM2.5 caused specifically by fireworks emissions. This value is not unity because fireworks also emit non-metallic PM2.5 species. We rely on the following assumptions for the analysis:

1) R was the same on July 4th-5th and New Year's Day meaning that the enhancement in total PM2.5 mass relative to the enhancement in metallic PM2.5 is consistent.

2) The increased PM2.5 mass ($\Delta PM25$) on July 4th-5th was solely caused by fireworks emissions. Summertime PM2.5 concentrations are typically consistent day to day as the meteorology is persistent in the South Coast Air Basin in the summer months. It is reasonable to assign any significant increases in PM2.5 during these months to changes in emission and not meteorology as the increased mass from fireworks is typically much larger than the mass on previous days.

3) The increased XRF mass (ΔXRF) on both July 4th-5th and New Year's Day were solely caused by fireworks emissions. As in (2), summertime XRF mass is typically consistent day to day as the meteorology is persistent in the South Coast Air Basin in the summer months. It is reasonable to assign any significant increases in XRF mass during these months to changes in emission and not meteorology.

To calculate $\Delta PM25$ on July 4th-5th, we subtracted the averaged FRM PM2.5 concentration measured in June and July from PM2.5 mass measured on July 4th and 5th. PM2.5 mass measured on July 4th and 5th were removed when calculating the June and July average.

To calculate ΔXRF on both July 4th-5th and New Year's Day, we estimated the XRF mass from fireworks emissions using either total PM2.5 speciation mass measured by XRF (metals + S, Cl, Si, and P), total metal concentration measured by XRF, or total concentrations of metals that are related to fireworks emissions (Na, Mg, Al, K, Ti, Cu, Sr, and Ba) measured by XRF. The long-term PM2.5 speciation data measured at the Los Angeles-North Main Street station were used to estimate the ambient background of the inorganic and metal species measured by the XRF.
Therefore, since R can be calculated using XRF and PM2.5 data on July 4th-5th, and the ΔXRF in Compton on Jan 1st, 2017 can be calculated with the methods shown above, the $\Delta PM25$ in Compton on Jan 1st, 2017 can then be estimated using ΔXRF/R. Results are shown in Table V-6. Using different assumptions for calculating ΔXRF, the PM2.5 caused by fireworks in Compton on Jan 1st, 2017 was estimated to be between 7.84 to 12.47 µg/m^3, which is 14.7 – 23.4% of the total PM2.5 mass measured in Compton on Jan 1st, 2017.

TABLE V-6

Estimation of the concentration of the PM2.5 caused by fireworks in Compton on Jan 1st, 2017.

	higher estimate of PM2.5 caused by fireworks, $\mu g/m^3$	lower estimate of PM2.5 caused by fireworks, $\mu g/m^3$
Using increased total XRF mass	12.47	8.38
Using increased total metal mass	10.3	7.84
Using increased fireworks metal mass	11.14	8.42

While this increased mass from fireworks on Jan 1st, 2017 was not large enough to give an exceptional event demonstration regulatory significance, this analysis shows that fireworks did play an important role in driving the atypically high concentrations on that day.

Residential wood burning likely contributed to high PM2.5 concentrations on Jan 1st, Dec 24th, and Dec 27th, 2017

Carbon Monoxide (CO) concentrations measured at Compton and other air quality monitoring stations in the South Coast AQMD's jurisdiction indicate that residential wood burning contributed to high PM2.5 concentrations on Jan 1st, Dec 24th, and Dec 27th, 2017. CO is a criteria pollutant that is measured continuously across the region and is a commonly used tracer for incomplete combustions. Gasoline vehicles are a major contributor to CO in urban environments, but residential wood burning activities also emit a large amount of CO, especially in the fall and winter months.

CO concentrations measured at Compton on Jan 1st and Dec 24th, 2017 are significantly higher than other stations in the South Coast Air Basin. CO concentrations measured at all stations in the South Coast Air Basin from Dec 27th, 2016 – Jan 4th, 2017 and Dec 21st, 2017 – Jan 2nd, 2018 are shown in Figure V-10. CO concentrations measured at Compton are shown in blue, while CO concentrations measured at other stations are shown in gray. As shown in the figure, CO concentrations usually show two peaks around morning and afternoon rush-hour, which are driven by vehicle traffic. However, on Jan 1st and Dec 24th, 2017, the highest CO concentration appeared at midnight on the following day. Since traffic are typically low during the overnight hours, these profiles suggest that residential wood burning was the dominant source of CO. Additionally, the peak CO concentration at Compton was roughly twice as high as the peak CO concentration measured at the second highest station on Jan 1st and Dec 24th, 2017, which suggests that there was more residential wood burning activity in or upwind of Compton than other regions of the South Coast Air Basin. On Dec 27th, 2017, the CO concentrations measured at Compton were also the highest in the region, but were not significantly higher than the other stations.

