



air pollution control district
SANTA BARBARA COUNTY

Annual Air Quality Report

2019

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1 2019 AIR QUALITY SUMMARY

This annual report provides information on the measured air quality concentrations in Santa Barbara County for 2019, as well as information on air quality trends. The report is available for download at the District's website, www.ourair.org/air-monitoring.

- Air quality standards and monitoring station locations are discussed in Section 2.
- Detailed air quality data for 2019 are provided in Section 3 for gaseous pollutants, and Section 4 for particulate matter.
- Section 5 includes a discussion of air quality trends.

In 2019, Santa Barbara County met the federal ambient air quality standards for all measured pollutants except the 8-hour ozone standard. The state ambient air quality standards were met for all pollutants except the 24-hour PM₁₀ standard and the 8-hour ozone standard.

Countywide, the federal and state 8-hour ozone standards were exceeded on one day, at three stations: Carpinteria, Paradise, and Las Flores Canyon. Measured concentrations at all other areas within Santa Barbara County were below the federal and state ozone standards during 2019.

The state 24-hour PM₁₀ standard of 50 µg/m³ was exceeded on 17 days countywide. The Santa Maria station exceeded that standard on all 17 days; the Las Flores Canyon and Santa Barbara stations exceeded the standard on 4 of those 17 days. All other stations had less than 4 exceedances of the state 24-hour PM₁₀ standard. The state annual arithmetic mean PM₁₀ standard of 20 µg/m³ was exceeded at the Santa Barbara and Santa Maria monitoring stations.

Table 1 presents a summary of the number of exceedances for each monitoring station in Santa Barbara County. A tabular summary of the federal and state ambient air quality standards is included in Appendix A.

TABLE 1-1: SANTA BARBARA COUNTY EXCEEDANCE SUMMARY FOR 2019¹

Number of Days that Exceeded Air Quality Standard									
Station	O ₃ -1hr (state)	O ₃ -8hr (state)	O ₃ -8hr (federal)	NO ₂	SO ₂	CO	PM ₁₀ (state)	PM ₁₀ (federal)	PM _{2.5} (federal)
Carpinteria	0	1	1	0	-	-	-	-	-
El Capitan	0	0	0	0	0	-	0	0	-
Goleta	0	0	0	0	-	0	2	0	0
Las Flores Canyon	0	1	1	0	0	0	4	0	-
Lompoc H Street	0	0	0	0	0	0	3	0	0
Lompoc North	0	0	0	0	0	-	-	-	-
Nojoqui	0	0	0	0	-	-	-	-	-
Paradise	0	1	1	0	-	-	-	-	-
Santa Barbara	0	0	0	-	-	-	4	0	0
Santa Maria	0	0	0	0	-	0	17	0	0
Santa Ynez	0	0	0	-	-	-	-	-	-
Vandenberg South Base	0	0	0	0	0	0	-	-	-
Countywide Total	0	1	1	0	0	0	17	0	0

¹ A dash indicates that the pollutant is not measured at this location.

2 AMBIENT AIR QUALITY STANDARDS AND AIR MONITORING STATIONS

Ambient Air Quality Standards

The Federal Clean Air Act (CAA) (Title 1, Section 109) requires the Environmental Protection Agency (EPA) to prescribe national primary ambient air quality standards (NAAQS) for certain air pollutants where public health criteria have been established. These pollutant levels were chosen to protect the health of the most susceptible individuals in a population, including children, the elderly, and those with chronic respiratory ailments. A secondary standard is also prescribed to protect human welfare (visibility, crop damage, building damage). These pollutants are known as criteria pollutants.

The EPA currently has NAAQS for six criteria pollutants: ozone (O₃), nitrogen dioxide (NO₂), carbon monoxide (CO), sulfur dioxide (SO₂), lead (Pb), particulate matter less than ten microns in diameter (PM₁₀) and fine particulate matter less than 2.5 microns in diameter (PM_{2.5}).

In addition to the EPA standards, the California Air Resources Board (CARB) has set air quality standards for the same federal criteria pollutants as well as four others: sulfates, hydrogen sulfide (H₂S), vinyl chloride (chloroethene, C₂H₃Cl), and visibility-reducing particles.

A list of the federal and state standards applicable in 2019 can be found in Appendix A. During 2019, there were no changes to federal or state or ambient air quality standards.

Air Monitoring Stations

In 2019, there were 16 monitoring stations operating in Santa Barbara County. Thirteen stations measured ambient air and meteorological conditions, two stations measured odors, and one station only measured meteorological conditions. Nine were operated by the Santa Barbara County Air Pollution Control District (APCD). The remaining stations were operated by CARB and private industry. The monitoring stations are divided into two categories: State and Local Air Monitoring Stations (SLAMS) and Industrial Monitoring Stations (IMS). The SLAMS stations are designed to monitor the air in the urban areas of the county while the IMS stations are required by several facility permits, in order to monitor air quality impacts from the operation of these facilities. While IMS stations are typically not compared to air quality standards, three in our network have their ozone monitors designated as SLAMS and are compared to the NAAQS. Figure 1 shows the locations of all monitoring stations in Santa Barbara County operating in 2019. Table 2 lists the monitoring stations operating in Santa Barbara County during 2019, the pollutants and parameters measured at each station, and their designations.

