South Coast AQMD

2022 DRAFT AIR QUALITY MANAGEMENT PLAN

Appendix II

Current Air Quality

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
GOVERNING BOARD

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- **Chapter 2: Air Quality in the South Coast Air Basin**

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SUMMARY

This appendix contains a detailed summary of air quality in 2020 and prior year trends for the South Coast Air Basin (Basin) and the Riverside County portion of Salton Sea Air Basin (Coachella Valley), under the jurisdiction of the South Coast Air Quality Management District (South Coast AQMD). The Basin includes Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties. The Riverside County portion of the Salton Sea Air Basin under South Coast AQMD jurisdiction is the Coachella Valley Planning Area (Coachella Valley).

Chapter 1 of this appendix presents descriptions of the air quality setting for the South Coast AQMD jurisdiction, including the relevant boundaries, weather factors and emissions for both the Basin and the Coachella Valley. It briefly describes the characteristics and health and welfare effects associated with criteria pollutants - those pollutants that have an associated health-based National Ambient Air Quality Standard (NAAQS or federal standard). It also details the level and form of both the NAAQS and the California Ambient Air Quality Standards (CAAQS or State standards).

Chapters 2 and 3 present summaries of current air quality and trends for each of the criteria pollutants in the Basin and the Coachella Valley, respectively. These chapters include the 2018–2020 3-year design values for comparison to federal and State standards, along with geographical, seasonal, and diurnal variations. Air quality statistics and trends presented in this appendix provide information on the recent history, current status, and progress toward attainment of the NAAQS and CAAQS, providing a baseline for planning toward future attainment.

In the Basin, ozone (O_3) and fine particulate matter (PM2.5, particles less than 2.5 microns in diameter) are the pollutants of primary concern. The Basin is designated nonattainment for current and former federal and State ozone standards, as well as the current PM2.5 standards[1]. However, 2018-2020 was the first three-year period where the Basin met the 24-hour PM2.5 standard of 35 $\mu g/m^3$ after removing elevated measurements driven by the Bobcat and El Dorado fires in the fall of 2020. The Basin had the highest number of days exceeding the federal ozone NAAQS of any urban area nationwide in 2020. State standards for ozone, PM2.5, and PM10 have also not been met in the Basin. The Basin attains the standards for other NAAQS and CAAQS with the exception of the lead NAAQS.[2] The Los Angeles County portion of the Basin is designated a

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[1] Annual and 24-hour PM2.5 design values meet the former 1997 Annual and 24-hour PM2.5 standards.

[2] In June 2013, the U.S. EPA approved re-designation of the Basin as an attainment area for the 24-hour PM10 NAAQS.

nonattainment area for the lead NAAQS based on source-specific monitoring at two locations using 2007–2009 data. However, all stations in the Basin, including the near-source monitoring in Los Angeles County, have remained below the lead NAAQS for the 2012 through 2020 period. Unfortunately, due to pandemic related monitor shutdowns, the lead data fails EPA completeness requirements. A request to U.S. EPA for re-designation to attainment will be prepared when monitoring requirements are satisfied.

The Coachella Valley remains a nonattainment area for both the 8-hour ozone and the PM10 NAAQS. However, the majority of high PM10 concentrations exceeding the federal 24-hour PM10 standard occurred on days influenced by high winds. These events were flagged by South Coast AQMD in the U.S. EPA Air Quality System (AQS) database to allow for the submittal of future exceptional event demonstrations if these events have regulatory significance.[3] The Coachella Valley is in attainment of the 1979 1-hour ozone NAAQS. PM2.5 concentrations remain below the federal and State standards in the Coachella Valley, along with the remainder of the criteria pollutants, except that the State hydrogen sulfide (H_2S) standard is exceeded due to naturally occurring emissions from the Salton Sea. Further details on the federal and State standards are presented in this chapter by pollutant, along with current attainment statuses in the South Coast AQMD jurisdiction.

Detailed air quality statistics for each of the South Coast AQMD monitoring locations in the Basin and the Coachella Valley are available online in the following locations:

South Coast AQMD Historical Air Quality Summary Tables: http://www.aqmd.gov/home/air-quality/historical-air-quality-data

California Air Resources Board iADAM: https://www.arb.ca.gov/adam

California Air Resources Board AQMIS: https://www.arb.ca.gov/html/ds.htm

U.S. EPA Air Quality Data Collected at Outdoor Monitors: https://www.epa.gov/outdoor-air-quality-data

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[3] Regulatory significant exceptional events are exceptional events whose removal from the design value calculation influences a regulatory decision such as attainment vs. nonattainment.

CHAPTER 1

INTRODUCTION

- **Air Quality Setting**
  - South Coast AQMD Jurisdiction and Air Quality Monitoring Network
  - Weather Factors

- **Ambient Air Quality Standards**
  - Design Values
  - Summary of Criteria Pollutants and Air Quality Standards

Air Quality Setting

South Coast AQMD Jurisdiction and Air Quality Monitoring Network

California's first local air pollution control agency, the Los Angeles County Air Pollution Control District (LAAPCD), was formed in 1947, and APCDs were formed in Orange, Riverside, and San Bernardino Counties soon afterward. These four agencies combined in 1976 to form the Southern California APCD, which was replaced by the South Coast Air Quality Management District (South Coast AQMD) by State legislation, effective February 1, 1977, with jurisdiction over the South Coast Air Basin (Basin). The Mojave Desert Air Quality Management District (MDAQMD) was also formed, which covers the Mojave Desert Air Basin (MDAB), except for a portion within South Coast AQMD jurisdiction in eastern Riverside County. Later, the Antelope Valley Air Pollution Control District (AVAPCD) was formed, which covers the Antelope Valley desert portion of Los Angeles County that is not within South Coast AQMD jurisdiction.

The Basin includes all of Orange County and the non-desert areas of Los Angeles, Riverside, and San Bernardino Counties. South Coast AQMD is also responsible for air quality in the Riverside County portion of the Salton Sea Air Basin (SSAB), which is referred to as the Coachella Valley Planning Area (Coachella Valley). The South Coast AQMD jurisdiction is shown in Figure 1-1.

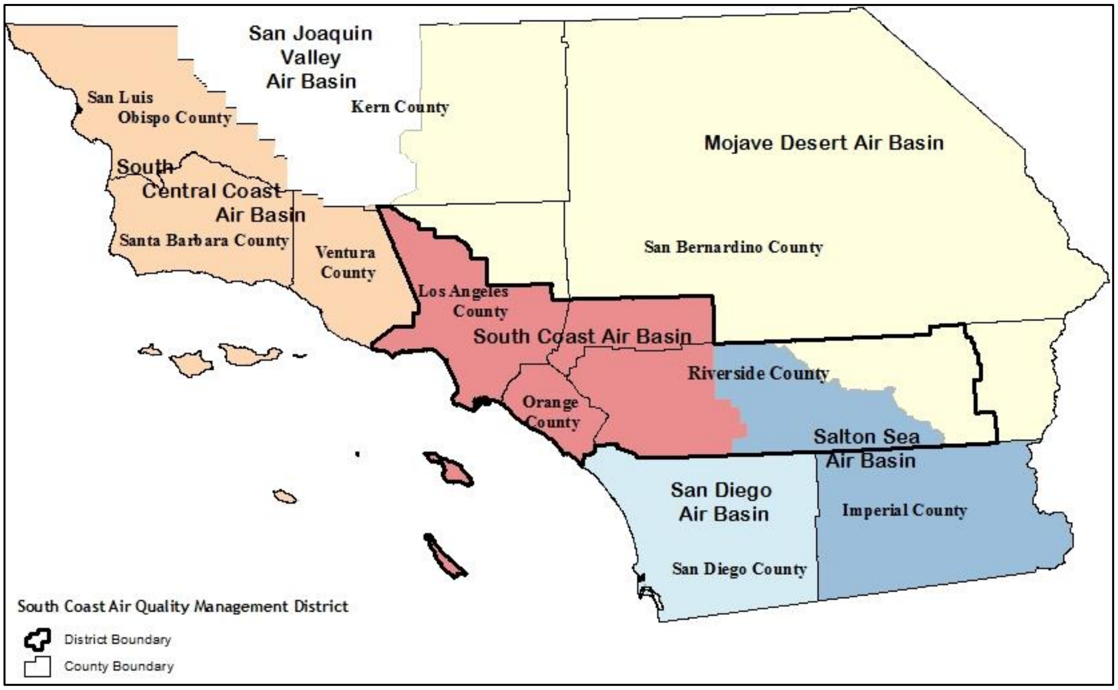

FIGURE 1-1

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT AND SURROUNDING JURISDICTIONS

The Basin has an area of 6,800 square miles with approximately 17 million residents in 2020. The Los Angeles-Long Beach-Anaheim metropolitan statistical area (the nation's second largest), and the Riverside-San Bernardino-Ontario metropolitan statistical area (the nation's 12th largest) lie within the Basin's boundaries. About two-thirds of the Basin's population lives within Los Angeles County.

The 2020 population in the Coachella Valley was approximately 487,000. South Coast AQMD also has jurisdiction over a small portion of the MDAB in Eastern Riverside County (see Figure 1-1). The area is sparsely populated desert and contains a portion of Joshua Tree National Park. The SSAB and the MDAB have a combined area of approximately 32,200 square miles. These two air basins include most of the desert portions of Los Angeles, Riverside, and San Bernardino Counties, as well as Imperial County and part of Kern County.

Table 1-1 summarizes the historic, current, and future projections of the populations of the Basin and the Coachella Valley.

TABLE 1-1
HISTORIC AND PROJECTED POPULATIONS FOR SOUTH COAST AIR BASIN AND COACHELLA VALLEY

Area	Historic Population			Projected Population			
	1990	2000	2010	2018	2030	2035	2045
South Coast Air Basin	13,083,594	14,640,692	15,735,186	16,671,807	17,984,614	18,470,403	19,264,860
Coachella Valley	244,070	325,937	425,404	471,012	568,622	613,096	698,607

Source: Historic populations from Southern California Association of Governments, January 2016 CARB 2013 Almanac of Emissions and Air Quality, 2013 Edition, Appendix C [http://www.arb.ca.gov/aqd/almanac/almanac13/almanac13.htm]; Population projections from Connect SoCal – The 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (Southern California Association of Governments)

Monitoring Network Status

U.S. EPA has set National Ambient Air Quality Standards (NAAQS) and monitoring requirements for the six criteria pollutants, including O_3, PM (including both PM10 and PM2.5), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb). In 2020, South Coast AQMD measured concentrations of air pollutants at 38 routine ambient air monitoring stations in its jurisdiction, with primary focus on these criteria pollutants. In addition to ambient air monitoring, lead concentrations are monitored at four source-oriented monitoring sites, immediately downwind of stationary lead sources.

There have been several changes to the South Coast AQMD ambient air monitoring network since the previous AQMP, which was finalized in 2016. Long-term monitoring stations at Costa Mesa and Long Beach Hudson were closed in 2017 and 2020[4], respectively, due to termination of a lease by the landlord (Costa Mesa) and

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[4] PM10 measurements at Long Beach Hudson were restarted in January 2022.

challenges meeting U.S. EPA siting criteria (40 CFR 58 Appendix E) at Long Beach Hudson. New monitoring stations were added in January 2020 in North Hollywood and Long Beach Signal Hill to represent the East San Fernando Valley and South Coastal Los Angeles County, respectively.

Figure 1-2 shows the locations of ambient air monitoring stations in the South Coast AQMD jurisdiction.[5]

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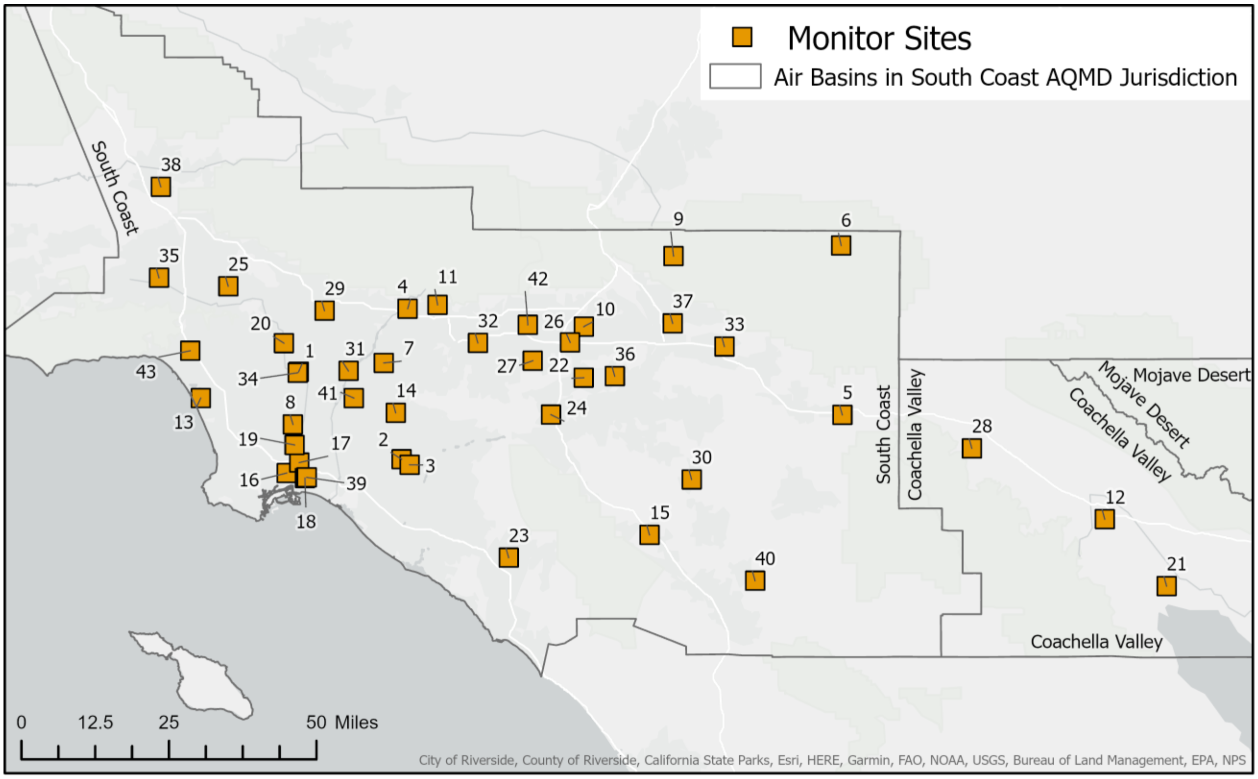
[5] For more detailed current information and maps of the South Coast AQMD air monitoring network by pollutant measured and monitoring station details, please refer to South Coast AQMD's Annual Air Monitoring Network Plan, available on the web at http://www.aqmd.gov/home/air-quality/clean-air-plans/monitoring-network-plan.



City of Riverside, County of Riverside, California State Parks, Esri, HERE, Garmin, FAO, NOAA, USGS, Bureau of Land Management, EPA, NPS

Label	Site Name	Label	Site Name	Label	Site Name
1	ATSF (Exide)	16	Long Beach (Hudson)	31	Pico Rivera #2
2	Anaheim	17	Long Beach (North)	32	Pomona
3	Anaheim Near-Road	18	Long Beach (South)	33	Redlands
4	Azusa	19	Long Beach-Route 710 Near Road	34	Rehrig (Exide)
5	Banning Airport	20	Los Angeles-North Main Street	35	Reseda
6	Big Bear	21	Mecca (Saul Martinez)	36	Rubidoux
7	Closet World (Quemetco)	22	Mira Loma (Van Buren)	37	San Bernardino
8	Compton	23	Mission Viejo	38	Santa Clarita
9	Crestline	24	Norco	39	Signal Hill (LBSH)
10	Fontana	25	North Hollywood (NOHO)	40	Temecula
11	Glendora	26	Ontario Near Road (Etiwanda)	41	Uddelholm (Trojan Battery)
12	Indio	27	Ontario-Route 60 Near Road	42	Upland
13	LAX Hastings	28	Palm Springs	43	West Los Angeles
14	La Habra	29	Pasadena		
15	Lake Elsinore	30	Perris		

FIGURE 1-2

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT AMBIENT AIR MONITORING STATIONS

(PALM SPRINGS, INDIO, AND MECCA (SAUL MARTINEZ) STATIONS ARE LOCATED IN THE COACHELLA VALLEY; ALL OTHER STATIONS ARE IN THE SOUTH COAST AIR BASIN)

Weather Factors

The climate of the South Coast AQMD jurisdiction varies considerably between the coastal zone, inland valleys, mountain areas, and deserts. Most of the Basin is relatively arid, with very little rainfall and abundant sunshine during the summer months. It has light winds and poor vertical mixing compared to most other large urban areas in the U.S. The combination of poor air dispersion and abundant sunshine provides conditions especially favorable to the formation of photochemical smog and the trapping of particulates and other pollutants. The Basin is bounded to the north and east by mountains with maximum elevations exceeding 10,000 feet. The unfavorable combination of meteorology, topography, and emissions from the nation's second largest urban area results in the Basin having some of the worst air quality in the U.S.

The prevailing daytime sea breeze tends to transport pollutants and precursor emissions from coastal areas into the Basin's inland valleys, and from there, even further inland into neighboring areas of the SSAB (especially the Coachella Valley) and the MDAB. Concentrations of primary pollutants (those emitted directly into the air) are typically highest close to the sources which emit them. However, secondary pollutants (those formed in the air by chemical reactions, such as ozone and the majority of PM2.5) reach maximum concentrations some distance downwind of the sources that emit the precursors as winds transport polluted air masses inland. As pollutants are transported beyond these areas into regions without significant emissions, dilution of the air mass results in a reduction in concentrations.

Ambient Air Quality Standards

Both the federal government and the State of California have adopted ambient air quality standards, which define the concentration below which long-term or short-term exposure to a pollutant is not expected to cause adverse effects to public health and welfare. The criteria pollutants, those that have federal health-based National Ambient Air Quality Standards (NAAQS or federal standards), are: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), coarse and fine particulate matter (PM10 and PM2.5, respectively), and lead (Pb). The State of California also has California Ambient Air Quality Standards (CAAQS or State standards) for these criteria pollutants, plus standards for sulfates, hydrogen sulfide (H_2S), and vinyl chloride (C_2H_3Cl), as well as a welfare-based standard for visibility-reducing particles.

For several of the NAAQS, there are both primary and secondary standards. Primary standards provide public health protection, including protecting the health of "sensitive" populations such as people with asthma, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. This document focuses mainly on the primary federal and State standards. The federal and State primary standards are summarized in Table 1-2, along with a brief summary of health and welfare effects. Further discussion of the health effects of air pollutants is presented in Chapter 2, and more detailed health information is presented in Appendix I: Health Effects.

TABLE 1-2

AMBIENT AIR QUALITY STANDARDS AND KEY HEALTH AND WELFARE EFFECTS

AIR POLLUTANT	FEDERAL STANDARD (NAAQS)	STATE STANDARD (CAAQS)	KEY HEALTH & WELFARE EFFECTS[#]
	Concentration, Averaging Time, Year of NAAQS Review	Concentration, Averaging Time	
Ozone (O3)	**0.070 ppm, 8-Hour (2015)** 0.075 ppm, 8-Hour (2008) 0.08 ppm, 8-Hour (1997) 0.12 ppm, 1-Hour (1979)	**0.070 ppm, 8-Hour** **0.09 ppm, 1-Hour**	(a) Pulmonary function decrements and localized lung injury in humans and animals; (b) asthma exacerbation; (c) chronic obstructive pulmonary disease (COPD) exacerbation; (d) respiratory infection; (e) increased school absences, and hospital admissions and emergency department (ED) visits for combined respiratory diseases; (e) increased mortality; (f) possible metabolic effects Vegetation damage; property damage
Carbon Monoxide (CO)	**35 ppm, 1-Hour (1971)** **9 ppm, 8-Hour (1971)**	**20 ppm, 1-Hour** **9.0 ppm, 8-Hour**	Visibility reduction (a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) possible impairment of central nervous system functions; (d) possible increased risk to fetuses; (f) possible increased risk of pulmonary disease; (g) possible emergency department visits for respiratory diseases overall and visits for asthma.

TABLE 1-2 (CONTINUED)

AMBIENT AIR QUALITY STANDARDS AND KEY HEALTH AND WELFARE EFFECTS

AIR POLLUTANT	FEDERAL STANDARD (NAAQS)	STATE STANDARD (CAAQS)	KEY HEALTH & WELFARE EFFECTS[#]
	Concentration, Averaging Time, Year of NAAQS Review	Concentration, Averaging Time	
Fine Particulate Matter (PM2.5)	**35 µg/m^3, 24-Hour (2006)** 65 µg/m^3, 24-Hour (1997) 12.0 µg/m^3**, Annual (2012)** 15.0 µg/m^3, Annual (1997)	**12.0 µg/m^3, Annual**	Short -term (a) increase in mortality rates; (b) increase in respiratory infections; (c) increase in number and severity of asthma attacks; (d) COPD exacerbation; (e) increase in combined respiratory-diseases and number of hospital admissions; (f) increased mortality due to cardiovascular or respiratory diseases; (g) increase in hospital admissions for acute respiratory conditions; (h) increase in school absences; (i) increase in lost work days; (j) decrease in respiratory function in children; (k) increase medication use in children and adults with asthma. Long-term (a) reduced lung function growth in children; (b) changes in lung development; (c) development of asthma in children; (d) increased risk of cardiovascular diseases; (e) increased total mortality from lung cancer; (f) increased risk of premature death. Possible link to metabolic, nervous system, and reproductive and developmental effects for short-term and long-term exposure to PM2.5.
Respirable Particulate Matter (PM10)	**150 µg/m^3, 24-Hour (1997)**	**50 µg/m^3, 24-Hour** **20 µg/m^3, Annual**	

TABLE 1-2 (CONTINUED)

AMBIENT AIR QUALITY STANDARDS AND KEY HEALTH AND WELFARE EFFECTS

AIR POLLUTANT	FEDERAL STANDARD (NAAQS)	STATE STANDARD (CAAQS)	KEY HEALTH & WELFARE EFFECTS#
	Concentration, Averaging Time, Year of NAAQS Review	Concentration, Averaging Time	
Nitrogen Dioxide (NO_2)	**100 ppb, 1-Hour (2010)** **0.053 ppm, Annual (1971)**	**0.18 ppm, 1-Hour** **0.030 ppm, Annual**	Short-term (a) asthma exacerbations (“asthma attacks”) Long-term (a) asthma development; (b) higher risk of all-cause, cardiovascular, and respiratory mortality. Both short and long term NO2 exposure is also associated with chronic obstructive pulmonary disease (COPD) risk. Potential impacts on cardiovascular health, mortality and cancer, aggravate chronic respiratory disease. Contribution to atmospheric discoloration
Sulfur Dioxide (SO_2)	**75 ppb, 1-Hour (2010)**	**0.25 ppm, 1-Hour** **0.04 ppm, 24-Hour**	Respiratory symptoms (bronchoconstriction, possible wheezing or shortness of breath) during exercise or physical activity in persons with asthma. Possible allergic sensitization, airway inflammation, asthma development
Lead (Pb)	**0.15 µg/m^3, rolling 3-month average (2008)**	**1.5 µg/m^3, 30-day average**	(a) Learning disabilities; (b) impairment of blood formation and nerve function; (c) cardiovascular effects, including coronary heart disease and hypertension Possible male reproductive system effects

TABLE 1-2 (CONCLUED)

AMBIENT AIR QUALITY STANDARDS AND KEY HEALTH AND WELFARE EFFECTS

AIR POLLUTANT	FEDERAL STANDARD (NAAQS)	STATE STANDARD (CAAQS)	KEY HEALTH & WELFARE EFFECTS[#]
	Concentration, Averaging Time, Year of NAAQS Review	Concentration, Averaging Time	
Sulfates	**N/A**	**25 µg/m^3, 24-Hour**	(a) Decrease in lung function; (b) aggravation of asthmatic symptoms; (c) vegetation damage; (d) Degradation of visibility; (e) property damage
Hydrogen Sulfide (H_2S)	**N/A**	**0.03 ppm, 1-hour**	Exposure to lower ambient concentrations above the standard may result in objectionable odor and may be accompanied by symptoms such as headaches, nausea, dizziness, nasal irritation, cough, and shortness of breath

ppm - parts per million by volume; ppb - parts per billion by volume (0.01 ppm = 10 ppb).

Standards in bold are the current, most stringent standards; there may be continuing obligations for former standards.

State standards are “not-to-exceed” values based on State designation value calculations.

Federal standards follow the 3-year design value form of the NAAQS.

[#] List of health and welfare effects is not comprehensive; detailed health effects information can be found in Appendix I: Health Effects or in the U.S. EPA NAAQS documentation at https://www.epa.gov/naaqs.

Design Values

Air quality statistics are often presented in terms of the maximum concentrations measured at monitoring stations or in air basins, as well as for the number of days exceeding State or federal standards. These are instructive in regard to trends and the effectiveness of control programs. However, an exceedance of the concentration level of a federal standard does not necessarily lead to a nonattainment designation. For NAAQS attainment/nonattainment decisions, a metric called the *design value* is calculated for each station typically using the most recent three years of data along with the form of the standard. For example, the design value for the 24-hour PM2.5 NAAQS is based on the annual 98th percentile measurement of all the 24-hour samples at each station, averaged over 3 years. The overall design value for an air basin is the highest design value of all the stations in that basin. U.S. EPA also allows certain data to be excluded from consideration for NAAQS attainment status, when that data is influenced by exceptional events, such as high wind events, wildfires, volcanoes, or some cultural events (e.g. Independence Day fireworks) that meet strict criteria. Table 1-3 shows the design value requirements using the form of the federal standards for the federal criteria pollutants.

TABLE 1-3
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) AND DESIGN VALUE REQUIREMENTS

Pollutant	Averaging Time[**]	NAAQS Level	Design Value Form of NAAQS[*]
Ozone (O_3)	1-Hour (1979) [revoked 2005]	0.12 ppm	Not to be exceeded more than once per year averaged over 3 years
	8-Hour (2015)	**0.070 ppm**	**Annual fourth highest 8-hour average concentration, averaged over 3 years**
	8-Hour(2008) [revised 2015]	0.075 ppm	
	8-Hour(1997) [revoked 2015]	0.08 ppm	
Fine Particulate Matter (PM2.5)	**24-Hour (2006)**	**35 µg/m^3**	**3-year average of the annual 98th percentile of daily 24-hour concentration**
	24-Hour (1997)	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	
Respirable Particulate Matter (PM10)	**24-Hour (1987)**	**150 µg/m^3**	**Not to be exceeded more than once per year averaged over 3 years**
	Annual (1987) [revoked 2006]	50 µg/m^3	Annual average concentration, averaged over 3 years
Carbon Monoxide (CO)	**1-Hour (1971)**	**35 ppm**	**Not to be exceeded more than once a year. Design value is the higher of each year's annual second maximum in a two-year period.**
	8-Hour (1971)	**9 ppm**	
Nitrogen Dioxide (NO_2)	**1-Hour (2010)**	**100 ppb**	**3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations**
	Annual (1971)	**0.053 ppm**	**Annual average concentration, averaged over 3 years**
Sulfur Dioxide (SO_2)	**1-Hour (2010)**	**75 ppb**	**3-yer average of the 99th percentile of the daily maximum 1-hour average concentrations**
	24-Hour (1971) [revoked 2010]	0.14 ppm	Not to be exceeded more than once per
	Annual (1971) [revoked 2010]	0.03 ppm	Annual arithmetic average
Lead (Pb)	**3-Month Rolling Average (2008)[##]**	**0.15 µg/m^3**	**Highest rolling 3-month average of the 3 years**

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; for pollutants with the design values based on “exceedances” (1-hour ozone, 24-hour PM10, CO, and 24-hour SO_2), the NAAQS is attained when the concentration associated with the design value is less than or equal to the standard level:

- For 1-hour ozone and 24-hour PM10, the NAAQS is attained when the fourth highest daily concentrations of the 3-year period is less than or equal to the standard level.
- For CO, the standard is attained when the maximum of the second highest daily concentration each year in the most recent two years is equal to or less than the standard level.

** 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: for 1-hour ozone, the Basin has continuing obligations under the former 1979 standard; for 8-hour ozone, the NAAQS was lowered from 0.08 ppm to 0.075 ppm to 0.070 ppm, but the previous 8-hour ozone NAAQS and most related implementation rules remain in place until that standard is attained.

3-month rolling averages of the first year (of the three year period) include November and December monthly averages of the prior year; the 3-month average is based on the average of “monthly” averages.

Summary of Criteria Pollutants and Air Quality Standards

Ambient air quality standards are periodically reviewed by U.S. EPA and State agencies to incorporate the findings from the most current research available on the effects of pollutants. Alert and advisory levels for advising the public about unhealthful air quality are also recommended. The section below summarizes pollutant properties and health information, along with air quality standards, including the recently revised or newly established standards. Health effects associated with each pollutant are provided in Appendix I in detail.

Ozone Properties

The Basin's unique air pollution problem was first recognized in the 1940s as the Los Angeles urban area smog was worse than other areas. Early research showed that ozone was being formed in the Basin's atmosphere from volatile organic compounds (VOCs) and nitrogen oxides (NOx) that were emitted into the air and reacted in the presence of sunlight. Polluted air masses were trapped laterally by the mountainous terrain and vertically by strong low-altitude temperature inversions that act as a lid to vertical mixing of air. The Los Angeles Air Pollution Control District (LAAPCD) began regular monitoring of total oxidants in the 1950s, and annual maximum 1-hour ozone concentrations in excess of 0.60 ppm (600 ppb) were recorded at that time.

Ozone, a colorless gas with a sharp odor at very high concentrations, is a highly reactive form of oxygen. High ozone concentrations exist naturally high above the earth in the stratosphere. Some mixing of stratospheric ozone downward to the earth's surface does occur; however, the extent of ozone intrusion from the stratosphere is limited. At the earth's surface in sites remote from urban areas, ozone concentrations are normally very low (0.03-0.05 ppm).

In urban areas, ozone is formed by a complicated series of chemical and photochemical reactions between VOCs, NOx, and oxygen in the air. A decrease in ozone precursors may or may not result in a linear decrease in ozone. Ozone concentrations are dependent not only on overall precursor levels, but also on the ratio of the concentrations of VOCs to NOx , the reactivity of the specific VOCs present, the spatial and temporal distribution of emissions, the level of solar radiation, and other weather factors.

Ozone is beneficial in the stratosphere, where it blocks cancer-causing ultraviolet radiation. However, it is also a highly reactive oxidant. It is this reactivity which accounts for its damaging effects on materials, plants, and human health at the earth's surface.

The propensity of ozone to react with organic materials causes it to damage living cells, and ambient ozone concentrations in the Basin are frequently high enough to cause adverse health effects. Ozone enters the human body primarily through the respiratory tract and causes respiratory irritation and discomfort, makes breathing more difficult during exercise, and reduces the respiratory system's ability to remove inhaled particles and fight infection. People with respiratory diseases, children, the elderly, and people who exercise heavily are more susceptible to the effects of ozone.

Plants are sensitive to ozone at concentrations well below the health-based standards, and ozone is responsible for significant crop damage and damage to forests and other ecosystems.

The adverse effects of ozone air pollution exposure on health have been studied for many years, as documented by a significant body of peer-reviewed scientific research, including studies conducted in Southern California. The 2020 U.S. EPA document, *Integrated Science Assessment of Ozone and Related Photochemical Oxidants*,[6] describes these health effects and discusses the state of the scientific knowledge and research. A summary of health effects information and additional references can also be found in Appendix I: Health Effects. EPA is currently reconsidering the decision to retain the 2015 ozone standard in 2020 based on the existing scientific record. This decision is expected by the end of 2023.[7]

Ozone Air Quality Standards

Studies have shown that even relatively low concentrations of ozone, if lasting for several hours, can significantly reduce lung function in healthy people. Effective September 16, 1997, the U.S. Environmental Protection Agency (U.S. EPA) adopted an 8-hour average federal ozone standard with a level of 0.08 ppm, intending to replace the 1-hour standard that was adopted in 1979 (0.12 ppm). This 1997 8-hour ozone standard was more stringent than the 1979 1-hour standard and provided greater protection to public health. The 8-hour standard is intended to help protect people who spend a significant amount of time working or playing outdoors, a group that is particularly vulnerable to the effects of ozone. (Due to the monitoring and reporting requirements of the older ozone standards, a level of 0.085 ppm or 85 ppb is required to exceed the 1997 8-hour standard, and 0.125 ppm or 125 ppb is required to exceed the 1979 1-hour standard.)

The U.S. EPA eventually revoked the 1979 federal 1-hour ozone standard, effective June 15, 2005. However, the South Coast Air Basin and the former Southeast Desert Modified Air Quality Management Area (which included the Coachella Valley) had not attained the 1-hour federal ozone standard by the attainment date. On August 25, 2014, U.S. EPA proposed a clean data finding based on 2011–2013 data and a determination of attainment for the 1-hour ozone NAAQS for the Southeast Desert nonattainment area; this ruling was finalized by U.S. EPA on April 15, 2015, effective May 15, 2015, including preliminary 2014 data. The Basin has not yet attained the 1-hour ozone NAAQS and has some continuing obligations under the former standard.

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[6] U.S. EPA. (2020). Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-20/012. https://www.epa.gov/isa/integrated-science-assessment-isa-ozone-and-related-photochemical-oxidants.

[7] https://www.epa.gov/ground-level-ozone-pollution/epa-reconsider-previous-administrations-decision-retain-2015-ozone

The 1997 8-hour standard was subsequently lowered from 0.08 to 0.075 ppm, effective May 27, 2008. On October 1, 2015, U.S. EPA finalized the new 2015 ozone NAAQS at 0.07 ppm, effective December 28, 2015. Nonattainment areas of the 1997 or the 2008 8-hour ozone standards, including the South Coast Air Basin and the Coachella Valley, still have continuing obligations to demonstrate attainment of that standard by the applicable attainment date. Statistics presented in this Appendix refer to the current 2015 8-hour ozone NAAQS, the revised 2008 NAAQS, and the revoked 1997 8-hour ozone NAAQS, as well as the revoked 1979 1-hour ozone NAAQS, for purposes of historical comparison and assessment of progress towards attainment of those standards.

The State of California Air Resources Board (CARB), established an 8-hour average State ozone standard (0.070 ppm), effective May 17, 2006. The earlier State 1-hour ozone standard (0.09 ppm) also continues to remain in effect.

While 1-hour ozone episode levels and related health warnings still exist, they have essentially been replaced by the more protective health warnings associated with the current 8-hour ozone NAAQS, which includes the Air Quality Index (AQI)[8] scale for real-time reporting of air pollution levels and forecasts. The older 1-hour ozone episode warning levels include the State Health Advisory (0.15 ppm), Stage 1 (0.20 ppm), Stage 2 (0.35 ppm) and Stage 3 (0.50 ppm). While the State 1-hour ozone Health Advisory was last exceeded in the Basin in 2020, the Basin's last 1-hour ozone Stage 1 episode occurred in 2003. The last 1-hour ozone Stage 2 episode occurred in 1988, and the last Stage 3 episode occurred in 1974.

Particulate Matter Properties

Particulate matter (PM) air pollution is a complex mixture of small particles and liquid droplets, with a wide variety of components, including acids and salts (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. Particles originate from a variety of anthropogenic mobile and stationary sources and from natural sources. These particles can be emitted directly or formed in the atmosphere by transformations of gaseous emissions, such as sulfur oxides (SOx), nitrogen oxides (NOx), ammonia (NH_3) and volatile organic compounds (VOC). Examples of secondary particle formation include: 1) conversion of SOx and NOx to acid droplets or vapor that further react with ammonia to form ammonium sulfate and ammonium nitrate; and 2) reactions involving gaseous VOC, yielding organic compounds that condense on existing particles to form secondary organic aerosol (SOA) particles.

A significant body of peer-reviewed scientific research, including studies conducted in Southern California, points to adverse impacts of particulate matter air pollution on both increased illness (morbidity) and increased death rates (mortality). The 2019 U.S. EPA *Integrated Science Assessment for Particulate Matter*[9] as well as the Supplement to the 2019 Integrated Science Assessment for Particulate Matter[10] describe these

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[8] U.S. EPA Air Quality Index (AQI). [https://www.airnow.gov/aqi/aqi-basics/]

[9] U.S. EPA. (2019). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-19/188. https://www.epa.gov/isa/integrated-science-assessment-isa-particulate-matter.

[10] U.S. EPA. (2021). Supplement to Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-21/198. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=352823.

health effects and discuss the state of the scientific knowledge. As of early 2022, U.S. EPA is evaluating the need to strengthen the standards for fine particulate matter based on the best available science and recommendations from the Clean Air Scientific Advisory Committee (CASAC)[11]. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

The size of particles is directly linked to their potential for causing health problems. Particles that are 10 micrometers (µm) in diameter or smaller (PM10) are of more concern than larger particles because they generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. PM air pollution is typically grouped into two overlapping categories:

- *Inhalable particles* (PM10), such as those found near roadways and dusty industrial sites, are smaller than 10 µm in diameter. PM10 includes all PM2.5 particles;
- *Fine particles* (PM2.5), such as those found in smoke and haze, are 2.5 µm in diameter and smaller. These particles can be directly emitted from combustion sources, such as from diesel exhaust (soot) or forest fire smoke, or they can form when gases emitted from power plants, industrial facilities and motor vehicles react in the air to form secondary inorganic aerosol or secondary organic aerosol. PM2.5 is a subset of PM10 particles.

PM10 Properties

Inhalable particles (particulate matter less than about 10 micrometers in diameter) can accumulate in the respiratory system and aggravate health problems such as asthma, bronchitis, and other lung diseases. Children, the elderly, exercising adults, and those suffering from asthma are especially vulnerable to PM10.

PM10 particles are both directly emitted and formed chemically in the atmosphere from diverse emission sources. Major sources of PM10 include re-suspended road dust or soil entrained into the atmosphere by wind or activities such as construction and agriculture. These are mainly the coarser particles, in the PM10-2.5 coarse fraction range (often referred to as PM-Coarse, i.e., particles in the size range between 2.5 µm and 10 µm). Other components of PM10 form in the atmosphere (secondary PM10) from gaseous precursor emissions. These are mostly smaller particles, mainly in the PM2.5 size range.

PM2.5 Properties

PM2.5, also known as fine particles, are the finer sized particles less than 2.5 µm in diameter, small enough to penetrate the defenses of the human respiratory system and lodge in the deepest recesses of the lungs, causing adverse health impacts. Health effects include increased risks of heart attacks and strokes, aggravated asthma, acute bronchitis and chronic respiratory problems such as shortness of breath and painful breathing (in children, the elderly and sensitive people), and premature deaths (mainly in the elderly due to weaker immune systems). Sources of PM2.5 include diesel-powered vehicles such as buses and trucks, cooking, fuel combustion from automobiles, power plants, industrial processes, and wood burning.

In the Basin, a large fraction of the PM10 mass is actually PM2.5 (i.e., smaller in size than 2.5 µm), a situation which has major implications for both health and atmospheric visibility. Reducing PM2.5 concentrations will

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[11] U.S. EPA. (2021) Policy Assessment Updates for the PM NAAQS Reconsideration. https://casac.epa.gov/ords/sab/f?p=105:18:7422383326691:::RP,18:P18_ID:2607#report

therefore not only reduce the threat to the health of the Basin's population, but will also improve visibility in this region.

Total Suspended Particulate (TSP) Properties

Total suspended particulate (TSP) is the name applied to the complex mixture of particles suspended in the atmosphere, with no strict differentiation for particle size. TSP is collected on a glass fiber filter by means of a high volume sampler. Samples are collected for a 24-hour period every sixth day, and then returned to the laboratory to be weighed for mass and chemically analyzed to determine the concentrations of sulfate, nitrate, and lead. The federal and State standards for lead are based on the analysis of TSP samples. Other than the specific health effects of lead, the fine fraction of TSP has greater effects on health and visibility than the coarse fraction. Of greatest concern to public health are the particles small enough to be inhaled into the lungs (PM10) and especially the smaller fine particles that are inhaled more deeply into the lungs (PM2.5). As a result the federal standard for TSP mass has been replaced with the PM10 and PM2.5 standards.

Particulate Matter (PM) Air Quality Standards

PM10 Air Quality Standards

In 1987, U.S. EPA adopted PM10 standards, replacing the earlier TSP standard. South Coast AQMD began PM10 monitoring in 1984. U.S. EPA promulgated both a short-term 24-hour average standard (150 µg/m^3)[12] and an annual standard (50 µg/m^3). Over the years, the forms and levels of the federal PM10 standards were reviewed by U.S. EPA. Changes to the federal standards for PM10 went into effect on December 17, 2006. U.S. EPA first proposed to revise the 24-hour PM10 standard by establishing a new indicator for coarse particles (particles between 2.5 and 10 microns in diameter, PM10-2.5). U.S. EPA proposed to set the PM10-2.5 standard at a level of 70 µg/m^3. However, the coarse particle standard was not included as part of the final regulation which retained the 24-hour PM10 standard (150 µg/m^3).

U.S. EPA also revoked the annual PM10 standard due to a cited lack of evidence of adverse health effects linked to long-term exposure to coarse particles, beyond that already protected against by the PM2.5 annual standard. As part of the revision to the ambient air monitoring regulations in 2006, PM10-2.5 monitoring was required at National Core (NCore) multi-pollutant monitoring stations by January 1, 2011. Currently, South Coast AQMD measures PM10-2.5 at two NCore PM monitoring sites in the Basin (Central Los Angeles and Riverside-Rubidoux). In the most recent review of the PM standards completed in December of 2020, U.S. EPA did not propose changes to the PM10 standard, and a PM10-2.5 standard has not been promulgated.

PM2.5 Air Quality Standards

In 1997, U.S. EPA adopted new federal air quality standards for the subset of fine particulate matter, PM2.5, to complement existing PM10 standards that target the full range of inhalable particulate matter. South Coast AQMD began monitoring PM2.5 concentrations in 1999. In 2006, U.S. EPA significantly lowered the level of the 24-hour PM2.5 standard, from 65 µg/m^3 to 35 µg/m^3, while retaining the level of the annual PM2.5 standard at 15.0 µg/m^3.

In the 2006 PM NAAQS review, U.S. EPA determined that individuals with pre-existing heart and lung diseases, older adults, and children are at greater risk from the effects associated with fine PM exposures. Based on the

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[12] µg/m^3 = micrograms per cubic meter

results of the previous studies and an extensive new body of scientific evidence that links the negative health impacts of PM2.5 exposure on these and possibly additional sensitive groups, U.S. EPA strengthened the annual PM2.5 standard from 15.0 to 12.0 µg/m^3, effective March 18, 2013.[13] The current 24-hour standard of 35 µg/m^3 remained unchanged. In addition, U.S. EPA required near-roadway PM2.5 monitoring at two locations in the Basin, which was implemented by the January 1, 2015 deadline. Table 1-4 summarizes the history of the PM NAAQS to date.

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[13] Since the revised annual PM2.5 NAAQS rule was proposed by U.S. EPA on June 14, 2012, it is often referred to as the 2012 annual PM2.5 federal standard.

TABLE 1-4

SUMMARY OF NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) FOR PARTICULATE MATTER, 1971–PRESENT

Year of NAAQS Rulemaking	PM Indicator	Averaging Time	Level (µg/m^3)
1971	TSP - Total Suspended Particles (≤ 25–45 µm)	24-hour	260
		Annual	75
1987	PM10	24-hour*	150
		Annual	50
1997	PM2.5	24-hour**	65
		Annual	15.0
	PM10	24-hour*	150
		Annual	50
2006	PM2.5	24-hour**	35
		Annual	15.0
	PM10	24-hour*	150
		Annual	(revoked)
2012	PM2.5	24-hour**	**35**
		Annual	**12.0**
	PM10	24-hour*	**150**

* The form of the PM10 24-hour NAAQS is *not to be exceeded more than once per year averaged over 3 years by station.*

** The form of the PM2.5 24-hour NAAQS is based on the 98th percentile value by station.

CO Properties

Carbon monoxide (CO) is a colorless, odorless, relatively inert gas. It is a trace constituent in the unpolluted troposphere and is produced by both natural processes and human activities. In remote areas far from human populations, carbon monoxide occurs in air at an average background concentration of 0.04 ppm, primarily as a result of natural processes such as forest fires and the oxidation of methane. Global atmospheric mixing of CO from urban and industrial sources creates higher background concentrations (up to 0.20 ppm) near urban areas. The major source of CO in urban areas is incomplete combustion of carbon-containing fuels. CO concentrations have continued to decrease due to reformulated fuels and more efficient combustion in newer vehicles.

As a primary pollutant, carbon monoxide is directly emitted into the air. Ambient concentrations of CO in the Basin exhibit large spatial and temporal variations, due to variations in the rate and locations at which CO is emitted, and in the meteorological conditions that govern transport and dilution. Unlike ozone, CO tends to reach high concentrations in the fall and winter months. The highest concentrations frequently occur at times consistent with rush hour traffic and late at night during the coolest, most atmospherically stable portion of the day.

The adverse effects of ambient carbon monoxide air pollution exposure on health have been reviewed in the 2010 U.S. EPA *Integrated Science Assessment for Carbon Monoxide.*[14] This document presents a review of the available scientific studies and conclusions on the causal determination of the health effects of CO. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

CO Air Quality Standards

The CO standards are based on both short-term (1-hour; 35 ppm federal and 20 ppm State) and longer-term (8-hour; 9 ppm federal and 9.0 ppm State) exposures.