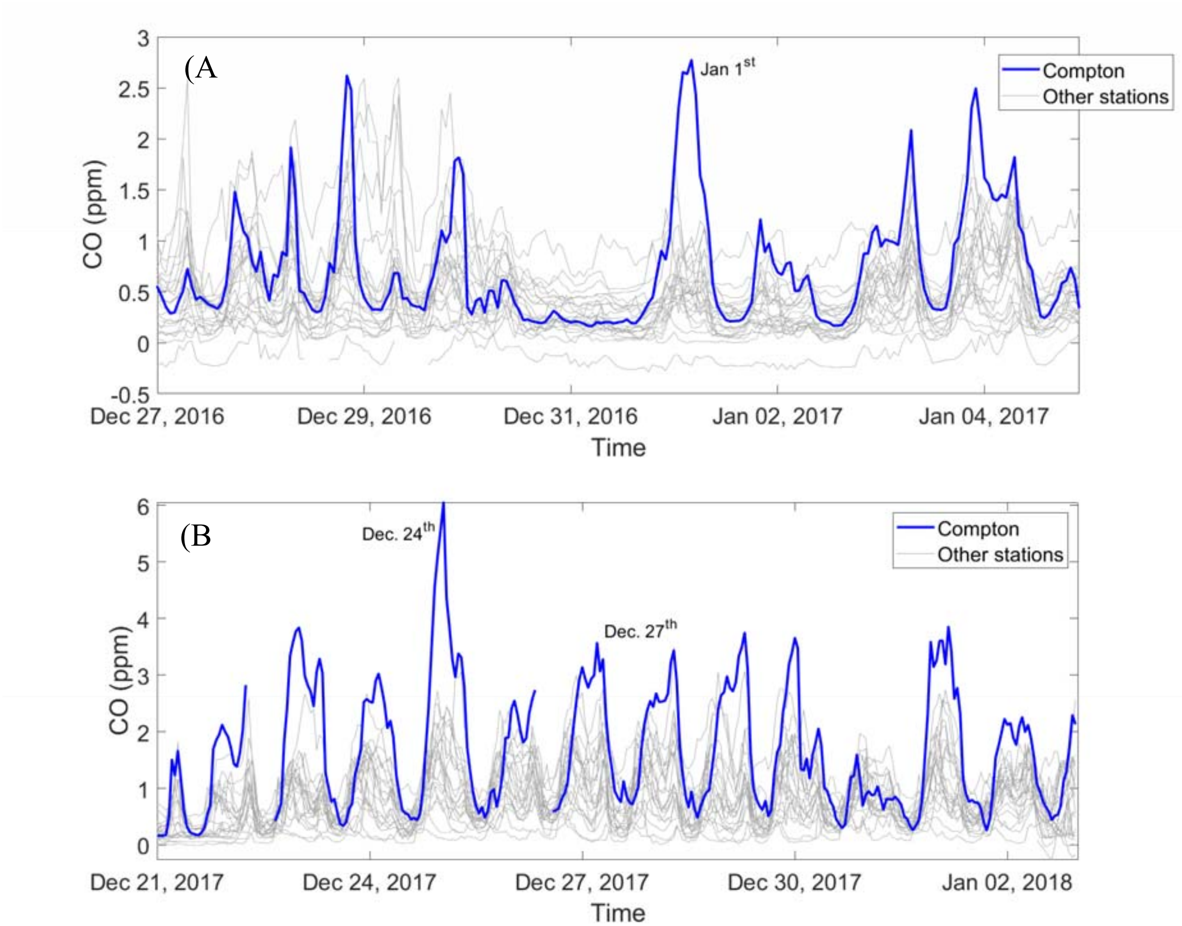


FIGURE V -9

CO Concentrations Measured at All Stations in the South Coast AQMD's Jurisdiction in (A) Dec 27th, 2016 – Jan 4th, 2017, and (B) Dec 21st, 2017 – Jan 2nd, 2018.

To further demonstrate that the CO concentrations measured on Jan 1st, Dec 24th, and Dec 27th, 2017 in Compton are abnormally high, we compared the CO diurnal profile measured on Jan 1st, Dec 24th, and Dec 27th, 2017 in Compton with the CO diurnal profile measured on all days between 2016 and 2019 (See Figure V-11). CO concentrations measured in each hour of all days in 2016-2019 are presented using a box-whisker plot. On Dec 24th and 27th, 2017, CO concentrations measured at almost all hours are in the range of the outliers, which are higher than the 99.65th percentile of all CO concentrations measured in each hour. On Jan 1st, 2017, with the exception of 9:00 am – 6:00 pm and 11:00 pm measurements, CO concentrations measured at all nighttime hours are either in the outlier range or higher than the 75th percentile of all CO concentrations measured in each hour.

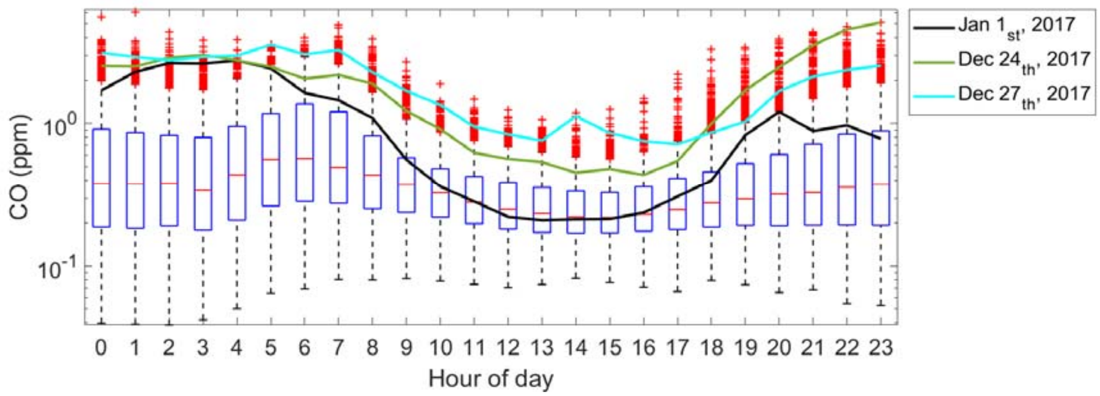
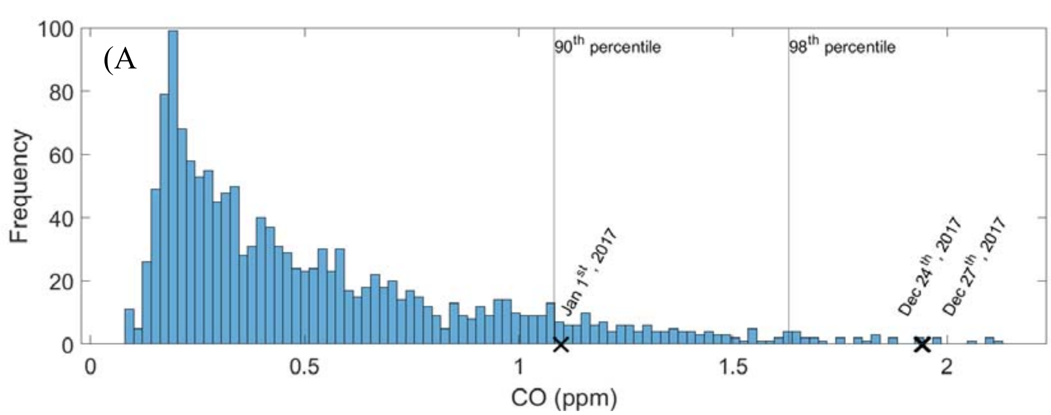


FIGURE V -10

Diurnal Profile of CO Concentrations Measured at Compton in 2016-2019. CO concentrations measured are presented using the box-whisker plot. The red line in the middle of the box represents the median value. The ends of the box represent the first and third quartiles. The length of the whiskers covers 99.3% assuming the data are normally distributed. Outliers are presented with red crosses. Note that the ordinate uses a logarithmic scale.