FIGURE 2-1: 2019 SANTA BARBARA COUNTY AIR MONITORING STATIONS

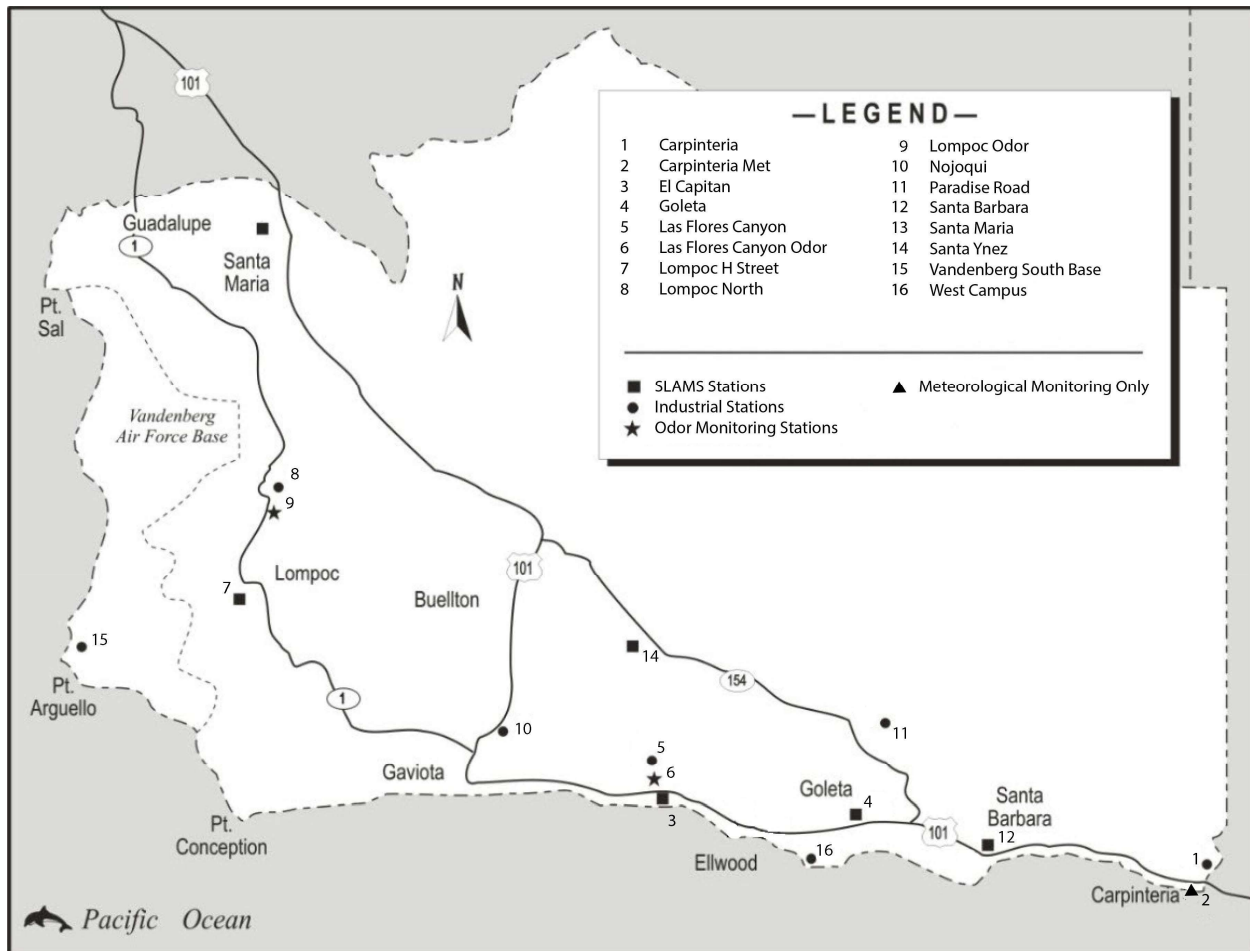


TABLE 2-1: MONITORING STATION PARAMETER LIST FOR 2019

Station	O ₃	NO ₂	SO ₂	CO	THC	H ₂ S	TRS	PM ₁₀	PM _{2.5}	WS	WD	ATM
Carpinteria	X	X								X	X	X
Carpinteria Met										X	X	X
El Capitan*	X	X	X					X		X	X	X
Goleta	X	X*		X*				X	X	X	X	X
Las Flores Canyon	X	X	X	X	X			X		X	X	X
Las Flores Canyon Odor						X				X	X	X
Lompoc H Street	X	X	X	X				X	X	X	X	X
Lompoc North	X	X	X		X					X	X	X
Lompoc Odor						X	X			X	X	X
Nojoqui*	X	X								X	X	X
Paradise Road	X	X								X	X	X
Santa Barbara	X							X	X	X	X	X
Santa Maria	X	X		X				X	X	X	X	X
Santa Ynez	X											
Vandenberg South Base*	X	X	X	X	X			X		X	X	X
West Campus			X		X	X	X			X	X	
SLAMS Monitors					Non-NAAQS Monitors							
*	Q1 Only					THC		Total Hydrocarbons				
WS	Wind Speed					TRS		Total Reduced Sulfur				
WD	Wind Direction					ATM		Ambient Temperature				

Monitoring Station Changes During 2019

The District received approval from the EPA and CARB to cease monitoring of all pollutants at the El Capitan, Nojoqui, and Vandenberg South Base monitoring stations, and CO and NO₂ at the Goleta monitoring station. These changes went into effect during the first quarter of 2019.

Ongoing Changes From 2018

The permit holders responsible for the operation of the Las Flores Canyon Odor site have received District approval to temporarily shut down the site while production at the associated processing plant is not in operation. The site was temporarily shut down in July 2018 and will be re-started when production at the associated processing plant resumes.

3 GASEOUS POLLUTANT SUMMARY

Gaseous air quality analyzers are operated in climate-controlled monitoring stations located throughout the county. These analyzers measure air quality 24 hours a day, except when they go through a nightly testing routine where they are challenged with known concentrations of calibration gas, in order to ensure data precision and accuracy. They collect real-time measurements that are used to calculate 1-hour and 8-hour concentrations, as applicable, for comparison to air quality standards. Ozone was measured at 12 stations throughout the county during 2019, NO₂ was measured at 10 stations, SO₂ was measured at six stations, and CO was measured at five stations. Section 2 of this report provides additional information on the monitoring network.