NO_2 Properties

Nitrogen dioxide (NO_2) is a reddish-brown gas with a bleach-like odor. Nitric oxide (NO) is a colorless gas, formed from nitrogen (N_2) and oxygen (O_2) in air under conditions of high temperature and pressure which are generally present during combustion of fuels; NO reacts with the oxygen in air to form NO_2. NO_2 is largely responsible for the brownish tinge of polluted urban air. The two gases, NO and NO_2, are referred to collectively as oxides of nitrogen (NOx). In the presence of sunlight, NO_2 reacts to produce nitric oxide and an oxygen atom. The oxygen atom can react further to produce ozone via a complex series of chemical reactions involving hydrocarbons (VOCs). NO_2 may also react to produce nitric acid (HNO_3) which reacts further to produce nitrates, which are a component of PM.

The adverse effects of ambient nitrogen dioxide air pollution exposure on health were reviewed in the 2008 U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen - Health Criteria*,[15] and more recently in the 2016 U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen - Health Criteria*.[16] These documents

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[14] U.S. EPA. (2010). Integrated Science Assessment for Carbon Monoxide (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/019F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=218686.

[15] U.S. EPA. (2008). Integrated Science Assessment for Oxides of Nitrogen - Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/071. http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645.

[16] U.S. EPA. (2016). Integrated Science Assessment for Oxides of Nitrogen - Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-15/068. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879.

present detailed reviews of the available scientific studies and conclusions on the causal determination of the health effects of NO_2. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

NO_2 Air Quality Standards

Effective April 12, 2010, U.S. EPA established a primary NO_2 1-hour NAAQS of 100 ppb (3-year average of the annual 98th percentile of 1-hour daily maximum concentrations for each station). The short-term standard supplements the existing 1971 annual NAAQS (0.053 ppm). In addition to the ambient NO_2 monitoring network, U.S. EPA also established requirements for near-road NO_2 monitoring in large metropolitan areas, within 50 meters of the most heavily trafficked roadways. Effective March 20, 2008, the California Air Resources Board (CARB) revised the State NO_2 1-hour standard from 0.25 ppm to 0.18 ppm and established a new annual State standard of 0.030 ppm.

SO_2 Properties

Sulfur dioxide (SO_2) is a colorless gas with a sharp odor. It reacts in the air to form sulfuric acid (H_2SO_4), which contributes to acid deposition, and sulfates, which are a component of PM10 and PM2.5. Most of the SO_2 emitted into the atmosphere is produced by the burning of sulfur-containing fuels.

The adverse effects of SO_2 air pollution exposure on health were reviewed in the 2017 U.S. EPA *Integrated Science Assessment (ISA) for Sulfur Oxides - Health Criteria*.[17] This document presents a review of the available scientific studies and conclusions on the causal determination of the health effects of SO_2. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Sulfur dioxide also causes plant damage, damage to materials, and acidification of lakes and streams.

SO_2 Air Quality Standards

Based on the review of the SO_2 standards, U.S. EPA has established the 1-hour SO_2 standard to protect the public health against short-term exposure. The 1-hour average NAAQS was set at 75 ppb and the annual (0.03 ppm) and 24-hour (0.14 ppm) federal standards were revoked, effective August 2, 2010.

Sulfate Properties

Sulfates are chemical compounds which contain the sulfate ion (SO_4^{2-}) and are part of the mixture of solid materials which make up PM2.5, PM10 and TSP. Most of the sulfates in the atmosphere are produced by oxidation of sulfur dioxide. Oxidation of sulfur dioxide yields sulfur trioxide (SO_3) which reacts with water to produce sulfuric acid (H_2SO_4), which contributes to acid deposition. The reaction of sulfuric acid with basic substances such as ammonia yields sulfates, a component of PM.

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[17] U.S. EPA. (2017). Integrated Science Assessment (ISA) for Sulfur Oxides - Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-17/451. https://www.epa.gov/isa/integrated-science-assessment-isa-sulfur-oxides-health-criteria.

In 2002, CARB reviewed and retained the State standard for sulfates, retaining the concentration level (25 µg/m^3) but changing the basis of the standard from a Total Suspended Particulate (TSP) measurement to a PM10 measurement. In their 2002 staff report,[18] CARB reviewed the health studies related to exposure to ambient sulfates, along with particulate matter, and found an association with mortality and the same range of morbidity effects as PM10 and PM2.5, although the associations were not as consistent as with PM10 and PM2.5. U.S. EPA has not promulgated a separate NAAQS for sulfates. The 2009 U.S. EPA *Integrated Science Assessment for Particulate Matter*[19] also contains a review of sulfate studies.

Lead (Pb) Properties

Lead in the atmosphere is present as a mixture of several lead compounds. Leaded gasoline and lead smelters had historically been the main Basin sources of lead emitted into the air. Due to the phasing out of leaded gasoline, there has been a dramatic reduction in atmospheric lead in the Basin over the past three decades. The primary source of lead is related to businesses that work with lead, such as lead battery recycling facilities. Another source is general aviation, since most small planes continue to use leaded fuels. However, the Federal Aviation Administration is working towards the phase out of lead in aviation fuels.[20]

The adverse effects of ambient lead exposures on health were reviewed in the 2013 U.S. EPA document, *Integrated Science Assessment for Lead: Final Report*.[21] This document presents a review of the available scientific studies and conclusions on the causal determination of the health effects of lead. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Lead Air Quality Standards

The national standard for lead was revised on October 15, 2008 from a quarterly average of 1.5 µg/m^3 to a rolling 3-month average of 0.15 µg/m^3, with a maximum (not-to-be-exceeded) form, evaluated over a 3-year period (36 months). The current indicator of lead in total suspended particles (Pb-TSP) was retained. The revision became effective on January 12, 2009.

U.S. EPA also enhanced the lead monitoring requirements in its 2008 NAAQS revisions, requiring air monitoring near lead sources, where 3-month average lead concentrations have the potential to exceed the revised standard of 0.15 µg/m^3. Lead monitoring is required in large urban areas with monitors located to measure lead concentrations in areas impacted by resuspended dust from roadways, nearby industrial sources identified as significant lead sources, hazardous waste sites, construction and demolition projects, or other fugitive dust sources of lead. Following a petition in 2009, U.S. EPA revised the monitoring requirements,

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[18] CARB. (2002). Staff Report: Public Hearing to Consider Amendments to the Ambient Air Quality Standards for Particulate Matter and Sulfates. California Air Resources Board, Sacramento, CA. [http://www.arb.ca.gov/regact/aaqspm/isor.pdf]

[19] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F. [http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546]

[20] Aviation Gasoline. Federal Aviation Administration, Washington, DC. [https://www.faa.gov/about/initiatives/avgas/]

[21] U.S. EPA. (2013). Integrated Science Assessment for Lead (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-10/075F. [http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=255721#Download]

lowering the emission threshold at which monitoring is required for both source-oriented and large urban area-based non-source oriented monitoring. The monitoring revision became effective in January 2011.

In 2020, South Coast AQMD's lead monitoring network included seven regular monitoring sites and an additional four source-specific sites. None of these locations exceeded the lead NAAQS in recent years. Unfortunately, due to pandemic related monitor shutdowns, the lead data fails EPA completeness requirements. A request to U.S. EPA for re-designation to attainment will be prepared when monitoring requirements are satisfied.

CHAPTER 2

AIR QUALITY IN THE SOUTH COAST AIR BASIN

Overview of Air Quality in the Basin

Current Air Quality Summary

Attainment/Nonattainment Designations

Air Quality Trends

Spatial and Temporal Variability

Pollutant-Specific Air Quality Discussion

Ozone (O_3)

Particulate Matter (PM)

Carbon Monoxide (CO)

Nitrogen Dioxide (NO_2)

Sulfur Dioxide (SO_2)

Sulfates (SO_4^{2-})

Lead (Pb)

Overview of Air Quality in the Basin

Current Air Quality Summary

The maximum pollutant concentrations measured at South Coast AQMD monitoring stations in 2020 exceeded the levels of the federal and State standards for ozone, PM2.5, PM10 and nitrogen dioxide (NO_2). One or more stations in the Basin exceeded current federal standards on a total of 181 days (49 percent of the year), including: 8-hour ozone (157 days over the 2015 ozone NAAQS), 24-hour PM2.5 (39 days)[22], PM10 (3 days), and NO_2 (1 day). In 2020, the Basin exceeded the revised 2008 and revoked 1997 8-hour ozone NAAQS on 142 and 97 days, respectively. Measured levels of other criteria pollutants, sulfur dioxide (SO_2), carbon monoxide (CO), and sulfates, did not exceed federal or State standards.

Both 24-hour and annual PM2.5 concentrations have improved significantly over the past 15 years. For the 2018-2020 periods, after removing exceptional events caused by the Bobcat and El Dorado Fires, the Basin met the 24-hour PM2.5 NAAQS. While several stations in the Basin remain in violation of the current 2012 annual PM2.5 NAAQS (12.0 $\mu g/m^3$), no stations in the Basin have violated the former (1997) annual PM2.5 NAAQS (15.0 $\mu g/m^3$) since 2014. Most of the high PM2.5 concentrations in the Basin occur in the late fall and winter months. Cold and humid weather conditions favor the partitioning of inorganic vapors into particles in the atmosphere, resulting in high PM2.5 levels. Other unfavorable weather conditions such as a low and stable boundary layer and the lack of rainfall can also contribute to high PM2.5 concentrations, as the precursors and particles are not dispersed or washed out as frequently. During the winter months, especially the holiday season, residential wood burning is also a major contributor to particulate mass and precursors, leading to high PM2.5 concentrations in the coastal and inland valley areas.

In 2020, NO_2 concentrations exceeded the level of the 1-hour NAAQS on one day at a single location. However, attainment of the NAAQS is measured with the three-year design value that takes into account the form of the federal standards and a multi-year average, as detailed previously in Table 1-3. The design value form of the NAAQS, based on the annual 98th percentile maximum daily 1-hour concentration at a station averaged over three years, did not violate the standard or affect the NO_2 NAAQS attainment designation.

From 2018 to 2020 the Basin exceeded the PM10 24-hour NAAQS 14 times. All of the exceedances were caused by windblown dust during high-wind events that would qualify for exclusion under the U.S EPA Exceptional Event Rule. South Coast AQMD has prepared exceptional event demonstrations for three of these events, two at Mira Loma (Van Buren) in October 2019 and one at Long Beach (Hudson) in April 2019. If data collected on these three exceptional event days is removed, the fourth highest in three-year 24-hour PM10 concentration-based design value in the Basin was 152 $\mu g/m^3$, with Azusa as the design station[23]. The design value does not exceed the level of the 24-hour PM10 NAAQS, 155 $\mu g/m^3$ after rounding.

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[22] Data includes both FRM filter-based and continuous measurements.

[23] A PM10 measurement conducted at the Long Beach Hudson monitor on July 19, 2018 resulted in an exceedance of the 24-hour PM10 standard. While South Coast AQMD staff believes that this exceedance does not meet the U.S. EPA criteria for removal as an exceptional event, it was recorded on a day with heavy construction immediately adjacent and underneath the monitoring station, and thus is not representative of local conditions. Following South Coast AQMD data validation procedures, this measurement has been invalidated using the U.S. EPA Air Quality System (AQS) null data code for Construction/Repairs in Area (AC).

Figure 2-1 shows the Basin maximum AQI for each day in 2020, based on which pollutant was the main driver of AQI. High ozone levels were the most frequent driver of maximum Basin AQI. Elevated PM2.5 levels also resulted in a large number of unhealthy air days, many of which were caused by local wildfires.

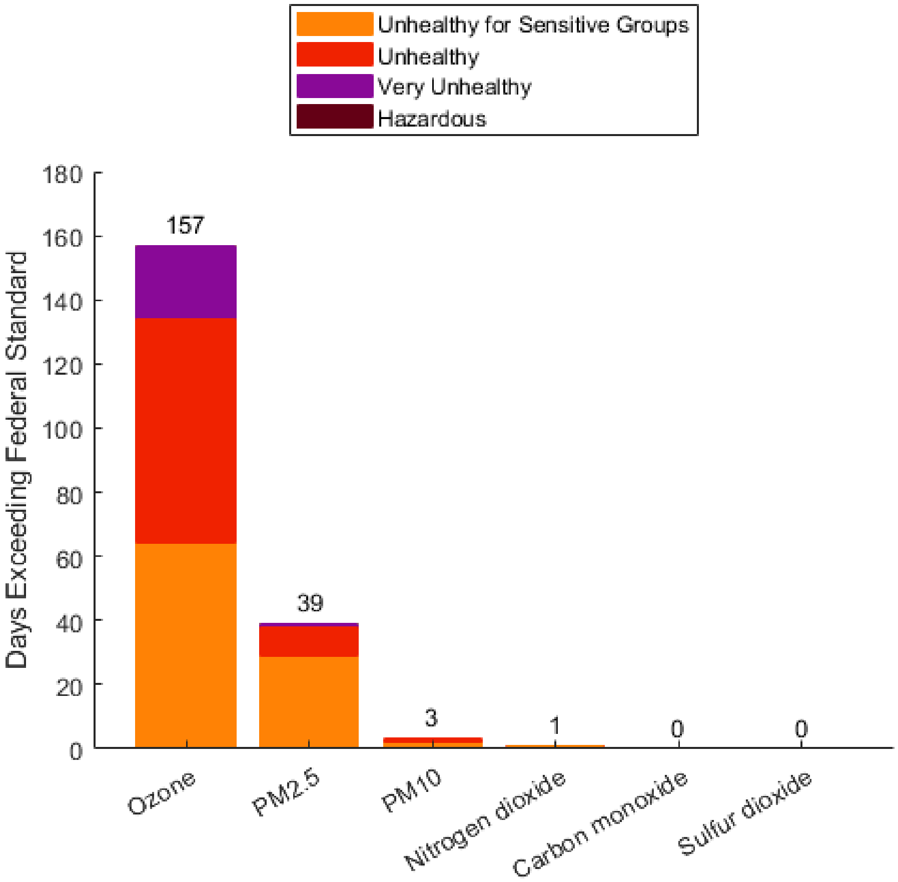

FIGURE 2-1

2020 EXCEEDANCES IN SOUTH COAST AIR BASIN BY AIR QUALITY INDEX (AQI) CATEGORY

(DAYS EXCEEDING FEDERAL STANDARD BY MAXIMUM AQI RECORDED IN THE BASIN)

Attainment/Nonattainment Designations

In the 2018-2020 design value period, the Basin exceeded the pollutant concentration levels defined by the 8 and 1 hour ozone and annual PM2.5 NAAQS. Attainment of the NAAQS is based on the design value level and form of the standard, which is typically averaged over a 3-year period. Figure 2-2 shows the current federal ozone and PM design value status for the Basin for the 2018–2020 3-year period, as compared to the current and former NAAQS. The current U.S. EPA NAAQS attainment designations for the Basin are presented in Table 2-1. The current attainment designation status of the State standards in the Basin is presented in Table 2-2.

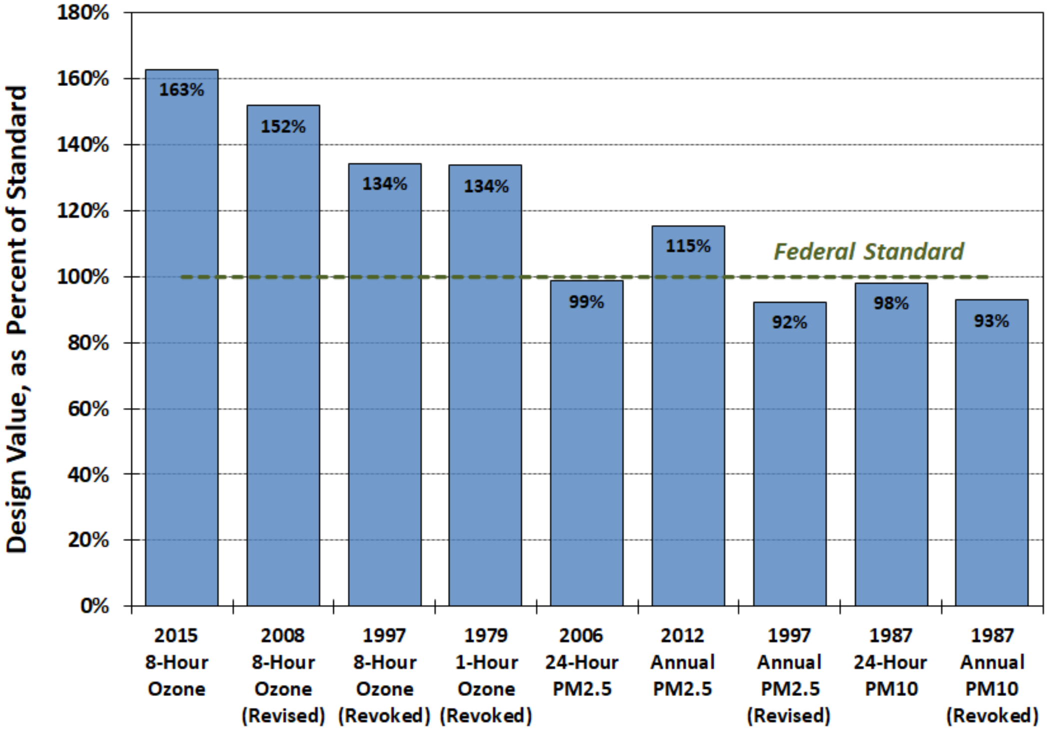

FIGURE 2-2

SOUTH COAST AIR BASIN 2018–2020 3-YEAR DESIGN VALUES

(PERCENTAGE OF CURRENT AND FORMER NAAQS)

TABLE 2-1

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) ATTAINMENT STATUS – *SOUTH COAST AIR BASIN*

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone (O_3)	(1979) **1-Hour** (0.12 ppm)[c]	Nonattainment (“extreme”)	2/26/2023 (revised deadline)
	(2015) **8-Hour** (0.070 ppm)[d]	Pending – Expect Nonattainment (“extreme”)	8/3/2038
	(2008) **8-Hour** (0.075 ppm)[d]	Nonattainment (“extreme”)	7/20/2032
	(1997) **8-Hour** (0.08 ppm)[d]	Nonattainment (“extreme”)	6/15/2024
PM2.5[e]	(2006) **24-Hour** (35 µg/m^3)	Nonattainment (“serious”)	12/31/2019
	(2012) **Annual** (12.0 µg/m^3)	Nonattainment (“serious”)	12/31/2021
	(1997) **Annual** (15.0 µg/m^3)	Attainment (final determination pending)	4/5/2015 (attained 2013)
PM10[f]	(1987) **24-hour** (150 µg/m^3)	Attainment (Maintenance)	7/26/2013 (attained)
Lead (Pb)[g]	(2008) **3-Months Rolling** (0.15 µg/m^3)	Nonattainment (Partial) (Attainment determination to be requested)	12/31/2015
CO	(1971) **1-Hour** (35 ppm)	Attainment (Maintenance)	6/11/2007
	(1971) **8-Hour** (9 ppm)	Attainment (Maintenance)	6/11/2007
NO_2[h]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Attainment (Maintenance)	9/22/1998 (attained)
SO_2[i]	(2010) **1-Hour** (75 ppb)	Unclassifiable/Attainment	1/9/2018
	(1971) **24-Hour** (0.14 ppm)	Unclassifiable/Attainment	3/19/1979 (attained)

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable.

b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration.

c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/2005; however, the Basin has not attained this standard and therefore has some continuing obligations with respect to the revoked standard. Original attainment date was 11/15/2010; the revised attainment date is 2/6/2023.

d) The 2008 8-hour ozone NAAQS (0.075 ppm) was revised to 0.070 ppm, effective 12/28/2015 with classifications and implementation goals to be finalized by 10/1/2017. The 1997 8-hour ozone NAAQS (0.08 ppm) was revoked in the 2008 ozone NAAQS implementation rule, effective 4/6/2015. There are continuing obligations under the revoked 1997 and revised 2008 ozone NAAQS until they are attained.

e) The attainment deadline for the 2006 24-hour PM2.5 NAAQS was 12/31/2015 for the former “moderate” classification; U.S. EPA approved reclassification to “serious,” effective 2/12/2016 with an attainment deadline of 12/31/2019. The 2012 (proposal year) annual

PM2.5 NAAQS was revised on 1/15/2013, effective 3/18/2013, from 15 to 12 µg/m^3; new annual designations were final 1/15/2015, effective 4/15/2015.

f) The annual PM10 NAAQS was revoked, effective 12/18/2006. The 24-hour PM10 NAAQS deadline was 12/31/2006; the Basin's Attainment Re-designation Request and PM10 Maintenance Plan was approved by U.S. EPA on 6/26/2013, effective 7/26/2013.

g) Partial Nonattainment designation – Los Angeles County portion of the Basin only for near-source monitors. These sites are expected to remain in attainment based on current monitoring data; pandemic related shutdowns led to inability to satisfy U.S. EPA data completeness requirements.

h) New 1-hour NO_2 NAAQS became effective 8/2/2010, with attainment designations effective 1/20/2012.

i) The 1971 annual and 24-hour SO2 NAAQS were revoked, effective 8/23/2010.

TABLE 2-2

CALIFORNIA AMBIENT AIR QUALITY STANDARDS (CAAQS) ATTAINMENT STATUS
SOUTH COAST AIR BASIN

Pollutant	Averaging Time and Level[b]	Designation[a] South Coast Air Basin
Ozone (O_3)	**1-Hour** (0.09 ppm)	Nonattainment
	8-Hour (0.070 ppm)	Nonattainment
PM2.5	**Annual** (12.0 μg/m^3)	Nonattainment
PM10	**24-Hour** (50 μg/m^3)	Nonattainment
	Annual (20 μg/m^3)	Nonattainment
Lead (Pb)	**30-Day Average** (1.5 μg/m^3)	Attainment
CO	**1-Hour** (20 ppm)	Attainment
	8-Hour (9.0 ppm)	Attainment
NO_2	**1-Hour** (0.18 ppm)	Attainment
	Annual (0.030 ppm)	Attainment
SO_2	**1-Hour** (0.25 ppm)	Attainment
	24-Hour (0.04 ppm)	Attainment
Sulfates	**24-Hour** (25 μg/m^3)	Attainment
H_2S	**1-Hour** (0.03 ppm)	Unclassified

a) CA State designations shown were updated by CARB in 2020, based on the 2017–2019 3-year period; stated designations are based on a 3-year data period after consideration of outliers and exceptional events. Source: http://www.arb.ca.gov/desig/statedesig.htm#current

b) CA State standards, or CAAQS, for ozone, CO, SO_2, NO_2, PM10 and PM2.5 are values not to be exceeded; lead, sulfates, and H_2S standards are values not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

Air Quality Trends

There have been significant improvements in the Basin's air quality over the years since measurements began. Figure 2-3 shows the trends of *basin-days*[24] exceeding the federal standards for ozone, PM10, and PM2.5 for 1990 through 2020, as a percentage of the number of days in a year. PM2.5 shows the most dramatic improvement of these pollutants. The number of exceedance days is a common metric to evaluate trends in air quality, but other metrics such as number of days at each air quality index level and design values should also be considered.

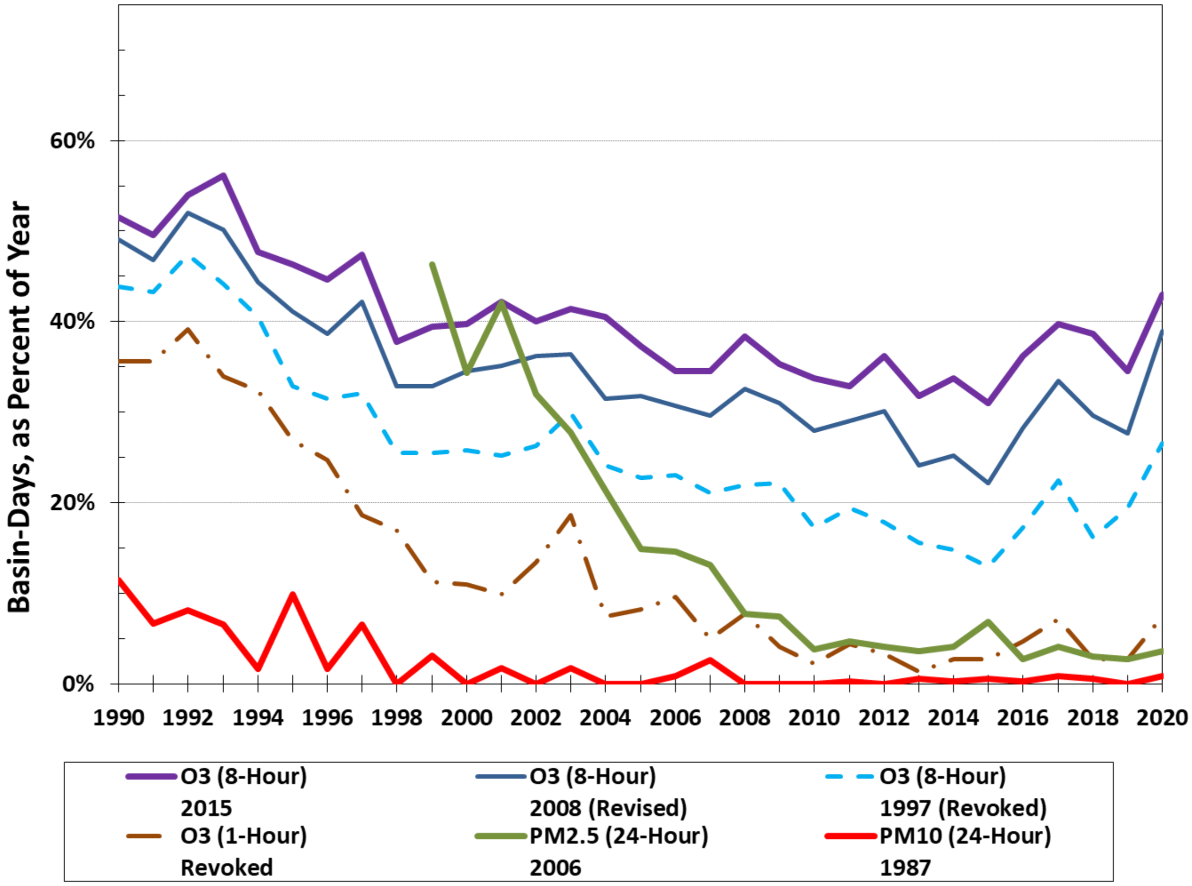

FIGURE 2-3

TREND OF BASIN-DAYS EXCEEDING FEDERAL STANDARDS, 1990–2020

(AS PERCENTAGES OF THE YEAR; FLAGGED PM10 EXCEPTIONAL EVENTS EXCLUDED)

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[24] A "basin-day" is recorded if one or more locations in the air basin exceeded the level of the standard on that day. Multiple locations exceeding on the same day count as a single basin-day.

Figure 2-4 shows the trend from 1980 through 2020 of the annual number of Basin days exceeding various metrics for ozone, including: the 1-hour Stage 1[25] level (0.20 ppm); the 1-hour State Health Advisory level (0.15 ppm); the revoked 1979 1-hour NAAQS (0.125 ppm); the revoked 1997 8-hour NAAQS (0.08 ppm); the revised 2008 8-hour NAAQS (0.075 ppm); and the new 2015 8-hour NAAQS (0.070 ppm). All the ozone trends show significant improvement achieved through the period. However, they also show the need for continued efforts to meet all the 8-hour ozone standards and the 1979 1-hour standard.

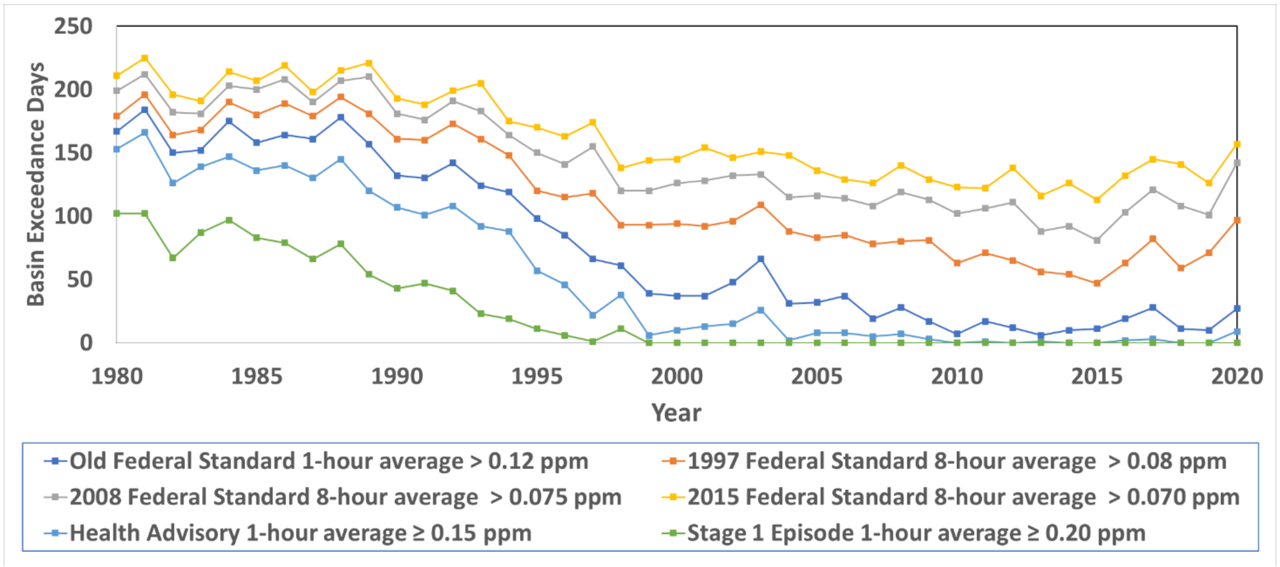

FIGURE 2-4

TREND OF NUMBER OF BASIN DAYS EXCEEDING CURRENT AND FORMER OZONE NAAQS AND 1-HOUR OZONE EPISODE LEVELS (HEALTH ADVISORY AND STAGE 1), 1980-2020

Figure 2-5 shows the trend of design value concentrations for ozone and PM2.5 in the Basin for the past two decades, as percentages of the corresponding federal standards. The pollutant-specific sections of this chapter contain additional trends by pollutant.

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[25] While the 1-hour ozone episode levels and the related 1-hour ozone health warnings still exist, they have been essentially replaced by the more protective health warnings associated with the current 8-hour ozone NAAQS. The 1-hour ozone episode warning levels include the State Health Advisory (0.15 ppm), Stage 1 (0.20 ppm), Stage 2 (0.35 ppm) and Stage 3 (0.50 ppm). The Basin's last 1-hour ozone Stage 1 episode occurred in 2003. The last 1-hour ozone Stage 2 episode occurred in 1988 and the last Stage 3 episode occurred in 1974.

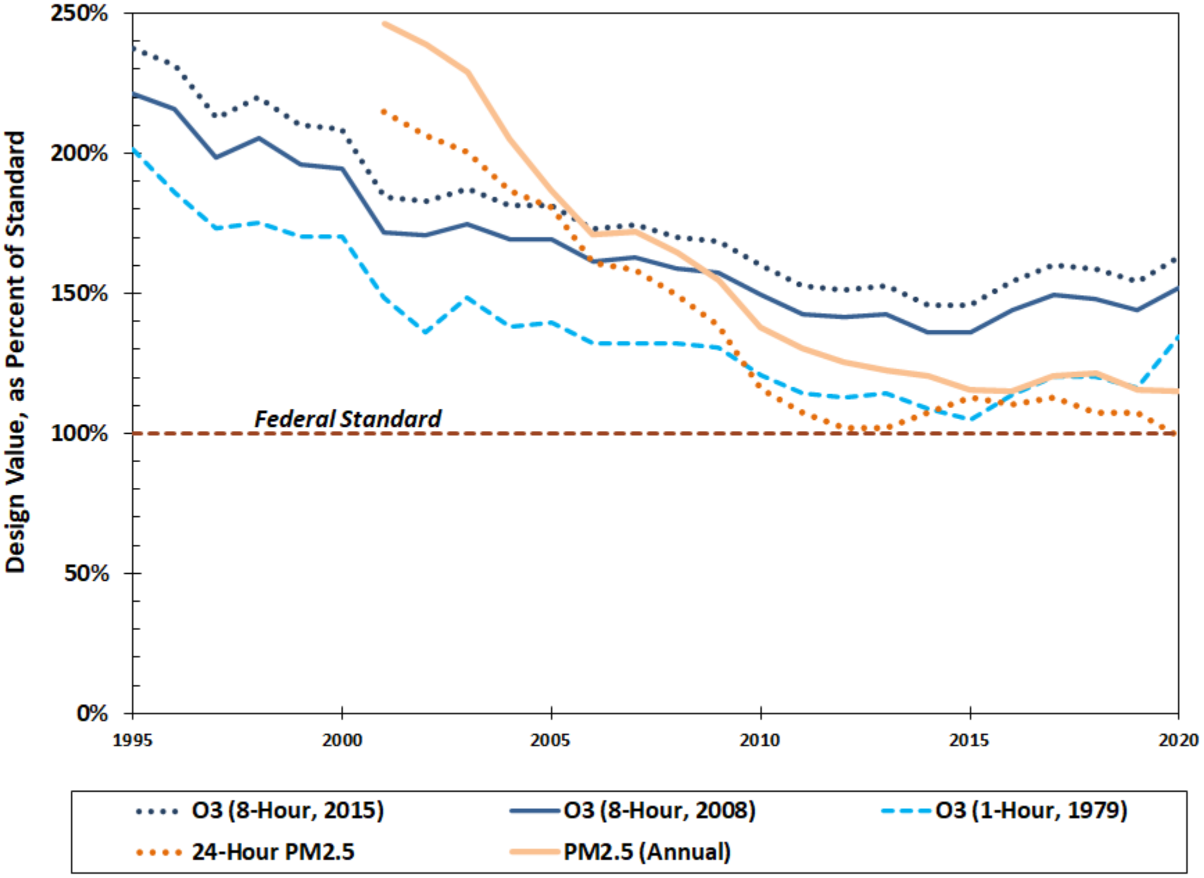

FIGURE 2-5

TRENDS OF SOUTH COAST AIR BASIN MAXIMUM 3-YEAR DESIGN VALUES FOR OZONE (2015 8-HOUR, 2008 8-HOUR, AND 1979 1-HOUR NAAQS) AND PM2.5 (24-HOUR AND ANNUAL), 1995–2020.

(AS PERCENTAGES OF CURRENT AND FORMER FEDERAL STANDARDS; 2001 WAS THE FIRST YEAR THAT 3-YEAR PM2.5 DESIGN VALUES WERE AVAILABLE)

Spatial and Temporal Variability

Air quality in the Basin varies widely by season and by area. The highest pollutant concentrations were all recorded in, or downwind of, the densely populated areas of the Basin. The Basin's air quality concentrations and the occurrence of exceedances vary with season due to seasonal differences in weather, solar radiation intensity for photochemical reactions, and to a lesser extent, seasonal variations in emissions. Higher ozone concentrations are generally recorded during the May to October "smog season" and exceedances of the federal and State ozone standards are most frequent in the summer.

Particulate matter (PM10 and PM2.5) levels do not have as clear of a seasonal pattern as ozone, and elevated concentrations are sometimes recorded throughout the year. PM2.5 exceedances outside of the winter months are largely due to wildfires or Independence Day fireworks. However, PM10 and PM2.5 concentrations most frequently exceed federal standards during the late fall and winter months. Figure 2-6 shows the number of basin-days per month when any of the federal standards were exceeded in the Basin in 2020.

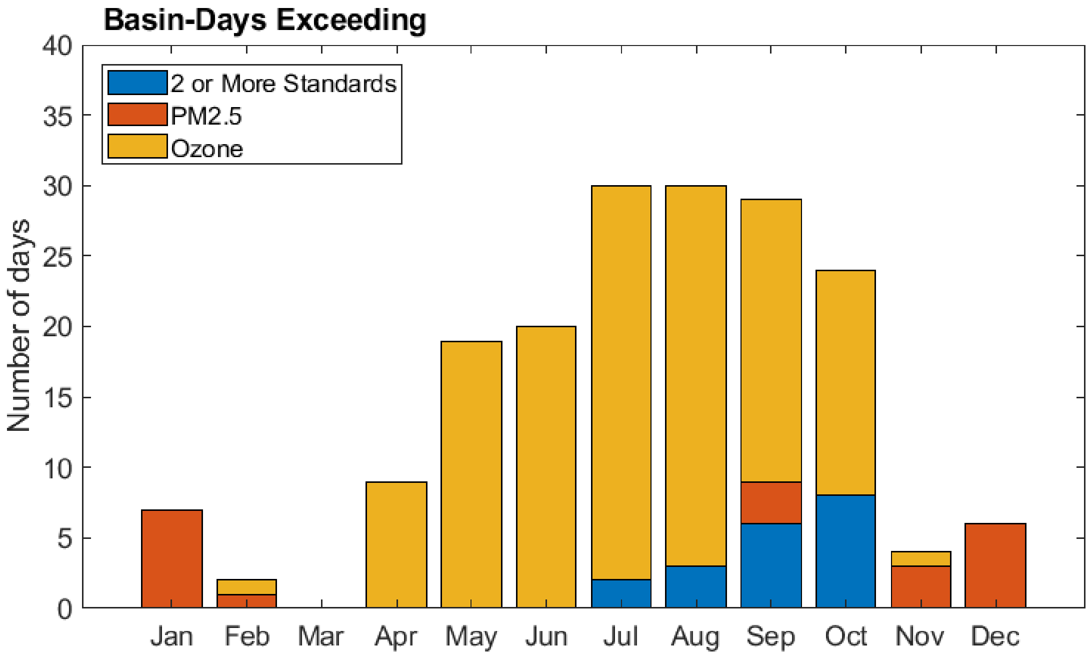

FIGURE 2-6

NUMBER OF BASIN-DAYS PER MONTH EXCEEDING THE FEDERAL STANDARDS IN 2020

(ALL PM10 EXCEEDANCE DAYS OCCURRED ON DAYS WHERE ANOTHER STANDARD WAS EXCEEDED IN 2020)

The number of days exceeding the level of the 2015 8-hour ozone NAAQS (0.070 ppm[26]) in 2020 varied widely by monitoring location, from 2 days to 141 days. Likewise, exceedances of the 2008 8-hour ozone NAAQS (0.075 ppm) also varied, from zero to 127 days. In both cases, the fewest ozone exceedances were recorded along the coast and increased through the inland valleys to a maximum in the Basin's eastern San Bernardino Valley. In the past, ozone concentrations were generally higher on weekends than on weekdays, however this difference is much less distinct in recent years and almost not evident in some stations. The time of day with the highest average ozone concentrations is in the early to middle afternoon, although the inland areas of the Basin will often peak later in the afternoon or in the early evening.

Day-of-week and time-of-day PM2.5 concentrations varied considerably by location for the 2018–2020 period. The hourly PM2.5 diurnal peaks generally occurred in the morning, starting with the period of heaviest morning traffic and more stagnant meteorology. Additional spatial and temporal analyses are presented in the pollutant-specific sections later in this chapter.

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[26] ppm = parts per million, by volume; ppb = parts per billion, by volume; 1 ppm = 1000 ppb

Pollutant-Specific Air Quality Summary

Ozone (O_3)

Current Ozone Air Quality

In 2020, South Coast AQMD monitored ozone concentrations at 27 locations in the Basin, and two locations in the Coachella Valley. Figure 2-7 shows the locations of South Coast AQMD ozone monitors.

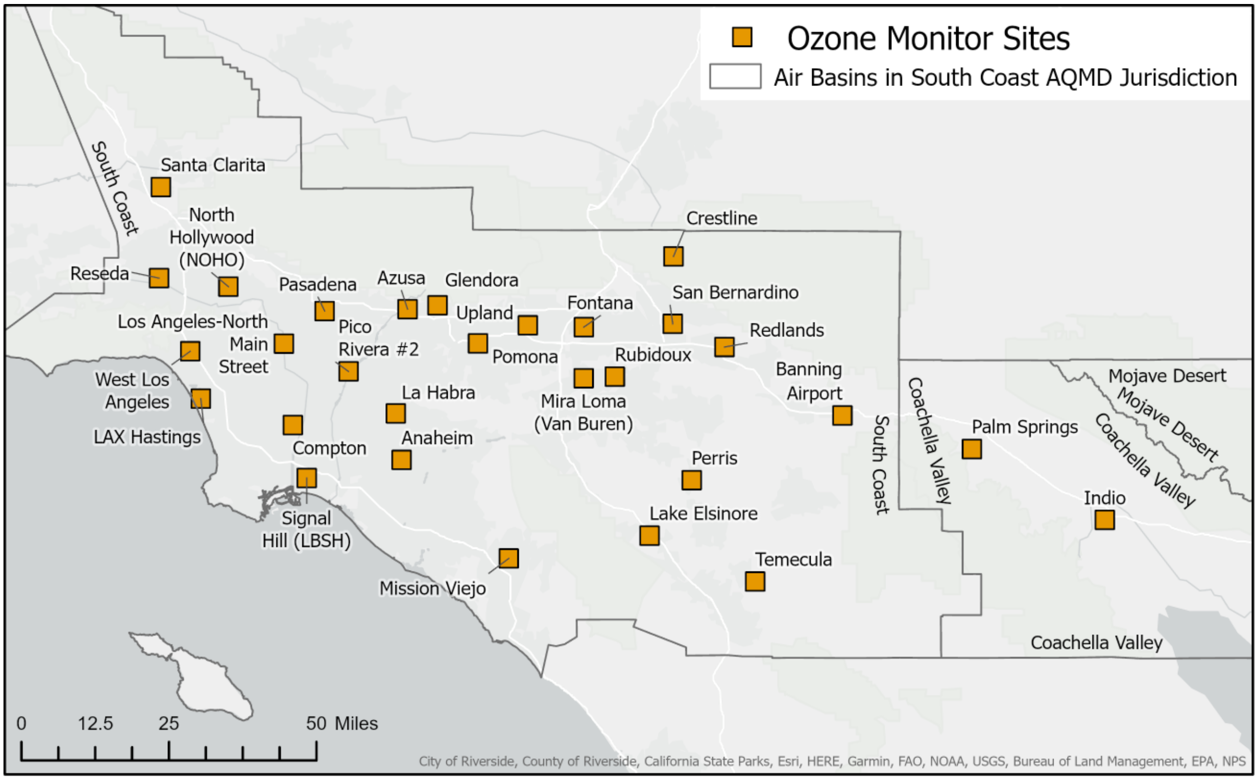

FIGURE 2-7

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT OZONE AIR MONITORING LOCATIONS IN 2020

The 2020 Basin maximum ozone concentrations continued to exceed federal standards by wide margins, although significant improvement has been achieved over the past several decades. All four counties in the Basin, as well as the Coachella Valley, exceeded the level of the 2015 (0.070 ppm), the 2008 (0.075 ppm) and 1997 (0.08 ppm) 8-hour ozone NAAQS in 2020. While not all stations had days exceeding the previous 8-hour federal standards, all South Coast AQMD monitoring stations exceeded the 2015 federal standard on at least one day.

Basin-wide, a total of 157 days exceeded the 2015 ozone federal standard (142 days over the 2008 standard and 97 days over the 1997 standard). The State 8-hour ozone standard was exceeded on 157 days. The highest number of days in 2020 over the 2015, 2008 and 1997 8-hour federal ozone standards (141, 127, and 78 days, respectively) occurred in the Eastern San Bernardino Valley. If multiple stations exceeded a standard on a single day, it was counted as one day. The 2020 maximum 8-hour average ozone concentration of 0.139 ppm was measured in the Central San Bernardino Mountains.

When comparing to the design value form of the federal standard, all four of the Basin's counties were above the 2015, 2008 and 1997 8-hour ozone NAAQS for the 2018–2020 design values. The Basin's highest 2018–2020 8-hour ozone design value (0.114 ppm, measured in the East San Bernardino Valley) was 163 percent of the 2015 8-hour ozone NAAQS (152 percent of the 2008 NAAQS and 134 percent of the 1997 NAAQS). Table 2-3 summarizes the number of days exceeding current and former federal and State 1-hour and 8-hour ozone standard levels by county in the Basin and the Coachella Valley in 2020. Table 2-4 shows the 2020 maximum 8-hour ozone concentrations and 3-year design values by air basin and county, for comparison to the current and former 8-hour ozone NAAQS, along with the State designation value, for comparison to the State ozone standards.

TABLE 2-3

NUMBER OF DAYS IN 2020 EXCEEDING CURRENT AND FORMER OZONE STANDARDS AT THE PEAK STATION BY COUNTY AND BASIN

Basin/County	2020 # Days > Current (2015) 8-Hour O_3 NAAQS (0.070 ppm)	Area of Maximum Exceedances of the 2015 Ozone NAAQS	2020 # Days > Former (2008) 8-Hour O_3 NAAQS (0.075 ppm)	2020 # Days > Former (1997) 8-Hour O_3 NAAQS (0.08 ppm)	2020 # Days > Former (1979) 1-Hour O_3 NAAQS (0.12 ppm)	2020 # Days > Current 8-Hour O_3 State Standard (0.07 ppm)	2020 # Days > Current 1-Hour O_3 State Standard (0.09 ppm)
South Coast Air Basin							
Los Angeles	97	Eastern San Gabriel Valley	71	32	17	97	76
Orange	32	Saddleback Valley	25	10	3	32	20
Riverside	89	Metropolitan Riverside County	62	32	7	89	51
San Bernardino	**141**	**East San Bernardino Valley**	**127**	**78**	**16**	**141**	**104**
Coachella Valley							
Riverside	49	Coachella Valley (Palm Springs)	28	5	0	49	9

Bold text denotes the peak value.