In Figure V-12, we presented the distribution of the daily average CO and the nighttime (midnight to 6:00 am and 6:00 pm to midnight) average CO measured in Compton in 2016-2019. Daily average measurements on Dec 24th and Dec 27th, 2017 are higher than the 98th percentile of all daily average CO measured in the 2016-2019 period while daily average CO measured on Jan 1st, 2017 is higher than the 90th percentile. For the nighttime average CO, measurements on Dec 24th and Dec 27th, 2017 are higher than the 98th percentile of all nighttime average CO measured in 2016-2019. The nighttime average CO measured on Jan 1st, 2017 was below but very close to the 98th percentile. The fact that CO concentrations were abnormally high on Jan 1st, Dec 24th, and Dec 27th, 2017 in Compton suggests that elevated residential wood burning activity contributed to the high PM2.5 concentrations measured on these days.



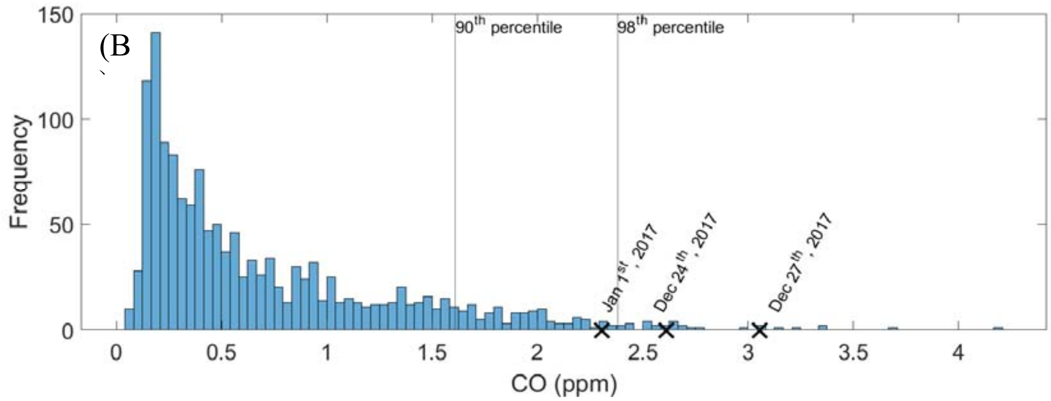


FIGURE V -11

The Distribution of (A) the Daily Average CO and (B) yhe Nighttime (from Midnight to 6 AM) Average CO Measured at Compton in 2016-2019

PM2.5 precursors, NOx and VOCs, have decreased over the past decade in Compton

Concentrations of PM2.5 precursors, NOx and VOCs, have both decreased over the past decade. Daily average NOx concentrations measured at the Compton station from Feb. 2009 to Aug. 2020 are presented in Figure V-10. The blue line is the linear trendline of all data, which illustrates a long-term declining trend. The annual NOx concentration in Compton decreased at an average rate of 1.39 ppb/year between 2009 and 2019. This trend in NOx concentrations suggest that NOx emission in Compton and its nearby areas have declined at a similar rate.

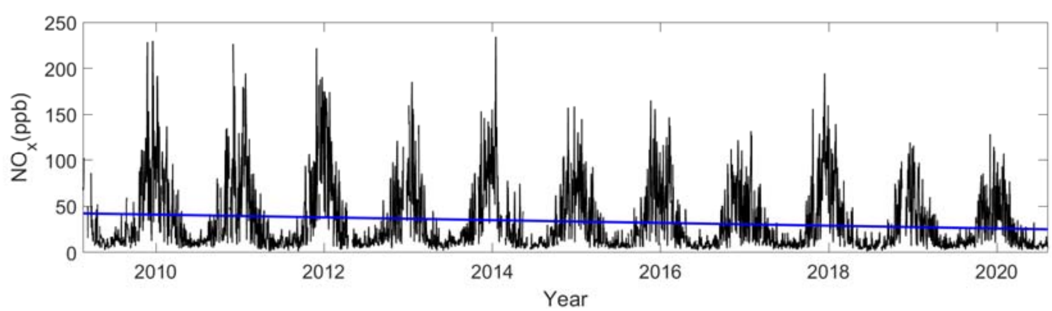


Figure V -12

Daily Average NOx Concentrations Measured in Compton

To show the long-term trend of the VOC concentration in Compton, we present the total speciated VOC concentrations measured in Compton during several periodic Multiple Air Toxics Exposure Studies (MATES) conducted by South Coast AQMD (Figure V-11). MATES are a series of year-long monitoring, modeling, and evaluation studies conducted in the South Coast Air Basin. The main purpose of MATES is to characterize the risk from exposure to air toxics across the South Coast Air Basin. Air toxics monitoring conducted for the three most recent MATES iterations, MATES III, MATES IV, and MATES V, occurred between Apr. 2004 – Mar. 2006, Jul. 2012 – Jun. 2013, May 2018 – Apr. 2019, respectively. Note that MATES V data is still preliminary. VOC samples were collected every 3 days during MATES III, and every 6 days during MATES IV and MATES V. Only VOC species that are measured in all three recent MATES are included to calculate the trends in total speciated VOC in Figure V-11. These VOC species are listed in Table V-7. The mean concentration of each VOC species was calculated using the Kaplan Meier Mean (KM mean) with Efron's bias correction to account for data below the method detection limit (MDL) (Helsel, 2012; Singh, Maichle, & Lee, 2006; Klein & Moeschberger, 2003). KM means of all speciated VOC concentrations are added together to calculate the total speciated VOC concentrations in Figure V-11. As shown in the figure, VOC concentrations measured in Compton have decreased from 2004 to 2019, indicating that the VOC emission in Compton have likely decreased over the same time period.