A summary of the highest gaseous pollutant values measured in Santa Barbara County during 2019 is provided in Tables 3-1 through 3-5. The tables show the four highest concentrations for each pollutant in 2019 and the dates they occurred.

TABLE 3-1: FOUR HIGHEST 1-HOUR O₃ CONCENTRATIONS FOR 2019¹

O ₃ 1-hour (ppb)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Carpinteria	86	9/14/2019	14:00	82	4/1/2019	15:00	82	4/18/2019	14:00	79	10/6/2019	13:00
Santa Barbara	81	4/18/2019	13:00	74	10/6/2019	14:00	69	4/1/2019	13:00	69	9/14/2019	13:00
Las Flores Canyon	78	10/6/2019	22:00	75	4/18/2019	13:00	75	10/13/2019	17:00	74	9/25/2019	15:00
Santa Ynez	78	10/6/2019	14:00	67	9/14/2019	13:00	66	10/5/2019	13:00	65	8/14/2019	13:00
Paradise	77	10/6/2019	16:00	70	3/19/2019	14:00	68	10/5/2019	15:00	67	9/12/2019	16:00
Goleta	72	10/6/2019	14:00	69	9/14/2019	13:00	68	4/1/2019	14:00	67	10/12/2019	15:00
Lompoc North	68	9/13/2019	17:00	66	3/19/2019	14:00	63	9/14/2019	0:00	60	3/17/2019	16:00
Santa Maria	59	3/19/2019	15:00	55	10/6/2019	14:00	52	10/5/2019	12:00	51	10/7/2019	11:00
El Capitan*	57	3/17/2019	15:00	56	3/19/2019	14:00	54	3/18/2019	11:00	53	2/8/2019	15:00
Vandenberg South Base*	54	2/13/2019	0:00	53	2/12/2019	18:00	51	1/11/2019	23:00	50	1/26/2019	21:00
Nojoqui*	47	3/19/2019	13:00	42	3/18/2019	14:00	41	3/17/2019	14:00	41	3/31/2019	14:00
Lompoc H Street	41	10/7/2019	10:00	39	10/12/2019	13:00	37	9/13/2019	13:00	37	10/5/2019	12:00

¹ State Standard = 0.09 ppm (95 ppb); *Q1 only

TABLE 3-2: FOUR HIGHEST 8-HOUR O₃ CONCENTRATIONS FOR 2019¹

O ₃ 8-hour (ppb)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Las Flores Canyon	72	10/6/2019	16:00	70	10/13/2019	13:00	68	9/14/2019	11:00	66	11/1/2019	11:00
Carpinteria	71	10/6/2019	9:00	69	9/14/2019	10:00	68	4/1/2019	11:00	68	4/18/2019	10:00
Paradise	71	10/6/2019	11:00	65	3/19/2019	10:00	63	10/5/2019	10:00	62	9/14/2019	10:00
Santa Ynez	68	10/6/2019	10:00	60	9/14/2019	9:00	60	10/5/2019	10:00	58	3/19/2019	11:00
Santa Barbara	67	4/18/2019	11:00	65	10/6/2019	10:00	62	9/14/2019	11:00	61	4/1/2019	11:00
Lompoc North	64	9/13/2019	15:00	58	3/19/2019	10:00	58	9/14/2019	9:00	57	3/17/2019	10:00
Goleta	62	10/6/2019	9:00	60	9/14/2019	10:00	59	4/1/2019	10:00	57	10/12/2019	10:00
El Capitan*	54	3/17/2019	10:00	51	3/14/2019	12:00	51	3/19/2019	10:00	50	3/18/2019	10:00
Vandenberg South Base*	52	2/12/2019	16:00	48	1/26/2019	18:00	47	2/4/2019	20:00	47	2/10/2019	9:00
Santa Maria	52	3/19/2019	11:00	46	3/17/2019	10:00	46	9/13/2019	10:00	45	3/14/2019	10:00
Nojoqui*	41	3/19/2019	11:00	38	3/17/2019	11:00	37	3/13/2019	10:00	37	3/14/2019	12:00
Lompoc H Street	33	4/9/2019	13:00	33	9/13/2019	10:00	33	10/5/2019	10:00	32	10/12/2019	10:00

¹ Federal and State Standard = 0.070 ppm (70 ppb); *Q1 only

TABLE 3-3: FOUR HIGHEST 1-HOUR NO₂ CONCENTRATIONS FOR 2019¹

NO ₂ (ppb)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Santa Maria	34	10/24/2019	18:00	33	1/26/2019	18:00	31	12/16/2019	18:00	30	11/1/2019	18:00
Goleta*	27	2/19/2019	7:00	20	1/3/2019	9:00	19	1/5/2019	8:00	19	2/12/2019	18:00
Lompoc H Street	27	10/21/2019	6:00	25	1/2/2019	20:00	25	1/25/2019	7:00	25	11/1/2019	6:00
Carpinteria	18	9/5/2019	18:00	16	1/5/2019	7:00	13	12/5/2019	16:00	12	1/11/2019	14:00
El Capitan*	18	2/12/2019	17:00	14	1/28/2019	7:00	12	1/3/2019	17:00	12	1/23/2019	19:00
Nojoqui	11	3/19/2019	8:00	10	1/30/2019	15:00	10	3/28/2019	7:00	9	1/28/2019	13:00
Las Flores Canyon	11	1/5/2019	11:00	11	2/12/2019	17:00	9	12/22/2019	8:00	8	12/4/2019	1:00
Paradise	11	1/5/2019	4:00	9	1/11/2019	15:00	7	2/12/2019	19:00	5	1/4/2019	17:00
Lompoc North	10	12/3/2019	23:00	6	12/4/2019	0:00	4	2/12/2019	20:00	4	10/16/2019	6:00
Vandenberg South Base*	9	1/16/2019	15:00	9	2/12/2019	15:00	5	1/4/2019	9:00	5	1/11/2019	5:00