TABLE 2-4

2020 MAXIMUM 8-HOUR AVERAGE OZONE CONCENTRATIONS AND 2018–2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum 8-Hour O_3 Average (ppm)	2018–2020 8-Hour O_3 Design Value (ppm)	Percent of New (2015) O_3 NAAQS (0.070 ppm)	Percent of Former (2008) O_3 NAAQS (0.075 ppm)	Percent of Former (1997) O_3 NAAQS (0.08 ppm)	Area of Design Value Maximum	2018–2020 8-Hour O_3 State Designation Value# (ppm)	Percent of State O_3 Standard (0.070 ppm)
South Coast Air Basin								
Los Angeles	0.138	0.107	153	143	127	East San Gabriel Valley	0.121	173
Orange	0.122	0.082	117	109	98	Saddleback Valley	0.092	131
Riverside	0.117	0.098	140	131	117	Metropolitan Riverside County	0.109	156
San Bernardino	**0.139**	**0.114**	**163**	**152**	**136**	**East San Bernardino Valley**	**0.126**	**180**
Coachella Valley								
Riverside	0.094	0.088	126	117	105	Coachella Valley (Palm Springs)	0.095	136

Bold text denotes the peak value.

The State 8-Hour Designation Value is the highest State 8-hour ozone average, rounded to three decimal places, during the last 3 years (State designation value source: https://www.arb.ca.gov/adam/select8/sc8start.php)

All monitored locations measured maximum 1-hour average ozone concentrations below the Stage 1 episode level (0.20 ppm, 1-hour) in 2020. Except for one day in 2003 (at a special-purpose monitor in the San Bernardino Mountains), the Stage 1 ozone episode level has not been exceeded in the Basin since 1998. There have been no exceedances of the Stage 2 episode level (1-hour average ozone ≥ 0.35 ppm) since 1988 and the Stage 3 episode level (1-hour average ozone ≥ to 0.50 ppm) has not been exceeded since 1974.

The Basin exceeded the level of the former (1979) 1-hour federal ozone standard (0.12 ppm) on 27 days in 2020, with exceedances in all four counties. The State 1-hour standard (0.09 ppm) was exceeded on 132 days in the Basin. The most exceedances of the former 1-hour standard in 2020 (17 days) occurred in the East San Gabriel Valley (Glendora air monitoring station). The 2020 peak 1-hour ozone concentration in the Basin was 0.185 ppm, measured in Metropolitan Los Angeles. The calculated peak 2018-2020 1-hour ozone design value[27] for the 2018-2020 period (0.167 ppm at Metropolitan Los Angeles) was 134 percent of the former 1-hour NAAQS. Table 2-5 shows the 2020 maximum 1-hour ozone concentrations and calculated design value by air basin and county for comparison to the revoked NAAQS, along with the 1-hour State designation value for comparison to the State 1-hour ozone standard.

TABLE 2-5

2020 MAXIMUM 1-HOUR AVERAGE OZONE CONCENTRATIONS AND 2018–2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum 1-Hour O_3 Average (ppm)	2018–2020 1-Hour O_3 Design Value (ppm)	Percent of Former (1979) O_3 NAAQS (0.12 ppm)	Area of Design Value Max	2018–2020 1-Hour O_3 State Designation Value# (ppm)	Percent of State O_3 Standard (0.09 ppm)
South Coast Air Basin						
Los Angeles	**0.185**	**0.167**	**135**	**East San Gabriel Valley**	**0.19**	**211**
Orange	0.171	0.113	91	North Orange County	0.17	189
Riverside	0.150	0.131	106	Metropolitan Riverside County	0.15	167
San Bernardino	0.173	0.155	125	East San Bernardino Valley	0.17	189
Coachella Valley						
Riverside	0.119	0.106	85	Coachella Valley (Palm Springs)	0.11	122

Bold text denotes the peak value.

\# The State 1-Hour designation value is the highest hourly ozone measurement during the last 3 years, rounded to two decimal places. In practice, the designation value is the highest measured concentration in the 3 year period that remains, after excluding measurements identified as affected by highly irregular or infrequent events (State designation value source: https://www.arb.ca.gov/adam/select8/sc8start.php)

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[27] The former 1979 1-hour ozone NAAQS allows for one exceedance per year on average when averaged over 3 years. The calculated design value is the 4th highest value over a 3-year period, allowing the design value to be expressed in terms of a concentration. When shown in parts-per-million to 3 decimal places the design value is compared to 0.125 ppm, which would exceed the NAAQS.

Ozone Spatial Variation

The number of days exceeding the ozone standards in the Basin varies widely by area. Figures 2-8 through 2-10 map the number of days in 2020 exceeding the 2015 8-hour ozone NAAQS and the former 2008 and 1997 8-hour ozone NAAQS in the Basin. The number of exceedances of the federal 8-hour ozone standards was lowest in the coastal areas, due in large part to the prevailing sea breeze which transports emissions inland before high ozone concentrations are reached. Ozone concentrations are typically higher in the Riverside County and San Bernardino County valleys and adjacent mountain areas, as well as in the area around Santa Clarita in Los Angeles County. The East San Bernardino Valley recorded the greatest number of exceedances of the current and former 8-hour federal ozone NAAQS (141 days for the 2015 ozone NAAQS, 127 days for the 2008 NAAQS, and 78 days for the 1997 NAAQS), as well as the 8-hour State ozone standard (141 days), in 2020. The three 8-hour ozone exceedance map exhibit similar spatial variations in the number of days exceeding the federal standards, but there are more days exceeding the 2015 NAAQS because this is the most stringent form among the three standards.

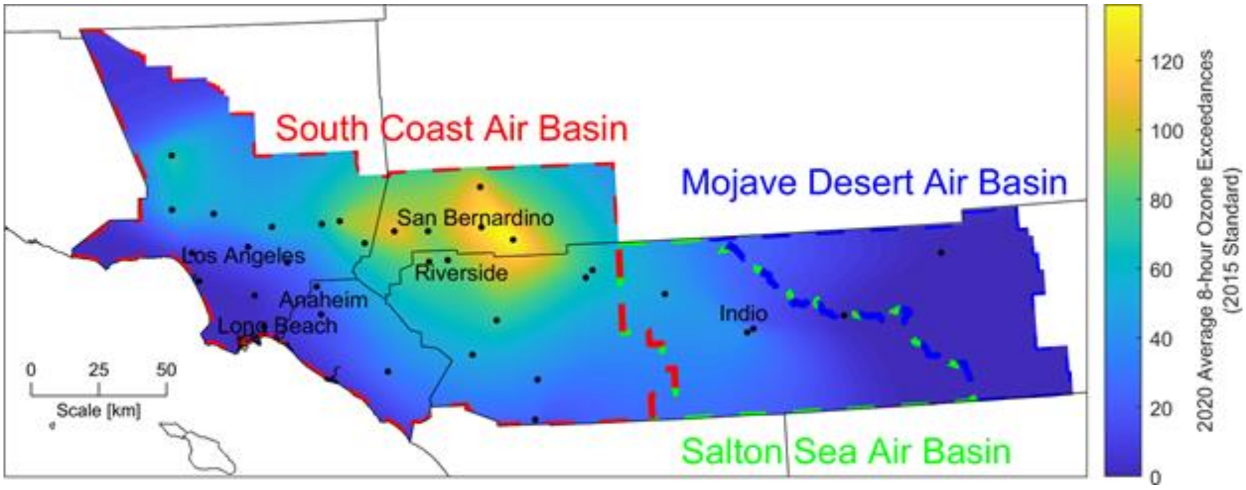


FIGURE 2-8

NUMBER OF DAYS IN 2020 EXCEEDING THE 2015 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.070 PPM)

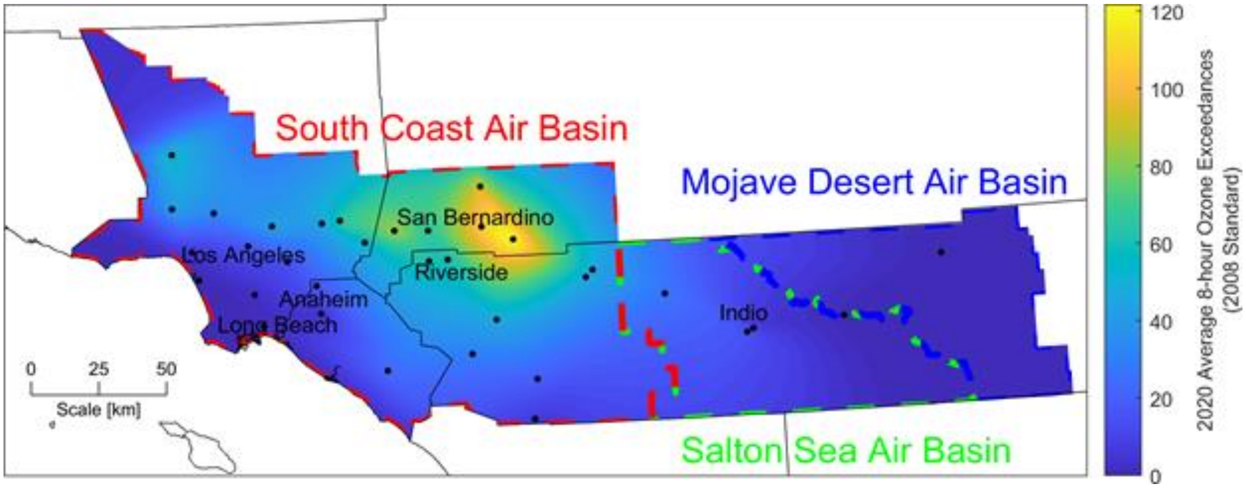


FIGURE 2-9

NUMBER OF DAYS IN 2020 EXCEEDING THE REVISED 2008 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.075 PPM)

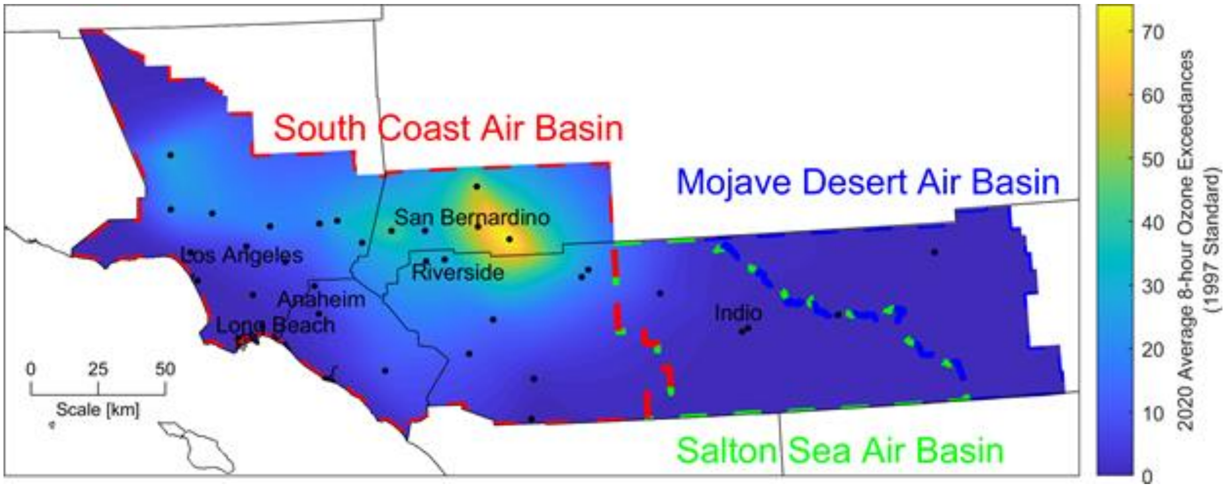


FIGURE 2-10

NUMBER OF DAYS IN 2020 EXCEEDING THE REVOKED 1997 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.08 PPM)

Figure 2-11 maps the number of days in 2020 exceeding the 1979 1-hour ozone NAAQS in different areas of the Basin. The 1-hour ozone standard was exceeded on the most days (17 days) in the inland East San Gabriel Valley. Exceedances of the 1-hour ozone standard extended to most areas monitored in the Basin, but the Coachella Valley did not exceed the former 1-hour ozone standard in 2020.

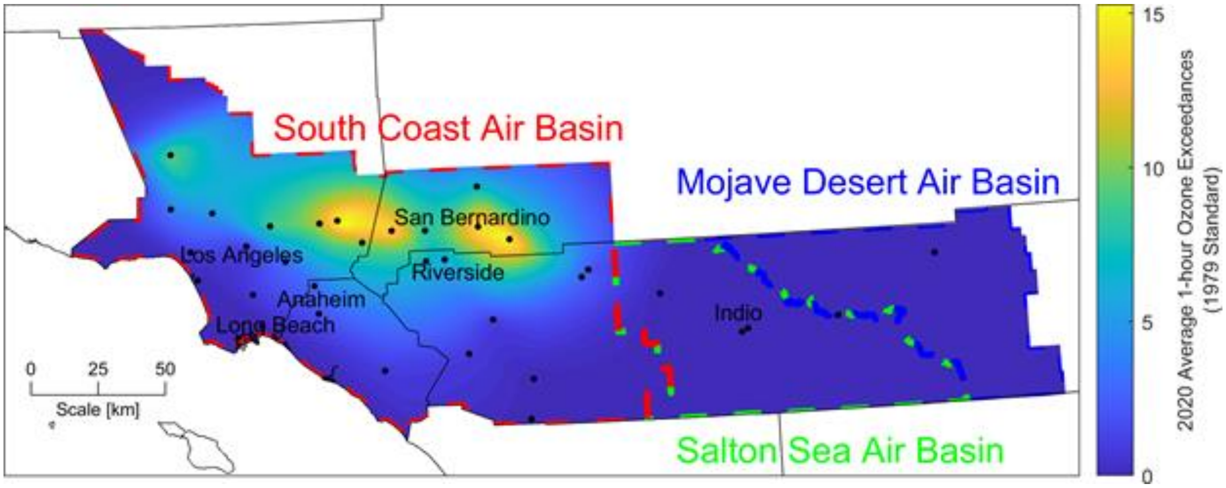


FIGURE 2-11

NUMBER OF DAYS IN 2020 EXCEEDING THE REVOKED 1979 1-HOUR FEDERAL OZONE STANDARD

(1-HOUR AVERAGE OZONE > 0.12 PPM)

Ozone Trends

The rate of ozone air quality improvement has been dramatic since the concerted effort to manage air quality in the Basin began decades ago. Significant improvements were seen throughout the 1990s. However, the rate of improvement in ozone has slowed somewhat since the year 2000. Figure 2-12 shows the Basin-wide trend (1990–2020) of number of days exceeding the 2015, 2008 and 1997 8-hour ozone standards and the former (1979) 1-hour ozone standard. Figure 2-13 shows the trend (1990–2020) of the 8-hour and 1-hour ozone design values for the Basin. Design values are based on three years of data and are assigned to the last year of the three year period.

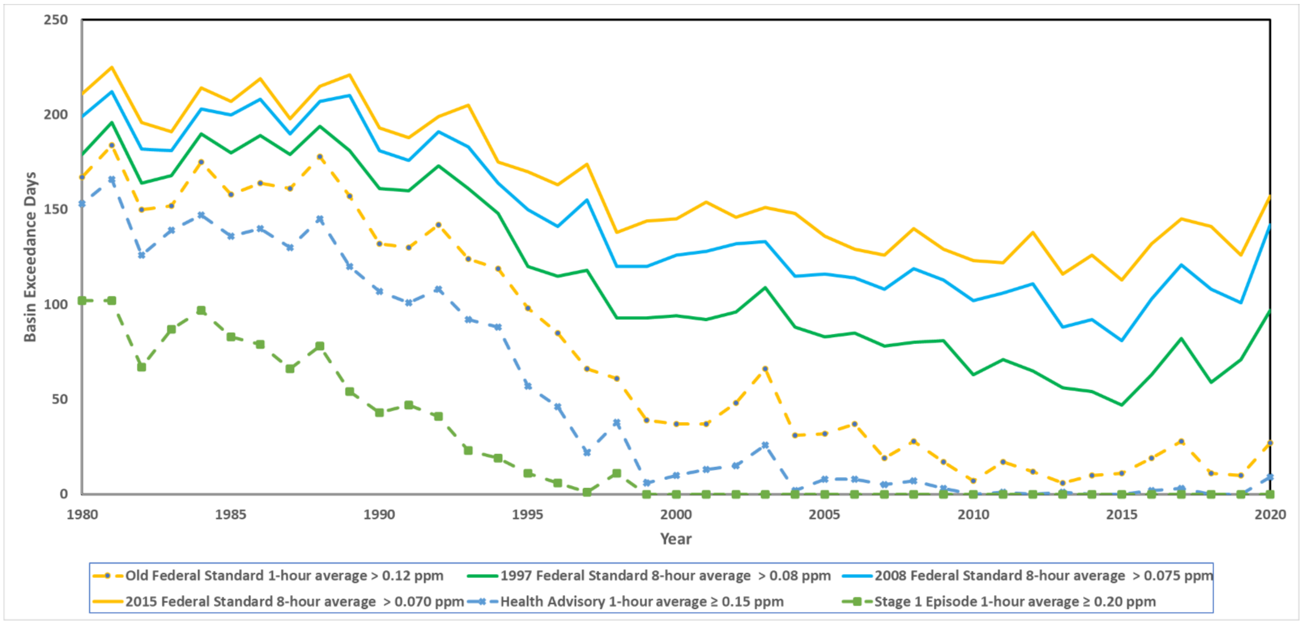


FIGURE 2-12

TREND OF ANNUAL BASIN DAYS EXCEEDING 8-HOUR AND 1-HOUR OZONE NAAQS

(SOUTH COAST AIR BASIN; BY YEAR, 1980–2020)

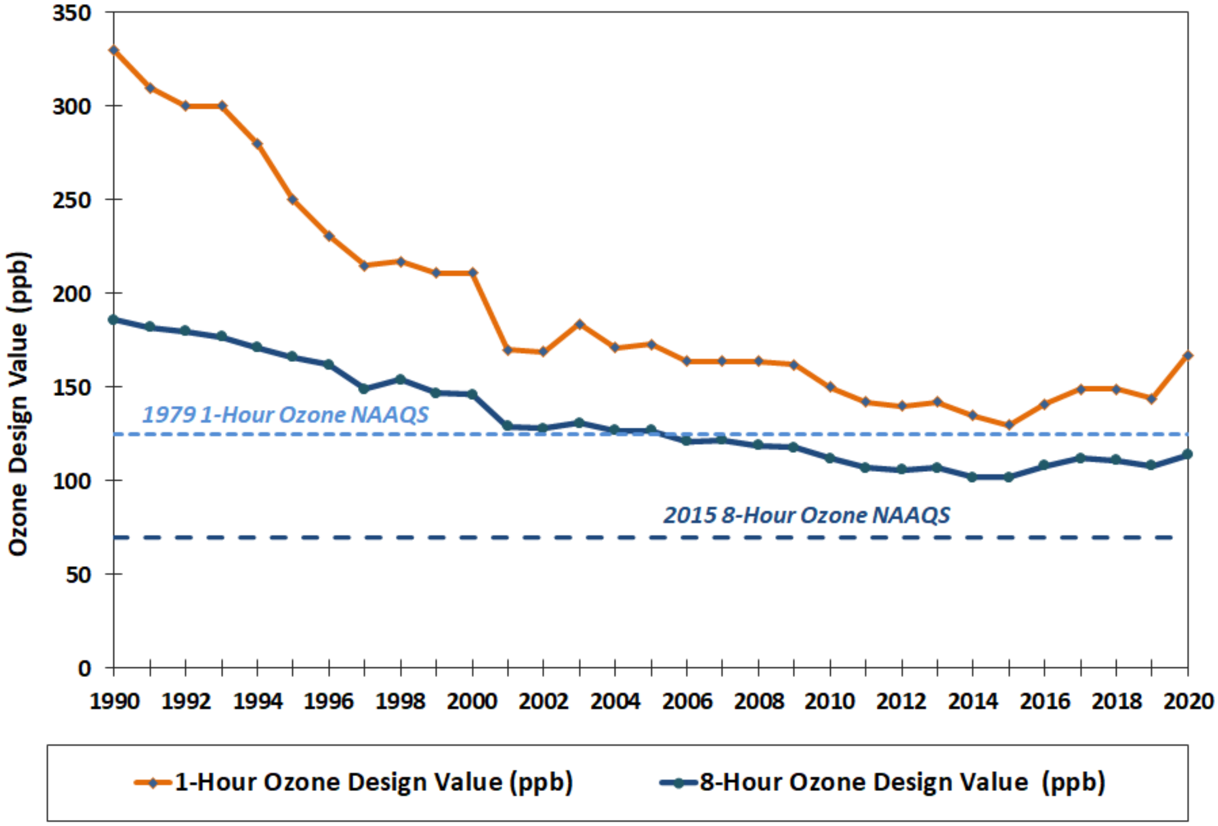


FIGURE 2-13

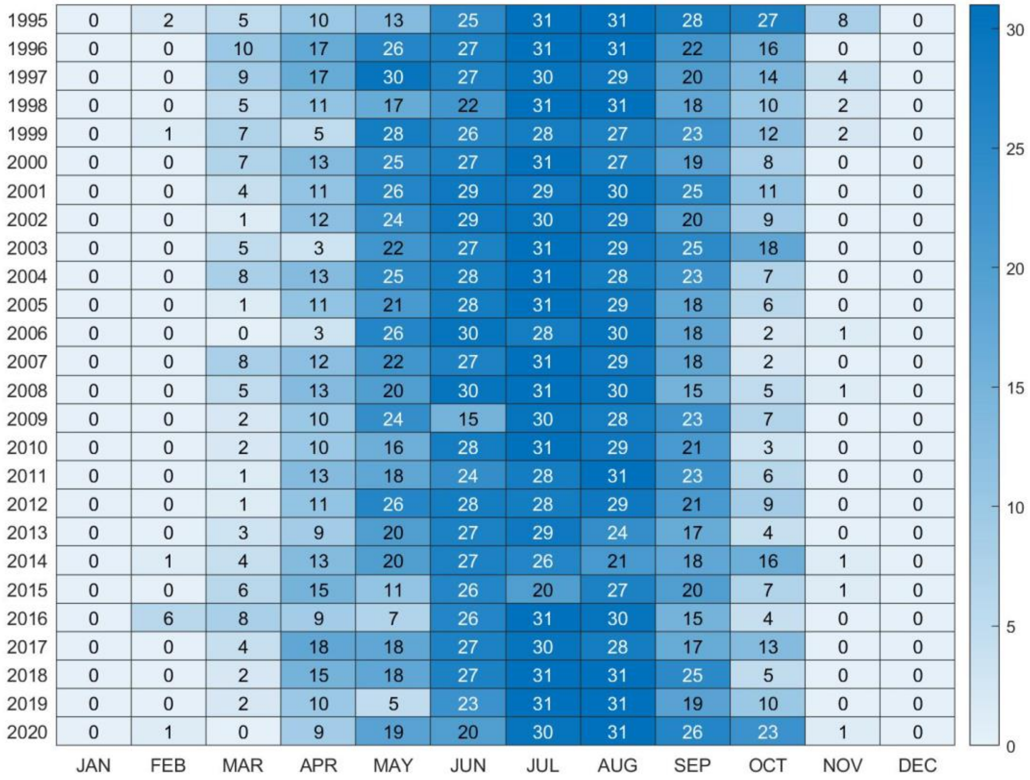
SOUTH COAST AIR BASIN OZONE DESIGN VALUE TRENDS, 1990–2020

Ozone Temporal Variation

Because photochemical reactions require sunlight to proceed, ozone formation is favored by strong solar radiation. Solar radiation is more intense and of longer duration in summer than in winter, and summertime temperature inversions are often strong and persistent, trapping pollutants in a shallow mixed layer. This causes ozone concentrations to be higher in summer than in winter. Peak ozone concentrations generally occur near the middle of the day during the period of May through September.

Figure 2-14 shows the number of days per month that one or more monitoring stations exceeded the 2015 federal 8-hour ozone standard level (0.070 ppm) for the period 1995-2020. May through October is typically considered to be the ozone "smog season" in Southern California, and most exceedances occur in the summer, with exceedances recorded on most days. Up until the late 1980s, exceedances of the 2015 federal ozone standard level were common through much of the year, including some exceedances even in the winter months. By the late 1990s there were very few exceedances in the months of November through

February.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1995	0	2	5	10	13	25	31	31	28	27	8	0
1996	0	0	10	17	26	27	31	31	22	16	0	0
1997	0	0	9	17	30	27	30	29	20	14	4	0
1998	0	0	5	11	17	22	31	31	18	10	2	0
1999	0	1	7	5	28	26	28	27	23	12	2	0
2000	0	0	7	13	25	27	31	27	19	8	0	0
2001	0	0	4	11	26	29	29	30	25	11	0	0
2002	0	0	1	12	24	29	30	29	20	9	0	0
2003	0	0	5	3	22	27	31	29	25	18	0	0
2004	0	0	8	13	25	28	31	28	23	7	0	0
2005	0	0	1	11	21	28	31	29	18	6	0	0
2006	0	0	0	3	26	30	28	30	18	2	1	0
2007	0	0	8	12	22	27	31	29	18	2	0	0
2008	0	0	5	13	20	30	31	30	15	5	1	0
2009	0	0	2	10	24	15	30	28	23	7	0	0
2010	0	0	2	10	16	28	31	29	21	3	0	0
2011	0	0	1	13	18	24	28	31	23	6	0	0
2012	0	0	1	11	26	28	28	29	21	9	0	0
2013	0	0	3	9	20	27	29	24	17	4	0	0
2014	0	1	4	13	20	27	26	21	18	16	1	0
2015	0	0	6	15	11	26	20	27	20	7	1	0
2016	0	6	8	9	7	26	31	30	15	4	0	0
2017	0	0	4	18	18	27	30	28	17	13	0	0
2018	0	0	2	15	18	27	31	31	25	5	0	0
2019	0	0	2	10	5	23	31	31	19	10	0	0
2020	0	1	0	9	19	20	30	31	26	23	1	0

FIGURE 2-14

MONTHLY DISTRIBUTION OF BASIN DAYS EXCEEDING THE 2008 8-HOUR OZONE NAAQS

(South Coast Air Basin, for Years 1995–2020)

Since the mid-1970s, measured ozone concentrations in the Basin are often higher on weekends than on weekdays, although ozone precursor emissions are generally lower on weekends than on weekdays. Similar effects have been observed in some other metropolitan areas such as San Francisco, Washington D.C., Philadelphia, and New York. This “weekend effect” was quite pronounced in previous years in the Basin. The California Air Resources Board (CARB) has sponsored several research projects to study the causes of elevated ozone levels on weekends in the Basin. Changes in daily traffic patterns that impact the relative quantity and temporal loading of precursor VOC and NOx emissions have been suggested as strongly contributing to this effect. Carryover of matured precursors from weekdays to weekends has also been suggested as a contributing factor. The weekday-weekend difference has decreased as ozone precursor emissions, especially NOx emissions, have declined significantly.

Figure 2-15 shows the percent of station-days[28] that the Basin exceeded the 2015 8-hour ozone federal standard for each day of the week for the 2018–2020 period. In that time period, Saturdays had the highest percent of exceedance days, while Sundays had the lowest. Tuesday through Friday had roughly the same percent of exceedance days.

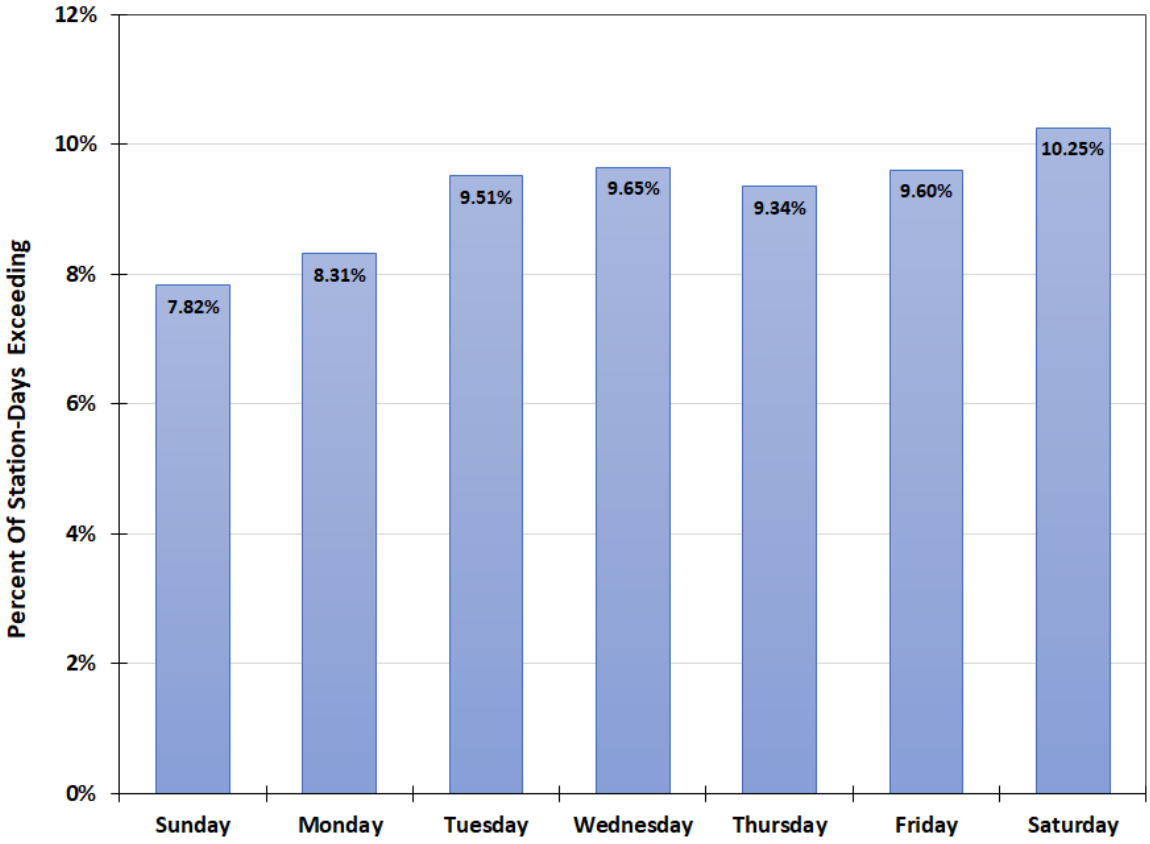


FIGURE 2-15

8-HOUR OZONE DAY-OF-WEEK VARIATION, 2018–2020

(PERCENT OF STATION-DAYS EXCEEDING THE 2015 8-HOUR OZONE NAAQS OVER THE 3-YEAR PERIOD BY DAY OF WEEK)

Because time and sunlight are required for precursor organic gases and nitrogen oxides to react to form ozone, the peak ozone concentrations usually occur between the early afternoon and early evening hours. By this time, the prevailing sea breeze has moved the polluted air mass miles inland from many of the major sources of precursor emissions. Ozone concentrations in the Basin are typically low during early morning hours, increasing rapidly after sunrise and peaking in the afternoon. Peak concentrations generally occur earlier in the day for coastal areas and later for locations further downwind. In the mountain and far downwind desert

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[28] The term *station-days* represents the total number of days the standard was exceeded at individual monitoring stations summed for all stations in the Basin.

areas, ozone can remain elevated well into the night due to the lack of NOx emissions in those areas to help scavenge the ozone when photochemical reactions cease after dark.

Figure 2-16 illustrates the average of the smog season (May–October) 1-hour ozone concentrations for each hour of the day (shown in Pacific Standard Time), by station, for the years 2018–2020. The average peak occurs near 2 p.m. for most of the stations on the western side of the Basin. The far inland stations in the Banning Pass Area (Banning) and Central San Bernardino Mountains (Crestline, where the highest concentrations have been measured in recent years) peak between 3 and 5 p.m., but the ozone at Crestline decreases at a slower rate in the evening, leading to higher 8-hour ozone values. On the worst smog days, ozone concentrations at this station can remain relatively high through the night.

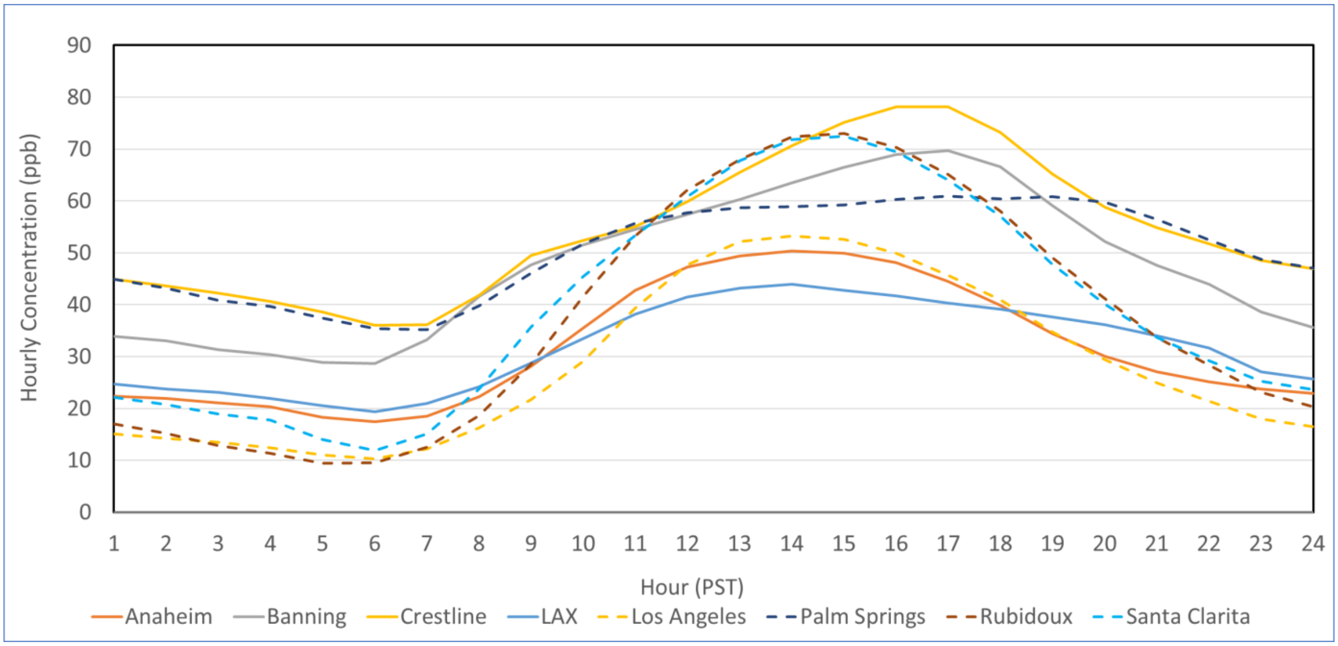

FIGURE 2-16

DIURNAL VARIATION OF MAY–OCTOBER HOURLY OZONE CONCENTRATIONS, 2018-2020

Particulate Matter (PM)

PM10 and PM2.5 concentrations are monitored throughout the South Coast AQMD jurisdiction by samples collected on quartz or Teflon filters in samplers with size selective inlets. These are known as the Federal Reference Methods (FRMs). Some stations also have continuous PM10 and/or PM2.5 measurements, using either Beta Attenuation Monitor (BAM) or Tapered Element Oscillating Microbalance (TEOM) instrumentation. This data is available in real-time and is used for air quality forecasting and public reporting of current conditions. Where the continuous BAM or TEOM PM10 monitors have been certified by U.S. EPA to be Federal Equivalent Methods (FEM), the continuous PM10 data is averaged for the 24-hour period (midnight to midnight) and used for comparison to federal standards.

For PM2.5, there can be significant differences between PM2.5 continuous monitors and FRM (filter-based) measurements that are well documented in national assessments of these methods.[29] South Coast AQMD has been evaluating PM2.5 continuous monitors since they were designated equivalent methods. Once enough data was collected, South Coast AQMD began to evaluate the performance of these methods compared to collocated FRM data per 40 CFR §58.11(e). Evaluation of FRM/FEM data per Table C-4 to subpart C of part 53 requires a slope of regression to be 1 ± 0.10 and an intercept of regression of 0 ± 2.0 to meet bias requirements.[30] The Los Angeles (Main Street) POC 9 monitor failed to meet these criteria, so South Coast AQMD requested that the data be set aside for comparison to the NAAQS. Therefore, only FRM measurement data is considered when calculating design values at the Los Angeles (Main Street) site. FEM measurements collected at the Anaheim, Ontario Route 60 Near Road, Rubidoux, and South Long Beach monitoring sites are used to supplement FRM measurements in the calculation of PM2.5 design values.[31] The U.S. EPA waiver from NAAQS comparison for the continuous monitors is re-evaluated annually as part of the South Coast AQMD Annual Air Quality Monitoring Network Plan.[32]

PM2.5 Air Quality

South Coast AQMD began regular monitoring of PM2.5 in 1999 following the U.S. EPA's adoption of the first national PM2.5 standards in 1997. Figure 2-17 shows the PM2.5 monitoring sites within the South Coast AQMD jurisdiction, including the Coachella Valley, in 2020. PM2.5 concentrations were measured at 27 locations throughout the South Coast AQMD jurisdiction in 2020, including two stations in the Coachella Valley and two near-road sites. Nineteen stations had filter-based FRM monitoring and nine of these FRMs (including the two near-road sites) sampled daily to improve temporal coverage beyond the required 1-in-3 day sampling schedule. One station, in the Big Bear Lake area of the Eastern San Bernardino Mountains, has a 24-hour sample collected every six days. Seventeen stations, including one near-road site, employed continuous PM2.5 BAM monitors. As discussed above, the continuous PM2.5 monitors in the Basin are used for forecasting, real-

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[29] The technical reports that compare PM2.5 concentrations measured at continuous monitors with collocated FRM samplers can be found at https://www.epa.gov/outdoor-air-quality-data/pm25-continuous-monitor-comparability-assessments.

[30] Part 53 – Ambient Air Monitoring Reference and Equivalent Methods is available at https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-53.

[31] See 40 CFR Appendix N to Part 50 – Interpretation of the National Ambient Air Quality Standards for PM2.5.

[32] Available at http://www.aqmd.gov/home/air-quality/clean-air-plans/monitoring-network-plan

time air quality alerts, real-time AQI dissemination, and for evaluating diurnal patterns, but only FRM data and NAAQS-comparable FEM data are used for comparison to the NAAQS.

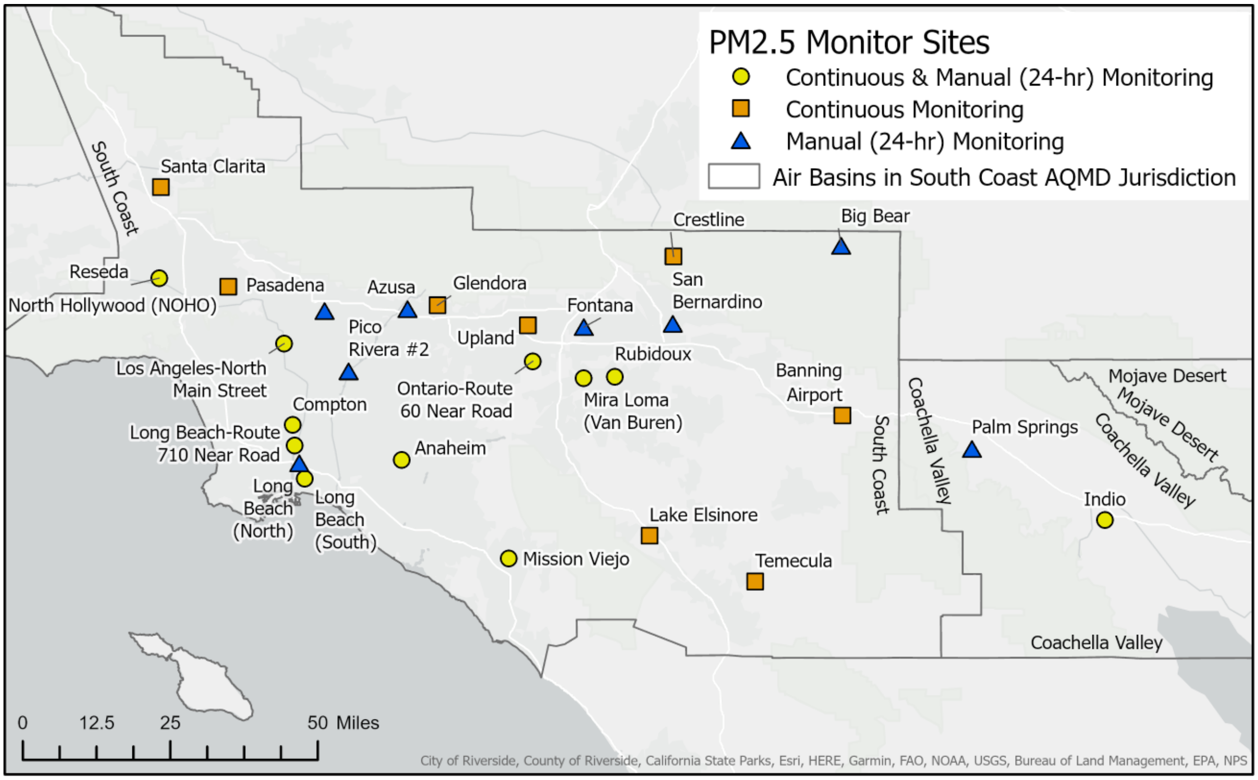

FIGURE 2-17

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT PM2.5 AIR MONITORING LOCATIONS IN 2020

The 2018-2020 24-hour PM2.5 design values are summarized in Table 2-6. PM2.5 concentrations were higher in the inland valley areas of Metropolitan Riverside County and in south central Los Angeles County. The Basin met the 24-hour PM2.5 NAAQS for the 2018-2020 period after removing exceedances recorded during the Bobcat and El Dorado Fires as these events meet the criteria for exclusion under the U.S. EPA Exceptional Events Rule. The highest 24-hour design value was measured in Metropolitan Riverside County (Mira Loma), with a design value of 35 µg/m^3. If exceptional events are not excluded, the highest 2018-2020 PM2.5 24-hour design value was measured at the Central Los Angeles and South San Gabriel Valley stations (37 µg/m^3). The 2018-2020 24-hour design values measured at the Metropolitan Riverside County (Mira Loma) and CA-60 Near Road stations (36 µg/m^3) would also violate the 24-hour PM2.5 NAAQS (35 µg/m^3) if exceptional events are not excluded. There is no State 24-hour PM2.5 standard.

The higher PM2.5 concentrations in the Basin are mainly due to the secondary formation of smaller particulates resulting from precursor gas emissions (i.e., NOx, SOx, NH_3, and VOC) that are converted to PM in the atmosphere. The precursors are from mobile, stationary and area sources, with the largest portion resulting from fuel combustion. Most of the 24-hour PM2.5 exceedances in the Basin occur in the late fall and winter months. Cold and humid weather conditions favor the partitioning of inorganic vapors into particles in the atmosphere, resulting in high PM2.5 levels. Other unfavorable weather conditions such as a low and stable boundary layer and the lack of storms and rainfall can also contribute to high PM2.5 concentrations, as the precursors and particles are not dispersed or washed out as frequently. During the winter months, especially the holiday season, residential wood burning is also a major contributor to particulate mass and precursors, leading to high PM2.5 concentrations in the coastal and inland valley areas.

TABLE 2-6

2018–2020 PM2.5 24-HR DESIGN VALUES BY BASIN AND COUNTY[*]

Basin/County	Regulatory Significant Exceptional Events Removed[**]			All data included[#]		
	2018-2020 PM2.5 24-Hour Design Value (µg/m^3)	Percent of Current (2006) PM2.5 NAAQS (35 µg/m^3)	Area of Design Value Max	2018-2020 PM2.5 24-Hour Design Value (µg/m^3)	Percent of Current (2006) PM2.5 NAAQS (35 µg/m^3)	Area of Design Value Max
South Coast Air Basin						
Los Angeles	**35**	**100[##]**	**East San Gabriel Valley (Azusa), South Central Los Angeles County, and I-710 Near Road**	**37**	**106**	**Central Los Angeles and South San Gabriel Valley**
Orange	33	94	Central Orange County	33	94	Central Orange County
Riverside	**35**	**100[##]**	**Metropolitan Riverside County (Mira Loma)**	36	103	Metropolitan Riverside County (Mira Loma)
San Bernardino	**35**	**100[##]**	**Central San Bernardino Valley (Fontana)**	36	103	CA-60 Near Road
Coachella Valley						
Riverside	17	49	Coachella Valley (Indio)	17	49	Coachella Valley (Indio)

Bold text denotes the peak value.

[*] Based on FRM filter data and NAQQS-comparable FEM continuous data

[**] 24-Hour PM2.5 samples exceeding the 24-hour PM2.5 NAAQS during September 11, 2020 – September 16, 2020 at the Central Los Angeles, Pico Rivera, Route 60 Near Road, and Mira Loma stations were removed to calculate design values; these exceedances were caused by smoke from the Bobcat and El Dorado Fires. South Coast AQMD is preparing an exceptional event demonstration consistent with U.S. EPA exceptional event guidance for this event. Events with an exceptional event demonstration that the U.S. EPA has concurred upon may be removed from the design value determination.

[#] Data includes exceptional events.

[##] 100 percent of the NAAQS is not in violation of that standard.

The 2018-2020 annual PM2.5 design values are summarized in Table 2-7. The Basin maximum 2018–2020 annual average design value was 14.2 µg/m^3 at the CA-60 Near Road station (118 percent of the current 2012 annual average PM2.5 NAAQS, 12.0 µg/m^3). This design value is below the former 1997 annual average PM2.5 NAAQS (15.0 µg/m^3), for which the Basin remains in attainment. The annual PM2.5 State standard is based on the highest annual average over the 3-year period.