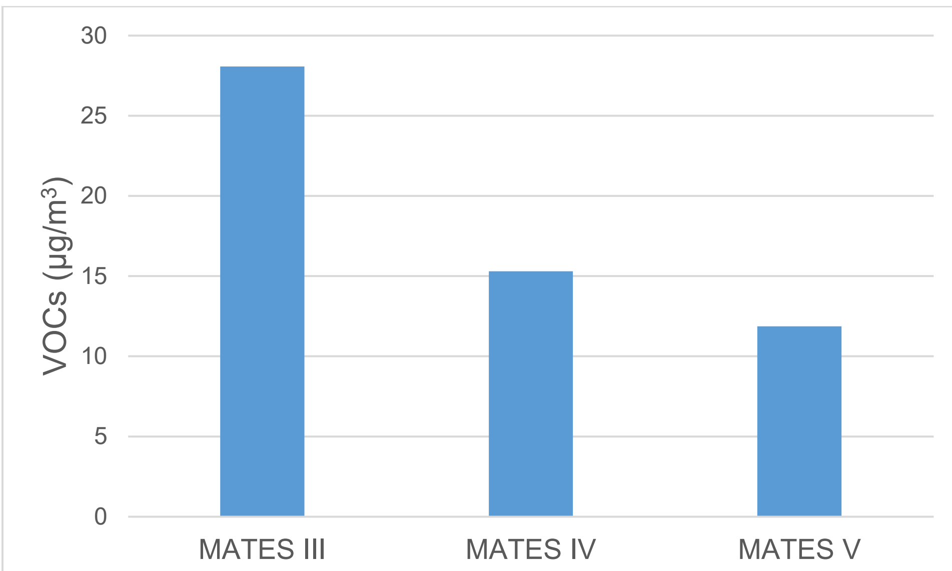


FIGURE V -13

Total Speciated Volatile Organic Compounds (VOCs) Concentrations Measured in Compton During the Multiple Air Toxics Exposure Studies (Mates). Mates V Data is Preliminary.

TABLE V-7

Key VOC species measured in MATES III, MATES IV, and MATES V.

VOC Species	CAS Number	MATES III number of valid samples	MATES IV number of valid samples	MATES V number of valid samples
1,3 Butadiene	106-99-0	69	48	51
Methylene Chloride	75-09-2	225	57	60
Methyl Ethyl Ketone	78-93-3	157	57	43
Benzene	71-43-2	237	57	61
Carbon Tetrachloride	56-23-5	235	51	61
Toluene	108-88-3	237	57	61
Ethyl Benzene	100-41-4	221	48	58
Xylene (m-, p-)	1330-20-7	237	56	57
Styrene	100-42-5	110	16	36
Xylene (o-)	95-47-6	129	36	58

PM2.5 design value is unlikely to exceed the PM2.5 24-hour federal standards in 2020-2023

To determine the likelihood of future PM2.5 design value exceedances in Compton during 2020 – 2023, we developed a statistical Monte Carlo technique to estimate future concentrations based on past measurements. We first start with the conservative assumption that PM2.5 precursor emissions and meteorology in future years will remain at 2009-2019 levels. We estimated the PM2.5 concentration on a given future day during 2020-2023 by randomly sampling one daily averaged PM2.5 concentration from PM2.5 concentrations measured on days near the same day of the year in the 2009-2019 period. This analysis assumes that emissions of PM2.5, including primary emissions and the emission of secondary PM precursors along with the resulting chemistry, are constant from 2009 to future years. This is a conservative assumption given that concentrations of PM2.5 precursors, NOx and VOCs, have decreased over the past decade (Figure V-10 and Figure V-11). Therefore, the actual PM2.5 design values in the future years are likely to be lower than the estimated design values with the assumption of constant emissions. This analysis also assumes that the meteorological conditions near the same day of the year in different years are similar.

Specifically, to estimate the PM2.5 concentrations measured in each future day during July 2020 – Dec. 2023, we set the sampling time window, N_{days}, as 7 days. The PM2.5 concentration in each future day is estimated as a random sample of all PM2.5 concentrations measured before and after N_{days} = 7 days of the same day of the year in 2009-2019. The PM2.5 concentration range for the random sampling of days during 2020 – 2023 is shown in Figure V-12. Since FRM PM2.5 data are available from Jan – Jun. 2020, the FRM PM2.5 measurements were directly used to estimate the design value. For July 2020 – Dec. 2023, the sampling range of PM2.5 in summer months is much smaller than in winter months, and the higher ends of the PM2.5 range in winter months are about 30-50 μg/m^3 higher than the higher ends of the PM2.5 range in summer months. After the estimation of the PM2.5 concentration in each future day, the annual 98th percentile daily PM2.5 concentrations in 2020-2023 were calculated as the 8th highest value of each year. The annual 98th percentile daily PM2.5 concentrations in 2018 and 2019 were calculated using the available FRM PM2.5 data. Then the PM2.5 design values for 2020, 2021, 2022, and 2023 were estimated using the three-year average of the annual 98th percentile daily PM2.5 concentrations. The whole process was iterated 10,000 times to get a distribution of estimated design values for each year between 2020 and 2023. For each year, the final design value was estimated as the average of the design value estimations from all iterations, and the uncertainty was estimated as the standard deviation of design value estimations from all iterations. The probability that the design value will exceed the 24-hour PM2.5 federal standard (P_{ex}) was estimated as:

$$P_{ex} = \frac{N_{DV>S}}{N_{iteration}}$$

Where $N_{DV>S}$ is the number of iterations that yield a design value estimation exceeding the PM2.5 24-hour federal standard, and $N_{iteration}$ is the total number of iterations.