¹ Federal Standard = 0.100 ppm (100 ppb); State Standard = 0.18 ppm (180 ppb); *Q1 only

TABLE 3-4: FOUR HIGHEST 1-HOUR SO₂ CONCENTRATIONS FOR 2019¹

SO ₂ (ppb)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Lompoc H Street	4	8/14/2019	14:00	4	9/2/2019	3:00	3	4/17/2019	9:00	3	7/3/2019	10:00
Vandenberg South Base*	2	1/5/2019	2:00	2	1/1/2019	2:00	2	1/2/2019	2:00	2	1/3/2019	2:00
El Capitan*	1	1/28/2019	12:00	1	2/26/2019	3:00	0	1/1/2019	1:00	0	1/2/2019	3:00
Las Flores Canyon	1	1/28/2019	11:00	1	2/1/2019	3:00	1	2/24/2019	3:00	1	2/28/2019	3:00
West Campus	1	6/7/2019	2:00	1	10/11/2019	7:00	1	10/12/2019	2:00	1	10/21/2019	2:00
Lompoc North	1	1/15/2019	11:00	1	2/1/2019	2:00	1	2/23/2019	18:00	1	4/9/2019	9:00

¹ Federal Standard = 0.075 ppm (75 ppb); State Standard = 0.25 ppm (250 ppb); *Q1 only

TABLE 3-5: FOUR HIGHEST 1-HOUR CO CONCENTRATIONS FOR 2019¹

CO (ppm)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Santa Maria	4	5/24/2019	18:00	1	9/20/2019	17:00	1	1/18/2019	7:00	1	12/9/2019	7:00
Goleta*	1	1/30/2019	10:00	1	1/2/2019	8:00	1	1/3/2019	8:00	1	1/5/2019	20:00
Lompoc H Street	1	1/25/2019	7:00	1	12/16/2019	7:00	1	1/24/2019	7:00	1	2/22/2019	7:00
Vandenberg South Base*	1	2/14/2019	4:00	1	2/12/2019	8:00	1	2/13/2019	0:00	1	2/20/2019	2:00
Las Flores Canyon	1	11/1/2019	12:00	1	11/26/2019	13:00	1	1/5/2019	10:00	1	1/9/2019	3:00

¹ Federal Standard = 35 ppm; State Standard = 20 ppm; *Q1 only

4 PARTICULATE MATTER SUMMARY

Seven stations collected PM₁₀ data in 2019. The seven stations used a PM₁₀ Beta Attenuation Monitor (BAM) sampler that operated 24 hours a day and provided real-time hourly values for ambient PM concentrations. Four stations collected PM_{2.5} data using a PM_{2.5} BAM, collecting continuous hourly data. The hourly concentrations are used to calculate daily 24-hour concentrations for comparison with the air quality standards.

A summary of the highest particulate matter values in Santa Barbara County during 2019 is provided in Tables 4-1 through 4-4. The summaries contain the four highest 24-hour PM concentrations, and the annual averages for each station. The state air quality standards are based on data collected at local conditions (i.e., pressure and temperature measured at the time of the sampling), while the federal standards are based on data corrected to standard conditions (i.e., pressure and temperature corrected to standard conditions at sea level).

TABLE 4-1: FOUR HIGHEST 24-HOUR AVERAGE LOCAL PM₁₀ CONCENTRATIONS FOR 2019¹

Particulate Matter Less Than 10 Microns (µg/m ³)								
Station	1st	Date	2nd	Date	3rd	Date	4th	Date
Santa Maria	137	10/28/2019	90	11/25/2019	89	4/9/2019	69	9/13/2019
Lompoc H Street	84	10/28/2019	53	11/25/2019	51	4/9/2019	47	11/1/2019
Las Flores Canyon	79	11/25/2019	73	10/28/2019	63	10/29/2019	56	10/10/2019
Santa Barbara	72	11/25/2019	64	10/10/2019	63	10/29/2019	53	10/28/2019
Goleta	63	11/25/2019	53	10/10/2019	49	10/28/2019	49	10/29/2019
Vandenberg South Base*	46	1/18/2019	38	1/17/2019	30	2/16/2019	27	2/17/2019
El Capitan*	32	1/17/2019	27	1/18/2019	25	1/9/2019	25	1/19/2019

¹ State 24-Hour Standard = 50 µg/m³ at local conditions; *Q1 only

TABLE 4-2: FOUR HIGHEST 24-HOUR AVERAGE STANDARD PM₁₀ CONCENTRATIONS FOR 2019¹

Particulate Matter Less Than 10 Microns (µg/m ³)								
Station	1st	Date	2nd	Date	3rd	Date	4th	Date
Santa Maria	132	10/28/2019	87	11/25/2019	86	4/9/2019	69	9/13/2019
Lompoc H Street	80	10/28/2019	50	11/25/2019	49	4/9/2019	44	11/1/2019
Las Flores Canyon	76	11/25/2019	70	10/28/2019	61	10/29/2019	54	10/10/2019
Santa Barbara	70	11/25/2019	62	10/10/2019	61	10/29/2019	50	10/28/2019
Goleta	61	11/25/2019	51	10/10/2019	46	10/28/2019	46	10/29/2019
Vandenberg South Base*	44	1/18/2019	35	1/17/2019	28	2/16/2019	24	2/17/2019
El Capitan*	30	1/17/2019	25	1/18/2019	23	1/9/2019	23	1/19/2019

¹ Federal 24-Hour Standard = 150 µg/m³ at standard conditions; *Q1 only

TABLE 4-3: FOUR HIGHEST 24-HOUR AVERAGE PM_{2.5} CONCENTRATIONS FOR 2019¹

Particulate Matter Less Than 2.5 Microns (µg/m ³)								
Station	1st	Date	2nd	Date	3rd	Date	4th	Date
Goleta	26	11/1/2019	16	11/26/2019	15	11/2/2019	14	4/23/2019
Lompoc H Street	23	11/2/2019	21	11/1/2019	16	10/27/2019	16	11/7/2019
Santa Barbara	23	7/30/2019	21	7/29/2019	19	7/27/2019	19	8/5/2019
Santa Maria	15	4/9/2019	14	4/23/2019	13	4/22/2019	13	6/7/2019