TABLE 2-7

2018-2020 PM2.5 ANNUAL DESIGN VALUES BY BASIN AND COUNTY

Basin/ County	2018-2020 PM2.5 Annual Design Value (μg/m^3)[*#]	Percent of Current (2012) PM2.5 Annual NAAQS (12.0 μg/m^3)	Percent of Former (1997) Annual NAAQS (15.0 μg/m^3)	Area of Design Value Max	2018-2020 3-Year High State Annual Average PM2.5 Designation Value (μg/m^3)[##]	Percent of State PM2.5 Annual Standard (12 μg/m^3)
South Coast Air Basin						
Los Angeles	13.0	108	87	South Central Los Angeles County	16.2	135
Orange	11.0	92	73	Central Orange County	12.3	103
Riverside	13.8	115	92	Metropolitan Riverside County (Mira Loma)	**16.4**	**137**
San Bernardino	**14.2**	**118**	**95**	**CA-60 Near Road**	15.4	128
Coachella Valley						
Riverside	8.0	67	53	Coachella Valley (Indio)	8.4	70

Bold text denotes the peak value.

[*] Based on FRM filter data and NAAQS-comparable FEM continuous data; the federal design value is based on the average of the 3 annual averages in the period.

[#] Value includes all exceptional events, however, removal of suspected exceptional events result in a lower design value.

[##] Based on combined FRM filter and continuous FEM data (federal FEM waiver is not applied to State designation value); data includes exceptional events; the State annual designation value is the highest year in the 3-year period

PM2.5 Spatial Variation

Figure 2-18 maps the distribution of 2018-2020 annual PM2.5 design values in different areas of the Basin. This map shows a peak in annual average concentrations in the Riverside metropolitan area where transport and secondary chemical processes are most important, as well as a secondary peak in the Central Los Angeles area due to abundant combustion sources.

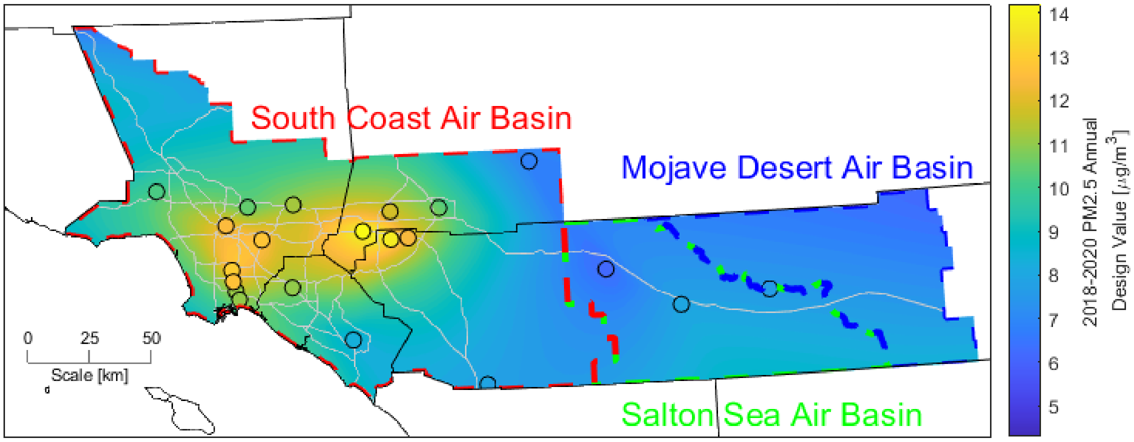

FIGURE 2-18

SPATIAL DISTRIBUTION OF 2018-2020 ANNUAL PM2.5 DESIGN VALUES

(THE 2012 ANNUAL PM2.5 NAAQS IS 12.0 µg/m^3, ANNUAL ARITHMETIC MEAN)

PM2.5 Trends

Figure 2-19 shows the trend of the Basin 3-year 24-hour and annual design values, compared to the current 2006 24-hour and 2012 annual PM2.5 standards, for the period of 2001 through 2020. Exceedances caused by Bobcat and El Dorado Fires have been removed to calculate the 2020 24-hour PM2.5 design value. This illustrates the significant progress toward attainment of the standards in the last 20 years. Programs and regulations aimed at reducing direct emissions of particles as well as those that reduce gaseous emissions that can form particles in the atmosphere have played an important role in reducing PM2.5 concentrations. These include the national, State, and regional programs designed to reduce ozone-forming emissions of VOCs and NOx, which also contribute to secondary PM2.5 formation.

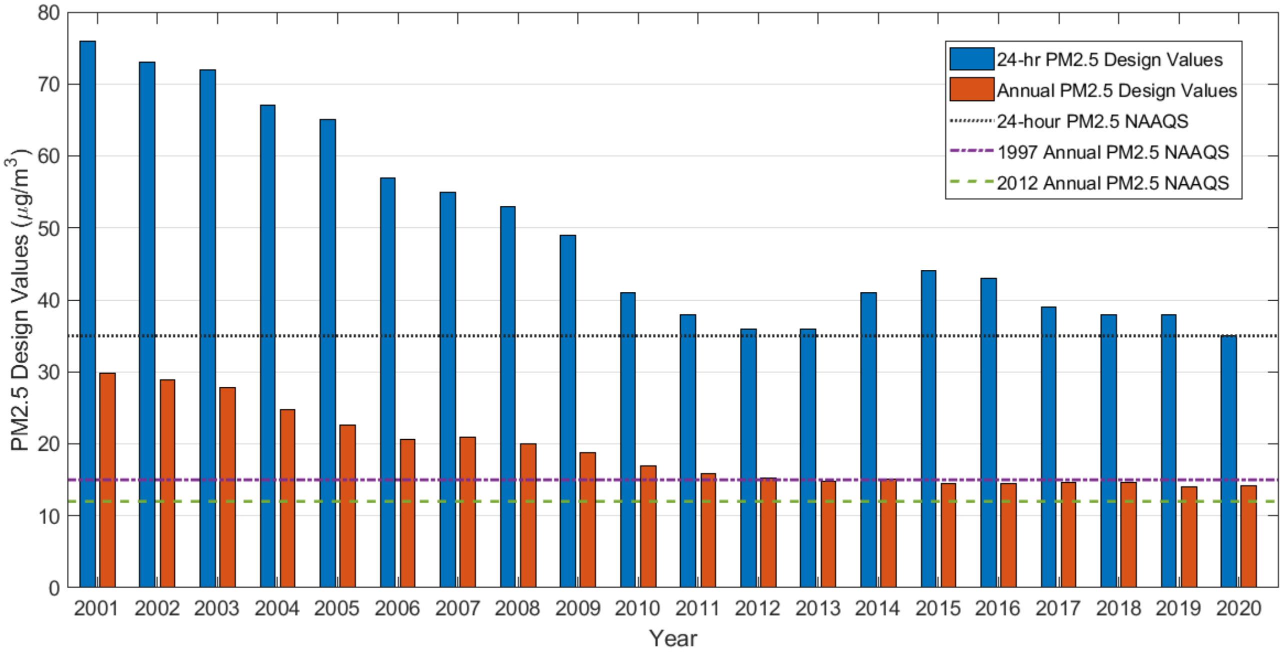

FIGURE 2-19

SOUTH COAST AIR BASIN PEAK PM2.5 DESIGN VALUE TRENDS, 2001–2020

PM2.5 Temporal Variation

Seasonal and day-of-week variations in PM2.5 concentrations are complex and location dependent and may vary from year to year depending on meteorological conditions, the presence of large wildfires, residential wood burning, and other factors. Meteorological conditions such as wind direction and speed, mixing height and temperature play an important role in the formation and removal mechanisms of PM and its components. PM2.5 concentrations typically have a distinct seasonal pattern in the Basin, with higher concentrations in the late fall and winter, from October to January. This is, in part, because secondary PM precursors, such as particulate nitrates and carbonaceous particles, are more readily formed in cooler weather. Wood stove and fireplace use in the cool months also increases direct emissions of carbon. Persistent trapping occurs in the cool months due to near-surface temperature inversions formed by the radiation of heat from the surface on the cool nights. Figure 2-20 shows the Basin-wide monthly averaged PM2.5 concentrations, by month for the years 2018–2020. The highest monthly PM2.5 average was recorded in September, which was largely caused by poor air quality in September 2020 from the El Dorado and Bobcat Fires. Other than September, the highest monthly PM2.5 averages were recorded in October and November, followed by January.

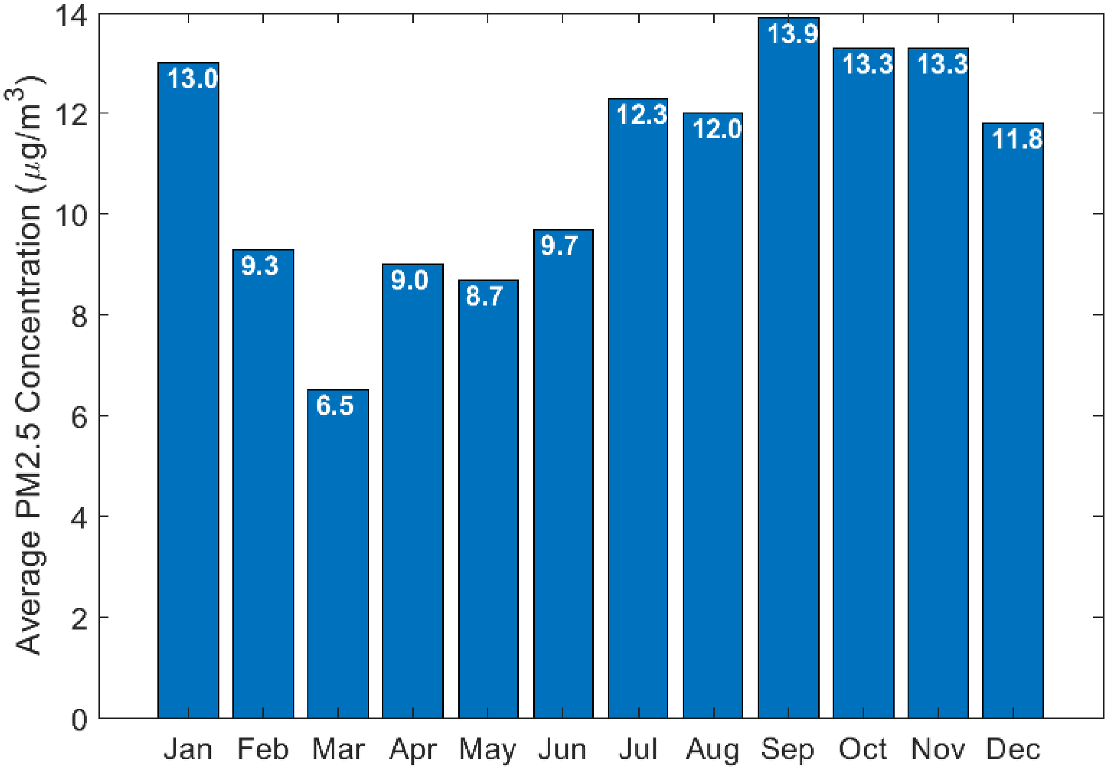

FIGURE 2-20

BASIN-WIDE MONTHLY AVERAGE PM2.5 CONCENTRATION, 2018–2020

As shown in Figure 2-21, the highest number of station-days when the PM2.5 concentration exceeded the 24-hour NAAQS from 2018-2020 occurred during the fall and winter seasons. The high number of exceedances in September was driven by high PM2.5 concentrations measured during the Bobcat and El Dorado Fires in September 2020.

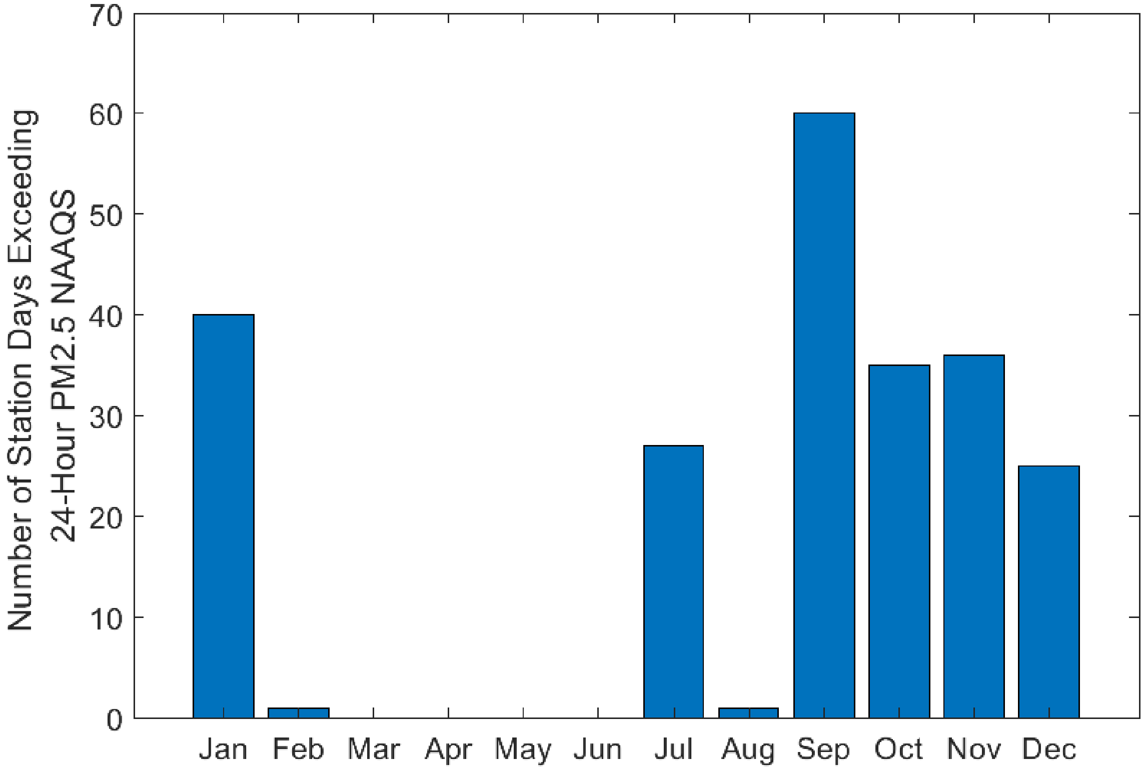

FIGURE 2-21

AVERAGE MONTHLY STATION-DAYS EXCEEDING FEDERAL 24-HOUR PM2.5 NAAQS (35.0 µg/m^3),2018-2020

Figure 2-22 shows day-of-week variation in average Basin-wide PM2.5 daily concentrations from 2018-2020. While there appears to be a day-of-week variation, differences between days are not statistically significant and may be due to the randomness of extreme air quality events occurring on a particular day of the week. For example, Sunday average concentrations were influenced by extremely high PM2.5 concentrations measured on July 5, 2020 due to Independence Day fireworks. Wildfires can also skew day-of-week patterns and mask day-of-week variation in anthropogenic PM2.5.

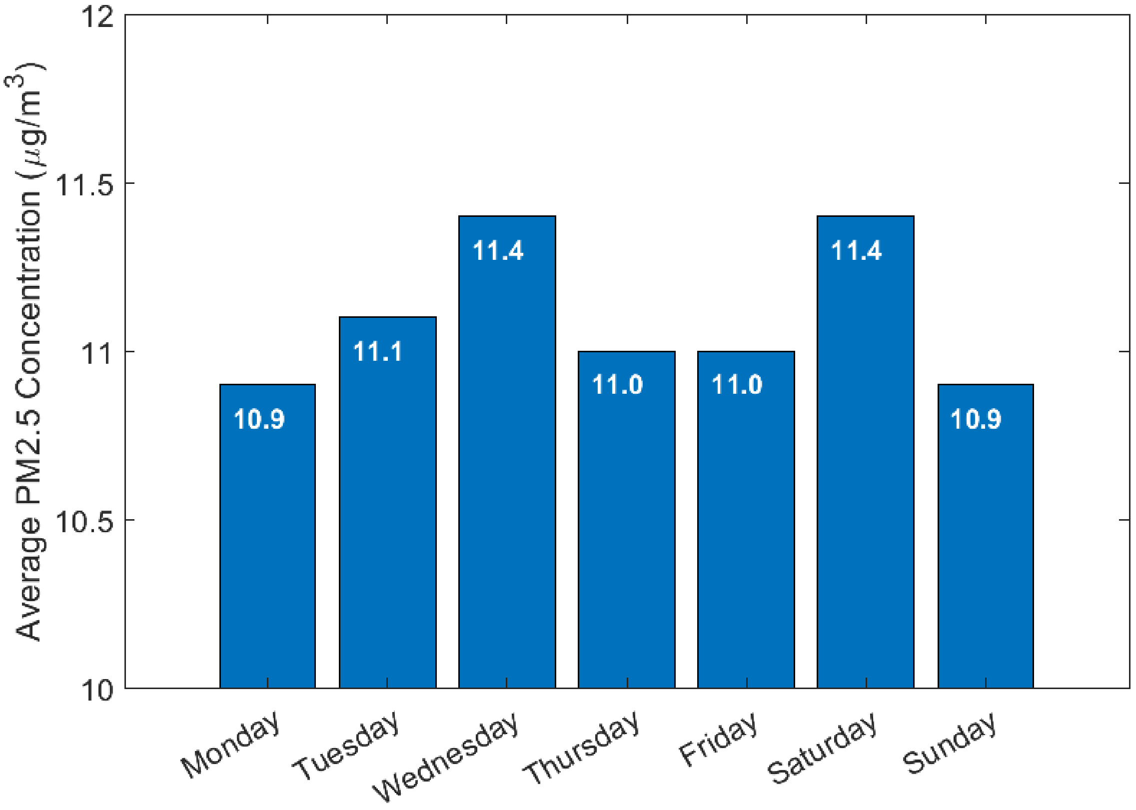

FIGURE 2-22

AVERAGE BASIN-WIDE DAILY PM2.5
CONCENTRATIONS BY DAY-OF-WEEK, 2018–2020

Figure 2-23 shows average PM2.5 concentration by hour of the day from 2018–2020, based on the continuous PM2.5 measurements using hourly FEM BAM sampler data. The diurnal plots are for the Basin maximum PM2.5 monitor at Metropolitan Riverside County (Mira Loma), as well as for Central Los Angeles (Downtown Los Angeles), Central Orange County (Anaheim), and for the average of all sites with continuous measurements throughout the Basin. In general, PM2.5 concentrations in urban environments have been shown to closely follow temporal variation in traffic density, with highest levels observed during rush hours on weekdays. As shown in Figure 2-23, PM2.5 concentrations peaked in the morning between 6 a.m. and 9 a.m. PST due to rush hour traffic and decreased throughout the day due to decreased traffic volume, increased wind speeds and subsequent dispersion of PM2.5 and precursor emissions. PM2.5 can also be formed by chemical reactions in the atmosphere, particularly in the photochemically active, warm seasons. PM2.5 concentrations reach a secondary peak in the evening hours, following evening traffic, and can remain elevated overnight when the lower nighttime temperature inversion (particularly in colder seasons) traps the pollutants in a shallower layer near the surface.

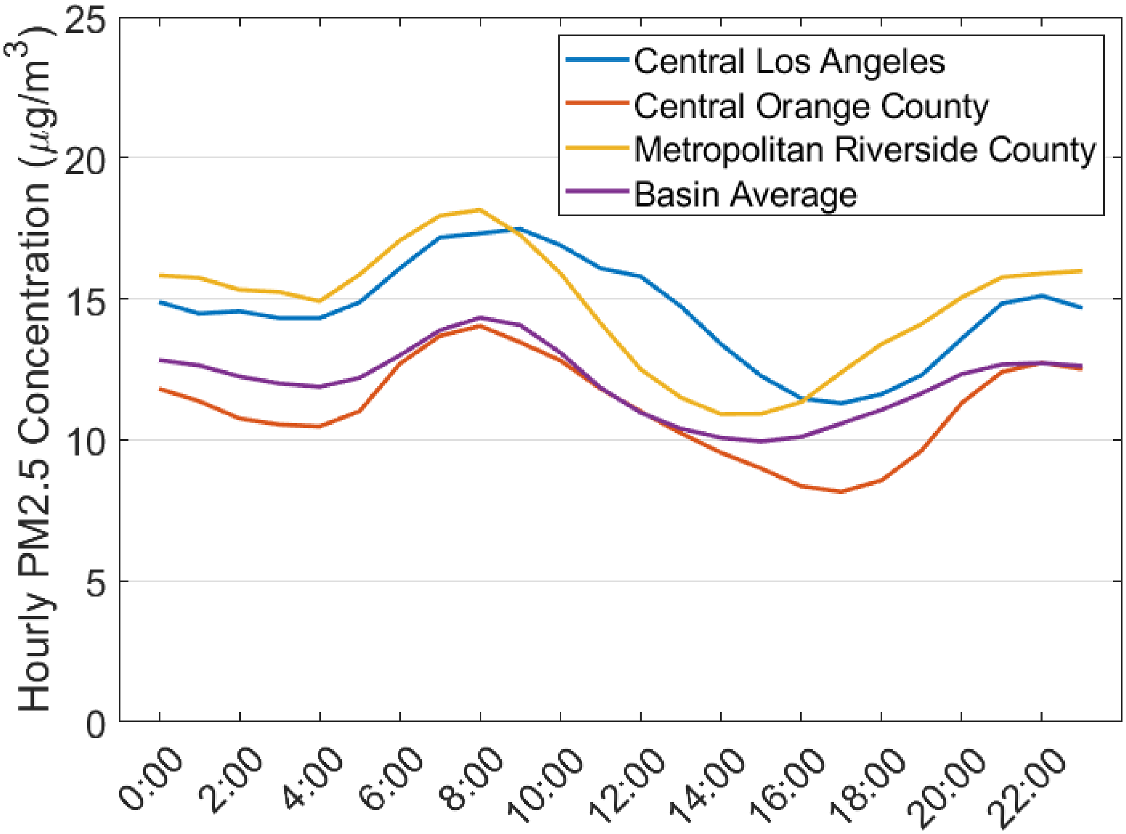

FIGURE 2-23

DIURNAL VARIATION OF HOURLY FEM PM2.5 CONCENTRATIONS, 2018–2020

The effect of meteorology on PM2.5 concentration is more evident when comparing average diurnal patterns for different seasons (Figure 2-24). Several factors contribute to the seasonal variability of PM2.5. The winter season, characterized by lower temperatures and lower mixing heights, along with wood burning and heating-related emissions, result in elevated PM2.5 levels in the evenings. Summer months are typically characterized by higher mid-day PM2.5 concentrations due to increased photochemical activity, favoring particle formation. As a result, summer PM2.5 concentrations remain elevated after the morning rush hour traffic peak and through much of the remainder of the day.

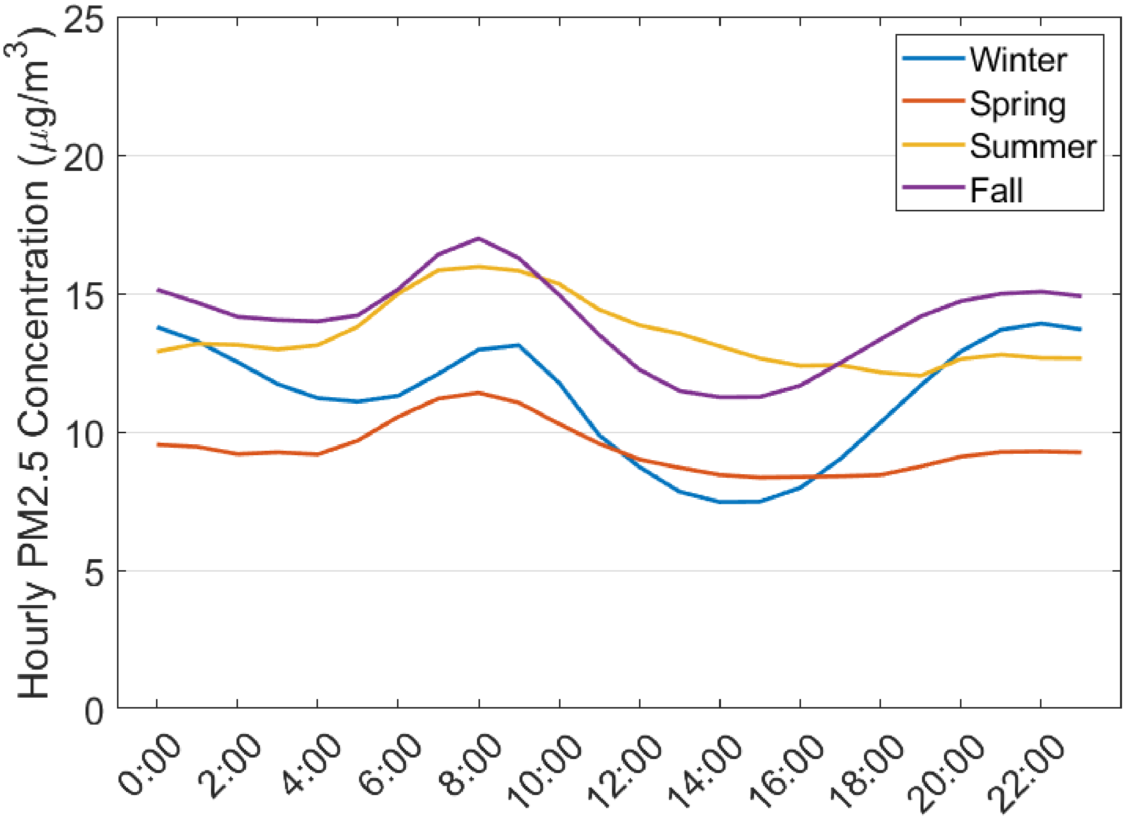

FIGURE 2-24

DIURNAL VARIATION OF AVERAGE BASIN-WIDE HOURLY FEM PM2.5 CONCENTRATIONS BY SEASON, 2018–2020

PM2.5 Speciation

Analysis of major chemical components of PM2.5 provides insight into the composition and sources of fine particulate matter in the Basin. Currently, PM2.5 speciation samplers are deployed at four representative locations in each of the Basin's counties (Anaheim, Fontana, Los Angeles, and Rubidoux stations). Integrated 24-hour filter samples are collected every six days and analyzed at the South Coast AQMD Laboratory.

Figure 2-25 shows trends in average annual concentrations of six PM2.5 component species: elemental carbon (EC), organic matter, sulfate, nitrate, ammonium ion, and crustal material from 2010-2019. Note that data from 2020 were not included due to a 3-month hiatus in PM2.5 speciation sampling at the beginning of the COVID-19 pandemic. EC, sulfate, nitrate, and ammonium ion were measured directly, while organic and crustal components were calculated from measurements of organic carbon and metal concentrations, respectively, according to guidance for the EPA Chemical Speciation Network (CSN):[33]

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[33] Air Quality Research Center, University of California, Davis. "Data Validation for the Chemical Speciation Network: A Guide for State, Local, and Tribal Agency Validators." 2019.

Organic Matter = 1.4 × Organic Carbon

Crustal Material = 2.2 × Aluminum + 2.49 × Silicon + 1.63 × Calcium + 2.42 × Iron + 1.94 × Titanium

Annual median field blank organic carbon (OC) concentrations across the four site network were subtracted from reported OC data to account for the well-documented positive sampling artifact caused by absorption of gas-phase OC onto filters.[34] This correction method is similar to the current OC artifact correction method used by the Interagency Monitoring of Protected Visual Environments (IMPROVE) network and CSN,[35] except annual field blank median concentrations were used instead of monthly medians to increase the pool of available field blank data. Furthermore, it is important to note that there is considerable uncertainty in the conversion factor between measured organic carbon and organic matter, which can range from just above 1 for organic matter with a composition close to pure carbon to >2 for highly oxidized organic matter. Thus, the trend shown in Figure 2-25 is an approximation assuming the average composition of organic matter in the Basin is relatively constant.

Reported concentrations below analytical detection limits also add some uncertainty to annual average concentrations, as the true concentration for a measurement below the detection limit may range from zero to the detection limit. To account for uncertainty in non-detect concentrations, annual means for each component were calculated by substituting zero and minimum detection limit concentrations for non-detects to calculate lower and upper limit means, respectively. As shown in Figure 2-25, crustal material was the only component that was significantly affected by non-detect concentration uncertainty.

Annual mean concentrations of most components show a generally decreasing trend over the ten-year period from 2010-2019 with more muted changes from 2015-2019. The largest decrease is observed for the EC component, with average concentrations dropping by more than 50% at all sites from 2010 to 2019. This reduction in EC concentrations reflects the continued success of regulatory efforts to control diesel emissions and other sources of EC in the Basin. In contrast to other components, average crustal concentrations remained largely similar at all sites throughout this period. Crustal material is primarily derived from windblown soil and anthropogenic sources of dust (fugitive dust, road dust, construction, etc.). These sources are generally more difficult to control and may be exacerbated by drought and other meteorological conditions.

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[34] Watson, John C., Judith C. Chow, L.-W. Antony Chen, and Neil H. Frank (2009). "Methods to Assess Carbonaceous Aerosol Sampling Artifacts for IMPROVE and Other Long-Term Networks." *Journal of the Air & Waste Management Association* (2009): 898-911.

[35] Dillner, Ann M. "Recent Changes to the IMPROVE and CSN Organic Carbon Artifact Adjustment Method." Presented at National Ambient Air Monitoring Conference, August 10, 2016. Available online at: https://www.epa.gov/sites/default/files/2016-10/documents/recent_changes_to_the_improve.pdf

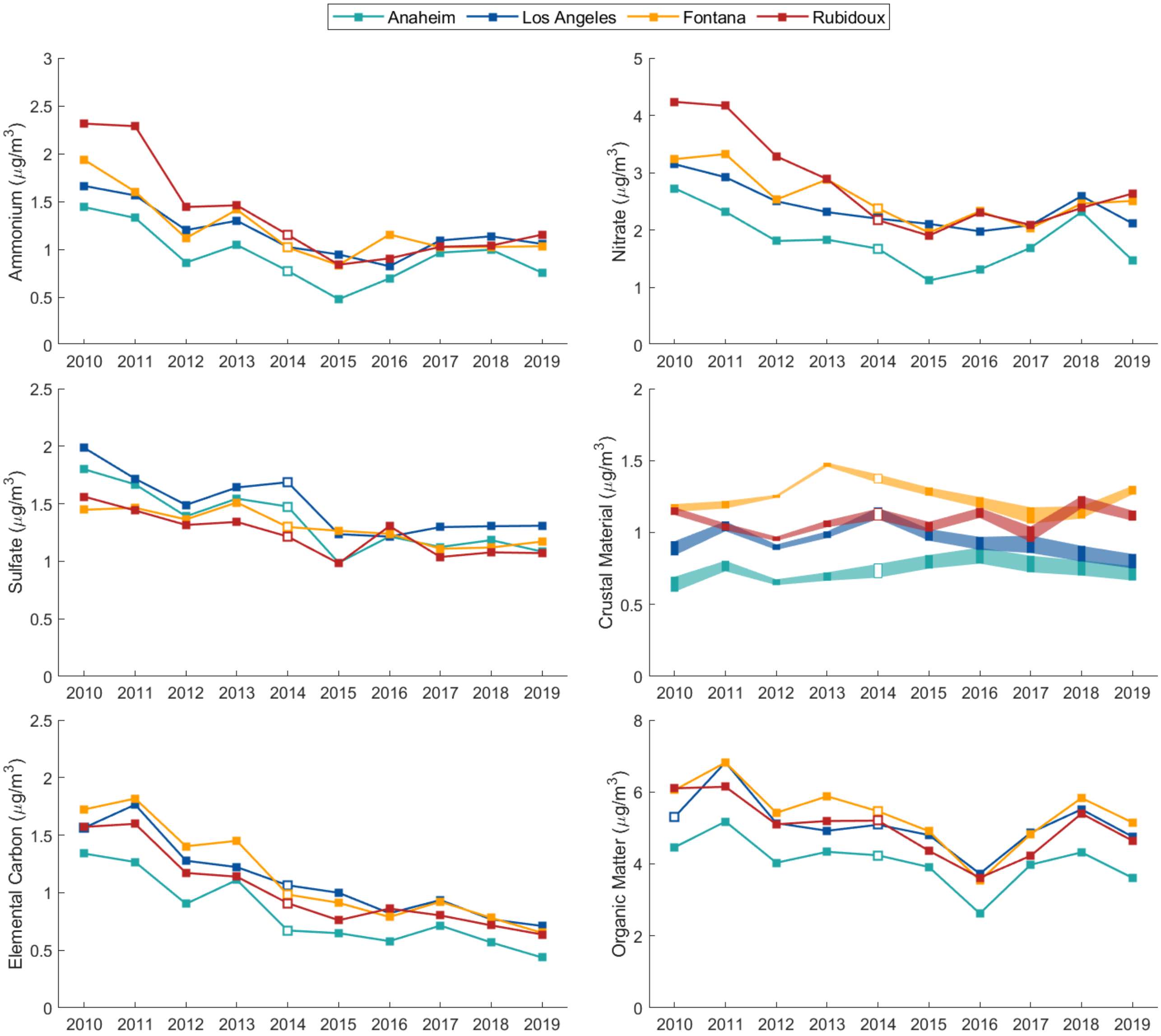

FIGURE 2-25

SOUTH COAST AIR BASIN PM2.5 SPECIATION NETWORK ANNUAL TRENDS, 2010–2019

(ANNUAL AVERAGE CONCENTRATIONS OF AMMONIUM ION, NITRATE, SULFATE, CRUSTAL MATERIAL, ORGANIC MATTER, AND ELEMENTAL CARBON IN PM2.5 AT ANAHEIM, FONTANA, LOS ANGELES, AND RUBIDOUX. OPEN SYMBOLS REPRESENT YEARS WITH <75% DATA COMPLETENESS (67-74%). THE UNCERTAINTY ASSOCIATED WITH CONCENTRATIONS BELOW ANALYTICAL DETECTION LIMITS IS REPRESENTED WITH SHADING AND MARKER SIZE FOR THE CRUSTAL COMPONENT. FOR ALL OTHER COMPONENTS, THIS UNCERTAINTY IS NEGLIGIBLE.)

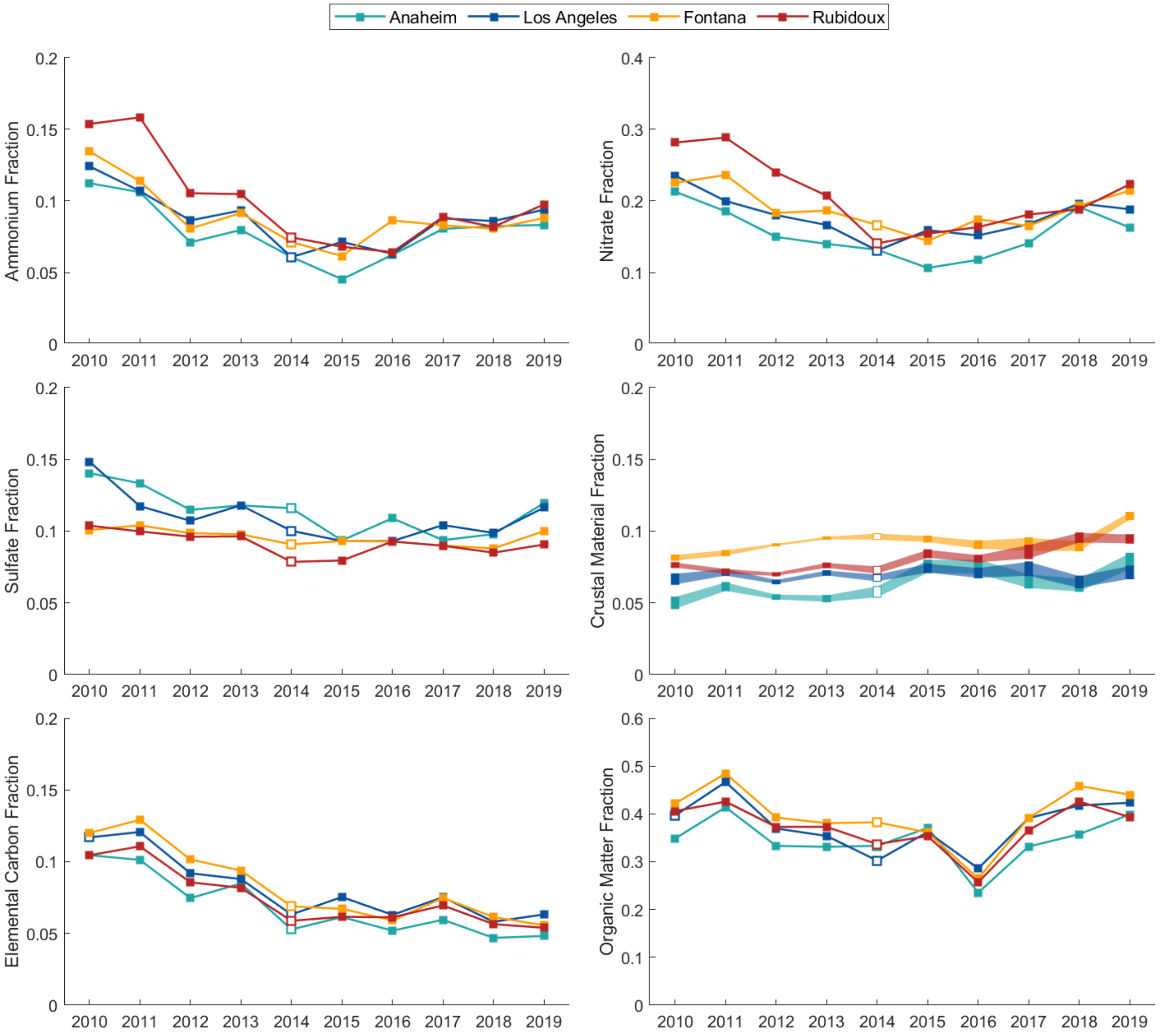

FIGURE 2-26

SOUTH COAST AIR BASIN PM2.5 SPECIATION NETWORK ANNUAL TRENDS OF RELATIVE CONTRIBUTION TO MASS, 2010–2019

(WEIGHTED ANNUAL AVERAGE OF RELATIVE CONTRIBUTIONS OF AMMONIUM ION, NITRATE, SULFATE, CRUSTAL MATERIAL, ORGANIC MATTER, AND ELEMENTAL CARBON TO TOTAL PM2.5 MASS AT ANAHEIM, FONTANA, LOS ANGELES, AND RUBIDOUX. OPEN SYMBOLS REPRESENT YEARS WITH <75% DATA COMPLETENESS (67-74%). THE UNCERTAINTY ASSOCIATED WITH CONCENTRATIONS BELOW ANALYTICAL DETECTION LIMITS IS REPRESENTED WITH SHADING AND MARKER SIZE FOR THE CRUSTAL COMPONENT. FOR ALL OTHER COMPONENTS, THIS UNCERTAINTY IS NEGLIGIBLE.)

Figure 2-26 shows the annual mean contribution of each component to measured PM2.5 mass, weighted by total mass (i.e., days with higher PM2.5 have more influence on annual average). Organic matter was the dominant fraction at all sites from 2010-2019, with estimated contributions ranging from 24-48% of total mass. Ammonium ion and nitrate contributions to PM2.5 mass have generally increased from 2015-2019 after reaching their lowest levels around 2014-2015. This increasing trend is driven by both slight increases in absolute nitrate and ammonium ion concentrations as well as decreasing contributions from other species such as EC. Sulfate and crustal material contributions to total mass generally show muted changes from 2010-2019, with slight increases in crustal contributions and slight decreases in sulfate contributions observed at some sites.

Average seasonal concentrations of PM2.5 components across all sites from 2015-2019 are shown in Figure 2-27. Organic matter was the dominant component in all seasons. Both nitrate and EC concentrations and relative mass contributions peaked in the winter, while sulfate concentration and mass contribution peaked in the summer. These seasonal trends are consistent with meteorological impacts on secondary ion formation and particulate accumulation, as well as changes in seasonal PM2.5 emissions (i.e., residential wood burning). Other components showed more complex seasonal patterns, reflecting the competing influences of meteorology, atmospheric chemical processes, and emission patterns.

The ratio of organic carbon to elemental carbon (OC/EC) can provide further insight into the sources of organic matter in the Basin, with lower OC/EC ratios associated with primary combustion sources (e.g., diesel and gasoline combustion) and higher ratios with secondary organic formation and other OC sources. As shown in Figure 2-28, annual median OC/EC ratios show a generally increasing trend from 2010-2019, which is consistent with the steady decline in EC concentrations during this period. This trend suggests that contributions of secondary and other sources of organic matter are becoming increasingly important as diesel emissions decrease.

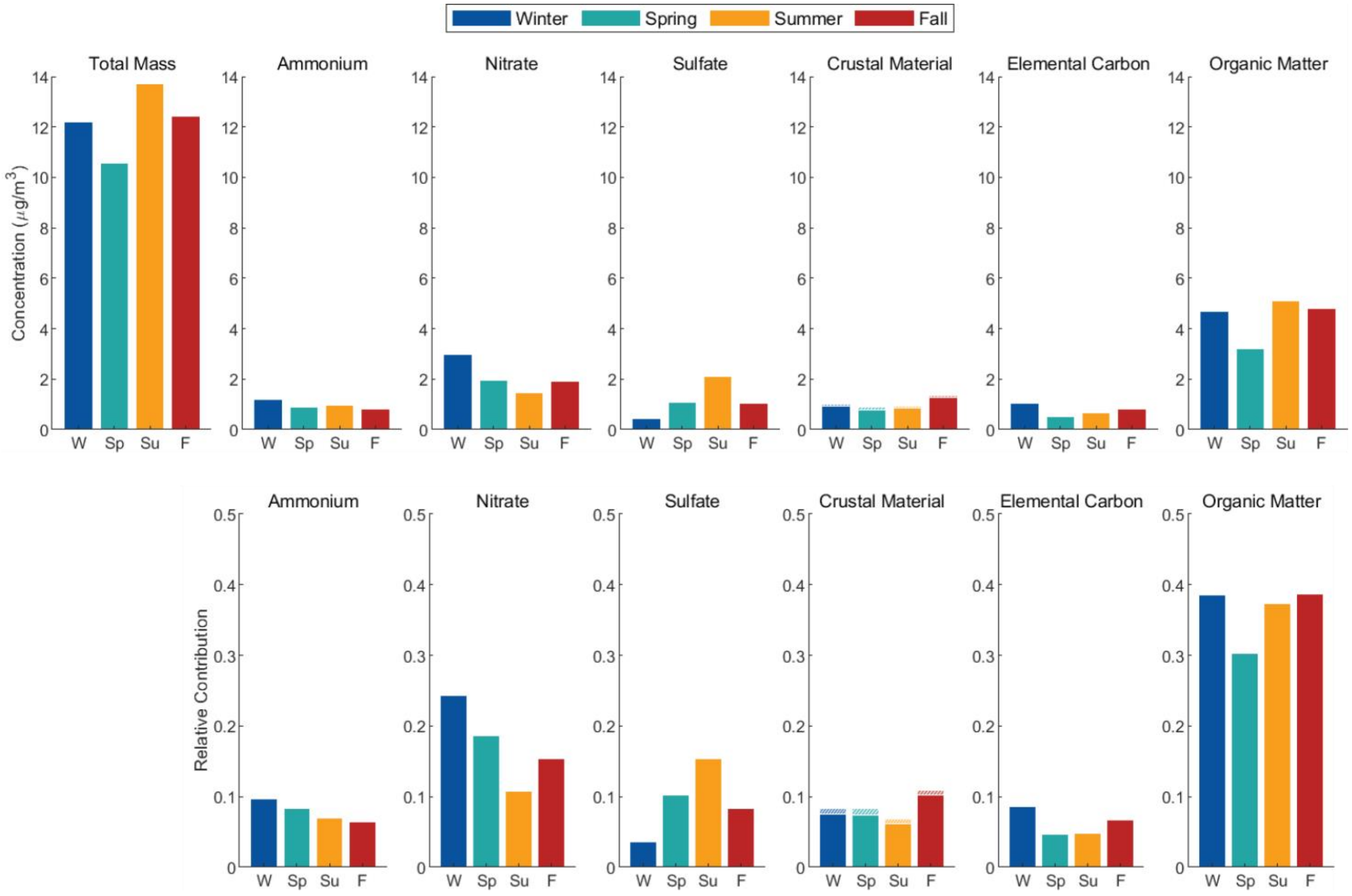

FIGURE 2-27

SEASONAL VARIATION IN CONCENTRATIONS OF PM2.5 COMPONENTS (TOP) AND RELATIVE CONTRIBUTION OF PM2.5 COMPONENTS TO TOTAL MASS (BOTTOM), 2015-2019

(AVERAGE SEASONAL CONCENTRATIONS AND RELATIVE CONTRIBUTIONS ACROSS ALL FOUR SITES FROM 2015-2019. THE UNCERTAINTY ASSOCIATED WITH CONCENTRATIONS BELOW ANALYTICAL DETECTION LIMITS IS REPRESENTED WITH HATCHED SHADING AT THE TOP OF EACH BAR.)