Distributions of estimated design values for each year between 2020 and 2023 are shown in Figure V-13. The estimated design values for the year 2020, 2021, 2022, and 2023 are 31.4 ± 0.8 μg/m^3, 30.8 ± 1.2 μg/m^3,32.8 ± 1.5 μg/m^3, and 32.6 ± 1.6 respectively. All of these design values are below the PM2.5 24-hour federal standards. The probabilities that the PM2.5 design value for the year 2020, 2021, and 2022 will exceed the 24-hour federal standard are 0, 0.07%, 4.6%, and 4.5%, respectively. This suggests that it is very unlikely that the design value for the year 2020, 2021, 2022, and 2023 will exceed the 24-hour standard even with the conservative assumption that PM2.5 emissions and emission precursors will remain constant.

The selection of the sampling time window, N_{days}, and the iteration times, $N_{iteration}$, may potentially impact the distribution of the estimated design values. To test the sensitivity of the estimated design value on the selection of N_{days} and $N_{iteration}$, we varied the N_{days} from 3 to 15 days and varied $N_{iteration}$ from 1000 times to 20000 times to calculate the P_{ex} and design values. Results are shown in Table V-8 through Table V-11. As shown in tables, P_{ex} and design values remain almost the same as N_{days} and $N_{iteration}$ vary. Therefore, the estimated design value in 2020-2023 are not sensitive to the selection of N_{days} and $N_{iteration}$.

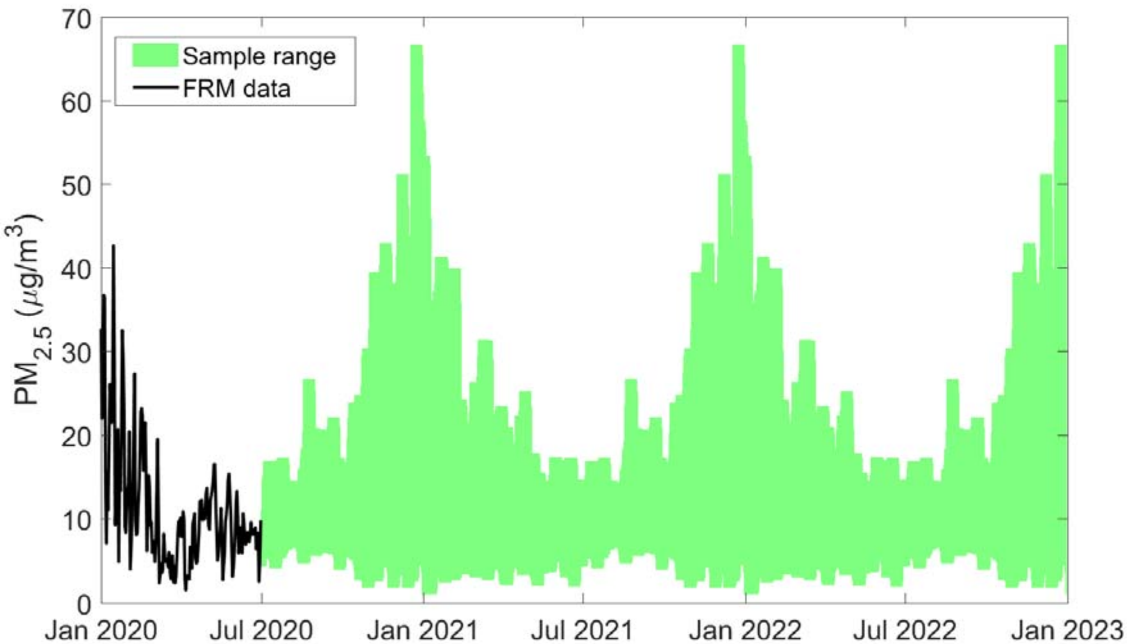
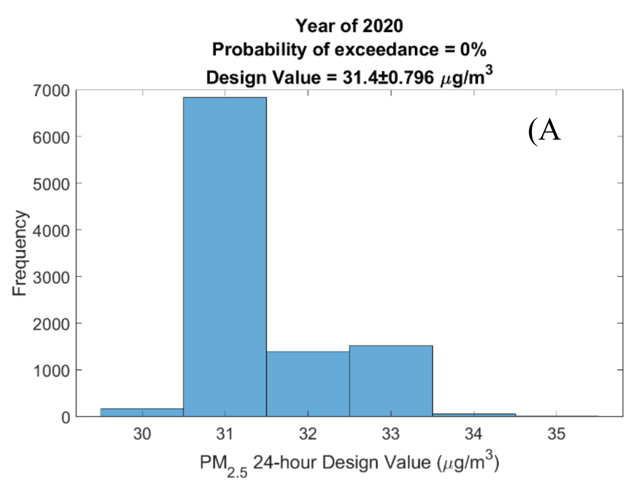


FIGURE V -14

PM2.5 Concentration Range for Random Sampling for Days During 2020-2022.