¹ Federal 24-Hour Standard = 35 µg/m³ at local conditions

**TABLE 4-4: ANNUAL ARITHMETIC MEAN
PM CONCENTRATIONS FOR 2019^{1,2}**

Particulate Matter ($\mu\text{g}/\text{m}^3$)		
Station	PM₁₀	PM_{2.5}
Santa Maria	22.0	4.8
Santa Barbara	20.1	6.8
Lompoc H Street	14.8	4.6
Goleta	14.7	5.0
El Capitan*		
Las Flores Canyon*		
Vandenberg South Base*		

¹ Federal and State PM_{2.5} Annual Arithmetic Mean Standard = 12 $\mu\text{g}/\text{m}^3$ at local conditions

² State PM₁₀ Annual Arithmetic Mean Standard = 20 $\mu\text{g}/\text{m}^3$ at local conditions

* insufficient data

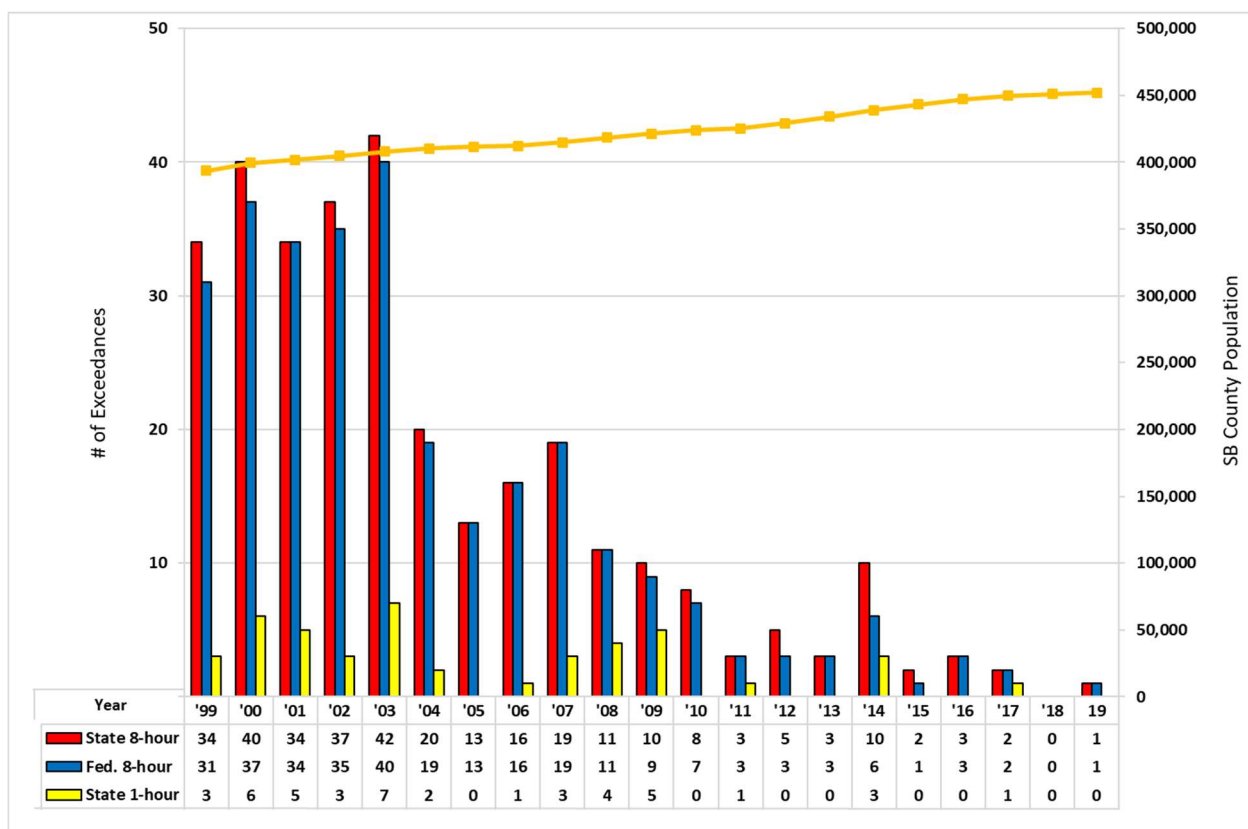
5 AIR QUALITY TRENDS

In 2019, Santa Barbara County generally had very good air quality, as evidenced by the data presented in this annual report. However, historical data show that this was not always the case. Over time, voluntary and regulatory measures, technology improvements, and better community and transportation planning have led to tremendous improvements in Santa Barbara County's air quality. This section provides information in several different formats to demonstrate the long-term trends for Santa Barbara County's air quality.

Number of Days Exceeding Ozone Standards

Figure 5-1 indicates the number of days that the county exceeded the federal and state ozone standard since 1999. The downward trend from 34 days in 1999 to 1 day in 2019 is a clear demonstration that the combined strategy of stationary and mobile source reductions of ozone precursor pollutants, in the form of both regulatory and voluntary measures, has achieved dramatic improvements in ozone levels. Figure 5-1 also includes information on population growth.