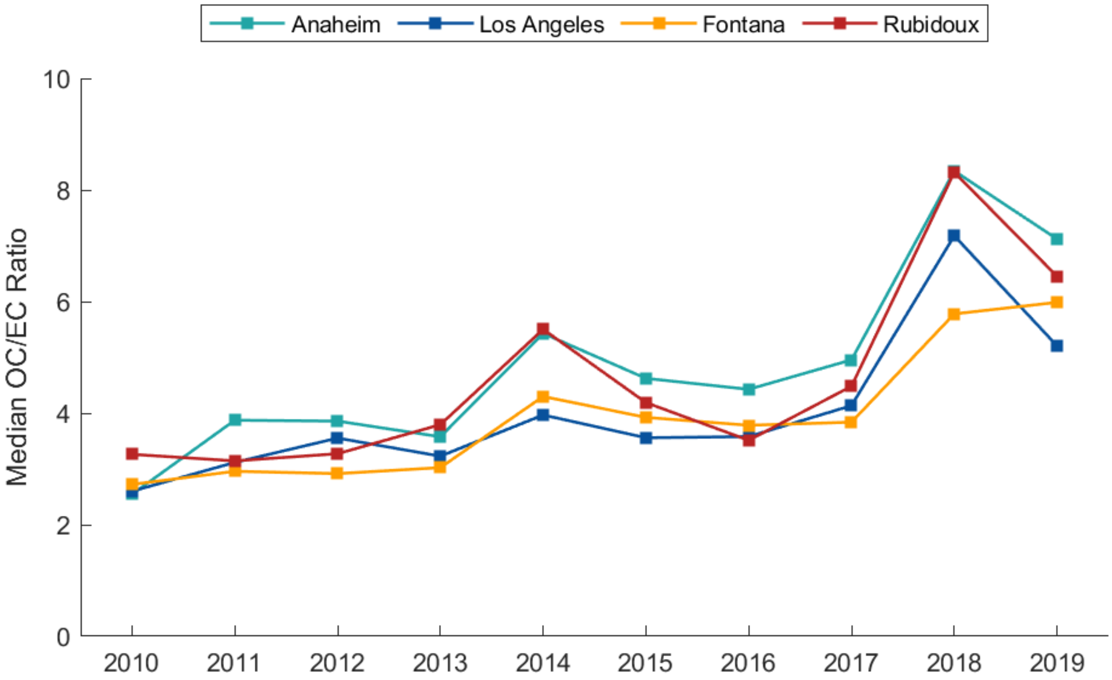

FIGURE 2-28

TRENDS OF SOUTH COAST AIR BASIN PM2.5 ORGANIC CARBON (OC) TO ELEMENTAL CARBON (EC) RATIO, 2010–2019

(ANNUAL MEDIAN BLANK-CORRECTED ORGANIC CARBON TO ELEMENTAL CARBON RATIO AT EACH SITE. NOTE THAT MEDIAN RATIOS WERE CALCULATED TO LIMIT EFFECT OF OUTLIERS ASSOCIATED WITH VERY LOW EC CONCENTRATIONS.)

Figure 2-29 shows PM2.5 composition from the speciation sampler at the Rubidoux station, comparing the 2019 annual average to the average composition on the three highest mass days (23.0-31.3 µg/m^3) sampled at this location. The Rubidoux station is the closest PM2.5 speciation station to Mira Loma, which recorded the maximum average PM2.5 concentration in the Basin from 2018-2020 (excluding near-road stations). On high mass days, ammonium ion and nitrate fractions increased compared to annual average composition, indicating that secondary ion formation (specifically, ammonium nitrate) was a key driver of high PM2.5 mass on these days.

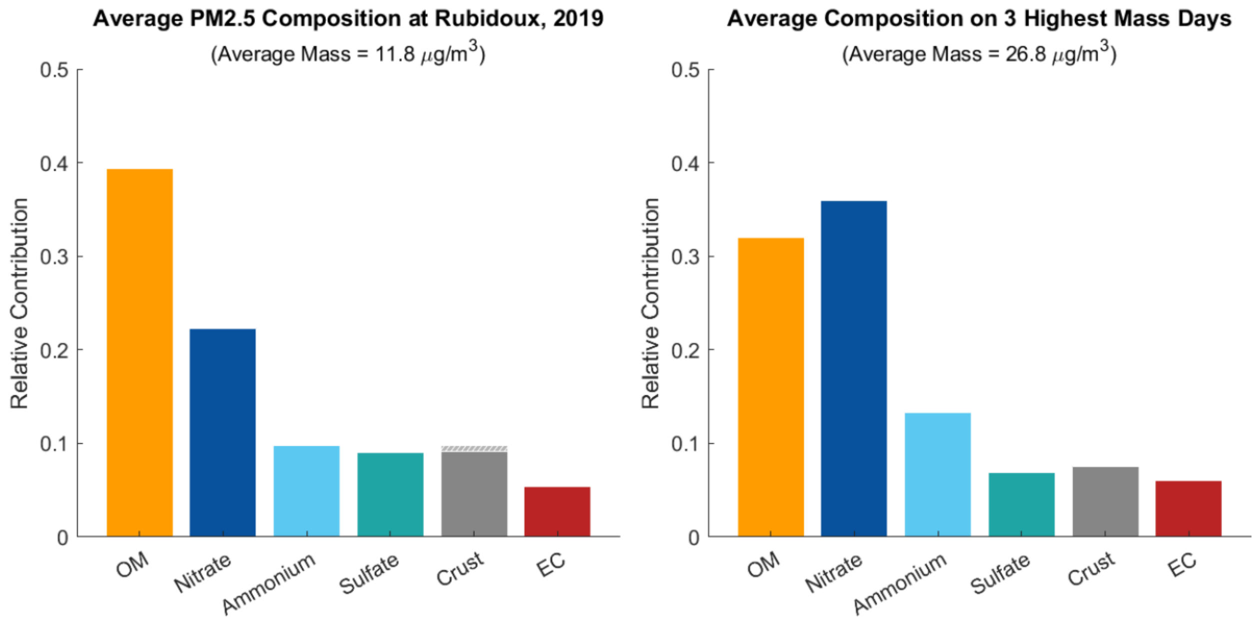

FIGURE 2-29

PM2.5 COMPOSITION FOR ANNUAL AVERAGE AND 3 HIGHEST MASS DAYS IN 2019 (RIVERSIDE-RUBIDOUX STATION)

(WEIGHTED AVERAGE RELATIVE CONTRIBUTIONS OF ORGANIC MATTER, NITRATE, AMMONIUM ION, SULFATE, CRUSTAL MATERIAL, AND ELEMENTAL CARBON TO PM2.5 MASS AT RUBIDOUX IN 2019 FOR ALL SAMPLES (LEFT PANEL) AND THREE HIGHEST MASS DAYS (RIGHT PANEL). THE UNCERTAINTY ASSOCIATED WITH CONCENTRATIONS BELOW ANALYTICAL DETECTION LIMITS IS REPRESENTED WITH HATCHED SHADING AT THE TOP OF EACH BAR.)

Near-Road PM2.5

On December 14, 2012, U.S. EPA strengthened the NAAQS for PM2.5 and introduced a requirement to monitor PM2.5 concentrations near the most heavily trafficked roadways in large urban areas. Particle pollution is potentially higher along these roadways as a result of direct emissions from cars and heavy-duty diesel trucks and buses. South Coast AQMD installed the two required PM2.5 monitors by January 1, 2015, at locations selected based upon the existing near-roadway NO_2 sites that were ranked higher for heavy-duty diesel traffic. These locations are: (1) I-710, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach and (2) CA-Route 60, located west of Vineyard Avenue near the San Bernardino/Riverside County border near Ontario, Mira Loma and Upland. These near-road sites measure PM2.5 daily with FRM filter-based measurements.

Table 2-8 summarizes the 2018-2020 annual and 24-hour PM2.5 design values from the near-road sites and nearby ambient monitoring stations. The 2018-2020 PM2.5 annual design values from the Route 710 and Route 60 Near-Road sites were 12.7 and 14.2 μg/m^3, respectively. The nearby ambient stations in South Coastal Los Angeles County (North Long Beach station) and in Metropolitan Riverside County (Mira Loma station) measured 11.1 and 13.8 μg/m^3, respectively, for the 2018-2020 annual design values. Thus, the PM2.5 annual design values of these sites for 2018-2020 indicate that the near-road sites do indeed measure higher concentrations than the nearby ambient stations, on average. The CA-60 near-road station became the 3-year design value site for the Basin for the PM2.5 annual average NAAQS beginning in 2017 when the first 3-year design value was available.

After removing the regulatory significant exceptional events, the 2018-2020 24-hour PM2.5 design value is higher at the I-710 Near-Road than at the nearby North Long Beach station. However, the 2018-2020 24-hour PM2.5 design value remains higher at Mira Loma (35 μg/m^3) than at the CA-60 Near-Road site (34 μg/m^3). PM2.5 24-hour concentrations at the Mira Loma station are higher than the near-road site on the highest days, potentially due to the influence of nearby residential wood burning and the influence of enhanced secondary particle formation at Mira Loma.

TABLE 2-8

2018-2020 ANNUAL PM2.5 DESIGN VALUES AND 24-HOUR PM2.5 DESIGN VALUES AT THE SOUTH COAST AIR BASIN NEAR-ROAD SITES AND NEARBY AMBIENT STATIONS

Near-Road PM2.5*			Nearby Ambient PM2.5*		
Near-Road Station	2018-2020 Annual PM2.5 Design Value (μg/m^3)#	2018-2020 24-Hour PM2.5 Design Value (μg/m^3)##	Ambient Station	2018-2020 Annual PM2.5 Design Value (μg/m^3)#	2018-2020 24-Hour PM2.5 Design Value (μg/m^3)##
Route 710 N. R.	**12.7**	**35**	North Long Beach	11.1	33
Route 60 N. R.	**14.2**	34	Mira Loma	13.8	**35**

Bold text denotes the peak value.

* Filter-based FRM measurements and NAAQS-comparable FEM measurements were used to calculate the design values.

\# Data includes exceptional events.

\#\# 24-Hour PM2.5 samples exceeding the 24-hour PM2.5 NAAQS during September 11, 2020 - September 16, 2020 at the Route 60 Near Road and Mira Loma stations were removed to calculate design values; these exceedances were caused by smoke from the Bobcat and El Dorado Fires. South Coast AQMD is preparing an exceptional event demonstration consistent with U.S. EPA exceptional event guidance for this event. Events with an exceptional event demonstration that the U.S. EPA has concurred upon may be removed from the design value determination.

The annual PM2.5 NAAQS is 12.0 μg/m^3; the 24-hour PM2.5 NAAQS is 35 μg/m^3.

I-710 N. R. is located on Interstate 710 at Long Beach Bl. in Long Beach in Los Angeles County.

CA-60 N.R. is located on California Route 60 west of Vineyard Av. in Ontario in San Bernardino County.

Impacts of Meteorology on PM2.5 Air Quality

PM2.5 concentrations are influenced by atmospheric pollutant transport and dispersion. Winds and turbulence mix air pollution with cleaner air in the atmosphere and transport pollutants out of the South Coast AQMD jurisdiction. Rainfall and associated storms also help to reduce PM2.5 concentrations. To analyze the impact of meteorology on PM2.5, we constructed two indexes that quantify the influence of atmospheric transport and dispersion on concentrations. The indexes are calculated using the following equations:

$$C_1 = \frac{1}{hU} \tag{1}$$

$$C_2 = \frac{1}{\sigma_w} \tag{2}$$

where *h* is the mixed layer height, *U* is the wind speed, and σ_w is the standard deviation of vertical turbulent velocity at a height of *h/2*. C_1 is indicative of meteorological influences on concentrations when pollutants are vertically mixed through the mixed layer height. C_2 is indicative of the influence of meteorology on concentrations when pollutants are not mixed through the mixed layer height, which occurs when the receptor is near the pollution source. The expressions are based on direct plume equations in the formulation of the AERMOD dispersion model[36], in which concentrations are inversely proportional to the product of wind speed and vertical plume spread, σ_z, and $\sigma_z \sim \sigma_w / U$. Many simplifications have been made and thus the expressions neglect complicating effects of the vertical structure of the mixed layer, lateral dispersion, effect of emission release height, plume rise, terrain, and buildings.

The meteorological indexes were calculated using hourly historical measurements of wind speed, temperature, and total sky cover at several South Coast AQMD and Automated Surface Observing Systems (ASOS) monitoring stations. The parameters *h,* σ_w, and *U* were determined using the AERMET meteorological processor and the AERSURFACE preprocessor for AERMET, which are preferred/recommended models in U.S. EPA's guidelines on air quality models[37]. AERMET estimates the surface friction velocity (u_*), convective velocity scale (w_*), and *h*, and AERSURFACE estimates the surface roughness length (z_0). Then the relationships $U = \frac{u_*}{\kappa} \ln\left(\frac{h/2}{z_0}\right)$, where $\kappa = 0.4$ is the von Karman constant, and $\sigma_w^2 = 0.35 w_*^2 + 0.8 u_*^2$, taken from the AERMOD formulation for the vertical profiles of *U* and σ_w at half the mixed layer height, are used to calculate the parameters in equations 1 and 2. During the night, when the surface heat flux is downward and no convection exists, $w_* = 0$.

The hourly indexes calculated using equations 1 and 2 were averaged over the four quarters of each year during the period from 2010 – 2021 (for 2021 only the first two quarters were calculated because quarters three and four were unavailable at the time this document was written). Then the baseline indexes for each quarter were calculated as the average of the meteorological indexes in each quarter over the period 2008 – 2021. Finally, the meteorological indexes in each quarter were normalized with the baseline index corresponding to that quarter.

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[36] See equation 59 of the AERMOD model formulation document https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod

[37] https://www.epa.gov/scram/meteorological-processors-and-accessory-programs

The trend of normalized quarterly meteorological indexes is shown in Figure 2-30. Both indices increased over time at both Compton and Mira Loma (Van Buren), the stations with the highest PM2.5 98th percentile values in recent years, relative to the baseline period of 2010 – 2020. The figures show that both of the dispersion indexes were greater than 1 in recent years, although there is significant variation. This means that there was less dispersion and ventilation in recent years compared with the average in the baseline years, and thus meteorological conditions were slightly favorable to higher concentrations in recent years. This shows that the transport and dispersion related meteorological conditions in the design value period of 2018 - 2020 were somewhat favorable to higher PM2.5 concentrations.

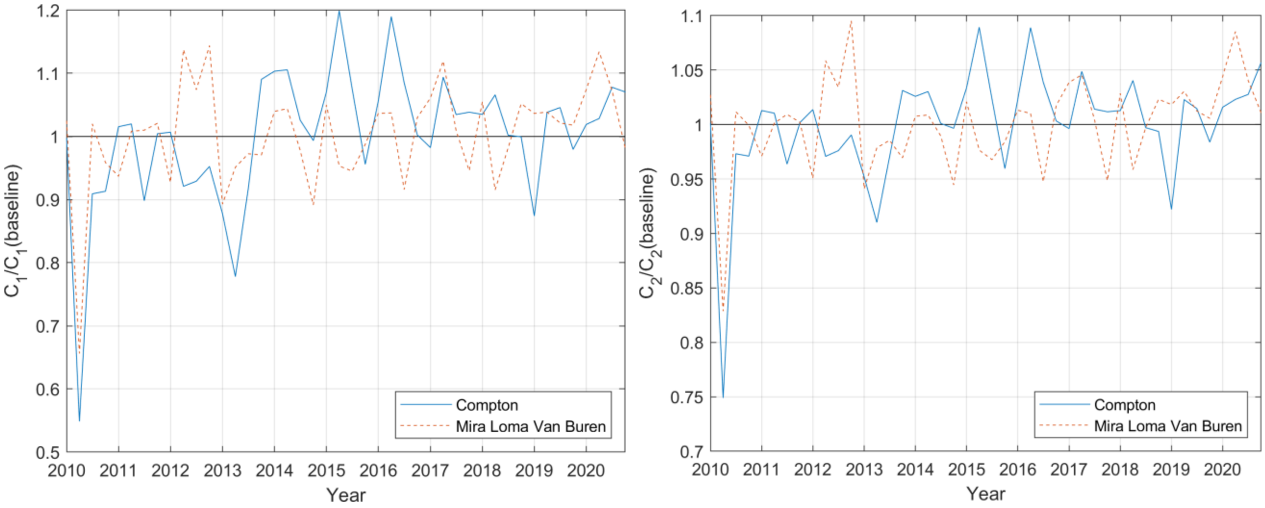

FIGURE 2-30

TREND OF DISPERSION INDEX (C_1, LEFT) AND (C_2, RIGHT) AT COMPTON AND MIRA LOMA (VAN BUREN)

The next section demonstrates that the dispersion indexes of equations 1 and 2 are useful for quantifying the influence of meteorology on concentrations. To do this, the relationship between hourly PM2.5 concentrations measured at Mira Loma (Van Buren) and the indices was analyzed. Variability of emission rates dominates the variation of measured PM2.5 concentrations; therefore, a model that could accommodate the variability was required for this analysis. An empirical model using data from 2010 to 2020 was fit after removing suspected exceptional events, with the hourly indices as independent variables and the measured concentrations as the dependent variable:

$$PM2.5 = A + (1 - B \times (year - 2010))Q_m(Q_{1h}\, C_1 + Q_{2h}C_2) \qquad (3)$$

where PM2.5 is the measured hourly concentration and A, B, Q_m, Q_{1h} and Q_{2h} are empirical parameters of the model. Q_{1h} and Q_{2h} are each sets of 24 parameters that are indexed by the hour of the day, h, and Q_m is a set of 12 parameters that is indexed by the month, m. The parameter B allows for the year-to-year decrease of PM2.5 concentrations that is observed due to emission reductions, Q_{1h} and Q_{2h} allow for diurnal variation of concentrations, which may in part be caused by emission variations over the day, and Q_m allows for seasonal variation of concentrations, which may in part be caused by emission variations over the year. Note that C_1 and C_2 are the dispersion indices developed in equations 1 and 2, respectively. The model in equation 3 was fit using the nonlinear fitting function least_squares in the Python scipy.optimize package, where lower bounds of A, Q_{1h}, Q_{2h}, *and* Q_m were set to a small number, the upper bound of A was set to 15 µg m^{-3}, and the upper bound of *B* was set to 0.05. The resulting standard error of the estimate was 11.0 µg m^{-3} and the parameters *A* and *B* were 10.4 µg m^{-3} and 0.05, respectively.

Monthly averages of the predicted PM2.5 were calculated using equation 3 (over the 2010 – 2020 period) and then compared the averages with the measured monthly average PM2.5 after removing suspected exceptional events. The measured and predicted monthly PM2.5 were first "normalized" as $Normalized\ PM2.5 = (PM2.5 - A)/((1 - B \times (year - 2010))Q_m))$. This normalization process isolates the influence of C_1 and C_2 on the concentrations and thus enables us to determine their relationship with the measured PM2.5. A linear regression model fit to the monthly averaged normalized data had intercept and slope of -8.45 µg m^{-3} ($p < 0.01$) and 2.53 ($p < 0.01$) and coefficient of determination $r^2 = 0.43$ (Figure 2-31). The coefficient of determination indicates that the predicted PM2.5 can explain a moderate amount of variation of the measured monthly average PM2.5. Variability of emission rates and the influence of atmospheric chemistry, transport, emission release heights, and terrain all contribute to additional variation of the measured PM2.5. However, the dispersion index was used to isolate the contribution of several meteorological factors on concentrations. This analysis demonstrates that the meteorological indices C_1 and C_2 are useful for the purpose of determining the influence of meteorological factors that govern atmospheric transport and dispersion on PM2.5 concentrations. This supports the conclusion that transport and dispersion related meteorological conditions in recent years were somewhat favorable to higher PM2.5 concentrations.

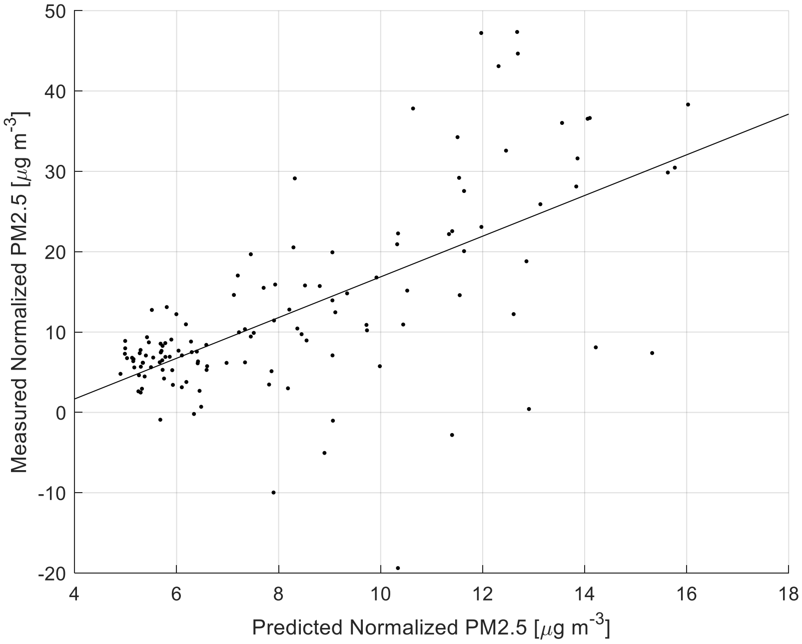

FIGURE 2-31

COMPARISON OF MONTHLY AVERAGE PM2.5 PREDICTED BY EQUATION 3 WITH MEASURED VALUES FROM 2010 TO 2020. THE LINE IS A LINEAR REGRESSION LINE.

The model parameters Q_{1h} and Q_{2h} for each hour of the day are shown in Figure 2-32. The parameters are related to emission rates but cannot be interpreted as emissions because the model that was used does not account for chemistry that relates precursor emissions with PM2.5, among other sources of variability.

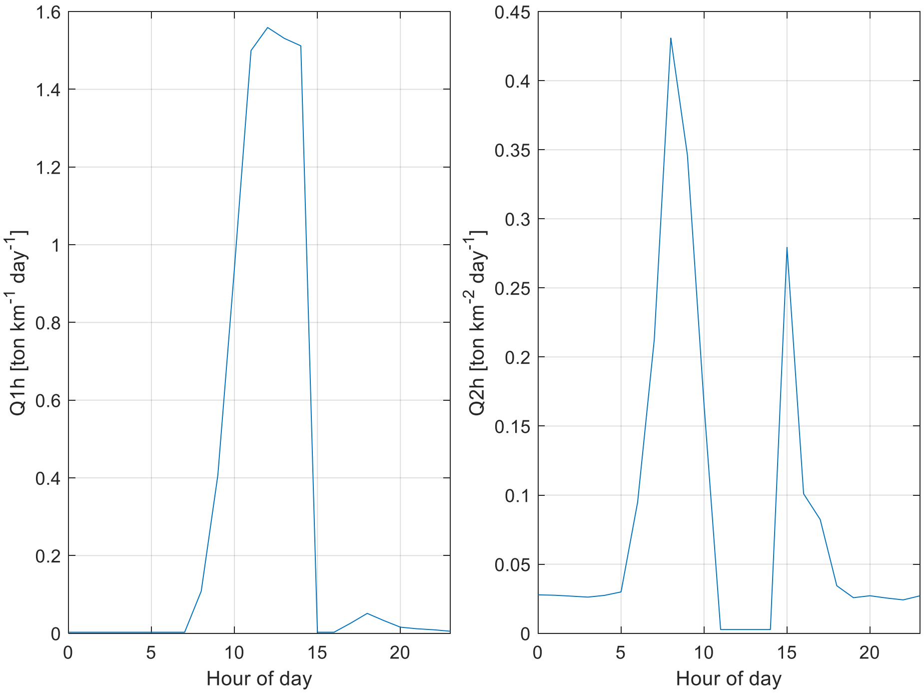

FIGURE 2-32

FITTED MODEL PARAMETERS Q_{1H} AND Q_{2H} FOR EACH HOUR OF THE DAY

Along with transport and dispersion, rainfall is an important meteorological factor that affects particulate concentrations. Lower rainfall results in less washing of road surfaces and drier ground surfaces, which reduces the natural crusting of soils that is improved by moisture. This can lead to enhanced resuspension of fugitive dust by moving vehicles and winds. Fugitive dust can raise concentrations of both PM10 and PM2.5. More importantly, less rain reduces the natural air pollution cleansing effect of precipitation due to washout – particulate matter and its precursors captured and removed by raindrops. The reduced frequency of storms also translates to fewer days of enhanced pollutant dispersion. Without the storm systems and related winds, there is less mixing of air pollutants with cleaner air in the atmosphere and less transport of pollutants out of the region. The lack of windy, unstable weather conditions during storms results in longer episodes of stagnant air when particulate pollution builds to unhealthful levels. Dry conditions also contribute to increased frequency and intensity of wildfire events throughout the State, with resulting impacts to both particulate and ozone air quality.

Table 2-9 shows the rainfall statistics for the National Weather Service Los Angeles International Airport (KLAX) and Ontario International Airport (KONT) meteorological stations from 2001–2020. The total rainfall during quarters 1 and 4, averaged over three years, at KLAX and KONT are shown in Figure 2-33 along with the trend of 24-hour PM2.5 design values. KLAX is located on the western side of the Basin and is representative of meteorology at the Compton monitoring station, which is located 11 miles away. KONT is located towards the center of the Basin and is representative of the Mira Loma monitoring station, which is located 9.6 miles from KONT. The first and fourth quarters are the most important to consider, since the vast majority of the days that exceed the federal 24-hour standard in the Basin occur during this period. This is also the time period that the Basin typically experiences the most rainfall and more frequent storm events.

TABLE 2-9

TRENDS OF QUARTERS 1 & 4 RAINFALL TOTALS AND NUMBER OF RAIN DAYS FOR KLAX AND KONT, 2001–2020

Year	Quarter 1 and 4 Rain Days (KLAX)	Quarter 1 and 4 Rain Days (KONT)	Quarter 1 and 4 Rainfall Total [inches] (KLAX & KONT average)
2001	48	36	14.26
2002	30	13	4.35
2003	24	19	7.78
2004	29	28	13.66
2005	25	44	14.09
2006	26	24	6.87
2007	22	12	3.81
2008	34	33	12.53
2009	24	34	8.05
2010	47	53	19.25
2011	28	29	9.40
2012	31	33	7.17
2013	16	25	3.64
2014	21	19	8.62
2015	21	24	4.06
2016	29	32	9.19
2017	30	22	11.02
2018	21	19	6.32
2019	38	40	16.94
2020	18	21	6.15
2000 - 2020	28	28	9.21

Rainfall data from National Weather Service, Los Angeles International Airport (KLAX) and Ontario International Airport (KONT) meteorological stations. Rainfall totals are average of KLAX and KONT. Rain days defined as measured rainfall ≥ 0.01 inches.

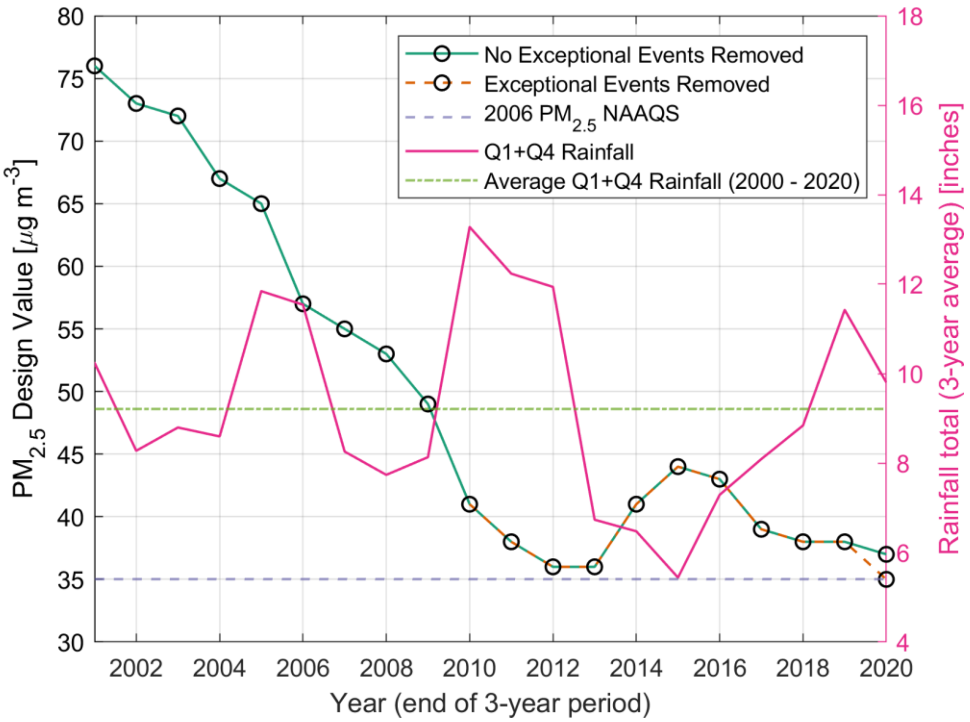

FIGURE 2-33

TREND OF SOUTH COAST AIR BASIN MAXIMUM 24-HOUR PM2.5 DESIGN VALUES AND 3-YEAR AVERAGE OF RAINFALL IN QUARTERS 1 (JAN.–MAR.) AND 4 (OCT.–DEC.) AT KLAX AND KONT.

After the drought from 2013 – 2015, annual precipitation totals in recent years (9.80 from 2018 – 2020) have been slightly above average (9.21 from 2000 – 2020). The average number of days with precipitation from 2018 – 2020 (26.2) was slightly lower than the average over 2000 – 2020 (28.1). The 98th percentile 24-hour PM2.5 concentrations steadily declined through 2012, as had been seen in most years since the PM2.5 measurements started in 1999. This consistent trend of improving fine particulate air quality is associated with the continued implementation of PM2.5-related emission reductions in the Basin.

The 2013 – 2015 average rainfall (Quarter 1 and Quarter 4) was just 5.44 inches, 59% percent of normal. The 2015 Mira Loma design value increased to 44 μg/m^3. The Basin's PM2.5-related emissions continued to decrease, while the long-term trend of steady progress seen in prior years started to reverse due to the drought-related meteorological conditions.

After 2015, due to rainfall returning to near-average levels, PM2.5 concentrations have resumed the long-term decreasing trend. The design value in 2020 was 35 μg/m^3 after removing exceedances caused by the Bobcat and El Dorado Fires, which caused high PM2.5 concentrations in the fall of 2020.

As a result of the disrupted progress toward attainment of the federal 24-hour PM2.5 standard, South Coast AQMD requested and the U.S. EPA approved, in January 2016, a "bump up" to the nonattainment classification from "moderate" to "serious," with a new attainment deadline as soon as practicable, but not beyond December 31, 2019. Because of the failure to attain the 2006 24-hour PM2.5 NAAQS by 2019, South Coast AQMD developed a Section 189(d) Plan) to address the attainment planning requirements for the Basin.

PM10 Air Quality

In 2020, South Coast AQMD routinely monitored PM10 concentrations at 19 locations in the Basin and three locations in the Coachella Valley. Of these, 19 stations employed high-volume, filter-based FRM PM10 samplers with size-selective inlets. The FRM PM10 minimum sampling schedule set by U.S. EPA requires one 24-hour filter sample every sixth day. At the Riverside-Rubidoux, Mira Loma, and Indio stations, the 24-hour filter sample is collected once every three days for additional temporal resolution at these historic peak PM10 locations. In addition, ten stations have FEM continuous monitors, which supplement the collocated FRM measurements at five stations and are the primary measurement at four more stations. Both FEM and FRM instruments are used for determining attainment. Attainment is considered at each instrument separately, even if they are collocated at the same station. Figure 2-34 shows the routine regional PM10 monitoring sites in the South Coast AQMD jurisdiction.

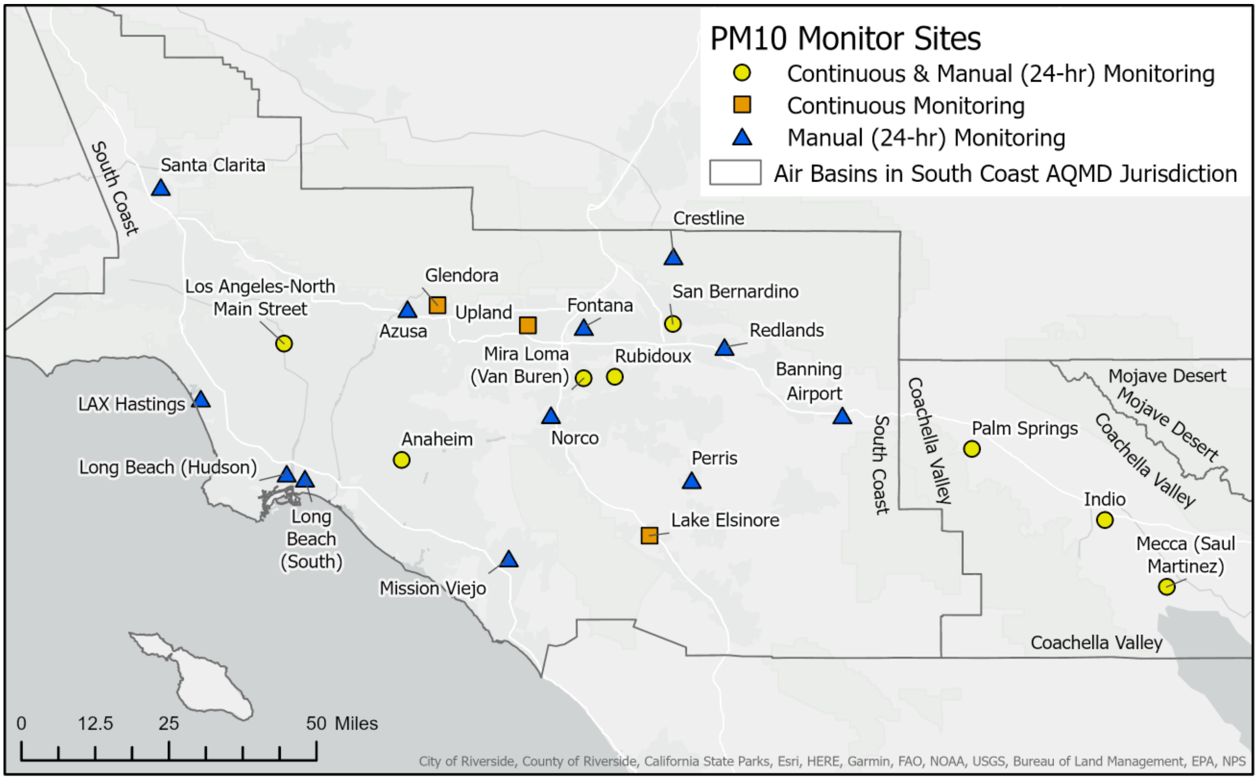

FIGURE 2-34

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT PM10 MONITORING LOCATIONS IN 2020

(Palm Springs, Indio and Mecca-Saul Martinez stations are in Coachella Valley; the manual FRM PM10 monitors also comprise the South Coast AQMD sulfates network)

Attainment of the 24-hour PM10 NAAQS is based on the design value, which represents the average number of exceedances of the standard in a three-year period. This form is not useful for analyzing trends of concentrations over time. We therefore also use a different but related form, referred to as the concentration-based design value in the sections on PM10.

For this analysis, the concentration-based design value is defined as the fourth highest concentration at a monitor in a three-year period, after simulating days without measurements. To simulate days without measurements, each measurement is repeated n times in each year, where $n = round\left(\frac{dyear}{d}\right)$, where $dyear$ is the number of days in the year (365 or 366), d is the number of measurements at the monitor, and $round()$ rounds to the nearest integer. The concentration-based design value can be complete or incomplete. The value is complete if all quarters in the three-year period are at least 75% complete or the concentration-based design value is 155 µg m^{-3} or larger (i.e., exceeds the federal 24-hour PM10 standard level). Completeness is calculated by dividing the number of valid samples by the number of scheduled samples. This methodology produces similar conclusions as the official exceedance-based design values but provides additional context when tracking trends in measured concentrations over time. In general, concentration-based design values of 155 µg m^{-3} or larger would also have exceedance-based design values that do not attain the standard.

The 24-hour PM10 design values in 2020 are summarized by county and basin in Table 2-10, along with the state designation values. The federal 24-hour standard level (155 µg/m^3 is the exceedance level) was only exceeded at seven stations in the Basin on nine different days from 2018 to 2020. These high 24-hour averages were due to high-wind exceptional events and do not jeopardize the attainment status because exceptional events are removed from design value calculations if they are concurred upon by U.S. EPA. The Basin has remained in attainment of the PM10 NAAQS since 2006.[38] The Basin maximum 2018–2020 concentration-based design value for 24-hour PM10, without exceptional events removed, is 170 µg/m^3, 110 percent of the NAAQS, in Metropolitan Riverside County at the Mira Loma (Van Buren) monitoring station. After removing exceptional events due to high-winds the maximum concentration-based design value is 152 µg/m^3, 98 percent of the NAAQS, in East San Gabriel Valley at the Azusa monitoring station. The much more stringent State 24-hour PM10 standard (50 µg/m^3) was exceeded at many stations in the Basin and in the Coachella Valley.

The Coachella Valley had eighteen days in 2018-2020 exceeding the 24-hour PM10 NAAQS, with concentrations as high as 680 µg/m^3 at the Mecca (Saul Martinez) monitoring station, almost all of which were due to windblown dust and sand associated with high-wind exceptional events. The Palm Springs monitoring station only exceeded on two of those days. The FEM monitor at Saul Martinez Elementary School, in the town of Mecca in the southeastern portion of the Coachella Valley, exceeded the standard on seventeen days from 2018-2020, almost all related to high-wind events. The Coachella Valley 2018–2020 concentration-based design value for 24-hour PM10 is 204 µg/m^3 at Mecca (Saul Martinez) after the exclusion of exceptional events with wind speeds exceeding 25 mph in the Coachella Valley. The official design value that is used to determine attainment is 2.0, which exceeds the PM10 NAAQS even after the exclusion of suspected exceptional events. The other exceedances at Mecca (Saul Martinez) were also likely caused by windblown dust and sand, but wind speeds in upwind regions were likely not high enough to entrain undisturbed natural soils, and thus these exceedances may not be exceptional events.

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[38] A PM10 measurement conducted at the Long Beach Hudson monitor on July 19, 2018 resulted in an exceedance of the 24-hour PM10 standard. While South Coast AQMD staff believes that this exceedance does not meet the U.S. EPA criteria for removal as an exceptional event, it was recorded on a day with heavy construction immediately adjacent to and underneath the monitoring station, and thus is not representative of local conditions. Following South Coast AQMD data validation procedures, this measurement has been invalidated using the U.S. EPA Air Quality System (AQS) null data code for Construction/Repairs in Area (AC).

TABLE 2-10

2018–2020 24-HOUR PM10 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2018–2020 PM10 24-Hour Concentration Based Design Value (µg/m^3)	2018–2020 Percent of PM10 NAAQS (150 µg/m^3)[#]	2018-2020 PM10 24-Hour Design Value	Area of Design Value Max	2018–2020 High State PM10 24-Hour Designation Value (µg/m^3)[##]	2018–2020 Percent of State PM10 24-Hour Standard (50 µg/m^3)
South Coast Air Basin						
Los Angeles	155 (152)	100 (98)	2.0 (0.7)	East San Gabriel Valley	95	190
Orange	127	82	0.3	Central Orange County	94	188
Riverside	**170 (148)**	**110 (95)**	**1.7 (1.0)**	Metropolitan Riverside County	**134**	**268**
San Bernardino	117	75	0.8	Northwest San Bernardino Valley	95	190
Coachella Valley						
Riverside	274 (204)	177 (132)	5.8 (2.0)	Mecca (Saul Martinez)	Insufficient data	Insufficient data

Bold text denotes the peak design value after removing exceptional events.
Values in parentheses are calculated after removing exceptional events. PM10 concentrations that were related to high-wind events have been flagged for exclusion from NAAQS comparison in accordance with the U.S. EPA Exceptional Events Rule; U.S. EPA concurrence is required for exclusion of exceptional events after submittal of supporting documentation.

[#] A concentration of 155 µg/m^3 is needed to exceed the level of the PM10 NAAQS.

[##] The State 24-hour Expected Peak Day Concentration (EPDC) is a calculated 3-year value after accounting for statistical outliers; the State 24-hour Designation Value is the highest concentration at or below the EPDC over the 3-year period. State data may include exceptional events. State PM10 24-hour average designation value includes FRM and BAM FEM data, but not TEOM FEM instruments since the TEOM is not a California Approved Sampler (CAS) for standard compliance (SCAQMD uses TEOM instruments to supplement FEM measurements in the Coachella Valley).

The annual PM10 design values and state designation values in 2020 are summarized by county and air basin in Table 2-11. Exceptional events were removed before calculating the design values. The annual PM10 design value for 2018–2020 exceeded the former annual PM10 NAAQS at Mira Loma (Van Buren), at 51 µg/m^3. No other stations in the Basin or the Coachella Valley exceeded the former NAAQS for the 2018–2020 design value. The much more stringent State annual PM10 standard (20 µg/m^3) was exceeded at most stations in each county in the Basin and in the Coachella Valley.

TABLE 2-11

2018–2020 ANNUAL PM10 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2018–2020 PM10 Annual Design Value (µg/m^3)	2018–2020 Percent of Former PM10 Annual NAAQS** (50 µg/m^3)	Area of Design Value Max	2018–2020 3-Yr. High State PM10 Annual Designation Value (µg/m^3)#	2018–2020 Percent of Current PM10 State Standard (20 µg/m^3)
South Coast Air Basin					
Los Angeles	33*	66	East San Gabriel Valley	34	170
Orange	27*	54	Central Orange County	28	140
Riverside	**51**	**102**	**Metropolitan Riverside County**	**45**	**225**
San Bernardino	35*	70	Central San Bernardino Valley	34	170
Coachella Valley					
Riverside	38*	76	Mecca (Saul Martinez)	39	195

Bold text denotes the peak value.

* All quarters do not have at least 75% data completeness.

** The federal annual PM10 standard was revoked in 2006.

\# State data may include exceptional events; State PM10 annual average designation value includes FRM and BAM FEM data, but not TEOM FEM instruments since the TEOM is not a California Approved Sampler (CAS) for standard compliance (SCAQMD uses TEOM instruments to supplement FEM measurements in the Coachella Valley); State annual designation value is the highest year in the 3-year period.

PM10 Spatial Variation

Figure 2-35 shows a contour map of the 2018-2020 annual PM10 design value distribution in the Basin. The highest annual PM10 design value was recorded in the Metropolitan Riverside County area at the Mira Loma station with an annual design value of 51 µg/m^3, which exceeded the revoked annual average PM10 NAAQS (50 µg/m^3). The areas with the highest annual PM10 design values were generally recorded in and around the Metropolitan Riverside County area and in the San Bernardino Valley areas, as shown in Figure 2-35. Much of eastern Los Angeles County also saw elevated annual PM10, but still below the former NAAQS. The much more stringent State annual PM10 standard (20 µg/m^3) was exceeded in most stations in each county in the Basin and in the Coachella Valley.

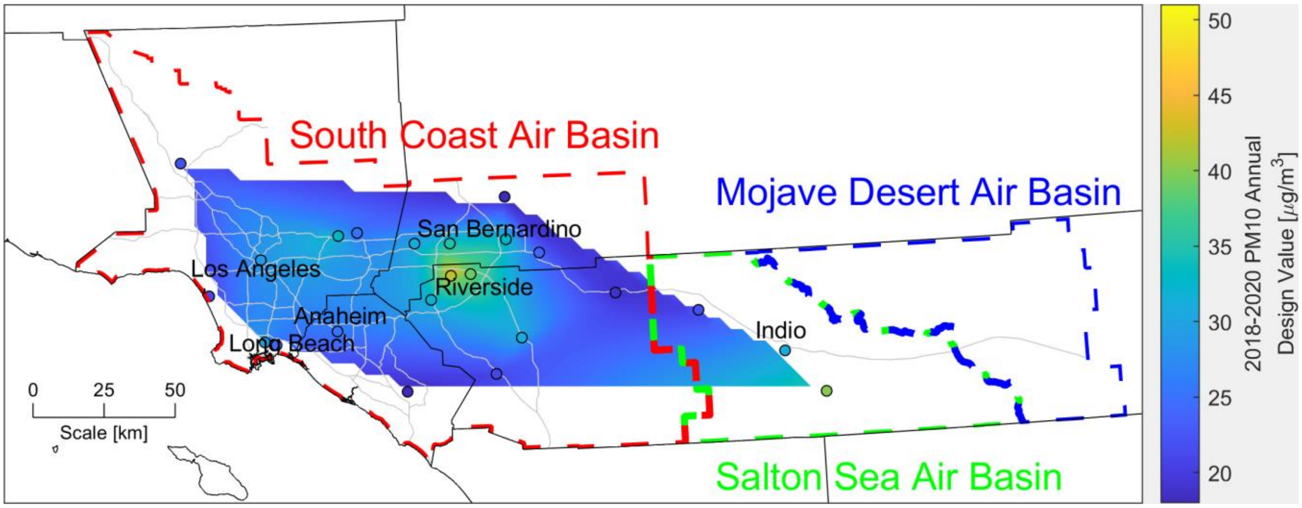

FIGURE 2-35
ANNUAL ARITHMETIC MEAN PM10 (μg/m^3) FOR 2018-2020[39]

PM10 Trends

Figure 2-36 shows the trend for the period between 1995 and 2020 of the concentration-based 24-hour PM10 design value (i.e., the fourth highest 24-hour average PM10 concentration in three years) and the annual PM10 design value for the Basin. The Basin's 24-hour PM10 concentration-based design value has remained below the federal PM10 NAAQS level (150 μg/m^3) since 2003, and U.S. EPA finalized a clean data finding in 2013. The Basin's annual average concentration was below the level of the revoked federal annual PM10 standard in 2011 but has since remained above that standard at one location (Mira Loma).

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[39] This map avoids extrapolating PM10 design values and therefore only shows interpolated PM10 design values between regulatory monitors.