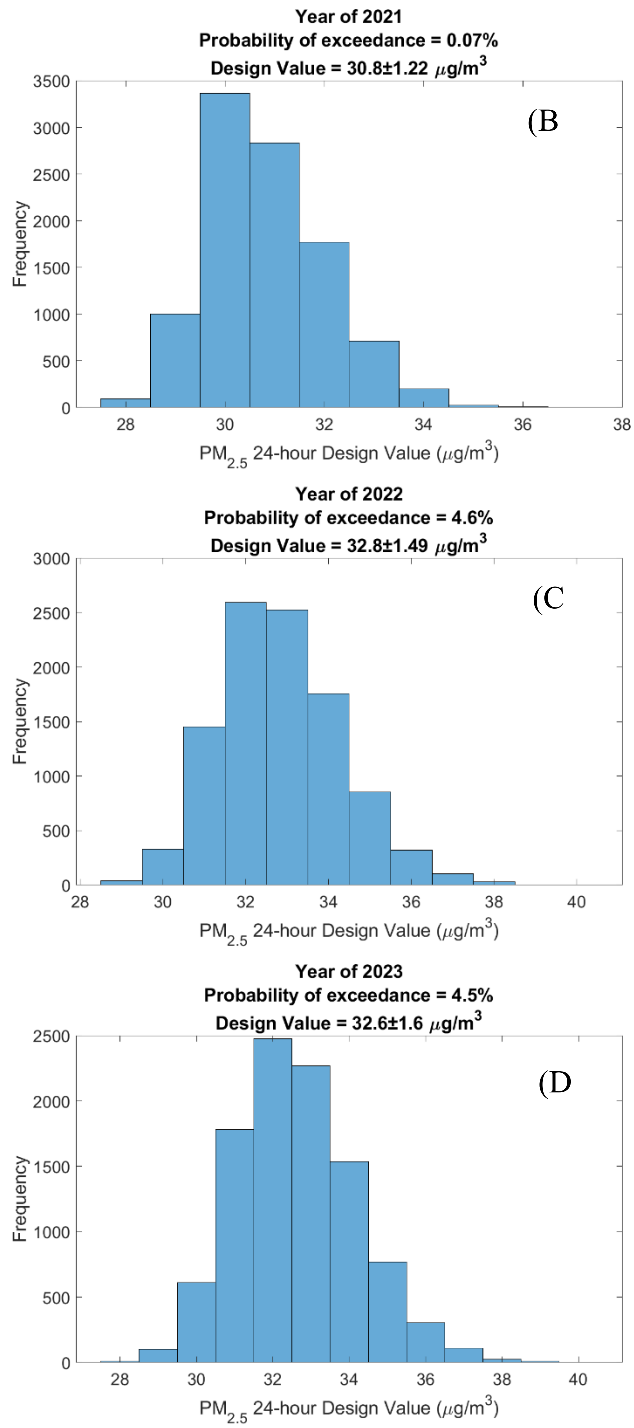


FIGURE V -15

Distribution of The Estimated Design Values in the Year of (A) 2020, (B) 2021, (C) 2022, and (D) 2023.

TABLE V-8

The probability of PM2.5 design values exceeding the PM2.5 federal 24-hour standard estimated using several iteration numbers, $N_{iteration}$. Sample time window, N_{day}, was held at 7 days.

Probability (%) that the design value will exceed the 24-hour standard:					
Year	**1000 iterations**	**2000 iterations**	**6000 iterations**	**10000 iterations**	**20000 iterations**
2020	0.00	0.00	0.00	0.00	0.00
2021	0.00	0.00	0.07	0.07	0.07
2022	5.10	4.50	4.50	4.60	4.50
2023	4.70	4.70	4.50	4.50	4.60

TABLE V-9

The probability of PM2.5 design values exceeding the PM2.5 federal 24-hour standard estimated using different sample time windows, N_{day}. Number of iterations, $N_{iteration}$, was held at 10000 iterations.

Probability (%) that the design value will exceed the 24-hour standard:				
Year	**3 days**	**7 days**	**10 days**	**15 days**
2020	0.00	0.00	0.00	0.00
2021	0.03	0.07	0.08	0.05
2022	4.20	4.60	3.90	4.30
2023	4.40	4.50	4.30	4.60

TABLE V-10

PM2.5 design values estimated using several iteration numbers, $N_{iteration}$. Sample time window, N_{day}, was held at 7 days.

Design value (µg/m^3) mean ± standard deviation:					
Year	**1000 iterations**	**2000 iterations**	**6000 iterations**	**10000 iterations**	**20000 iterations**
2020	31.5 ± 0.8	31.5 ± 0.8	31.5 ± 0.8	31.4 ± 0.8	31.5 ± 0.8
2021	30.8 ± 1.2	30.8 ± 1.2	30.8 ± 1.2	30.8 ± 1.2	30.8 ± 1.2
2022	32.9 ± 1.5	32.9 ± 1.5	32.9 ± 1.5	32.8 ± 1.5	32.8 ± 1.5
2023	32.6 ± 1.6	32.6 ± 1.6	32.6 ± 1.6	32.6 ± 1.6	32.6 ± 1.6

TABLE V-11

PM2.5 design values estimated using different sample time window, N_{day}. Number of iterations, $N_{iteration}$, was held at 10000 iterations.

Design value (µg/m3) mean ± standard deviation:				
Year	**3 days**	**7 days**	**10 days**	**15 days**
2020	31.5 ± 0.8	31.4 ± 0.8	31.4 ± 0.8	31.4 ± 0.8
2021	30.8 ± 1.2	30.8 ± 1.2	30.8 ± 1.2	30.8 ± 1.2
2022	32.8 ± 1.5	32.8 ± 1.5	32.8 ± 1.5	32.8 ± 1.5
2023	32.6 ± 1.6	32.6 ± 1.6	32.6 ± 1.6	32.6 ± 1.6

High PM2.5 concentrations measured during wintertime in Compton are heavily influenced by residential wood burning

The weekly pattern of the PM2.5 measured in Compton during the winter months (Nov. – Feb.) in 2009-2019 is shown in Figure V-14. Average PM2.5 concentrations measured on weekends are about 8-18% higher than the PM2.5 concentrations measured on weekdays. This is despite the fact that traffic and industrial emissions are typically higher during the week. Since residential wood burning activities are more intensive on weekends and holidays, the higher PM2.5 concentrations on weekends in winter months are likely caused by residential wood burning.

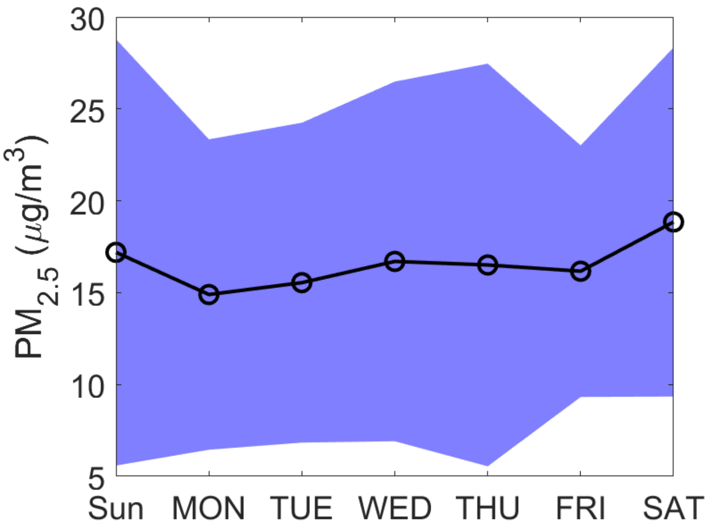


FIGURE V -16

Weekly Pattern of PM2.5 Measured in Compton in Winter Months (Nov. – Feb.). Black dots and line are average daily values. The blue shaded area represents the range of average values plus/minus standard deviations.