FIGURE 5-1: OZONE STANDARD EXCEEDANCE DAYS

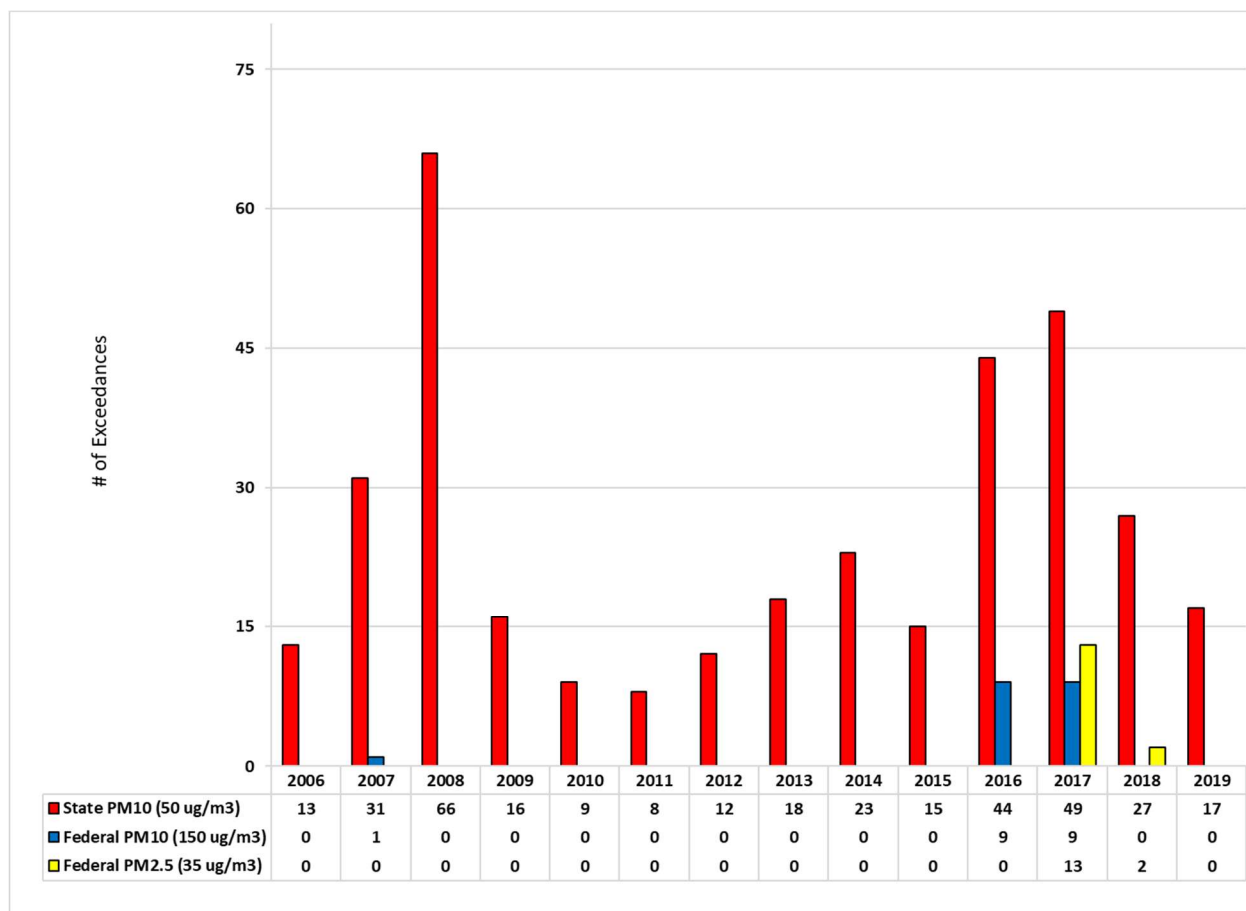


Number of Days Exceeding PM Standards

Prior to 2006, particulate monitoring in Santa Barbara County followed a six-day sampling schedule as set by federal and state agencies. Samples were taken over a 24-hour sampling period and required lab analysis to calculate the pollutant concentration. Our current network monitors PM data every day and every hour. The transition from six-day sampling to continuous sampling was phased in over a four-year period. The Santa Barbara and Santa Maria stations have continuously sampled both PM₁₀ and PM_{2.5} starting in 2006. The Lompoc station began continuous sampling for PM_{2.5} in 2007, and PM₁₀ was added in 2009. In 2010, continuous sampling for both PM₁₀ and PM_{2.5} was added at the Goleta station.

Figure 5-2 indicates the number of days that the county exceeded the state and federal PM standards since 2006. Data prior to 2006 is not provided because it does not compare well to the post-2006 PM data due to the difference in methods described above. Figure 5-2 shows that the county's particulate levels vary year-to-year, and the number of days that the county exceeds the air quality standards is influenced by natural events such as wildfires and droughts. Specifically, the Zaca Fire in 2007 burned for most of July and August and greatly affected particulate levels both locally and throughout the state. In 2008 and 2009, the Tea, Gap and Jesusita Fires caused high particulate levels while burning. More recently, the Thomas Fire and several other California wildfires caused high particulate levels. While fires are burning and smoke is present, PM_{2.5} levels are generally high and may cause health concerns. After fires are extinguished, residual ash can be re-entrained by wind and cause high PM₁₀ levels. During California's prolonged drought that occurred between December 2011 and March 2019, dry conditions likely contributed to many of these PM exceedances.