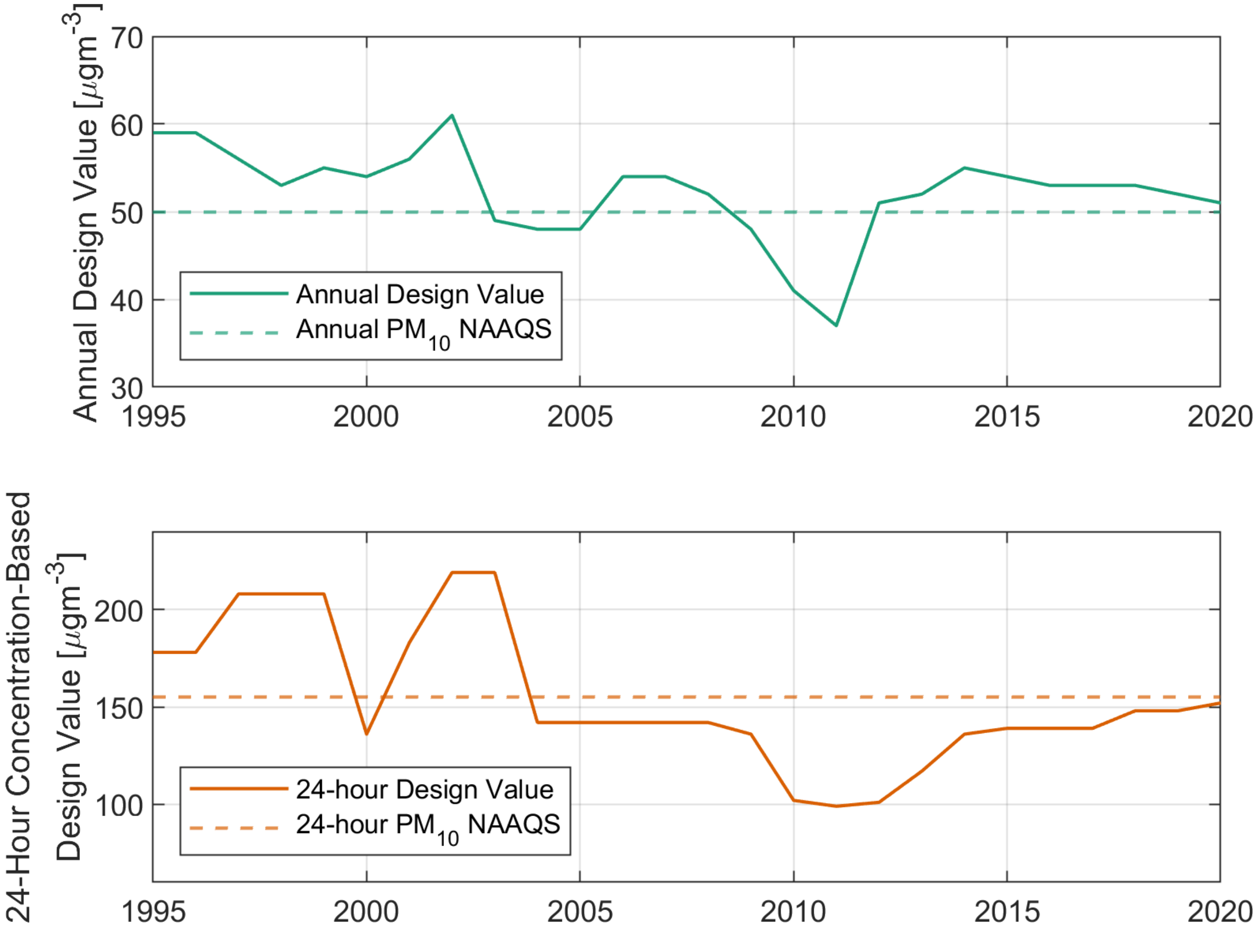


FIGURE 2-36

PM10 DESIGN VALUE TRENDS

(Annual Design Value and 24-Hour Concentration-Based Design Value from 1995 through 2020 in the Basin, μg/m^3)

PM10 Temporal Variation

Exceedances of the 24-hour PM10 federal standard in the Basin have become increasingly rare in recent years. In fact, the only exceedances in the Basin for the past decade have been associated with exceptional events, such as high-wind natural events or cultural events (Independence Day fireworks). As a consequence, variations in exceedances of the State 24-hour PM10 standard are considered here for the seasonal and day-of-week patterns in the Basin.

Figure 2-37 shows the number of days in each month exceeding the State standard at one or more Basin locations from 2018–2020. Overall, the greatest number of exceedances of the State standard occurred in the summer months. This is consistent with previous analyses of seasonal variations in PM10 showing that the monthly average PM10 concentrations and the monthly average number of days exceeding the State standard tend to peak in summer and fall in the inland valley areas of the Basin where PM10 concentrations are highest. Higher summertime PM10 concentrations can be attributed to elevated wind speeds and lower relative humidity that both enhance wind-driven resuspended particles. Due to the higher number of exceedances in the inland valleys, the pattern for the Basin is more similar to patterns for individual sites in the inland valley areas. However, in the South Coastal Los Angeles County area (Long Beach), monthly average PM10 concentrations and the average number of days exceeding the State standard show different monthly trends with highest concentrations recorded in the late fall and winter months.

Figure 2-38 shows the monthly average concentration for stations in two areas, Metropolitan Riverside County (Riverside-Rubidoux) and Southwest Coastal Los Angeles County (LAX). As was found in the previous analyses, PM10 concentrations tend to be higher in the summer and fall months in the inland valley areas, but also remain relatively high in the late fall and winter months in the coastal areas. Most of the coastal high values occur at that time due to windblown dust from the strong, offshore Santa Ana winds that occur in the fall and winter. While most PM10 events in the South Coast Air Basin are caused by regional wind events, localized monsoonal storm activities in the late summer and early fall can contribute to elevated PM10 levels in some years.

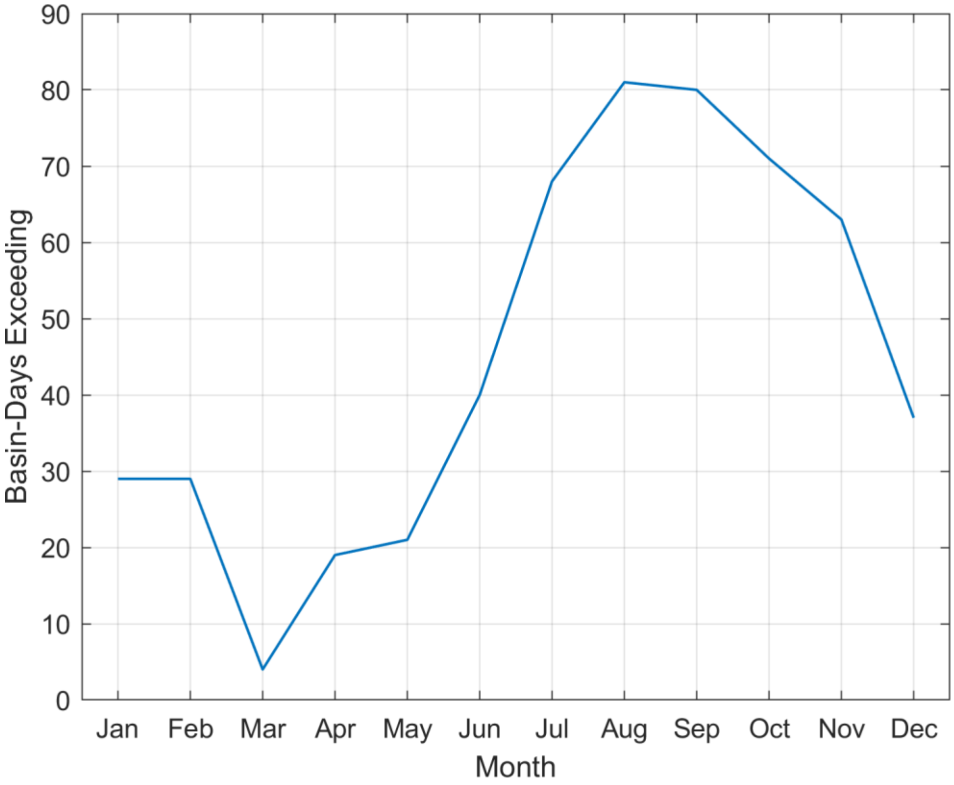


FIGURE 2-37

BASIN-DAYS EXCEEDING THE STATE PM10 STANDARD (50 μg/m^3) BY MONTH, 2018–2020

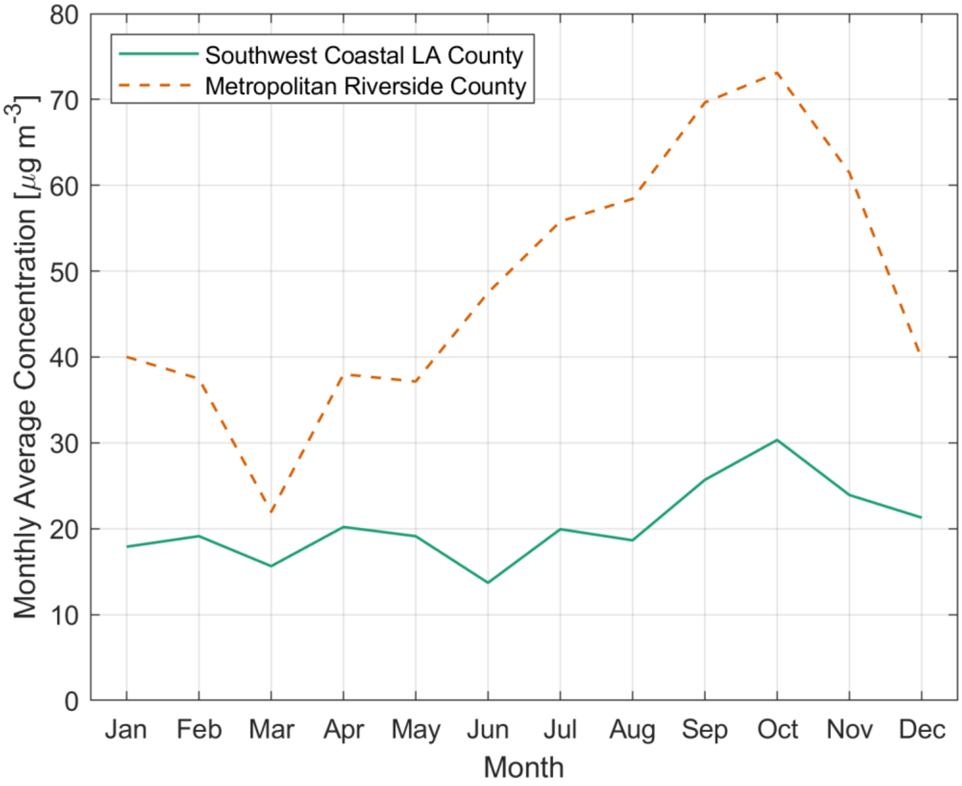


FIGURE 2-38

MONTHLY AVERAGE PM10 CONCENTRATION (µg/m^3), 2018–2020

Figure 2-39 shows averaged hourly PM10 concentrations for each hour of the day in 2020, including the entire Basin (average of measurements at FEM instruments) and averaged for select monitoring stations in each of the counties in the Basin. The morning concentration peak is likely the result of morning rush-hour traffic. As the day progresses and temperature increases, the temperature inversion base rises and vertical mixing increases, resulting in a decrease in PM10 concentrations. The morning peak is followed by the secondary PM10 peak around 3 p.m. PST likely associated with the evening rush hour traffic and higher afternoon wind speed and surface friction velocity which increase windblown dust emissions.

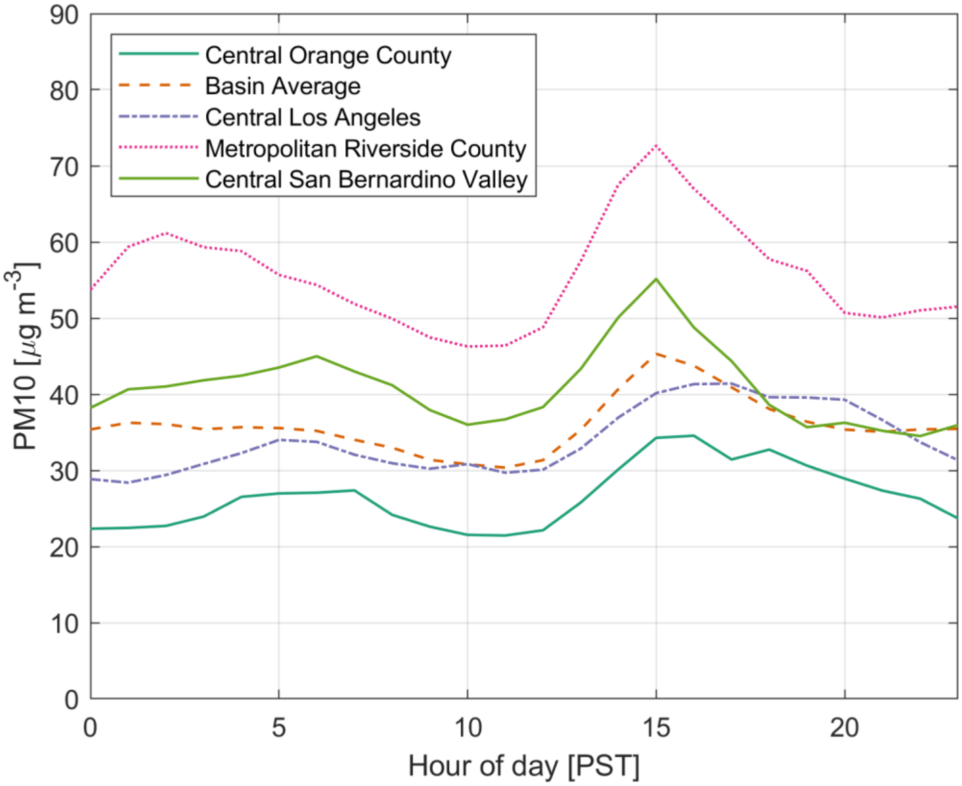


FIGURE 2-39

PM10 DIURNAL VARIATION, 2020

(ANNUAL AVERAGED FEM HOURLY PM10 CONCENTRATIONS, BY HOUR OF THE DAY; TIME IN PACIFIC STANDARD TIME)

Carbon Monoxide (CO)

CO Air Quality

In 2020, ambient CO concentrations were monitored at 23 locations throughout the South Coast AQMD jurisdiction, including one station in the Coachella Valley and two near-road monitors. Figure 2-40 shows the locations of routine ambient CO monitoring sites in the South Coast AQMD jurisdiction.

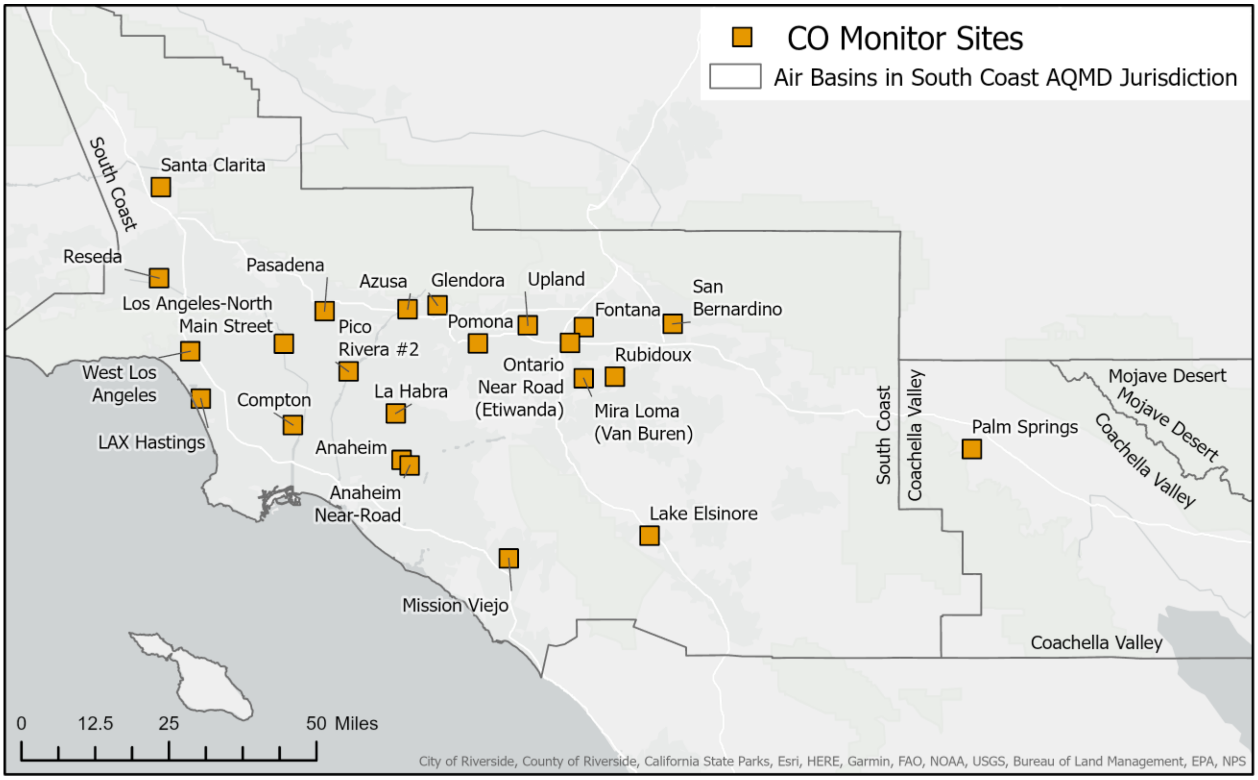


FIGURE 2-40

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT CARBON MONOXIDE AIR MONITORING LOCATIONS

Tables 2-12 and 2-13 summarize the 2020 1-hour and 8-hour average CO maximum concentrations and 2020 design values by air basin and county. In 2020, no areas exceeded the CO air quality standards, including the near-road stations. The highest ambient station concentrations of CO were recorded in the areas of Los Angeles County, where vehicular traffic is dense and weak nighttime drainage flows transport CO from surrounding areas under relatively stagnant conditions. The Basin's 1-hour and 8-hour CO maximum concentrations (4.5 ppm and 3.1 ppm, respectively) and design values (3.8 ppm and 2.9 ppm, respectively) were both recorded in the South Central Los Angeles County area. While maximum CO values or design values were not recorded at near-road monitors, near-road concentrations were often higher than the nearest ambient stations.

All areas of the Basin have continued to remain below the federal standard level since 2003. U.S. EPA redesignated the Basin to attainment of the federal CO standards, effective June 11, 2007. There have also been no exceedances of the Stage 1 episode (federal alert) level (8-hour average CO ≥ 15 ppm) since 1997. The CO concentrations have also remained well below the State standards.

TABLE 2-12

2020 MAXIMUM 1-HOUR CO CONCENTRATIONS AND 2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum CO 1-Hour Average (ppm)	2019-2020 CO 1-Hour Design Value* (ppm)	Percent of CO 1-Hour NAAQS (35 ppm)	Area of Design Value Max	Percent of CO 1-Hour State Standard (20 ppm)
South Coast Air Basin					
Los Angeles	**4.5**	**3.8**	**11**	South Central Los Angeles County	**19**
Orange	2.4 *(2.4 at I-5 N.R.)*	2.5 *(2.5 at I-5 N.R.)*	7 *(7)*	North Orange County	13 *(13)*
Riverside	1.9	1.8	5	Metropolitan Riverside County	9
San Bernardino	1.9 *(1.5 at I-10 N.R.)*	2.2 *(1.5 at I-10 N.R.)*	6 *(4)*	Central San Bernardino Valley	11 *(8)*
Coachella Valley					
Riverside	0.8	0.8	2	Coachella Valley	4

Bold text denotes South Coast AQMD maximum; I-5 and I-10 near-road monitors are shown in parentheses.

* The 1-hour CO design value is the highest 2nd highest daily maximum 1-hour average concentration at the most polluted station in a two-year period.

TABLE 2-13

2020 MAXIMUM 8-HOUR CO CONCENTRATIONS AND 2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum CO 8-Hour Average (ppm)	2020 CO 8-Hour Design Value* (ppm)	Percent of CO 8-Hour NAAQS (9 ppm)	Area of Design Value Max	Percent of CO 8-Hour State Standard (9.0 ppm)
South Coast Air Basin					
Los Angeles	**3.1**	**2.9**	**32**	South Central Los Angeles County	**32**
Orange	2.0 *(2.0 at I-5 N.R.)*	1.8 *(1.8 at I-5 N.R.)*	20 *(20)*	I-5 Near Road	20 *(20)*
Riverside	1.5	1.5	17	Metropolitan Riverside County	17
San Bernardino	1.4 *(1.2 at I-10 N.R.)*	1.4 *(1.1 at I-10 N.R.)*	16 *(12)*	Central San Bernardino Valley	16 *(12)*
Coachella Valley					
Riverside	0.5	0.5	6	Coachella Valley	6

Bold text denotes South Coast AQMD maximum; I-5 and I-10 near-road monitors are shown in parentheses.

* The 8-hour CO design value is the 2nd highest daily maximum 8-hour average concentration at the most polluted station in a two-year period.

Near-Road CO

On August 12, 2011, U.S. EPA issued a decision to retain the existing NAAQS for CO, determining that those standards provided the required level of public health protection. However, U.S. EPA added a monitoring requirement for near-road CO monitors in urban areas with population of 1 million or more, utilizing stations that would be implemented to meet the 2010 NO_2 near-road monitoring requirements. The two CO monitors are at the I-5 Near-Road site, located in Orange County near Anaheim, and the I-10 Near-Road site, located near Etiwanda Avenue in San Bernardino County near Ontario, Rancho Cucamonga and Fontana.

Near-road CO measurements began at these two locations in late December 2014. From that time to the end of 2020, the data shows that while the near-road measurements were often higher than the nearest ambient monitors, as would be expected in the near-road environment, they did not exceed the levels of the 1-hour or 8-hour CO NAAQS. Tables 2-14 and 2-15 compare the available near-road measurements for annual peak 1-hour and 8-hour CO, respectively, to the comparable measurements from the nearby ambient stations at Anaheim and Fontana. The form of the CO standard is that the peak concentration is not to be exceeded more than once per year. The tables include the design value, which is the second highest CO concentration in a single year at an individual station.

The 2020 near-road peak 1-hour CO concentration was 2.4 ppm, measured at the I-5 Near-Road site, while the peak 8-hour CO concentration was 2.0 ppm at the I-10 Near-Road site, both well below the respective NAAQS levels (35 ppm and 9 ppm, respectively). The 2020 I-5 near-road CO design values were higher than those of the nearest ambient station (Anaheim) for both federal standards. While the I-10 near-road design values were comparable to the nearest ambient station (Fontana), South Central Los Angeles (Compton) continues to be the station with the highest CO design values in the Basin.

TABLE 2-14

MAXIMUM AND SECOND HIGHEST 1-HOUR CO CONCENTRATIONS AT SOUTH COAST AIR BASIN NEAR-ROAD SITES AND NEARBY REGIONAL STATIONS, 2018-2020

Near-Road Station	Near-Road Sites CO						Ambient Station	Nearby Ambient CO					
	Peak 1-Hour CO (ppm)			2nd Maximum 1-Hour CO (ppm)				Peak 1-Hour CO (ppm)			2nd Maximum 1-Hour CO (ppm)		
	2018	2019	2020	2018	2019	2020		2018	2019	2020	2018	2019	2020
I-5 N. R.	**2.7**	**2.6**	**2.4**	**2.7**	**2.3**	**2.1**	Anaheim	2.3	2.4	2.3	2.2	2.4	2.1
I-10 N. R.	1.6	1.5	1.5	1.5	1.4	**1.5**	Fontana	**1.9**	**2.7**	**1.7**	**1.6**	**2.2**	**1.5**

Bold text denotes maximum concentration between near-road and nearby ambient stations.
I-5 N. R. is located on Interstate 5 at Vernon St. in Anaheim in Orange County.
I-10 N.R. is located on Interstate 10 at Etiwanda Av. in Ontario in San Bernardino County.

TABLE 2-15

MAXIMUM AND SECOND HIGHEST 8-HOUR CO CONCENTRATIONS AT SOUTH COAST AIR BASIN NEAR-ROAD SITES AND NEARBY REGIONAL STATIONS, 2018-2020

Near-Road Station	Near-Road Sites CO						Ambient Station	Nearby Ambient CO					
	Peak 8-Hour CO (ppm)			2nd Maximum 8-Hour CO (ppm)				Peak 8-Hour CO (ppm)			2nd Maximum 8-Hour CO (ppm)		
	2018	2019	2020	2018	2019	2020		2018	2019	2020	2018	2019	2020
I-5 N. R.	**2.2**	**1.6**	**2.0**	**2.0**	**1.5**	**1.8**	Anaheim	1.9	1.3	1.7	1.8	1.3	1.6
I-10 N. R.	**1.3**	**1.1**	**1.2**	**1.3**	**1.1**	**1.1**	Fontana	1.1	1.0	1.1	1.1	1.0	**1.1**

Bold text denotes maximum concentration between near-road and nearby ambient stations.
I-5 N. R. is located on Interstate 5 at Vernon St. in Anaheim in Orange County.
I-10 N.R. is located on Interstate 10 at Etiwanda Av. in Ontario in San Bernardino County.

Nitrogen Dioxide (NO_2)

NO_2 Air Quality

In 2020, ambient NO_2 concentrations were monitored at 27 locations throughout the South Coast AQMD jurisdiction, including one station in the Coachella Valley and four near-road monitoring stations. Figure 2-41 shows the locations of routine ambient NO_2 monitoring sites in the South Coast AQMD jurisdiction.

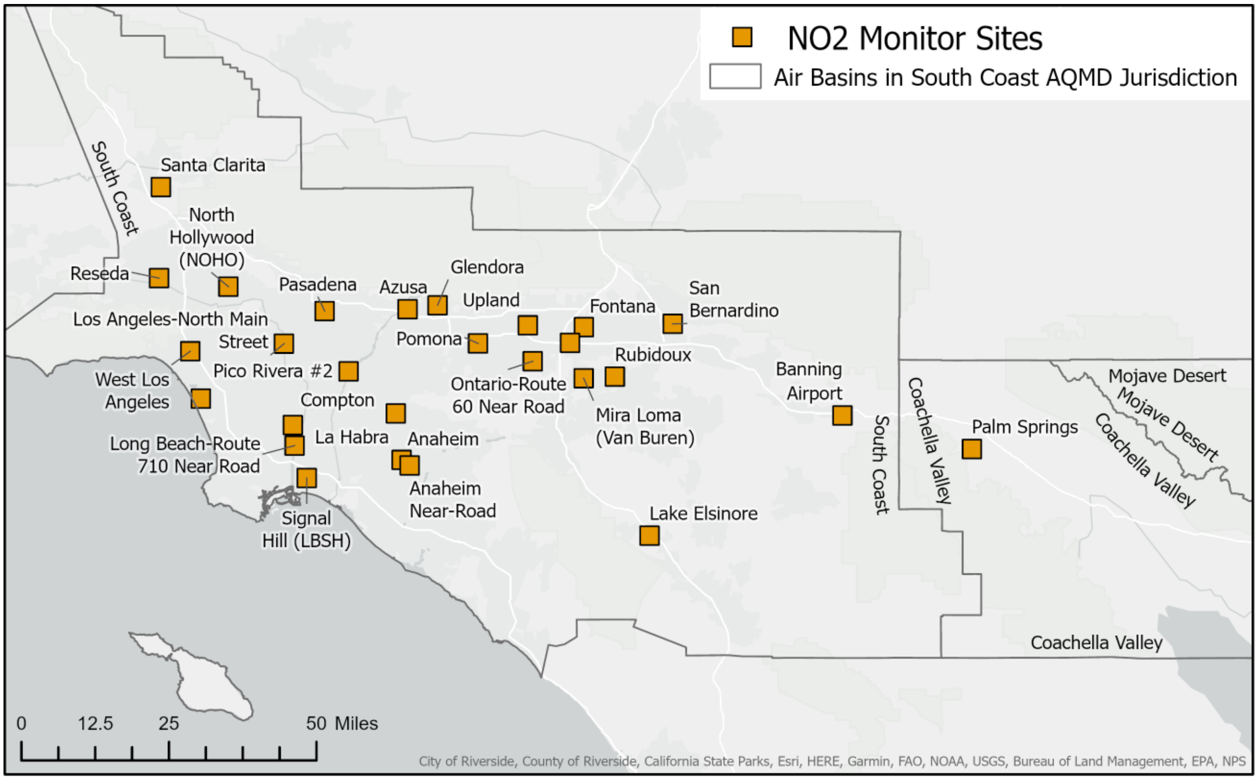


FIGURE 2-41

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT NITROGEN DIOXIDE AIR MONITORING LOCATIONS IN 2020

The current 1-hour average NO_2 NAAQS (100 ppb) was exceeded on one day in 2020 at the CA-60 near road site in San Bernardino County. However, the 98th percentile form of the standard was not exceeded and the 2018–2020 design value is not in violation of the NAAQS. Although the Basin is in attainment of State and federal standards, NO_2 is still of concern, since oxides of nitrogen (NOx) are precursors to both ozone and particulate matter. Further control of NO_x will be required to attain the ozone and particulate standards.

The Basin has not exceeded the federal annual standard for NO_2 (0.053 ppm or 53 ppb) since 1991, when the Los Angeles County portion of the Basin recorded the last violation of that standard in the U.S. to date. No State NO_2 standards were exceeded in 2020. Tables 2-16 and 2-17 summarize the 2020 ambient station maximum 1-hour and annual average concentrations of NO_2 by air basin and county, in comparison to federal and State standards. The near-road NO2 data is summarized further below.

TABLE 2-16

2020 MAXIMUM 1-HOUR NO_2 CONCENTRATIONS AND 2018–2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum NO_2 1-Hour Average (ppb)	2018–2020 NO_2 1-Hour Design Value (ppb)	Percent of NO_2 1-Hour NAAQS (100 ppb)	Area of Design Value Max	2018–2020 NO_2 1-Hour State Designation Value (ppm)	Percent of NO_2 1-Hour State Standard (0.18 ppm)
South Coast Air Basin						
Los Angeles	90.3	**81**	**81**	I-710 Near Road	**0.100**	**56**
Orange	70.9	53	53	I-5 Near Road	0.060	33
Riverside	66.4	52	52	Metropolitan Riverside County	0.060	33
San Bernardino	**101.6**	74	74	CA-60 Near Road	0.090	50
Coachella Valley						
Riverside	47.4	34	34	Coachella Valley	0.040	22

Bold text denotes the peak value.

The 1-hour NO_2 design value is the annual 98th percentile daily maximum 1-hour concentration, averaged over 3 years at a station.

* Although the maximum 1-hour concentrations exceeded the standard on one day, the 98th percentile form of the design value did not exceed the NAAQS.

TABLE 2-17

2020 MAXIMUM ANNUAL AVERAGE NO_2 CONCENTRATIONS AND 2018–2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum NO_2 Annual Average (ppm)	2018–2020 NO_2 Annual Design Value (ppm)	Percent of NO_2 Annual NAAQS (0.053 ppm)	Area of Design Value Max	2018–2020 NO_2 Annual State Designation Value# (ppm	Percent of NO_2 Annual State Standard (0.030 ppm)
South Coast Air Basin						
Los Angeles	0.0223	0.023	43	710 Near Road	0.023	77
Orange	0.0188	0.019	36	I-5 Near Road	0.020	67
Riverside	0.0136	0.015	28	Metropolitan Riverside County	0.014	47
San Bernardino	**0.0291**	**0.029**	**55**	CA-60 Near Road	**0.030**	**100**
Coachella Valley						
Riverside	0.0066	0.007	13	Coachella Valley	0.007	23

Bold text denotes the peak value.
The annual NO_2 design value is the annual average of the quarterly averages, averaged over 3 years at a station.

Near-Road NO_2

With the revised NO_2 NAAQS in 2010, near-road NO_2 measurements were required to be phased in for larger cities. The four near-road monitoring stations are: (1) I-5 Near-Road, located in Orange County near Anaheim; (2) I-710 Near-Road, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach; (3) CA-60 Near-Road, located west of Vineyard Avenue near the San Bernardino/Riverside County border near Ontario, Mira Loma and Upland; and (4) I-10 Near-Road, located near Etiwanda Avenue in San Bernardino County near Ontario, Rancho Cucamonga and Fontana. Even with the addition of the near-road sites, all of the standards remain in attainment. There have been exceedances of the peak 1-hour standard, at the I-710 near-road station in 2017, and the CA-60 near-road in 2020. However, the 98th percentile value has not exceeded the standard. Tables 2-18 and 2-19 show that while the near-road stations have recorded higher NO_2 concentrations than nearby stations, they do not violate federal standards.

TABLE 2-18

MAXIMUM AND 98TH PERCENTILE 1-HOUR NO_2 CONCENTRATIONS AT SOUTH COAST AIR BASIN NEAR-ROAD SITES AND NEARBY REGIONAL STATIONS, 2018-2020

Near-Road Station	Near-Road Sites NO2						Ambient Station	Nearby Ambient NO2					
	Annual Peak 1-Hour NO2 (ppb)			98th Percentile 1-Hour NO2 (ppb)				Annual Peak 1-Hour NO2 (ppb)			98th Percentile 1-Hour NO2 (ppb)		
	2018	2019	2020	2018	2019	2020		2018	2019	2020	2018	2019	2020
I-5 N. R.	61.7	**59.4**	69.9	**55.8**	**50.4**	**52.6**	Anaheim	**66.0**	**59.4**	**70.9**	54.5	49.2	52.1
I-710 N. R.	**90.3**	**97.7**	**90.3**	**79.1**	**78.3**	**79.1**	Compton	68.3	70.0	72.3	55.6	52.8	60.5
CA-60 N. R.	**79.4**	**87.7**	**101.6**	**71.3**	**73.9**	**78.0**	Upland	58.7	57.9	55.4	48.9	46.4	44.8
I-10 N. R.	**88.3**	**86.3**	**94.2**	**67.7**	**70.5**	**75.1**	Fontana	63.0	76.1	66.4	55.9	57.7	57.9

Bold text denotes maximum concentration between near-road and nearby ambient stations.

N/A = data not available (monitoring not started).

The 1-hour NO2 NAAQS is 100 ppb.

I-5 N. R. is located on Interstate 5 at Vernon St. in Anaheim in Orange County.

I-710 N. R. is located on Interstate 710 at Long Beach Bl. in Long Beach in Los Angeles County.

CA-60 N.R. is located on California Route 60 west of Vineyard Av. in Ontario in San Bernardino County.

I-10 N.R. is located on Interstate 10 at Etiwanda Av. in Ontario in San Bernardino County.

TABLE 2-19

2019 AND 2020 ANNUAL NO_2 CONCENTRATIONS AT SOUTH COAST AIR BASIN NEAR-ROAD SITES AND NEARBY REGIONAL STATIONS

Near-Road Station	Near-Road NO2 Annual Average NO2 (ppb)			Ambient Station	Nearby Ambient NO2 Annual Average NO2 (ppb)		
	2018	2019	2020		2018	2019	2020
I-5 N. R.	**20.8**	**19.2**	**18.8**	Anaheim	13.7	12.7	13.3
I-710 N. R.	**22.3**	**22.8**	**22.3**	Compton	15.0	14.1	14.5
CA-60 N. R.	**30.4**	**29.0**	**29.1**	Upland	14.7	14.0	13.9
I-10 N. R.	**27.2**	**27.6**	**28.7**	Fontana	18.3	14.3	14.9

Bold text denotes maximum concentration between near-road and nearby ambient stations.
N/A = data not available (monitoring not started).
The annual average NO2 NAAQS is 0.053 ppm, or 53 ppb.
I-5 N. R. is located on Interstate 5 at Vernon St. in Anaheim in Orange County.
I-710 N. R. is located on Interstate 710 at Long Beach Bl. in Long Beach in Los Angeles County.
CA-60 N.R. is located on California Route 60 west of Vineyard Av. in Ontario in San Bernardino County.
I-10 N.R. is located on Interstate 10 at Etiwanda Av. in Ontario in San Bernardino County.

Sulfur Dioxide (SO_2)

SO_2 Air Quality

In 2015, ambient sulfur dioxide was measured at four Basin locations. Figure 2-42 shows the locations of routine ambient SO_2 monitoring sites in the South Coast AQMD jurisdiction.

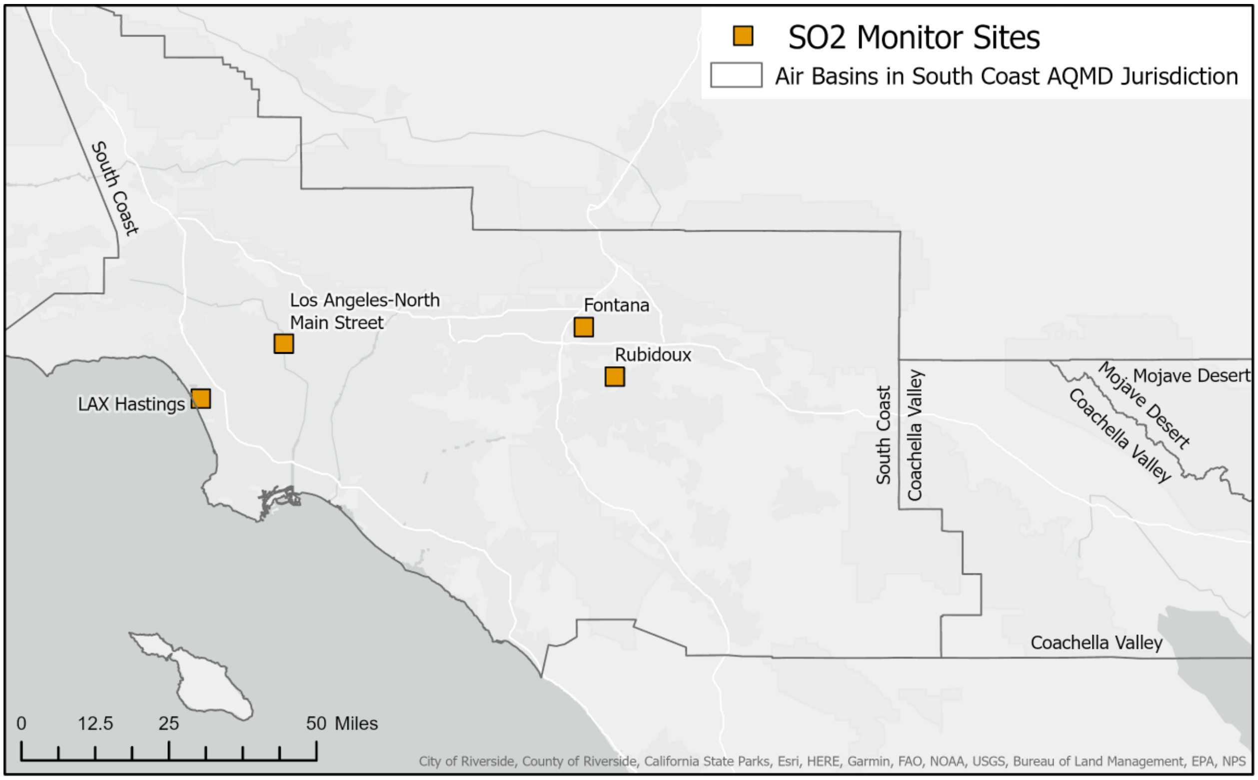


FIGURE 2-42

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT SULFUR DIOXIDE AIR MONITORING LOCATIONS IN 2020

Based on the review of the SO_2 standards, U.S. EPA established the 1-hour SO_2 standard to protect the public health against short-term exposure. The level of the 1-hour average standard was set at 75 ppb, effective August 2, 2010, revoking the former annual (0.03 ppm) and 24-hour (0.14 ppm) federal standards. No exceedances of federal or State standards for sulfur dioxide occurred in 2020, or in any recent year, at any of the four South Coast AQMD ambient monitoring locations. The annual and 24-hour federal standards were last exceeded in the 1960s and State standards were last exceeded in 1990. Though sulfur dioxide concentrations remain well below the standards, sulfur dioxide is a precursor to sulfate, which is a component of fine particulate matter. Table 2-20 summarizes the 2020 maximum 1-hour concentrations of SO_2 by air basin and county. Sulfur dioxide was not measured at any of the Orange County or Coachella Valley sites in 2020. Historical measurements and source emission profiles show that expected concentrations in the Orange County or Coachella Valley would be well below State and federal standards.

TABLE 2-20

2020 MAXIMUM 1-HOUR SO_2 CONCENTRATIONS AND 2018–2020 DESIGN VALUES BY BASIN AND COUNTY

Basin/County	2020 Maximum SO_2 1-Hour Average (ppb)	2018–2020 SO_2 1-Hour Design Value (ppb)	Percent of SO_2 1-Hour NAAQS (75 ppb)	Area of Design Value Max	Percent of SO_2 1-Hour State Standard (0.25 ppm = 250 ppb)
South Coast Air Basin					
Los Angeles	**6.0**	**4**	**5**	Southwest Coastal Los Angeles County	**2**
Orange	N.D.	N.D.	N.D.	North Coastal Orange County	N.D.
Riverside	2.2	2	3	Metropolitan Riverside County	1
San Bernardino	2.5	2	3	Central San Bernardino Valley	1
Coachella Valley					
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.

Bold text denotes the peak value.

N.D. = No Data. Historical measurements and lack of emissions sources indicate concentrations are well below standards.

The 1-hour SO_2 design value is the annual 99th percentile 1-hour daily maximum concentration, averaged over 3 years at a station.

Sulfates (SO_4^{2-})

Sulfates, as measured from FRM PM10 filters, were sampled at seven stations in 2020 in the South Coast AQMD jurisdiction, including one location in the Coachella Valley. Since the sulfates are analyzed in the laboratory from the collected 24-hour PM10 filters, sulfate measurements are only conducted at locations in the FRM PM10 monitoring network. Measurements are conducted in Central Los Angeles, South Coastal Los Angeles County, East San Gabriel Valley, Central Orange County, Metropolitan Riverside County, the Coachella Valley, and Central San Bernardino Valley. Samples are collected every third day at stations in Metropolitan Riverside County and the Coachella Valley and every sixth day at all other stations.

In 2020, the State standard of 24-hour PM10 sulfates (25 $\mu g/m^3$) was not exceeded anywhere in the Basin or the Coachella Valley, nor has it been exceeded since 1990. The peak Basin sulfate concentration of 5.2 $\mu g/m^3$ (21 percent of the State standard) was measured in Metropolitan Riverside County. There is no corresponding federal standard for sulfates. Maximum 24-hour concentrations and 3-year maximum State designation values by air basin and county are summarized in Table 2-21.

TABLE 2-21

2020 MAXIMUM 24-HOUR AVERAGE CONCENTRATIONS OF SULFATES BY BASIN AND COUNTY

Basin/County	2020 Maximum SO_4^{2-} 24-Hour Average (µg/m^3)	2018–2020 SO_4^{2-} 24-Hour State Designation Value (µg/m^3)	2020 Percent of SO_4^{2-} State Standard (25 µg/m^3)	Area of Max
South Coast Air Basin				
Los Angeles	**3.3**	**6.9**	**28**	**Metropolitan Los Angeles County**
Orange	3.3	4.2	17	Central Orange County
Riverside	5.2	4.2	17	Metropolitan Riverside County
San Bernardino	3.0	4.6	18	Central San Bernardino Valley
Coachella Valley				
Riverside	2.7	2.6	10	Coachella Valley (Indio)

Bold text denotes the peak value.

Lead (Pb)

Current Lead Air Quality

Lead (Pb), as analyzed from Total Suspended Particulate (TSP) samples, was measured at seven ambient locations and an additional four source-specific stations in the Basin in 2020. Figure 2-43 shows the locations of ambient and source-specific lead monitoring sites in the South Coast AQMD jurisdiction.

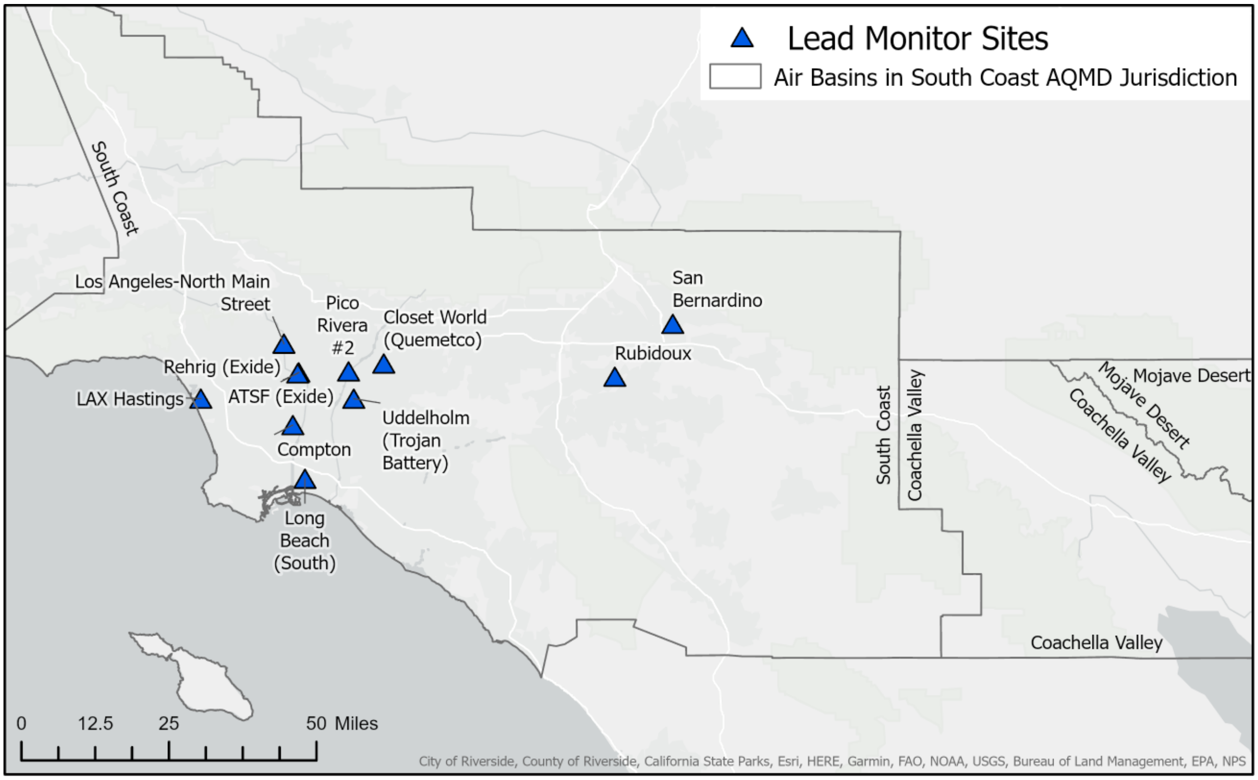


FIGURE 2-43

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT REGIONAL AND SOURCE-SPECIFIC LEAD (Pb) AIR MONITORING LOCATIONS IN 2020

Based on the review of the NAAQS for lead, U.S. EPA established the current standard of 0.15 µg/m^3 for a rolling 3-month average, effective October 15, 2008. There have been no violations of the lead standards at South Coast AQMD's population-based ambient air monitoring stations since 1982, primarily as a result of removal of lead from gasoline. However, monitoring at two stations immediately adjacent to stationary sources of lead recorded exceedances of the current standard in Los Angeles County over the 2007–2009 time period. These data were used for designations under the revised standard that also included new requirements for near-source monitoring. As a result, a nonattainment designation was finalized for much of the Los Angeles County portion of the Basin when the current standard was implemented.