To better quantify the impact of residential wood burning on PM2.5 in Compton, we created a forecasting tool specifically tailored to residential woodburning patterns in the South Coast Air Basin. Machine learning techniques were used to create a forecasting model for residential wood smoke based on levoglucosan observations during MATES V. The levoglucosan observations are referred to as the 'training data' for the model. The model relies on the fact that residential wood smoke concentrations are influenced by the selected predictor variables. The influence of meteorology on wood smoke concentrations is represented in the model by meteorological forecast data from the North American Mesoscale (NAM) model (National Centers for Environmental Information, 2020). The influence of human behavior on wood smoke concentrations is represented in the model by calendar-based patterns such as day of week and holidays and meteorological variables such as evening temperature. Levoglucosan concentrations are modeled and then conversion factors are used to estimate the PM2.5 concentrations due to wood smoke. This forecast tool can be used to estimate wood smoke concentrations on days without levoglucosan measurements based on a training data set of 854 measurements during 2018-2019 at 10 stations. Note that this model assumes that the measurements in 2018 capture the behavior in adjacent years. It estimates wood smoke concentrations based on “typical” behavior as a function of meteorology and calendar parameters and therefore, cannot accurately simulate wood smoke concentrations on days outside of the measurement period where wood burning behavior was atypical for the conditions.

We calculated the fraction of PM2.5 from wood smoke using the wood smoke PM2.5 concentrations estimated by the levoglucosan model divided by the total PM2.5 concentration measured on corresponding days (See Figure V-15). A comprehensive literature review was performed to determine a range of how much wood smoke PM2.5 should be expected for a given levoglucosan concentration. The mid-range estimate of this factor is used for the analysis. Wood smoke simulations and FRM PM2.5 data from 2009 to 2019 were used to create the figure. As shown in the figure, the fraction of PM2.5 from wood smoke has a clear seasonal cycle, which peaks in winter months and is lowest in summer months. In winter months, from Nov. to Feb., wood smoke fractions are in general higher than 10%, while in summer months, from Apr. to Sept., wood smoke fractions are in general lower than 10%.

The correlation between simulated PM2.5 concentrations from wood smoke and FRM PM2.5 concentrations in Compton is shown in Figure V-16. They are weakly correlated, with a correlation coefficient $R^2 = 0.19$. The data presented in Figure V-16 only include winter months, Nov. – Feb., during 2009-2019.

In Figure V-17, we compared the average fraction of PM2.5 from wood smoke in monitoring stations across the South Coast Air Basin in winter months (Nov.- Feb.) during 2016-2019. As shown in the figure, the average fraction of PM2.5 from wood smoke in Compton in the winter months is 7%, which is the highest among all the stations presented in Figure V-17. As discussed above, the CO concentrations measured in Compton on Jan 1st, Dec 24th, and Dec 27th, 2017 were significantly higher than CO concentrations measured in other regions and in other time periods, which also suggests that there were excessive wood burning activities in Compton on these three days. As shown in Figure V -10, the CO concentrations measured at Compton are almost always the highest among all stations in the South Coast Air Basin, further supporting the hypothesis that there are more wood burning activities in and upwind of Compton than in other areas. Therefore, it is likely that atypically high concentrations recorded on Dec. 24th, Dec. 27th, and Jan. 1st, 2017 were influenced by excess wood smoke concentrations.

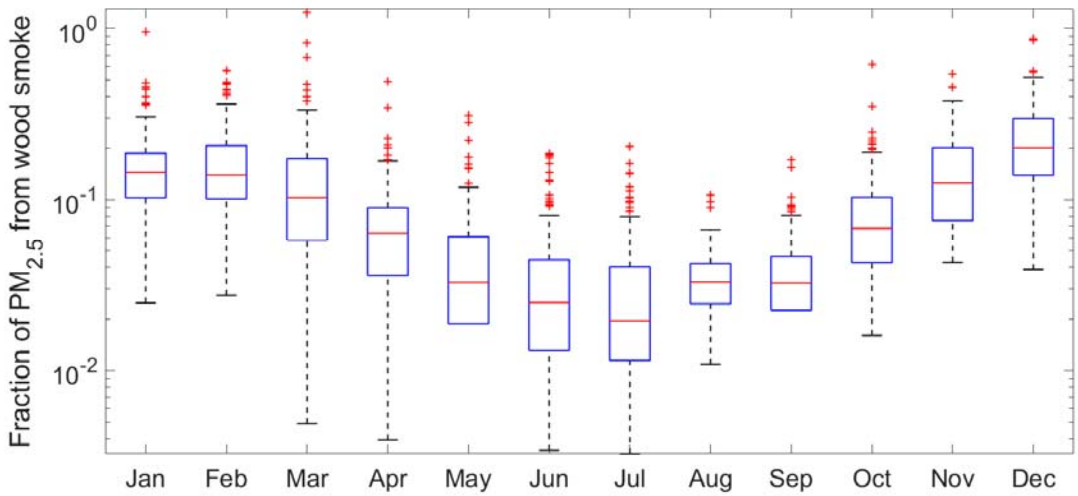


FIGURE V -17

Fraction of PM2.5 from Wood Smoke in Compton in 2009-2019. Data in each month are presented using box-whisker plot. The red line in the middle of the box represents the median value. the ends of the box represent the first and third quartiles. The length of the whiskers covers 99.3% assuming the data are normally distributed. Outliers are presented with red crosses. Note that the ordinate uses a logarithmic scale.