FIGURE 5-2: PARTICULATE MATTER EXCEEDANCES

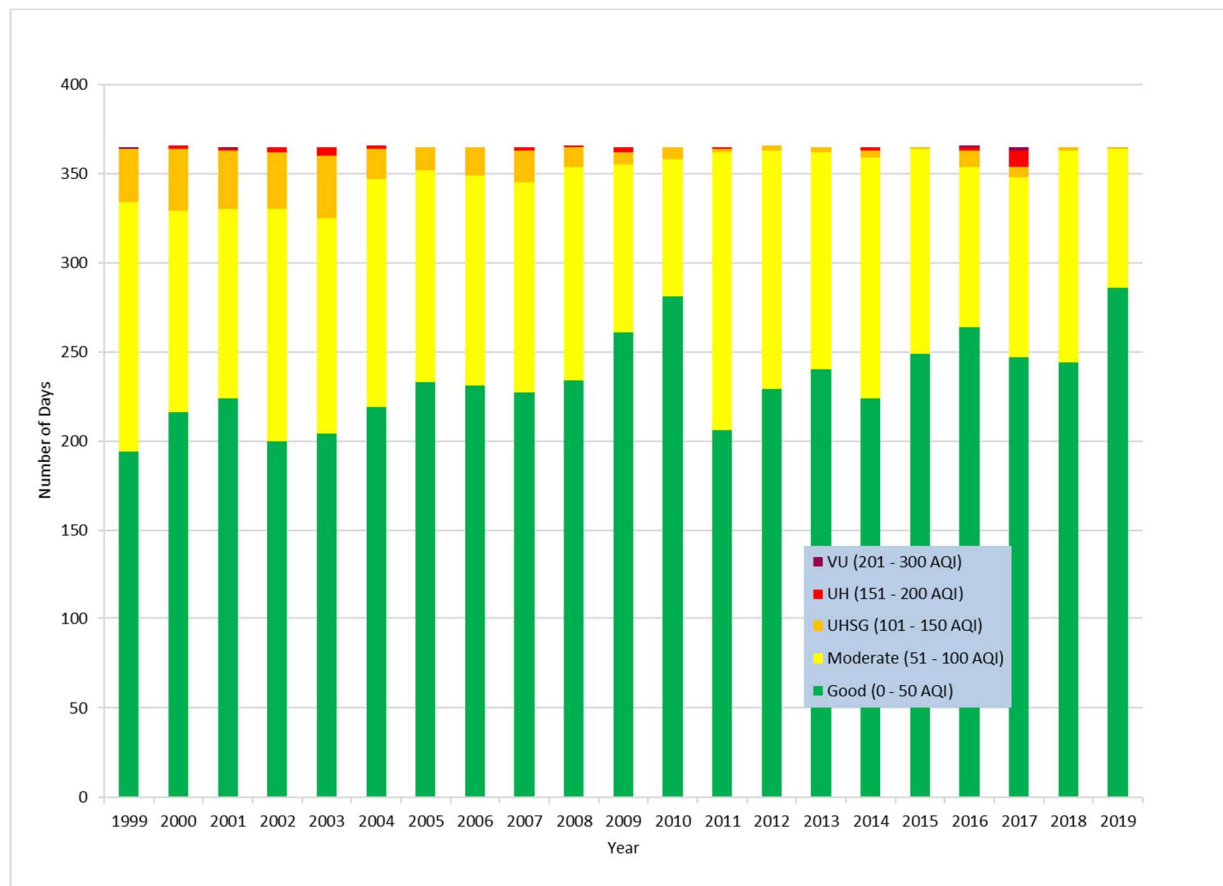


Air Quality Index Trends

The Air Quality Index, or AQI, is a standardized value that was developed by the EPA to communicate to the public on whether air pollution levels are healthy or unhealthy. Ground-level ozone and particulate matter are the two pollutants that pose the greatest threat to public health; the AQI value is based on the pollutant with the highest measured levels at that time. The AQI levels range from “good,” represented by a green color, to “hazardous,” represented by a maroon color. More information on the AQI can be found on the District’s website at www.ourair.org/todays-air-quality.

Figure 5-3 shows the numbers of days each year that Santa Barbara County air quality was at each of the different AQI levels. As demonstrated in this figure, the majority of days (286 days, or 78.3%) in Santa Barbara County were green, or good air quality, during 2019. The remainder of the days were moderate (78 days, 21.4%) or unhealthy for sensitive groups (1 day, or 0.3%). A moderate AQI means that there is a moderate health concern for individuals that are unusually sensitive to air pollution. The AQI trends in Figure 5-3 represent the highest AQI readings from all monitoring stations in the county each day.

FIGURE 5-3: AIR QUALITY INDEX TRENDS



Detailed Trends for Individual Pollutants

Figures 5-4 through 5-9 provide a more detailed picture of trends for each pollutant over time, and how the measured values for each pollutant have changed. These charts show trends for the highest measured values, using data from all monitoring stations in the county. Different types of values are referenced for each of the pollutants (e.g., 2nd and 4th maximum values for ozone), because each of the air quality standards define which values are relevant for that pollutant standard.

FIGURE 5-4: MEASURED OZONE LEVELS (PARTS PER BILLION)