Table 2-22 summarizes the Basin's maximum 3-month rolling average lead concentrations recorded in 2020 and in the 2018–2020 design value period, by county. The current lead concentrations in Los Angeles County are now well below the NAAQS, including at source-oriented locations where the maximum 3-month rolling average recorded from 2018-2020 was 40 percent of the NAAQS level. More recent lead concentrations measured at source-specific locations have been even lower due in part to implementation of stricter South Coast AQMD rules for these sources. The peak 3-month average in 2020 (0.02 µg/m^3) was only 13 percent of the NAAQS. Lead concentrations measured in the other three counties in the Basin have also remained well below the NAAQS. The less stringent State 30-day standards for lead were not exceeded in any area of the South Coast AQMD jurisdiction in 2020, or in recent years.

The 2018-2020 design values are all less than the NAAQS. However, filter-based measurements for lead from March 28, 2020 to June 26, 2020 were not collected due to the COVID-19 pandemic. Thus, the values for 2020 are considered invalid since they fail data completeness requirements. It will not be possible to request redesignation as attainment until there are three consecutive complete years of data, which would be after 2023. South Coast AQMD plans to petition the EPA for redesignation as attainment for lead after data completeness requirements are met.

TABLE 2-22

2020 MAXIMUM 3-MONTH ROLLING AVERAGE LEAD (Pb) CONCENTRATIONS AND 2018–2020 DESIGN VALUES BY BASIN AND COUNTY [*]

Basin/County	2020 Max Pb 3-Month Rolling Average (μg/m^3)	2018–2020 Max Pb 3-Month Rolling Average Design Value (μg/m^3)	Percent of Current Pb NAAQS (0.15 μg/m^3)	Area of Design Value Max	2020 Max Pb 30-Day Average (μg/m^3)	Percent of State Pb Standard (1.5 μg/m^3)
South Coast Air Basin						
Los Angeles[**]	**0.02**	**0.06**	**40**	**Metropolitan Los Angeles**	**0.025**	**4**
Orange	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Riverside	0.01	0.010	7	Metropolitan Riverside County	0.016	1
San Bernardino	0.01	0.01	7	Central San Bernardino Valley	0.010	1
Coachella Valley						
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.	N.D.

Bold text denotes the peak value.

N.D. = No Data. Historical measurements and emissions profiles indicate concentrations would be well below standards.

[*] Filter-based measurements for lead from March 28, 2020 to June 26, 2020 have limited availability due to the COVID-19 pandemic. As a result, none of the values presented here meet EPA completeness criteria except for the near-source ATSF station.

[**] The maximum 3-month average design value was measured at a near-source station in Los Angeles County (Uddelholm).

CHAPTER 3

AIR QUALITY IN THE COACHELLA VALLEY

Overview of Coachella Valley Air Quality

Current Air Quality Summary

Attainment/Nonattainment Designations

Pollutant-Specific Air Quality Discussion

Ozone (O_3)

Fine Particulate Matter (PM2.5)

Particulate Matter (PM10)

Carbon Monoxide (CO)

Nitrogen Dioxide (NO_2)

Sulfur Dioxide (SO_2)

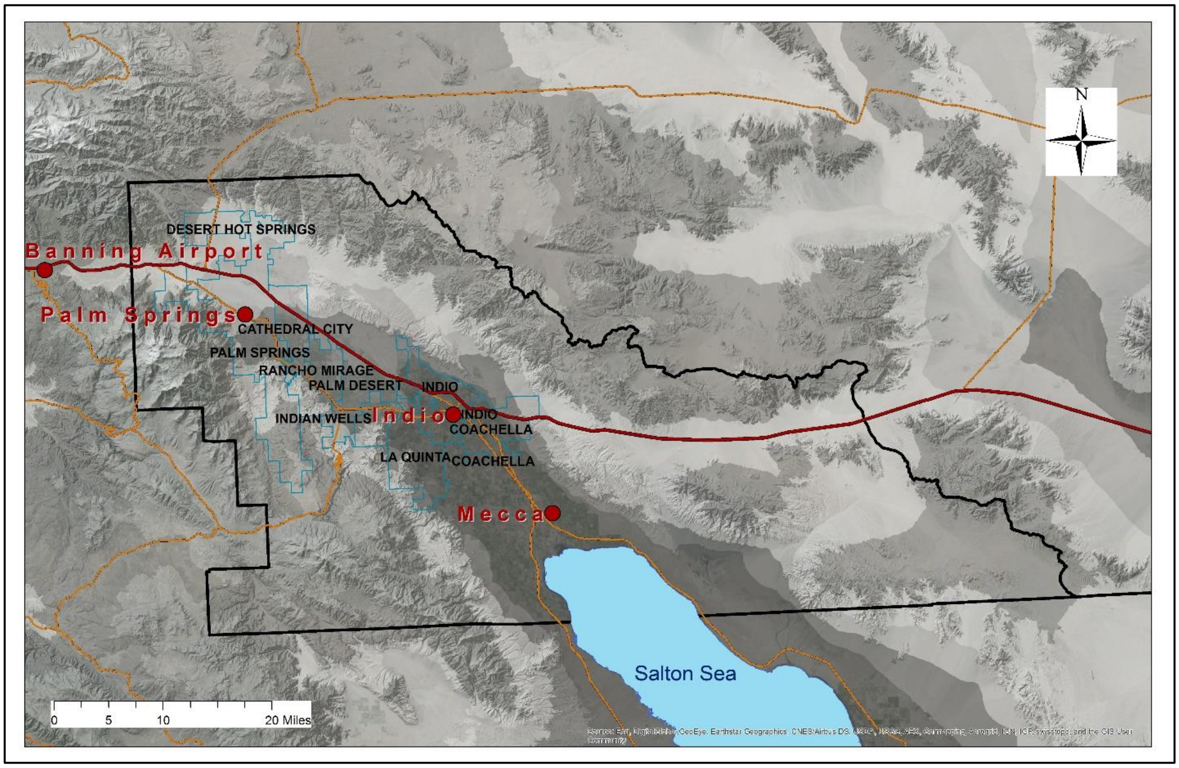
Sulfate (SO_4^{2-})

Lead (Pb)

Hydrogen Sulfide (H_2S)

Overview of Coachella Valley Air Quality

In 2020, South Coast AQMD monitored air quality at three routine locations in the Riverside County portion of the Salton Sea Desert Air Basin (SSAB), all within the Coachella Valley. Figure 3-1 shows a map of the area and topography. A long-term monitoring station (Palm Springs) is located immediately downwind of the densely populated South Coast Air Basin (Basin). A second long-term station (Indio) is located further downwind in the Coachella Valley. A relatively new monitoring station has also been operational in the community of Mecca at the Saul Martinez Elementary School to measure PM10, with a continuous TEOM instrument and filter-based measurements, and hydrogen sulfide (H_2S), a gas emitted naturally from the Salton Sea that causes strong odors at times. The Mecca station is in the southeastern Coachella Valley, a few miles from the northern shore of the Salton Sea. Additional continuous H_2S monitoring is also conducted at the northern shore of the Salton Sea in a sparsely populated area.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FIGURE 3-1

LOCATION AND TOPOGRAPHY OF THE COACHELLA VALLEY PLANNING AREA

(The San Gorgonio Pass (aka Banning Pass) is the west-east pass between the mountains near the Banning Airport air monitoring station that leads from the South Coast Air Basin into the Coachella Valley; South Coast AQMD air monitoring stations at Palm Springs, Indio, and Mecca are shown within the Coachella Valley boundaries)

Current Air Quality Summary

Federal and State standards for PM2.5, carbon monoxide (CO), and nitrogen dioxide (NO_2) were not exceeded in the Coachella Valley in 2020, nor was the State standard for sulfates. However, the Coachella Valley exceeded State and federal standards for both ozone and PM10, although most of the NAAQS PM10 exceedances were due to high-wind exceptional events.

In 2020, the 2015 8-hour ozone federal standard (0.070 ppm) was exceeded in the Coachella Valley on 49 days (13 percent of the year), while the revised 2008 (0.075 ppm) and revoked 1997 (0.08 ppm) 8-hour standards were exceeded on 28 and 5 days, respectively. The maximum 8-hour ozone concentration was 0.094 ppm (134, 125 and 112 percent of the 2015, 2008 and 1997 ozone standards, respectively). The former 1979 1-hour federal ozone standard level (0.12 ppm) was not exceeded in the Coachella Valley in 2020, with a maximum 1-hour concentration of 0.12 ppm. Ozone concentrations in the Coachella Valley, and the number of days exceeding the federal 8-hour ozone standards, are greatest in the late spring and summer months, with no exceedances during the winter. The Palm Springs station consistently has more days above the federal and State ozone standards each year than the Indio station.

PM10 concentrations in the Coachella Valley exceeded the 24-hour PM10 NAAQS on 18 days from 2018-2020, with concentrations as high as 680 µg/m^3 at the Mecca (Saul Martinez) monitoring station. Almost all of these exceedances were caused by windblown dust and sand associated with high-wind exceptional events. The number of exceedances recorded at individual stations ranged from two exceedances at Palm Springs to 17 exceedances at Mecca (Saul Martinez). The Coachella Valley 2018–2020 concentration-based design value for 24-hour PM10 is 204 µg/m^3 at Mecca (Saul Martinez) after the exclusion of exceptional events with wind speeds exceeding 25 mph. The exceedance-based design value that is used to determine attainment is 2.0 average estimated exceedances, which is above the PM10 NAAQS (1.0 average estimated exceedance) even after the exclusion of suspected exceptional events. Other exceedances at Mecca (Saul Martinez) were also likely caused by windblown dust and sand, but wind speeds in upwind regions do not meet the U.S. EPA criteria for a high-wind exceptional event[40], and thus these exceedances may not be exceptional events.

The number of days exceeding federal air quality standards at Coachella Valley air monitoring stations in 2020 are shown in Figure 3-2, separated by air quality index category. Figure 3-3 shows the Coachella Valley 3-year (2018-2020) design values, as percentages of the current and revoked federal standards.

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[40] 25 mph is the wind threshold established by the U.S. EPA for which winds are strong enough to entrain undisturbed natural soils

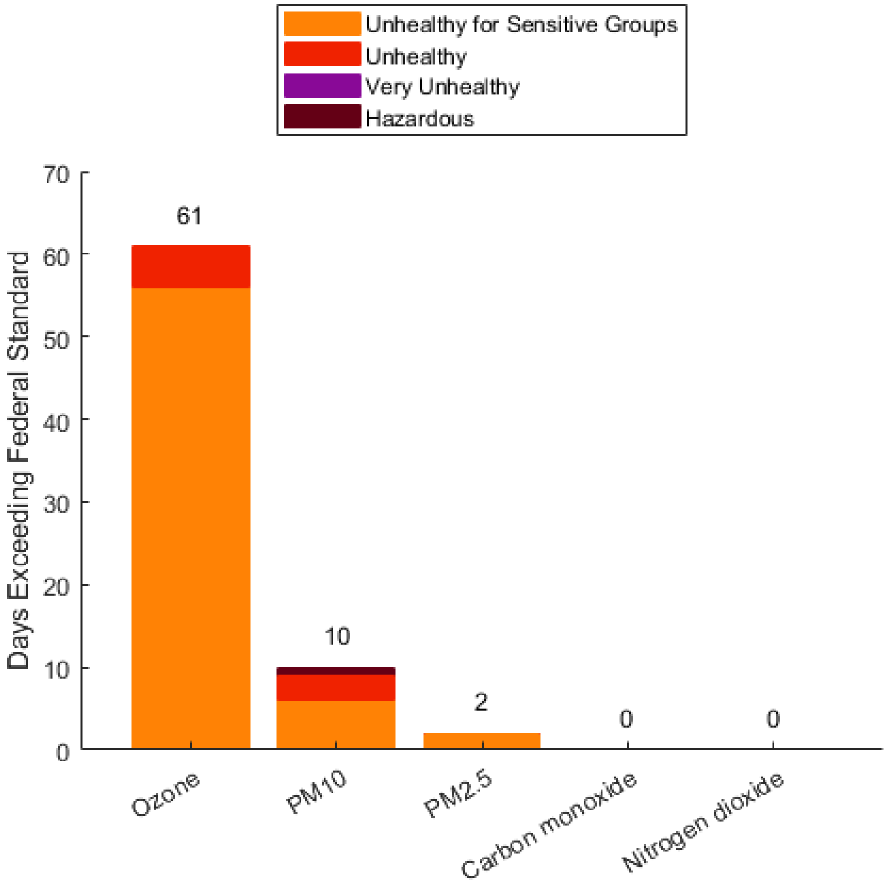

FIGURE 3-2

2020 EXCEEDANCES IN COACHELLA VALLEY BY AIR QUALITY INDEX (AQI) CATEGORY

(DAYS EXCEEDING FEDERAL STANDARD BY MAXIMUM AQI RECORDED IN THE COACHELLA VALLEY. NOTE THAT SULFUR DIOXIDE IS NOT MONITORED AT ANY STATION IN THE COACHELLA VALLEY.)

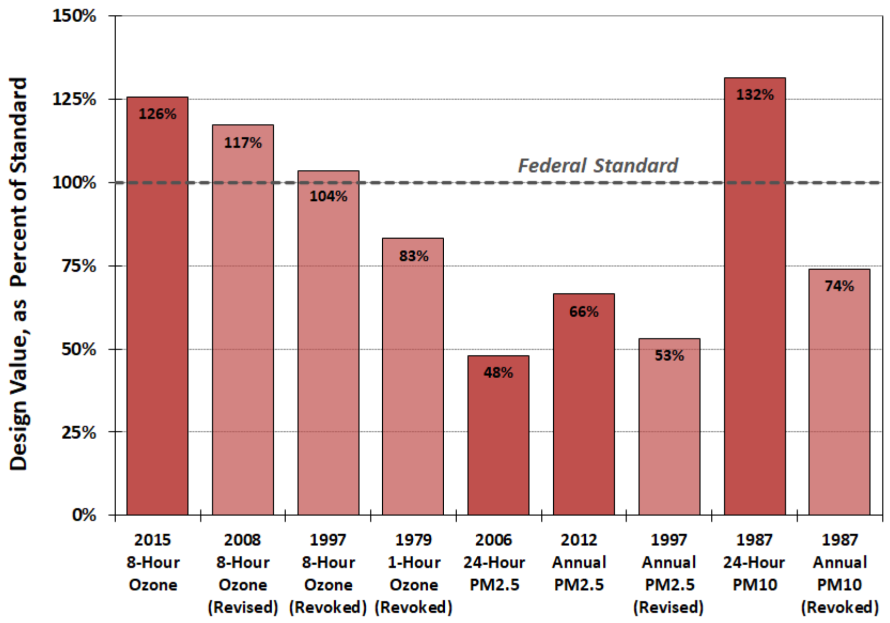

FIGURE 3-3

COACHELLA VALLEY 3-YEAR (2018–2020) DESIGN VALUES AS PERCENT OF FEDERAL STANDARD

(PM10 FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED BUT SUPPORTING DOCUMENTATION AND U.S. EPA CONCURRENCE IS STILL NEEDED; NOTE THAT 100 PERCENT OF THE FEDERAL STANDARD IS NOT EXCEEDING THAT STANDARD; DARKER SHADING INDICATES CURRENT, MOST-STRINGENT NAAQS)

Attainment/Nonattainment Designations

The current NAAQS and CAAQS, with attainment designations for the Coachella Valley, are presented in Tables 3-1 and 3-2, respectively.

TABLE 3-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) ATTAINMENT STATUS
IN THE COACHELLA VALLEY

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone **(O_3)**	(1979) **1-Hour** (0.12 ppm)[c]	Attainment	11/15/2007 (attained 12/31/2013)
	(2015) **8-Hour** (0.070 ppm)	Nonattainment (Severe-15)	8/3/2033
	(2008) **8-Hour** (0.075 ppm)	Nonattainment (Severe-15)	7/20/2027
	(1997) **8-Hour** (0.08 ppm)	Nonattainment (Severe-15)	6/15/2024
PM2.5[d]	(2006) **24-Hour** (35 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
	(2012) **Annual** (12.0 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
	(1997) **Annual** (15.0 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
PM10[e]	(1987) **24-hour** (150 µg/m^3)	Nonattainment (Serious)	12/31/2006
Lead (Pb)	(2008) **3-Months Rolling** (0.15 µg/m^3)	Unclassifiable/Attainment	Unclassifiable/ Attainment
CO	(1971) **1-Hour** (35 ppm)	Unclassifiable/Attainment	N/A (attained)
	(1971) **8-Hour** (9 ppm)	Unclassifiable/Attainment	N/A (attained)
NO_2[f]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Unclassifiable/Attainment	N/A (attained)
SO_2[g]	(2010) **1-Hour** (75 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **24-Hour** (0.14 ppm) (1971) **Annual** (0.03 ppm)	Unclassifiable/Attainment	Unclassifiable/ Attainment

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable.

b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration.

c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/2005. The Southeast Desert Modified Air Quality Management Area, including the Coachella Valley, had not timely attained this standard by the 11/15/2007 "severe-17" deadline, based on 2005-2007 data. On 8/25/2014, U.S. EPA proposed a clean data finding based on 2011-2013 data and a determination of attainment for the former 1-hour ozone NAAQS for the Southeast Desert nonattainment area; this rule was finalized by U.S. EPA on 4/15/2015, effective 5/15/2015, and included preliminary 2014 data.

d) The annual PM2.5 standard was revised on 1/15/2013, effective 3/18/2013, from 15 to 12 µg/m^3.

e) The annual PM10 standard was revoked, effective 12/18/2006; the 24-hour PM10 NAAQS attainment deadline was 12/31/2006. The Coachella Valley Attainment Redesignation Request and PM10 Maintenance Plan was postponed by U.S. EPA pending additional monitoring and analysis in the southeastern Coachella Valley.

f) New 1-hour NO_2 NAAQS became effective 8/2/2010, and attainment designation was effective 1/20/2012.

g) The 1971 Annual and 24-hour SO_2 NAAQS were revoked, effective 8/23/2010.

TABLE 3-2

CALIFORNIA AMBIENT AIR QUALITY STANDARDS (CAAQS) ATTAINMENT STATUS *IN THE COACHELLA VALLEY*

Pollutant	Averaging Time and Level[b]	Designation[a]
		Coachella Valley
Ozone **(O_3)**	**1-Hour** (0.09 ppm)[c]	Nonattainment
	8-Hour (0.070 ppm)[d]	Nonattainment
PM2.5	**Annual** (12.0 µg/m^3)	Attainment
PM10	**24-Hour** (50 µg/m^3)	Nonattainment
	Annual (20 µg/m^3)	Nonattainment
Lead (Pb)	**30-Day Average** (1.5 µg/m^3)	Attainment
CO	**1-Hour** (20 ppm)	Attainment
	8-Hour (9.0 ppm)	Attainment
NO_2	**1-Hour** (0.18 ppm)	Attainment
	Annual (0.030 ppm)	Attainment
SO_2	**1-Hour** (0.25 ppm)	Attainment
	24-Hour (0.04 ppm)	Attainment
Sulfates	**24-Hour** (25 µg/m^3)	Attainment
H_2S[c]	**1-Hour** (0.03 ppm)	Unclassified[c]

a) CA State designations shown were updated by CARB in July 2019, based on the 2016-2018 3-year period; stated designations are based on a 3-year data period after consideration of outliers and exceptional events. [Source: http://www.arb.ca.gov/desig/statedesig.htm#current]

b) CA State standards, or CAAQS, for ozone, CO, SO_2, NO_2, PM10 and PM2.5 are values not to be exceeded; lead, sulfates, and H_2S standards are values not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

c) South Coast AQMD began monitoring H_2S in the southeastern Coachella Valley in November 2013 due to odor events related to the Salton Sea; this area has not yet been classified, but nonattainment is anticipated for the H_2S CAAQS in at least part of the Coachella Valley.

Pollutant-Specific Air Quality Summary

Ozone (O_3)

Ozone in the Coachella Valley is both directly transported from the Basin and formed photochemically from precursors emitted upwind. Ozone precursors are emitted in greatest quantities in the coastal and central Los Angeles County areas of the Basin. Prevailing sea breezes in the Basin causes polluted air to be transported inland. As the air is being transported inland, ozone is formed, with peak concentrations occurring in the inland valleys of the Basin, extending from eastern San Fernando Valley through the San Gabriel Valley into the Riverside-San Bernardino area and the adjacent mountains. As the air is transported still further inland into the Coachella Valley, through the San Gorgonio Pass, ozone concentrations typically decrease due to dilution, although ozone standards can still be exceeded.

Ozone is measured continuously at two locations in the Coachella Valley at the Palm Springs and Indio air monitoring stations. In 2020, the 2015 8-hour ozone federal standard (0.070 ppm) was exceeded in the Coachella Valley on 61 days (17 percent of the year), while the previous 2008 (0.075 ppm) and 1997 (0.08 ppm) 8-hour standards were exceeded on 37 and 5 days, respectively. The maximum 8-hour ozone concentration was 0.094 ppm (134, 125 and 112 percent of the level of the 2015, 2008 and 1997 ozone standards, respectively). The former 1979 1-hour federal ozone standard level (0.12 ppm) was not exceeded in the Coachella Valley in 2020 with a maximum 1-hour concentration of 0.119 ppm. Ozone concentrations in the Coachella Valley, and the number of days exceeding the federal ozone standards, are greatest in the late spring and summer months, with no exceedances during the winter.

The 8-hour ozone design value for the Coachella Valley for the 3-year period of 2018–2020 was 0.088 ppm (126, 117, and 104 percent of the 2015, 2008, and 1997 ozone 8-hour NAAQS, respectively). The 1-hour ozone design value was 0.106 ppm, which is 85 percent of the former 1979 1-hour ozone NAAQS. While the Coachella Valley remains in attainment of the former 1-hour federal standard, the 8-hour NAAQS are still violated. The Palm Springs station had higher ozone design values and significantly more days with ozone concentrations above standards than the Indio station.

The 1-hour and 8-hour State ozone standards were exceeded on 9 days and 53 days, respectively, in the Coachella Valley in 2020. The 1-hour ozone health advisory level (≥ 0.15 ppm) has not been exceeded in the Coachella Valley area since 1998. No 1-hour Stage 1 episode levels (≥ 0.20 ppm) have been recorded in the Coachella Valley area since 1988.

Figure 3-4 shows the trend of the annual number of days exceeding federal and State ozone standards at Coachella Valley monitoring sites from 1990–2020. Figure 3-5 shows the 3-year ozone design value trends from 1990 through 2020 (labeled as the end year of each 3-year design value period). While ozone concentrations have decreased significantly in the Coachella Valley over the past two decades, additional measures are needed to achieve the 8-hour ozone standards.

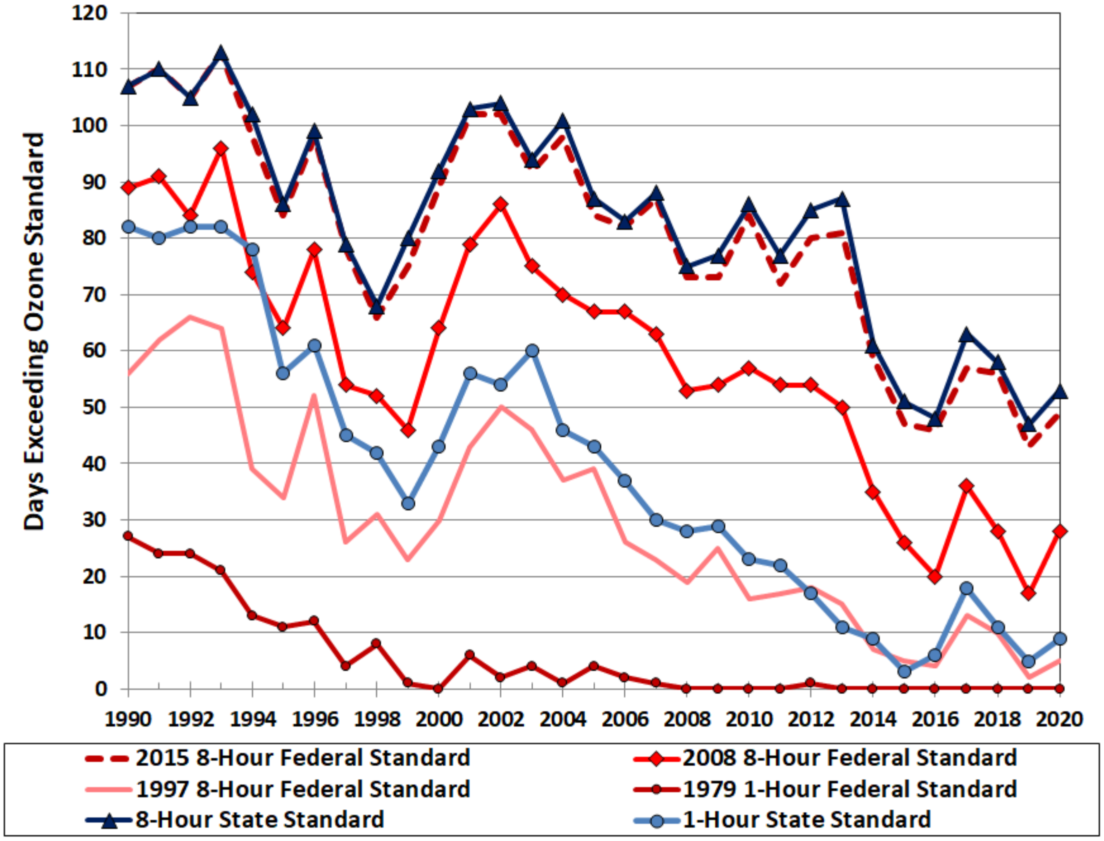

FIGURE 3-4

NUMBER OF DAYS EXCEEDING FEDERAL AND STATE OZONE STANDARDS IN THE COACHELLA VALLEY, 1990–2020

(THE 2015 8-HOUR FEDERAL STANDARD IS THE CURRENT OZONE NAAQS, BUT COMMITMENTS REMAIN TOWARD TIMELY ATTAINMENT OF THE FORMER FEDERAL STANDARDS; THE COACHELLA VALLEY HAS ATTAINED THE FORMER 1979 FEDERAL 1-HOUR OZONE STANDARD.)

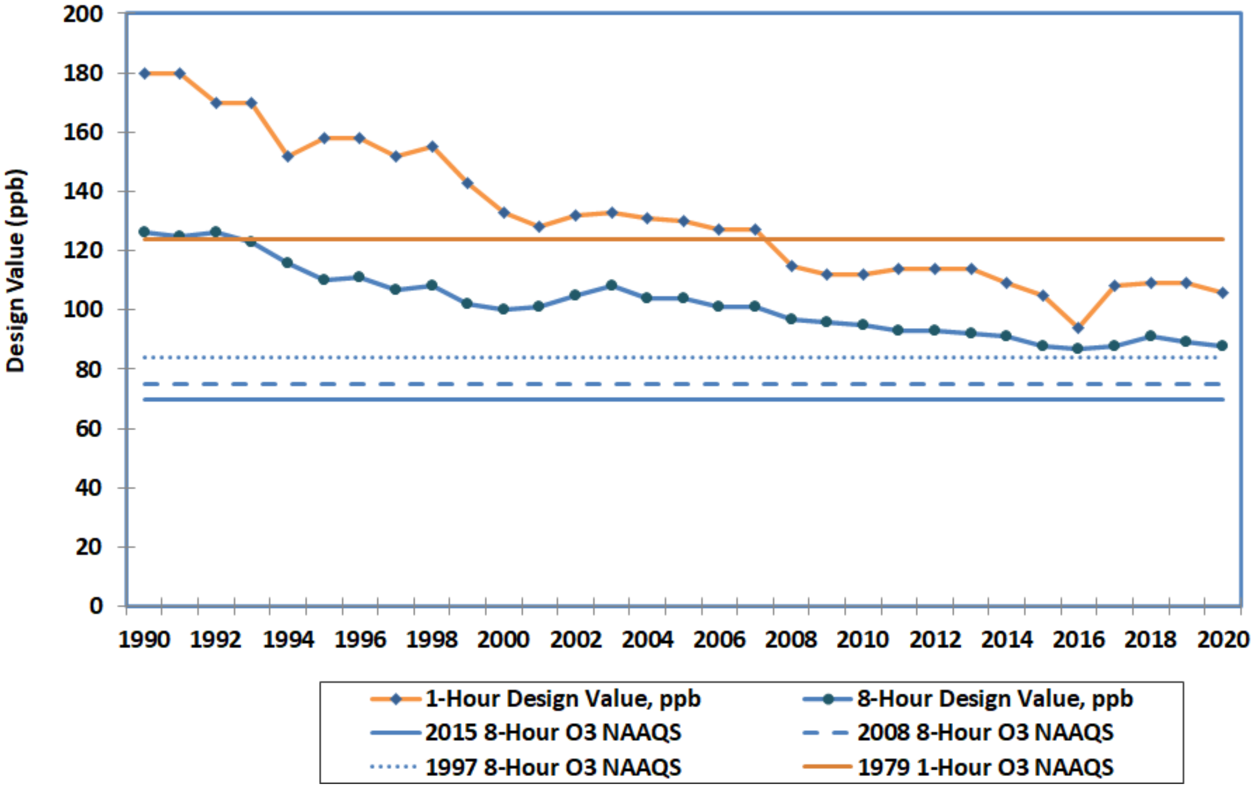

FIGURE 3-5

COACHELLA VALLEY FEDERAL 8-HOUR AND 1-HOUR OZONE 3-YEAR DESIGN VALUE TRENDS, 1990–2020

(DASHED LINES INDICATE THE CURRENT 2015, REVISED 2008, AND REVOKED 1997 8-HOUR NAAQS AND THE REVOKED 1979 1-HOUR OZONE NAAQS (ATTAINED); YEAR PLOTTED IS THE END YEAR OF THE 3-YEAR DESIGN VALUE PERIOD)

Ozone and Ozone Precursor Transport

Atmospheric ozone in the Coachella Valley is both directly transported from the Basin and formed photochemically from precursors emitted upwind and within the Coachella Valley. Pollutant transport from the South Coast Air Basin to the Salton Sea Air Basin occurs through the San Gorgonio Pass (sometimes referred to as the Banning Pass) to the Coachella Valley.[41] The transport pathway to the Coachella Valley has been well documented and studied in the past. An experiment in the early 1970s concluded that the South Coast Air Basin was the source of the observed high ozone levels in the Coachella Valley.[42] Transport from Anaheim to

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[41] Keith, R.W. (1980). A Climatological Air Quality Profile: California’s South Coast Air Basin. Staff Report, South Coast Air Quality Management District.

[42] Kauper, E.K. (1971). Coachella Valley Air Quality Study. Final Report, Pollution Res. & Control Corp., Riverside County Contract & U.S. Public Health Service Grant No. 69-A-0610 RI.

Palm Springs was directly identified with an inert sulfur hexafluoride tracer release.[43] A comprehensive study of transport from the South Coast Air Basin to the Salton Sea Air Basin also confirmed the ozone transport pathway to the Coachella Valley.[44]

Ozone pollutant transport to the Coachella Valley can be demonstrated by examining averaged ozone concentrations by time of day for various stations along the transport corridor from Los Angeles County into Riverside County and into the Coachella Valley. Figure 3-6 shows the diurnal distribution of averaged 1-hour ozone concentrations for the May-October smog season, by hour, for the 2018–2020 period. The four sites shown represent a Coachella Valley transport route starting at Central Los Angeles as the main emissions source region and passing through Riverside-Rubidoux and Banning and finally through the San Gorgonio Pass to Palm Springs in the Coachella Valley. Near the source regions, ozone typically peaks just after mid-day during the peak of incoming solar radiation and therefore the peak of ozone production. Peak ozone concentrations near the emissions source region are not as high as those further downwind, due to the photochemical reaction time needed for ozone to form from precursor gases. Downwind of the source region, ozone peaks occur later in the day and at generally higher concentrations as ozone and ozone precursors are transported downwind and photochemical reactions continue. At Palm Springs, ozone concentration peaks occur in the late afternoon or early evening. If this peak were predominately generated from local emissions, it would be occurring closer to near mid-day, as observed in the major source areas of the South Coast Air Basin, and not in the late afternoon or early evening, as observed at Palm Springs.

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[43] Drivas, P.J., and F.H. Shair. (1974). A Tracer Study of Pollutant Transport in the Los Angeles Area. *Atmos. Environ*. 8, 1155-1163.

[44] Smith, T.B., et al. (1983). The Impact of Transport from the South Coast Air Basin on Ozone Levels in the Southeast Desert Air Basin. CARB Research Library Report No. ARB-R-83-183. CARB Contract to MRI/Caltech. [http://www.arb.ca.gov/research/single-project.php?row_id=64953]

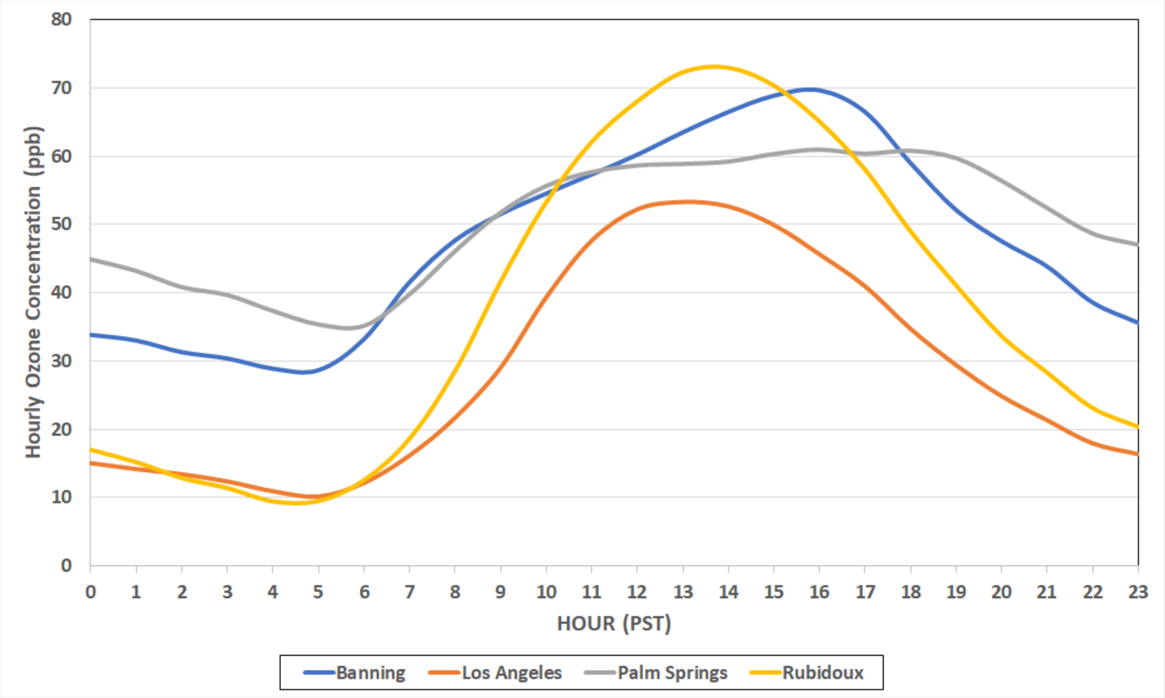

FIGURE 3-6

DIURNAL PROFILE OF 3-YEAR (2018–2020) HOURLY OZONE CONCENTRATIONS ALONG THE TRANSPORT ROUTE INTO THE COACHELLA VALLEY

(HOURS IN PACIFIC STANDARD TIME (PST); AVERAGED FOR THE MAY-OCTOBER OZONE SEASON BY HOUR)

Palm Springs also exhibits higher morning ozone concentrations compared to morning concentrations at Basin stations closer to the main emissions source areas (i.e., Los Angeles and Rubidoux). These stations have more local NOx emissions (mostly from mobile sources) that help scavenge[45] the ozone after dark when ozone photochemistry ceases. The Coachella Valley has limited local NOx emissions to help scavenge the ozone at night. This elevated overnight ozone contributes to an early morning start to the daily ozone increase in Coachella Valley, starting after sunrise (5-6 AM PST), with the ample sunlight and strong overnight temperature inversions in the desert. Ozone concentrations observed on high ozone days in the Coachella Valley can reach an initial peak before noon and then drop slightly with increased mixing in the early afternoon, before climbing to the daily peak, typically between 4 and 6 p.m., as the typical onshore flow reaches the Coachella Valley through the San Gorgonio Pass, transporting new ozone from the South Coast Air Basin.

Fine Particulate Matter (PM2.5)

South Coast AQMD began PM2.5 monitoring in both the Coachella Valley and the Basin in 1999. Two long-term, routine stations (Palm Springs and Indio) measure PM2.5 with 24-hour filter-based FRM measurements every third day, as required by U.S. EPA monitoring regulations. Another routine station in the Joshua Tree National Park measures PM2.5 with a continuous BAM monitor, which is maintained by the National Park Service. PM2.5 has remained relatively low, especially when compared to the South Coast Air Basin, due to

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[45] Freshly emitted NOx includes NO, which destroys ozone through a fast reaction colloquially termed ‘scavenging.’

fewer combustion-related emissions sources and less secondary aerosol formation. There is also typically increased vertical mixing and horizontal dispersion in the desert areas. For the 2018-2020 period, the Coachella Valley PM2.5 24-hour design value (17 µg/m^3) was 48 percent of the 24-hour NAAQS (35 µg/m^3) and the annual average design value (8.0 µg/m^3) was 66 percent of the current (2012) annual NAAQS (12.0 µg/m^3).

Figure 3-7 shows the trend of 3-year design values for annual average and 24-hour PM2.5 from 2001 through 2020. The stations in the Coachella Valley have not violated the 3-year design value form of the current standards since monitoring began. The annual average for the first year of measurements (1999) was just slightly above the level of the current federal standard, as shown in Figure 3-8.

There are occasional exceedances of the 24-hour PM2.5 standard in the Coachella Valley, due to the PM2.5 portion of windblown dust during very high PM10 events caused by high winds. Even though the PM2.5 standard can be exceeded during these exceptional events, the PM2.5 mass is a very small fraction of the total PM10 mass. These events are extreme and can be flagged as exceptional events, but they do not occur frequently enough to violate the 98th percentile form of the 24-hour PM2.5 standard.

The 2020 Coachella Valley maximum 24-hour average and the highest annual average concentrations (20.2 µg/m^3 and 8.4 µg/m^3, respectively, both at Indio) were 57 percent and 70 percent of the current federal 24-hour and annual standards. The annual PM2.5 State standard (12.0 µg/m^3), which is the same level as the federal annual standard, but with different rounding requirements, was also not exceeded in the Coachella Valley.

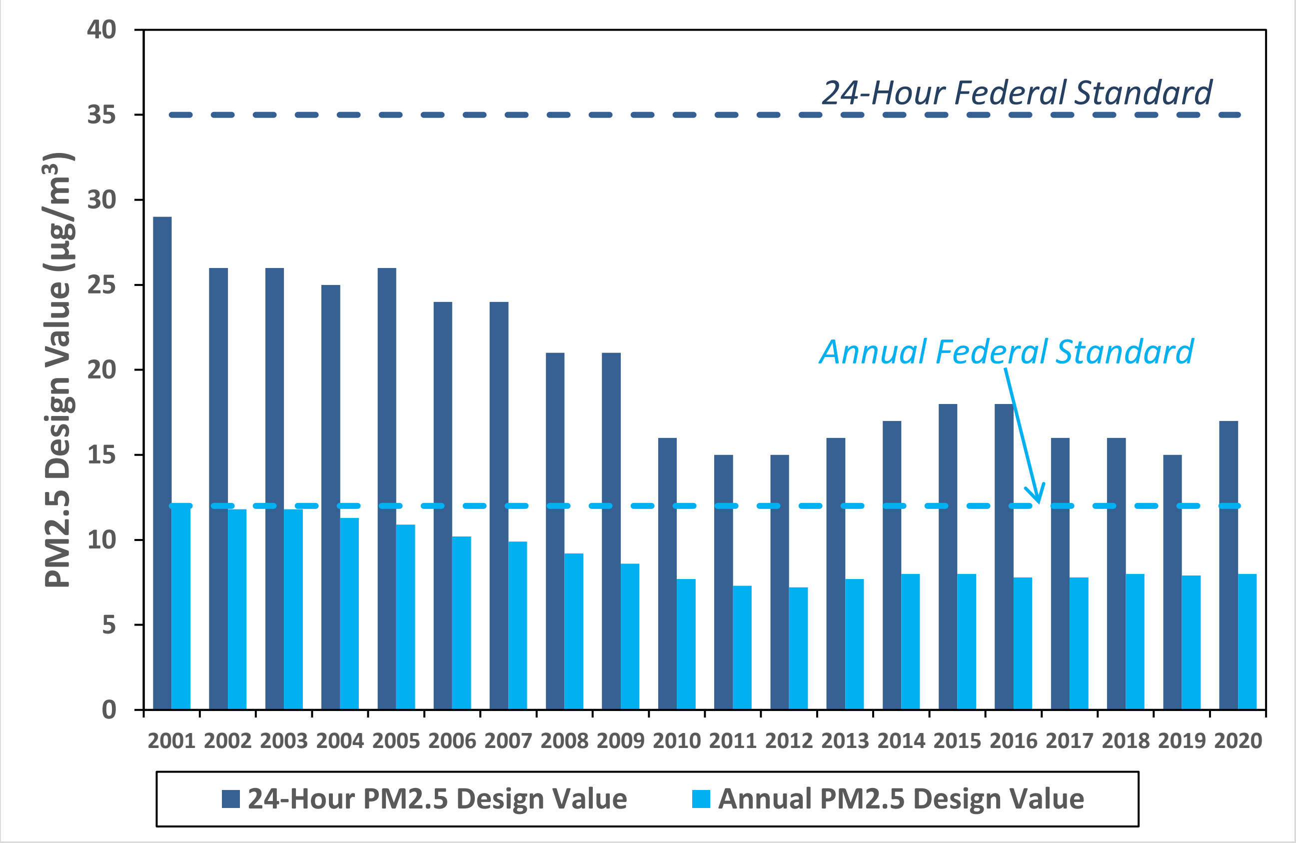

FIGURE 3-7

COACHELLA VALLEY 24-HOUR AND ANNUAL AVERAGE PM2.5 DESIGN VALUES, 2001–2020

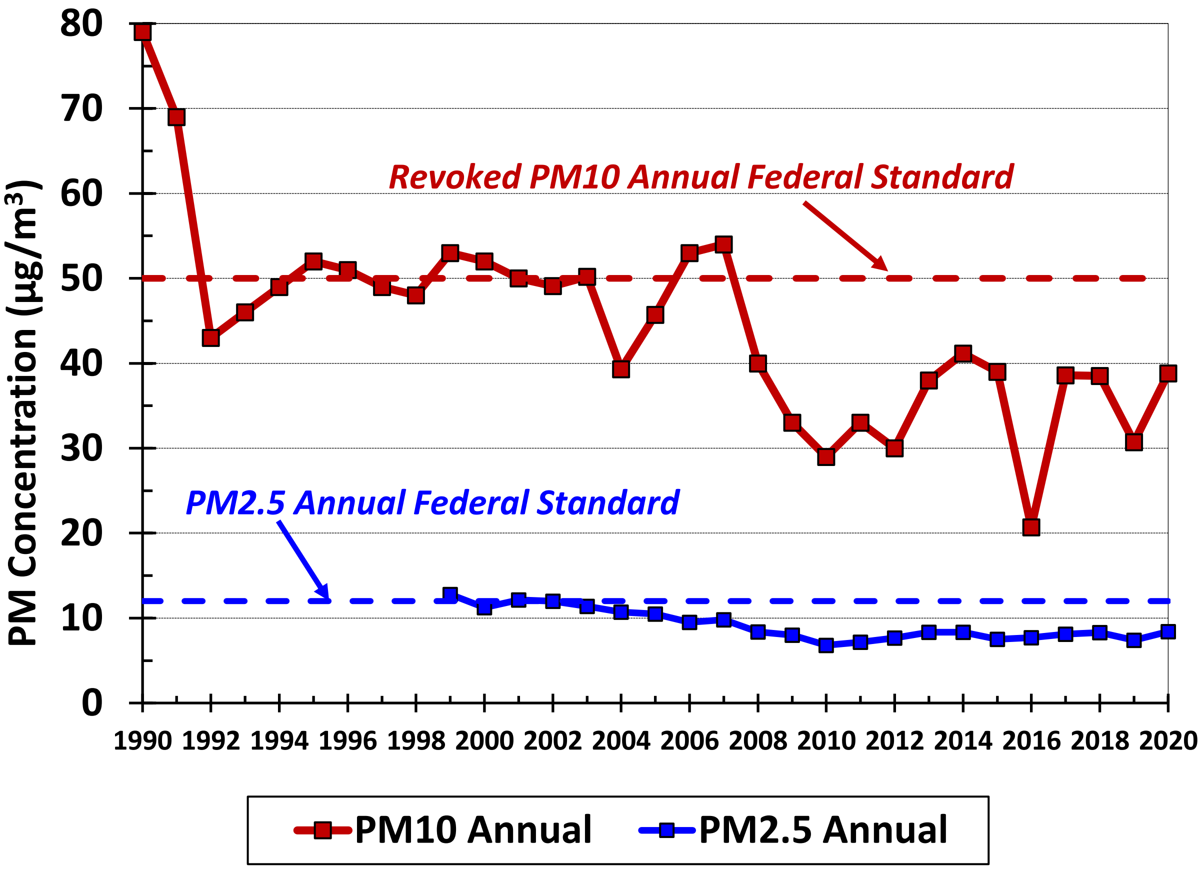

FIGURE 3-8

COACHELLA VALLEY TREND OF ANNUAL AVERAGE PM10 AND PM2.5, 1990–2020

Particulate Matter (PM10)

PM10 is measured daily at both Indio and Palm Springs by supplementing the (primary) 1-in-3-day Federal Reference Method (FRM) filter sampling at Indio and the 1-in-6-day FRM sampling at Palm Springs with continuous hourly Federal Equivalent Method (FEM) measurements at both stations. In addition, a third station has been operational in the community of Mecca in the southeastern Coachella Valley since 2013, measuring PM10 with a real-time FEM sampler and 1-in-6 day FRM sampler. This monitoring was started at the request of U.S. EPA Region 9 to help evaluate windblown dust in that portion of the Coachella Valley, which is potentially impacted by high-wind natural events, agricultural activities, and fugitive dust from the exposed shoreline of the receding Salton Sea.