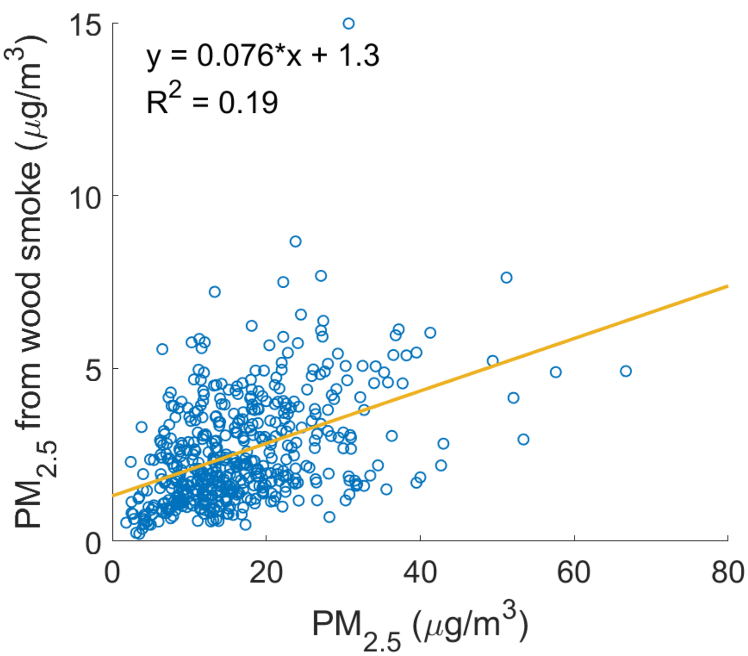


FIGURE V -18

Correlation Between Simulated PM2.5 Concentrations from Wood Smoke and PM2.5 Concentrations in Compton in Winter Months (Nov. – Feb.) in 2009-2019.

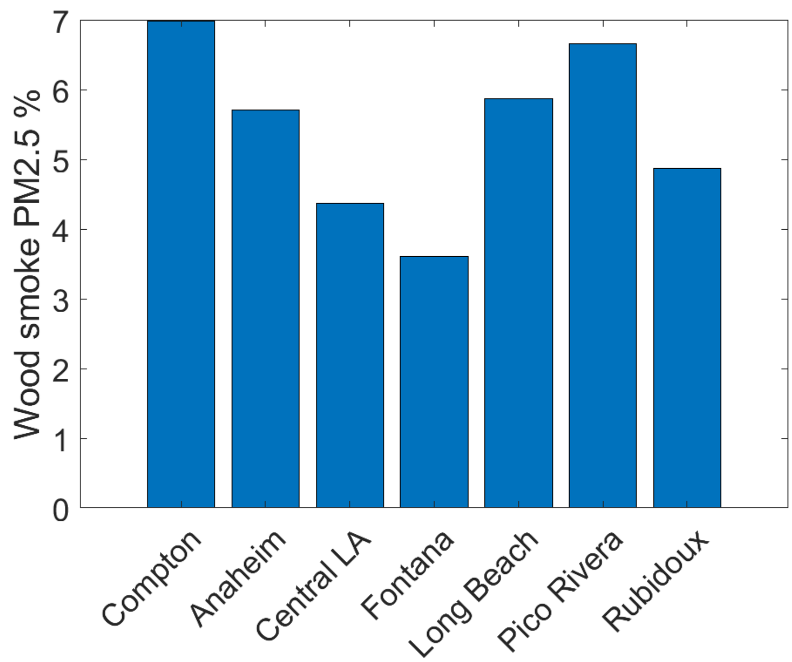


FIGURE V -19

Average Fraction of PM2.5 from Wood Smoke in Monitoring Stations Across the South Coast Air Basin in Winter Months (Nov.- Feb.) During 2016-2019. Only stations with FRM PM2.5 measurements are included in this figure.

Conclusions

A weight-of-evidence approach using supplemental analyses was employed to demonstrate future attainment of the 2006 24-hr $PM_{2.5}$ NAAQS in Compton. Together, the supplemental analyses demonstrate attainment of the 2006 24-hour PM2.5 standard in Compton by 2023. Key findings are summarized below:

- Since PM2.5 FRM measurements began in 2008, all DVs were below 35 ug/m3, the 2006 24-hour PM2.5 standard, until 2017. The unusually high PM2.5 levels that caused the exceedance in 2017 did not recur. Ambient monitoring data from 2018 to the 1st half of 2020 indicates that it is highly likely that Compton will attain the standard by December 31, 2020.

- Three dates in 2017 (Jan. 1, Dec. 24 and 27) had remarkably high PM2.5 concentrations at Compton. These dates represent 3 out of the 4 highest 24-hour PM2.5 concentrations ever recorded at Compton since measurements began in Dec. 2008. Prior to 2017, the PM2.5 24-hour Design Value had consistently been below the 24-hour federal PM2.5 standard, and these three measurements caused the design value to be above the 24-hour federal PM2.5 standard for 2017, 2018, and 2019.

- While the high PM2.5 days in 2017 were influenced by a combination of woodsmoke, fireworks and adverse meteorology, custom-built tools using statistical algorithms indicated that the observed high PM levels cannot be explained by solely by business-as-usual emissions or meteorology. Therefore, the 2017 high PM days in question were likely driven by episodic and localized emissions, which have not recurred.

- An analysis comparing the metal composition on the sample filters collected on Jan. 1, 2017 with those collected at multiple stations on Jul. 4 and 5 of 2017 and 2018 found that 14.7-23.4% of the PM2.5 on Jan. 1, 2017 was likely due to fireworks.

- An analysis of meteorological conditions found that Dec. 24 and 27 had conditions that were rare and highly favorable to the accumulation of high PM2.5 concentrations, while results of a PM2.5 model using machine learning techniques shows that meteorological conditions and calendar parameters were not sufficient to explain the exceptionally high concentrations on those days meaning that atypical episodic emissions likely also contributed to the high PM2.5 concentrations.

- A statistical Monte Carlo model of the PM2.5 24-hour design value shows that the design value is unlikely to exceed the PM2.5 24-hour federal standard during 2020-2023, assuming that NOx and VOC concentrations are constant at 2009-2019 levels. NOx and VOC concentrations are decreasing over time, making it even less likely that the design values during 2020-2023 will exceed the federal standard.

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