Although exceedances of the ozone standard in the Coachella Valley area are primarily due to the transport of ozone and its precursors from the densely populated areas of the upwind Basin to the west, PM10 in the Coachella Valley is largely due to locally generated sources of fugitive dust (e.g., construction activities, re-entrained dust from paved and unpaved road travel, and natural wind-blown sources). The Coachella Valley is subject to frequent high winds that generate wind-blown sand and dust, leading to high episodic PM10 concentrations, especially from disturbed soil and natural desert blowsand[46] areas. PM10 is the only pollutant that frequently reaches higher concentrations in the Coachella Valley compared to the Basin. All days in recent years that exceeded the 24-hour PM10 NAAQS at the Indio, Palm Springs, or Mecca stations would not have exceeded that standard except for the contribution of windblown dust and sand due to strong winds in the upwind source area. However, not all events would qualify as an exceptional event based on U.S. EPA guidance.

On some of the Coachella Valley's high PM10 days, long-range transport of wind-generated dust and sand occurs with relatively light winds in the Coachella Valley, when entrained dust from desert thunderstorm outflows is transported to the Coachella Valley from the desert areas of southeastern California, Arizona, Nevada or northern Mexico. These events are typically seen in the summer months with southeasterly flows and thunderstorm activity related to the North American Monsoon.[47] In the more extreme cases seen in the southwestern U.S. deserts, a deep wall of dust entrained by thunderstorm downdraft and outflow can advance long distances from the origin, creating dust storms that are often referred to as *haboobs*.

On other high PM10 days, local windblown dust and sand is generated from strong winds in the Coachella Valley. Air forced through the San Gorgonio Pass (also referred to as Banning Pass) can create strong northwesterly winds along the centerline of the Coachella Valley. This wind forcing is often related to a marine air mass with a deep marine layer and strong westerly onshore (sea-breeze) flows in the South Coast Air Basin pushing through the San Gorgonio Pass. On other days, storm systems with frontal passages create strong winds through the San Gorgonio Pass and Coachella Valley. Hourly averaged winds measured near Cathedral City, in the Whitewater River Wash near the centerline of the Coachella Valley, typically exceeded 25 mph for at least one hour on approximately one third of the days in each year.

From 2018 to 2020, 18 24-hour PM10 exceedances at the monitors in Indio, Palm Springs, or Mecca were recorded, all due to high winds. These measurements are summarized in Table 3-3. Concentrations impacted by wind speed in excess of 25 miles per hour is one of the criteria that U.S. EPA uses to determine if an exceptional event was caused by high winds, and thus exceptional event demonstrations for these events would likely be concurred upon by U.S. EPA with additional supporting information. These "suspected" exceptional events were identified as days when the daily maximum of the five-minute average wind speed measured at Palm Springs Regional Airport or Jacqueline Cochran Regional Airport exceeded 25 miles per hour. Only two exceedances of the 24-hour PM10 NAAQS did not meet the wind speed criteria, however, they were also likely caused by high winds.

The 2018-2020 events in the Coachella Valley meeting the 25 mile per hour criteria have been flagged in the U.S. EPA Air Quality System (AQS) database as high-wind exceptional events, in accordance with the U.S. EPA Exceptional Events Rule. South Coast AQMD does not plan to submit exceptional event demonstrations to U.S. EPA for these events as their removal does not result in an attaining design value and thus are not regulatory

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[46] The blowsand process is a natural sand migration caused by the action of winds on the vast areas of sand in the Coachella Valley. The sand is supplied by weather erosion of the surrounding mountains and foothills. Although the sand migration is somewhat disrupted by urban growth in the Valley, the overall region of blowsand activity encompasses approximately 130 square miles, extending from near Cabazon in the San Gorgonio Pass to the Salton Sea.

[47] Adams, D.K., and A.C. Comrie. (1997). The North American Monsoon. *Bull. Amer. Meteor. Soc.,* 78, 2197-2213. [https://journals.ametsoc.org/view/journals/bams/78/10/1520-0477_1997_078_2197_tnam_2_0_co_2.xml]

National Weather Service Climate Prediction Center. (2004). The North American Monsoon. Reports to the Nation on our Changing Planet. NOAA/National Weather Service. [https://www.cpc.ncep.noaa.gov/products/outreach/Report-to-the-Nation-Monsoon_aug04.pdf] significant. After excluding days with wind speeds exceeding 25 miles per hour in the Coachella Valley, the federal 24-hour and former annual PM10 standards were exceeded at the Mecca monitors but not at Indio or Palm Springs monitors in the period from 2018 to 2020. The fourth highest in three-year 24-hour PM10 concentration-based design value at Mecca (204 µg/m^3) was 132% of the current 24-hour federal PM10 standard.

TABLE 3-3

HIGH-WIND EXCEPTIONAL EVENT DAYS IN THE COACHELLA VALLEY FROM 2018 THROUGH 2020

Date	Indio (2) (µg/m^3)	Indio (3) (µg/m^3)	Mecca (1) (µg/m^3)	Mecca (3) (µg/m^3)	Palm Springs (2) (µg/m^3)	Palm Springs (3) (µg/m^3)	Event Description
2/11/2018	ND	108	ND	**191**	ND	78	High winds
2/19/2018	51	56	ND	**264**	17	21	Wind speed > 25 mph
4/12/2018	ND	120	ND	**194**	ND	45	High winds
4/16/2018	ND	**259**	ND	**179**	ND	43	Wind speed > 25 mph
4/29/2018	57	58	ND	**170**	ND	31	High winds
7/9/2018	ND	**335**	ND	**274**	ND	**421**	Wind speed > 25 mph
7/10/2018	149	146	ND	109	ND	**173**	High winds
10/30/2019	71	80	**204**	**232**	27	31	High winds
1/29/2020	ND	59	ND	**173**	ND	21	Wind speed > 25 mph
5/12/2020	ND	29	ND	**298**	ND	19	Wind speed > 25 mph
5/13/2020	ND	30	ND	**181**	ND	17	Wind speed > 25 mph
5/19/2020	ND	25	ND	**220**	ND	12	Wind speed > 25 mph
5/22/2020	ND	29	ND	**259**	ND	21	Wind speed > 25 mph
6/5/2020	ND	141	ND	**680**	ND	33	Wind speed > 25 mph
6/6/2020	ND	50	ND	**289**	ND	16	Wind speed > 25 mph
6/7/2020	ND	40	ND	**207**	ND	24	Wind speed > 25 mph
10/26/2020	ND	103	ND	**239**	ND	ND	Wind speed > 25 mph
11/7/2020	ND	102	ND	**218**	ND	ND	Wind speed > 25 mph

ND = No Data

Bold text indicates concentrations in excess of the PM10 NAAQS.

Monitor POC numbers are shown in parenthesis in the table header.

The POC 3 monitors were measurement with continuous FEM Tapered Element Oscillating Microbalance (TEOM) instruments.

When considering the form of the federal PM10 standards, and after excluding the flagged high-wind exceptional events, the 3-year (2018–2020) concentration-based design values for the Coachella Valley are 204 µg/m^3 for the 24-hour average and 38 µg/m^3 for the annual average (former standard). These are 132 and 76 percent of the 24-hour and former annual PM10 federal standards, respectively. The 24-hour average concentration-based design value is 408 percent of the California State 24-hour (50 µg/m^3) PM10 standard and the 2018–2020 high state PM10 annual designation value (39 µg/m^3) is 195 percent of the state annual average PM10 standard (20 µg/m^3). Figure 3-8 (in the previous section) shows the trend of the annual average PM10 concentrations in the Coachella Valley for the station showing the highest PM10 measurements from 1990 through 2020, along with the annual PM2.5 trend.

Carbon Monoxide (CO)

Carbon monoxide was measured at one Coachella Valley air monitoring station (Palm Springs) in 2020. Neither the federal nor State standards were exceeded. The maximum 8-hour average CO concentration recorded in 2020 (0.5 ppm) was less than 6 percent of both the federal (9 ppm) and State (9.0 ppm) 8-hour standards. The maximum 1-hour CO concentration (0.8 ppm) was 2 percent of the federal (35 ppm) and 4 percent of the State (20 ppm) 1-hour CO standards. Historical carbon monoxide air quality data show that the Coachella Valley area has not exceeded the federal CO standards in over three decades.

For the 3-year period from 2018–2020, the 1-hour and 8-hour design values were 0.8 ppm and 0.5 ppm, 2 and 6 percent, respectively, of the federal standards (4 percent of the State 1-hour standard and 6 percent of the State 8-hour standard).

Nitrogen Dioxide (NO_2)

Nitrogen dioxide was measured at one station (Palm Springs) in the Coachella Valley in 2020. The maximum 1-hour average NO_2 concentration (47.4 ppb) was 47 percent of the 2010 federal 1-hour standard (100 ppb) and 26 percent of the State 1-hour standard (180 ppb). The maximum annual average NO_2 concentration (0.0066 ppm) was approximately 12 percent of the federal annual standard (0.0534 ppm) and 22 percent of the State annual standard (0.030 ppm).

For the 3-year period from 2018–2020, the NO_2 design values for the Coachella Valley were 34 ppb for the 1-hour average and 0.007 ppm for the annual average, 34 percent and 13 percent of those NAAQS, respectively.

Sulfur Dioxide (SO_2)

Sulfur dioxide was not measured in the Coachella Valley in 2020. Historic analyses have shown SO_2 concentrations to be well below the State and federal standards, and there are no significant emissions sources of SO_2 in the Coachella Valley.

Sulfates (SO_4^{2-})

Sulfates, from FRM PM10 filters, were measured at two stations (Palm Springs and Indio) in the Coachella Valley in 2020. The 2020 maximum 24-hour average sulfate concentration was 2.7 µg/m^3 and the 3-year maximum State designation value was 4 µg/m^3 (16 percent of the 25 µg/m^3 State standard of sulfates).

Lead (Pb)

Lead concentrations were not measured in the Coachella Valley in 2020. Historic analyses have shown concentrations to be less than the State and federal standards and no major sources of lead emissions are located in the Coachella Valley.

Hydrogen Sulfide (H_2S)

South Coast AQMD started measuring H_2S near the Salton Sea at two locations in November 2013, in order to better understand odor events related to the Salton Sea and to better inform the community about these events. One of the H_2S monitoring stations is located on Torres-Martinez tribal land that is close to the shore, in a sparsely populated area. The second monitor is located at the South Coast AQMD Mecca air monitoring station site (Saul Martinez Elementary School), a more populated community approximately four miles north of the Salton Sea.

A significant H_2S odor event occurred in September 2012, bringing sulfur or rotten-egg odors and widespread attention to this issue of H_2S odors from the Salton Sea. This event affected people in communities throughout the Coachella Valley, across many areas of the South Coast Air Basin, and into portions of the Mojave Desert Air Basin to the north. Over 235 complaints were registered with South Coast AQMD during this event, from as far west as the San Fernando Valley in Los Angeles County.

The H_2S produced in the Salton Sea is a product of anaerobic organic decay that is particularly active in the summer months, especially at the bottom of the shallow Sea with the abundant desert sunlight and heat. The 2012 event occurred during a period of moist southeasterly “monsoonal” flows in desert areas of southeastern California, along with desert thunderstorms. Strong outflow winds from thunderstorms to the south crossed the Salton Sea, causing mixing in the water layers that released and transported significant amounts of H_2S gas and the associated odors.

While strong events like that of September 2012 are uncommon, less extreme releases of H_2S can frequently cause odors in areas close to the Salton Sea. These events are more prevalent during the hot summer months, especially when the southeasterly “monsoonal” flow events occur, but they sometimes occur at other times of the year. Elevated H_2S concentrations are typically measured near the Salton Sea during wind shifts that bring flows from the south or east directions. These shifts occur most often in the early morning or the late afternoon/early evening hours in this area. The Salton Sea’s receding shorelines and shallower waters may affect the number or severity of these odor events in the future.

While there is no federal standard for H_2S, the State of California has set a standard of 30 parts per billion (ppb), averaged over one hour as a level not to be reached or exceeded. The State standard was adopted in 1969, based on the thresholds for annoyance and unpleasant odors, with the purpose of decreasing odor annoyances.[48] Humans can detect H_2S odors at extremely low concentrations, down to a few ppb. Above the State standard, most individuals can smell the offensive odor and many may experience temporary symptoms such as headaches and nausea due to unpleasant odors. The CAAQS for H_2S was reviewed in 1984 and retained.

Figure 3-9 shows annual totals of days with at least one hour that exceeded the 1-hour state H_2S standard at near-shore (Torres-Martinez) and Mecca stations from 2014 to 2020. During this period, H_2S concentrations at the Torres-Martinez site near the Salton Sea shoreline exceeded the 1-hour state standard an average of 38.3

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[48] https://ww2.arb.ca.gov/resources/hydrogen-sulfide-and-health

days per year, with a range of 22 to 68 days. Of the 268 exceeding days during this period, 121 days (45%) had H_2S exceedances that lasted longer than one hour (2-20 hours). Most exceedances occurred during summer months (June – September), with exceedances peaking in either August or September each year.

Further north from the Salton Sea in Mecca, H_2S concentrations exceeded the state standard an average of 6.6 days per year from 2014-2020, with a range of 2 to 14 exceeding days. Multi-hour (2-7 hours) exceedances were recorded on half of the 46 exceeding days from 2014-2020. Nearly all exceedances recorded at Mecca occurred during summer months and most frequently occurred in August or September.

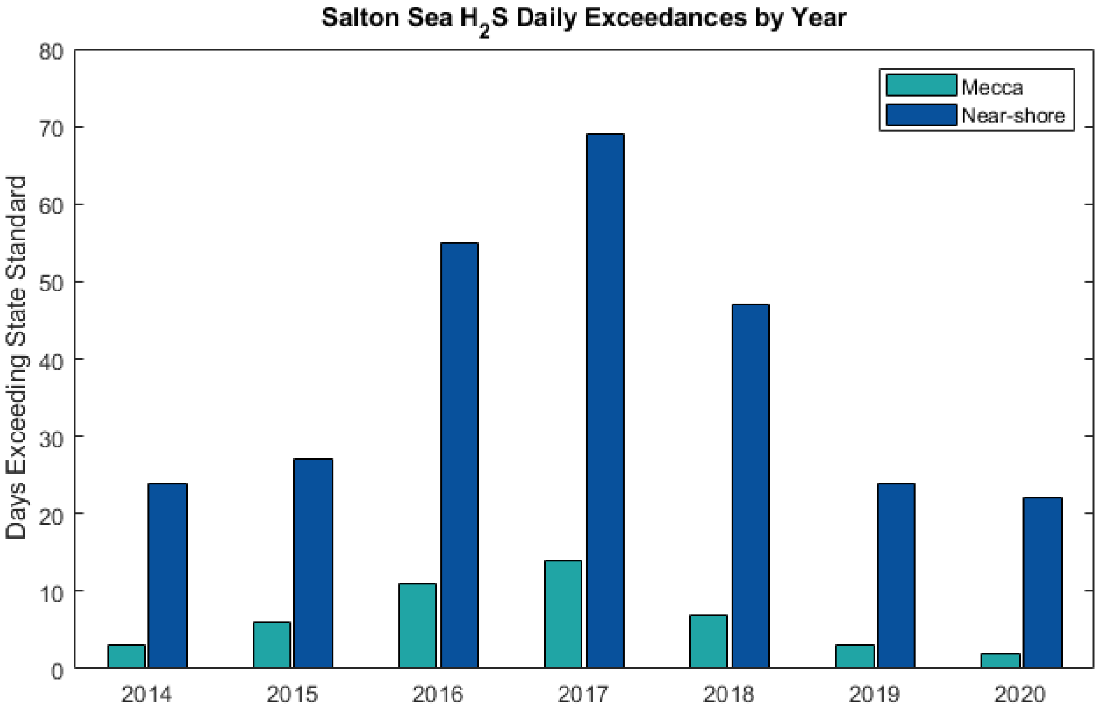

FIGURE 3-9

NUMBER OF DAYS IN EACH YEAR WITH 1-HOUR HYDROGEN SULFIDE CONCENTRATIONS (H_2S) OVER THE STATE STANDARD AT COACHELLA VALLEY MONITORING STATIONS, 2014-2020

Attachments 1 through 7 contain air quality indicators endorsed by the California Air Resources Board on July 8, 1993, to report progress towards attaining the state ambient air quality standards[49].

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[49] https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/93-49.pdf

ATTACHMENT 1

2018-2020 NO_2 1-HOUR DESIGNATION VALUES AT SOUTH COAST AIR BASIN

Site Name	EPA Air Quality System Site ID	Designation Values	Valid Expected Peak Day Concentrations
Los Angeles County			
Azusa	06-037-0002	70	70
Compton	06-037-1302	70	70
Glendora	06-037-0016	50	50
Long Beach- Webster	06-037-4006		
Route 710 Near Road	06-037-4008	100	100
Long Beach-Signal Hill	06-037-4009	70	70
Central Los Angeles	06-037-1103	70	70
Los Angeles-Westchester	06-037-5005	60	60
North Hollywood	06-037-4010	60	60
Pasadena	06-037-2005	60	60
Pico Rivera	06-037-1602	70	70
Pomona	06-037-1701	70	70
Reseda	06-037-1201	60	60
Santa Clarita	06-037-6012	40	40
West Los Angeles	06-037-0113	50	50
Orange County			
I-5 Near-Road	06-059-0008	60	60
Anaheim	06-059-0007	60	60
La Habra	06-059-5001	60	60
Riverside County			
Banning	06-065-0012	50	50
Lake Elsinore	06-065-9001	40	40
Mira Loma Van Buren	06-065-8005	60	60
Riverside-Rubidoux	06-065-8001	60	60
San Bernardino County			
Fontana	06-071-2002	70	70
Ontario I-10 Near-Road	06-071-0026	90	90
Ontario-Route 60 Near Road	06-071-0027	90	90
San Bernardino	06-071-9004	60	60
Upland	06-071-1004	60	60

State NO_2 1-hour standard is 180 ppb.

ATTACHMENT 2

2018-2020 NITROGEN DIOXIDE (NO2) ANNUAL DESIGNATION VALUES (DV) AND ANNUAL DATA REPRESENTATIVENESS

Site Name	EPA Air Quality System Site ID	Designation values	2018	2019	2020
Los Angeles County					
Azusa	06-037-0002	14	Y	Y	Y
Compton	06-037-1302	15	Y	Y	Y
Glendora	06-037-0016	9	Y	Y	Y
Long Beach Webster	06-037-4006	17	Y	Y	Y
Route 710 Near Road	06-037-4008	23	Y	Y	Y
Long Beach-Signal Hill	06-037-4009	12			Y
Central Los Angeles	06-037-1103	18	Y	N	N
Los Angeles-Westchester	06-037-5005	9	N	Y	Y
North Hollywood	06-037-4010	14			Y
Pasadena	06-037-2005	14	Y	Y	Y
Pico Rivera	06-037-1602	18	Y	Y	Y
Pomona	06-037-1701	19	Y	Y	Y
Reseda	06-037-1201	12	Y	Y	Y
Santa Clarita	06-037-6012	10	Y	Y	Y
West Los Angeles	06-037-0113	12	N	Y	Y
Orange County					
I-5 Near Road	06-059-0008	20	Y	Y	Y
Anaheim	06-059-0007	13	Y	Y	Y
La Habra	06-059-5001	13	Y	Y	Y
Riverside County					
Banning	06-065-0012	8	Y	Y	Y
Lake Elsinore	06-065-9001	8	Y	Y	Y
Mira Loma Van Buren	06-065-8005	13	Y	Y	Y
Riverside-Rubidoux	06-065-8001	14	Y	Y	Y
San Bernardino County					
Fontana	06-071-2002	18	Y	Y	Y
Ontario I-10 Near-Road	06-071-0026	28	Y	Y	Y
Ontario-Route 60 Near Road	06-071-0027	30	Y	Y	Y
San Bernardino	06-071-9004	15	Y	Y	Y
Upland	06-071-1004	14	Y	N	Y

State Annual NO$_2$ Standard (Arithmetic Mean) is 30 ppb.

Data impacted by exceptional or unusual concentration event removed from consideration.

ATTACHMENT 3

2018-2020 CO STATE 1-HOUR DESIGNATIONS DATA

County	Site Name	Site ID	Year	State 1-Hour Designation Value, ppm	Expected Peak Day Concentrations 1-hour, ppm
San Bernardino	Fontana	2266	2020	2	2
San Bernardino	Ontario I-10 Near-Road	3820	2020	1	2
San Bernardino	San Bernardino	2221	2020	2	2
San Bernardino	Upland	2485	2020	2	2
Riverside	Lake Elsinore	2943	2020	1	1
Riverside	Mira Loma Van Buren	3702	2020	2	2
Riverside	Riverside-Rubidoux	2596	2020	2	2
Orange	I-5 Near Road	3809	2020	3	3
Orange	Anaheim	3674	2020	2	2
Orange	La Habra	2249	2020	3	3
Orange	Mission Viejo	3265	2020	1	1
Los Angeles	Azusa	2484	2020	2	2
Los Angeles	Compton	3743	2020	4	4
Los Angeles	Glendora	2849	2020	1	1
Los Angeles	Central Los Angeles	2899	2020	2	2
Los Angeles	Los Angeles-Westchester	3683	2020	2	2
Los Angeles	Pasadena	2160	2020	2	2
Los Angeles	Pico Rivera	3693	2020	2	2
Los Angeles	Pomona	2898	2020	2	2
Los Angeles	Reseda	2420	2020	3	3
Los Angeles	Santa Clarita	3502	2020	1	1
Los Angeles	West Los Angeles	2494	2020	2	2

Data impacted by exceptional or unusual concentration event removed from consideration.

ATTACHMENT 4

2018-2020 CO STATE 8-HOUR DESIGNATIONS DATA

County	Site Name	Site ID	EPA Air Quality System ID	Year	State 8-Hour Designation Value, ppm	Expected Peak Day Concentrations 8-Hour, ppm
Los Angeles	Azusa	2484	060370002	2020	1.2	1.2
Los Angeles	Compton	3743	060371302	2020	3.2	3.2
Los Angeles	Glendora	2849	060370016	2020	0.9	1.0
Los Angeles	Central Los Angeles	2899	060371103	2020	1.7	1.7
Los Angeles	Los Angeles-Westchester	3683	060375005	2020	1.5	1.5
Los Angeles	Pasadena	2160	060372005	2020	1.4	1.4
Los Angeles	Pico Rivera	3693	060371602	2020	1.7	1.7
Los Angeles	Pomona	2898	060371701	2020	1.3	1.3
Los Angeles	Reseda	2420	060371201	2020	2.1	2.1
Los Angeles	Santa Clarita	3502	060376012	2020	0.7	0.7
Los Angeles	West Los Angeles	2494	060370113	2020	1.2	1.2
Orange	I-5 Near Road	3809	060590008	2020	1.8	1.8
Orange	Anaheim	3674	060590007	2020	1.7	1.7
Orange	La Habra	2249	060595001	2020	1.4	1.4
Orange	Mission Viejo	3265	060592022	2020	0.8	0.8
Riverside	Lake Elsinore	2943	060659001	2020	0.7	0.7
Riverside	Mira Loma Van Buren	3702	060658005	2020	1.5	1.6
Riverside	Riverside-Rubidoux	2596	060658001	2020	1.4	1.5
San Bernardino	Fontana	2266	060712002	2020	1.2	1.2
San Bernardino	Ontario I-10 Near-Road	3820	060710026	2020	1.2	1.2
San Bernardino	San Bernardino	2221	060719004	2020	1.4	1.5
San Bernardino	Upland	2485	060711004	2020	1.2	1.3

Data impacted by exceptional or unusual concentration event removed from consideration.

ATTACHMENT 5

2018-2020 OZONE STATE 8-HOUR EXPOSURE DATA

Year	Population-Weighted State 8-hr Ozone Exposure (ppm-hrs)	Area-Weighted State 8-hr Ozone Exposure (ppm-hrs)
2008	2.485	5.023
2009	1.648	3.192
2010	1.093	2.107
2011	1.406	2.976
2012	1.503	2.382
2013	0.927	1.466
2014	1.223	2.139
2015	1.3042	1.6704
2016	1.5039	1.8273
2017	2.3999	2.8529
2018	1.34342	2.08089
2019	1.34805	1.53154
2020	3.65300	3.04884

Data impacted by exceptional or unusual concentration event removed from consideration.

ATTACHMENT 6

1985-2020 AREA WEIGHTED OZONE STATE 1-HOUR EXPOSURE DATA

YEAR	Area Weighted Exposure (ppm-hrs)	
	Single-year Average	3-year Average
1985	11.747	N/A
1986	11.210	N/A
1987	10.071	11.009
1988	11.542	10.941
1989	11.169	10.928
1990	6.164	9.625
1991	6.925	8.086
1992	5.977	6.355
1993	4.728	5.876
1994	6.136	5.613
1995	3.714	4.859
1996	3.390	4.413
1997	1.793	2.966
1998	3.187	2.790
1999	0.733	1.904
2000	0.856	1.592
2001	1.531	1.040
2002	1.494	1.293
2003	2.495	1.840
2004	0.973	1.654
2005	0.997	1.488
2006	0.766	0.912
2007	0.429	0.730
2008	0.849	0.681
2009	0.350	0.543
2010	0.159	0.452
2011	0.452	0.320
2012	0.2064	0.272
2013	0.1003	0.253
2014	0.1349	0.147
2015	0.16679	0.134
2016	0.23153	0.178
2017	0.39921	0.266
2018	0.22711	0.286
2019	0.16330	0.263
2020	0.55410	0.315

ATTACHMENT 7

1985-2020 POPULATION WEIGHTED OZONE STATE 1-HOUR EXPOSURE DATA

YEAR	Population Weighted Exposure (ppm-hrs)	
	Single-year Average	3-year Average
1985	14.720	N/A
1986	12.615	N/A
1987	9.651	12.329
1988	10.573	10.947
1989	9.829	10.018
1990	5.868	8.757
1991	6.569	7.422
1992	6.427	6.288
1993	4.218	5.738
1994	4.526	5.057
1995	3.045	3.930
1996	2.116	3.229
1997	0.843	2.001
1998	1.816	1.591
1999	0.328	0.995
2000	0.559	0.901
2001	0.765	0.550
2002	0.701	0.675
2003	1.436	0.967
2004	0.566	0.901
2005	0.489	0.830
2006	0.726	0.593
2007	0.394	0.536
2008	0.575	0.565
2009	0.331	0.433
2010	0.137	0.348
2012	0.2386	0.227
2013	0.1210	0.221
2014	0.1644	0.175
2015	0.21812	0.168
2016	0.28832	0.224
2017	0.46664	0.324
2018	0.23417	0.330
2019	0.20992	0.304
2020	0.89417	0.446

ATTACHMENT 8

AIR QUALITY DATA FOR 2020

2020			Carbon Monoxide [a]			Ozone [b]										Nitrogen Dioxide [c]				Sulfur Dioxide [d]		
										Number of Days Standard Exceeded												
Source/Receptor Area No.	Location	Station No.	No. Days of Data	Max Conc. in ppm 1-hour	Max Conc. in ppm 8-hour	No. Days of Data	Max. Conc. in ppm 1-hour	Max. Conc. in ppm 8-hour	Fourth High Conc. ppm 8-hour	Old Federal > 0.124 ppm 1-hour	Current Federal > 0.070 ppm 8-hour	2008 Federal > 0.075 ppm 8-hour	1997 Federal > 0.084 ppm 8-hour	Current State > 0.09 ppm 1-hour	Current State > 0.070 ppm 8-hour	No. Days of Data	Max Conc. in ppb 1-hour	98th Percentile Conc. ppb 1-hour	Annual Average AAM Conc. ppb	No. Days of Data	Max. Conc. in ppb 1-hour	99th Percentile Conc. ppb 1-hour
LOS ANGELES COUNTY																						
1	Central LA	087	359	1.9	1.5	332	0.185	0.118	0.093	1	22	16	6	14	22	364	61.8	54.7	16.9	333	3.8	3.3
2	Northwest Coastal LA County	091	365	2.0	1.2	357	0.134	0.092	0.078	1	8	5	1	6	8	360	76.6	43.9	10.6	--	--	--
3	Southwest Coastal LA County	820	364	1.6	1.3	350	0.117	0.074	0.066	0	2	0	0	1	2	364	59.7	50.9	9.5	361	6.0	3.3
4	South Coastal LA County 1	072	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4	South Coastal LA County 2	077	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--
4	South Coastal LA County 3	033	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.4
4	South Coastal LA County 4	039	--	--	--	332	0.105	0.083	0.071	0	4	2	0	4	4	357	75.3	56.3	12.8	--	--	--
4	I-710 Near Road##	032	--	--	--	--	--	--	--	--	--	--	--	--	--	355	90.3	79.1	22.3	--	--	--
6	West San Fernando Valley	074	349	2.0	1.7	345	0.142	0.115	0.097	0	49	23	12	14	49	365	57.2	50.1	12.1	--	--	--
7	East San Fernando Valley	200	--	--	--	359	0.133	0.108	0.102	5	49	33	20	31	49	357	60.4	52.4	14.5	--	--	--
8	West San Gabriel Valley	088	361	2.6	2.2	354	0.163	0.115	0.108	9	60	44	21	41	60	354	61.2	49.7	13.6	--	--	--
9	East San Gabriel Valley 1	060	349	2.4	2.0	347	0.168	0.125	0.105	11	61	43	19	53	61	347	64.8	54.1	13.6	--	--	--
9	East San Gabriel Valley 2	591	310	2.3	1.9	348	0.173	0.138	0.124	17	97	71	32	76	97	366	50.4	41.9	8.5	--	--	--
10	Pomona/Walnut Valley	075	363	1.5	1.1	353	0.180	0.124	0.106	10	84	53	29	51	84	355	67.9	59.8	18.3	--	--	--
11	South San Gabriel Valley	085	362	3.1	1.7	356	0.169	0.114	0.089	3	23	15	7	20	23	365	69.2	57.8	17.8	--	--	--
12	South Central LA County	112	364	4.5	3.1	354	0.152	0.115	0.072	1	4	3	2	3	4	362	72.3	60.5	14.5	--	--	--
13	Santa Clarita Valley	090	363	1.2	0.8	348	0.148	0.122	0.106	10	73	56	29	44	73	361	46.3	35.9	9.4	--	--	--
ORANGE COUNTY																						
16	North Orange County	3177	347	2.1	1.2	340	0.171	0.113	0.088	3	23	19	6	15	23	347	57.2	50.1	12.7	--	--	--
17	Central Orange County	3176	361	2.3	1.7	356	0.142	0.097	0.079	2	15	4	3	6	15	364	70.9	52.1	13.3	--	--	--
17	I-5 Near Road##	3131	359	2.4	2.0	--	--	--	--	--	--	--	--	--	--	365	69.9	52.6	18.8	--	--	--
19	Saddleback Valley	3812	366	1.7	0.8	364	0.171	0.122	0.090	1	32	25	10	20	32	--	--	--	--	--	--	--
RIVERSIDE COUNTY																						
22	Corona/Norco Area	4155	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
23	Metropolitan Riverside County 1	4144	361	1.9	1.4	348	0.143	0.115	0.102	6	81	59	27	46	81	359	66.4	54.1	13.6	356	2.2	1.7
23	Metropolitan Riverside County 3	4165	359	1.8	1.5	350	0.140	0.117	0.103	7	89	62	32	51	89	352	58.1	49.9	12.3	--	--	--
24	Perris Valley	4149	--	--	--	358	0.125	0.106	0.097	1	74	48	14	34	74	--	--	--	--	--	--	--
25	Elsinore Valley	4158	358	0.9	0.7	355	0.130	0.100	0.093	1	52	30	10	18	52	345	43.6	37.9	7.4	--	--	--
26	Temecula Valley	4031	--	--	--	364	0.108	0.091	0.084	0	37	20	2	5	37	--	--	--	--	--	--	--
29	San Gorgonio Pass	4164	--	--	--	358	0.150	0.115	0.104	3	68	48	21	29	68	363	51.1	47.1	8.5	--	--	--
30	Coachella Valley 1**	4137	365	0.8	0.5	360	0.119	0.094	0.089	0	49	28	5	9	49	365	47.4	34.3	6.6	--	--	--
30	Coachella Valley 2**	4157	--	--	--	358	0.097	0.084	0.081	0	42	17	0	2	42	--	--	--	--	--	--	--
30	Coachella Valley 3**	4032	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SAN BERNARDINO COUNTY																						
32	Northwest San Bernardino Valley	5175	364	1.5	1.1	360	0.158	0.123	0.116	15	114	87	43	82	114	364	55.4	44.8	13.9	--	--	--
33	I-10 Near Road##	5035	363	1.5	1.2	--	--	--	--	--	--	--	--	--	--	345	94.2	75.1	28.7	--	--	--
33	CA-60 Near Road##	5036	--	--	--	--	--	--	--	--	--	--	--	--	--	346	101.6	78.0	29.1	--	--	--
34	Central San Bernardino Valley 1	5197	358	1.7	1.2	348	0.151	0.111	0.105	8	89	65	27	56	89	360	66.4	57.9	18.7	363	2.5	1.7
34	Central San Bernardino Valley 2	5203	360	1.9	1.4	359	0.162	0.128	0.122	15	128	110	60	89	128	365	54.0	45.6	14.9	--	--	--
35	East San Bernardino Valley	5204	--	--	--	361	0.173	0.136	0.125	16	141	127	78	104	141	--	--	--	--	--	--	--
37	Central San Bernardino Mountains	5181	--	--	--	364	0.159	0.139	0.117	7	118	97	55	69	118	--	--	--	--	--	--	--
38	East San Bernardino Mountains	5818	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--
	DISTRICT MAXIMUM [e]			4.5	3.1		0.185	0.139	0.125	17	141	127	78	104	141		101.6	86.3	29.1		6.0	3.3
	SOUTH COAST AIR BASIN [f]			4.5	3.1		0.185	0.139	0.125	27	157	142	97	132	157		101.6	86.3	29.1		6.0	3.3

* Incomplete data. ** Salton Sea Air Basin -- Pollutant not monitored ppm - Parts Per Million parts of air, by volume ppb – Parts Per Billion parts of air, by volume AAM = Annual Arithmetic Mean

a) The federal and state 8-hour CO standards (9 ppm and 9.0 ppm) and the federal and state 1-hour CO standards (35 ppm and 20 ppm) were not exceeded.
b) The current (2015) O_3 federal standard was revised effective December 28, 2015.
c) The NO_2 federal 1-hour standard is100 ppb annual standard is annual arithmetic mean NO2 > 0.0534 ppm (53.4 ppb). The state 1-hour and annual standards are 0.18 ppm and 0.030 ppm.
d) The federal SO_2 1-hour standard is 75 ppb (0.075 ppm). The state standards are 1-hour average SO2 > 0.25 ppm (250 ppb) and 24-hour average SO2 > 0.04 ppm (40 ppb).
e) District Maximum is the maximum value calculated at any station in the South Coast AQMD Jurisdiction
f) Concentrations are the maximum value observed at any station in the South Coast Air Basin. Number of daily exceedances are the total number of days that the indicated concentration is exceeded at any station in the South Coast Air Basin
\## Four near-road sites measuring one or more of the pollutants $PM_{2.5}$, CO and/or NO_2 are operating near the following freeways: I-5, I-10, CA-60 and I-710.

South Coast
Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4182
www.aqmd.gov

For information on the current standard levels and most recent revisions please refer to "Appendix II – Current Air Quality" of the "2016 AQMP" which can be accessed at http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-ii.pdf?sfvrsn=4. Maps showing the source/receptor area boundaries can be accessed via the Internet by entering your address in the South Coast AQMD Air Quality Forecast Map at www.aqmd.gov/forecast. A printed map or copy of the AQMP Appendix II is also available free of charge from the South Coast AQMD Public Information Center at 1-800-CUT-SMOG.

2020

Source/Receptor Area No.	Location	Station No.	**Suspended Particulates PM10** [e) k) +]					**Fine Particulates PM2.5** [g) #]					**Lead** [i) ++]		**PM10 Sulfate** [j)]	
			No. Days of Data	Max. Conc. in µg/m^3 24-hour	No. (%) Samples Exceeding Standards Federal > 150 µg/m^3 24-hour	No. (%) Samples Exceeding Standards State > 50 µg/m^3 24-hour	Annual. Average Conc. [f)] (AAM) µg/m^3	No. Days of Data	Max. Conc. in µg/m^3 24-hour	98th Percentile Conc. in µg/m^3 24-hour	No (%) Samples Exceeding Federal Std. > 35 µg/m^3 24-hour	Annual. Average Conc. [h)] (AAM) µg/m^3	Max. Monthly Average Conc. µg/m^3	Max. 3-Months Rolling Averages µg/m^3	No. Days of Data	Max. Conc. in µg/m^3 24-hour
LOS ANGELES COUNTY																
1	Central LA	087	337	77	0	24 (7%)	23.0	353	47.30	28.00	2 (1%)	12.31	0.013	0.011	45	3.3
2	Northwest Coastal LA County	091	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3	Southwest Coastal LA County	820	37	43	0	0	22.5	--	--	--	--	--	0.008	0.005	--	--
4	South Coastal LA County 1	072	--	--	--	--	--	117	28.10	26.10	0	11.26	--	--	--	--
4	South Coastal LA County 2	077	42	59	0	2 (5%)	24.9	357	39.00	28.00	1 (0%)	11.38	0.008	0.006	--	--
4	South Coastal LA County 3	033	12	54	0	2 (17%)	27.8	--	--	--	--	--	--	--	14	2.3
4	South Coastal LA County 4	039	--	--	--	--	--	--	--	--	--	--				
4	I-710 Near Road[##]	032	--	--	--	--	--	356	44.00	31.50	2 (1%)	12.93	--	--	--	--
6	West San Fernando Valley	074	--	--	--	--	--	116	27.60	26.40	0	10.13	--	--	--	--
7	East San Fernando Valley	200	--	--	--	--	--	--	--	--	--	--				
8	West San Gabriel Valley	088	--	--	--	--	--	117	34.90	31.20	0	11.06	--	--	--	--
9	East San Gabriel Valley 1	060	43	95	0	8 (19%)	37.7	116	33.00	25.80	0	11.13	0.010	0.007	45	3.1
9	East San Gabriel Valley 2	591	333	105	0	9 (3%)	25.2	--	--	--	--	--	--	--	--	--
10	Pomona/Walnut Valley	075	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11	South San Gabriel Valley	085	--	--	--	--	--	116	35.40	30.50	0	13.22	0.012	0.011	--	--
12	South Central LA County	112	--	--	--	--	--	352	43.20	34.10	7 (2%)	13.57	0.010	0.009	--	--
13	Santa Clarita Valley	090	36	48	0	0	22.5	--	--	--	--	--	--	--	--	--
ORANGE COUNTY																
16	North Orange County	3177	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17	Central Orange County	3176	329	120	0	13 (4%)	23.9	355	41.40	27.10	1 (0%)	11.27	--	--	44	3.3
17	I-5 Near Road[##]	3131	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19	Saddleback Valley	3812	42	53	0	1 (2%)	16.8	120	35.00	32.70	0	8.81	--	--	--	--
RIVERSIDE COUNTY																
22	Corona/Norco Area	4155	44	100	0	10 (23%)	39.1	--	--	--	--	--	--	--	--	--
23	Metropolitan Riverside County 1	4144	320	104	0	110 (34%)	30.0	357	41.00	29.60	4 (1%)	12.63	0.016	0.010	84	5.2
23	Metropolitan Riverside County 3	4165	304	124	0	154 (51%)	52.2	358	38.70	34.70	5 (1.%)	14.03	--	--	--	--
24	Perris Valley	4149	37	77	0	6 (16%)	35.9	--	--	--	--	--	--	--	--	--
25	Elsinore Valley	4158	334	84	0	7 (2%)	22.0	--	--	--	--	--	--	--	--	--
26	Temecula Valley	4031	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29	San Gorgonio Pass	4164	42	46	0	0	19.2	--	--	--	--	--	--	--	--	--
30	Coachella Valley 1[**]	4137	251	48	0	0	20.4	122	23.90	16.90	0	6.42	--	--	--	--
30	Coachella Valley 2[**]	4157	317	77	0	8 (3%)	29.1	121	25.60	20.20	0	8.41	--	--	89	2.7
30	Coachella Valley 3[**]	4032	320	259	1 (0%)	69 (22%)	38.0	--	--	--	--	--	--	--	--	--
SAN BERNARDINO COUNTY																
32	Northwest San Bernardino Valley	5175	305	63	0	12 (4%)	30.5	--	--	--	--	--	--	--	--	--
33	I-10 Near Road[##]	5035	--	--	--	--	--	--	--	--	--	--	--	--	--	--
33	CA-60 Near Road[##]	5036	--	--	--	--	--	356	53.10	33.70	4 (1%)	14.36	--	--	--	--
34	Central San Bernardino Valley 1	5197	40	61	0	6 (15%)	35.8	117	46.10	27.40	1 (1%)	11.95	--	--	44	3.0
34	Central San Bernardino Valley 2	5203	320	80	0	81 (25%)	38.7	115	25.70	24.70	0	11.66	0.010	0.009	--	--
35	East San Bernardino Valley	5204	40	57	0	1 (3%)	23.4	--	--	--	--	--	--	--	--	--
37	Central San Bernardino Mountains	5181	40	51	0	1 (3%)	18.1	--	--	--	--	--	--	--	--	--
38	East San Bernardino Mountains	5818	--	--	--	--	--	58	24.30	20.40	0	7.62	--	--	--	--
	DISTRICT MAXIMUM [l)]			259	1	154	52.2		53.1	34.1	7	14.36	0.016	0.011		5.2
	SOUTH COAST AIR BASIN [m)]			124	0	173	52.2		53.1	34.1	13	14.36	0.016	0.011		5.2

* Incomplete data due to the site improvement. ** Salton Sea Air Basin µg/m^3 – Micrograms per cubic meter of air AAM – Annual Arithmetic Mean -- Pollutant not monitored

\+ High PM10 (≥ 155 µg/m^3) data recorded in the Coachella Valley and the Basin attributed to high winds are excluded because they likely meet the exclusion criteria specified in the U.S. EPA Exceptional Event Rule. Exceptional event demonstrations will be submitted to U.S. EPA for events that have regulatory significance.

\# PM2.5 concentrations above the 24-hour standard attributed to wildfire smoke and fireworks are excluded because they likely meet the exclusion criteria specified in the U.S. EPA Exceptional Event Rule. Exceptional event demonstrations will be submitted to U.S. EPA for events that have regulatory significance.

e) PM10 statistics listed above are based on combined Federal Reference Method (FRM) and Federal Equivalent Method (FEM) data.

f) State annual average (AAM) PM10 standard is 20 µg/m^3. Federal annual PM10 standard (50 µg/m^3) was revoked in 2006.

g) PM2.5 statistics listed above represent FRM data only with the exception of Central Orange County, I-710 Near Road, Metropolitan Riverside County 1 and 3, CA-60 Near Road, and South Coastal LA County 2 where FEM PM2.5 measurements are used to supplement missing FRM measurements because they pass the screening criteria in the South Coast AQMD Continuous Monitor Comparability Assessment and Request for Waiver dated July 1, 2021.

h) The Federal and State annual standards are 12.0 µg/m^3.

i) Federal lead standard is 3-months rolling average > 0.15 µg/m^3; state standard is monthly average ^{3} 1.5 µg/m^3. Lead standards were not exceeded.

j) State sulfate standard is 24-hour ^{3} 25 µg/m^3. There is no federal standard for sulfate.

k) Filter-based measurements for PM10 from March 28, 2020 to June 26, 2020 are not available due the COVID-19 Pandemic

l) District Maximum is the maximum value calculated at any station in the South Coast AQMD Jurisdiction

m) Concentrations are the maximum value observed at any station in the South Coast Air Basin. Number of daily exceedances are the total number of days that the indicated concentration is exceeded at any station in the South Coast Air Basin

++ Higher lead concentrations were recorded at near-source monitoring sites immediately downwind of stationary lead sources. Maximum monthly and 3-month rolling averages recorded were 0. 096 µg/m^3 and 0.059 µg/m^3, respectively.

\## Four near-road sites measuring one or more of the pollutants PM2.5, CO and/or NO2 are operating near the following freeways: I-5, I-10, CA-60 and I-710.