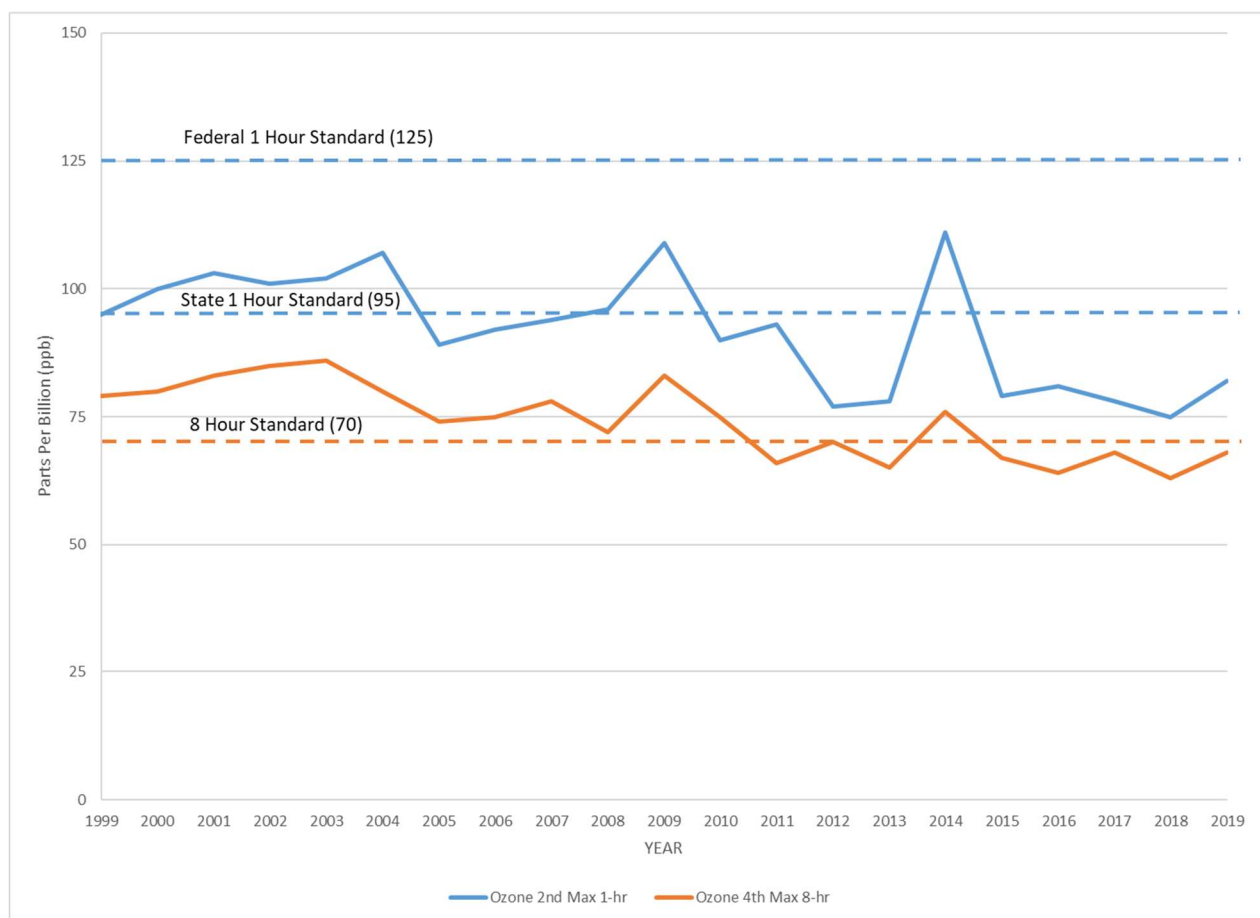


FIGURE 5-5: MEASURED NITROGEN DIOXIDE LEVELS (PARTS PER BILLION)

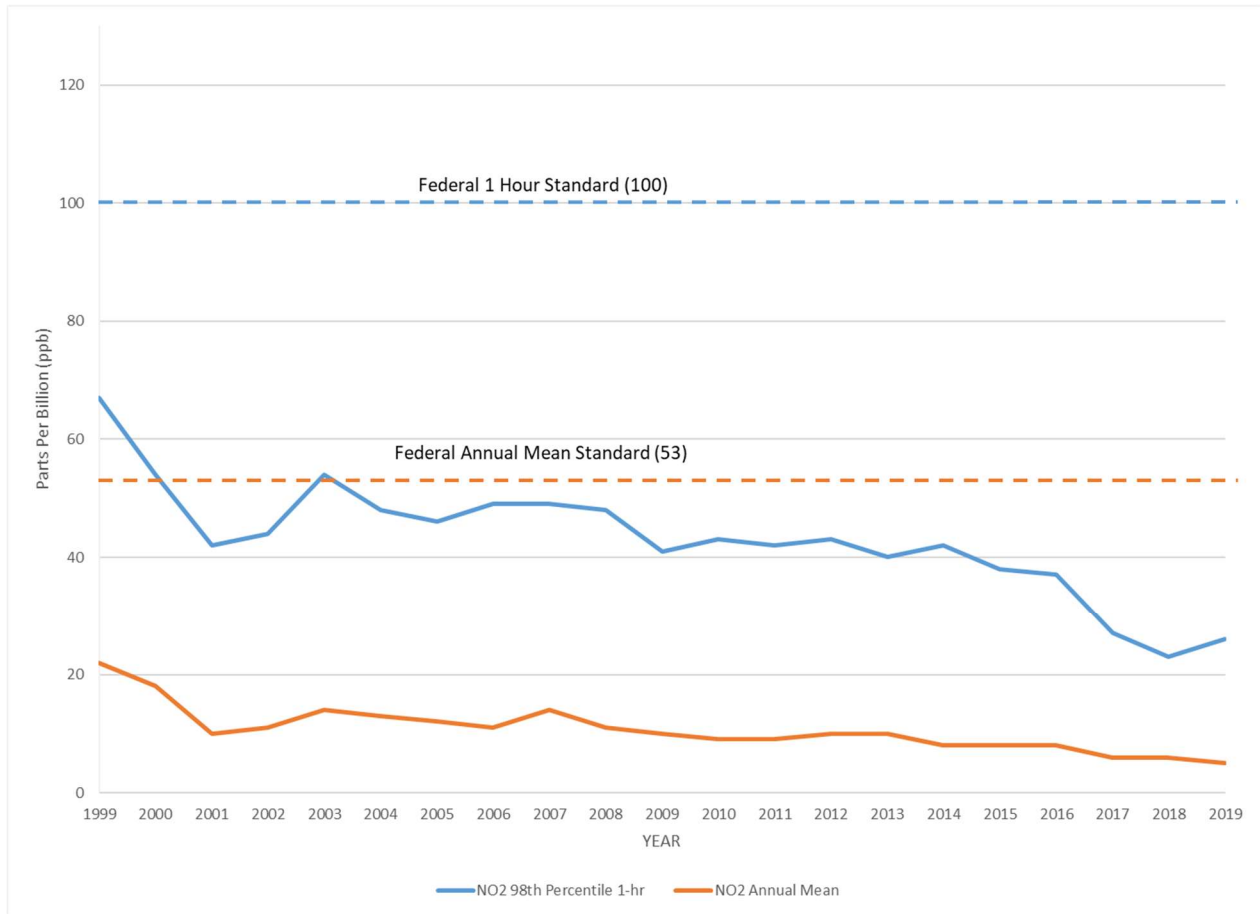
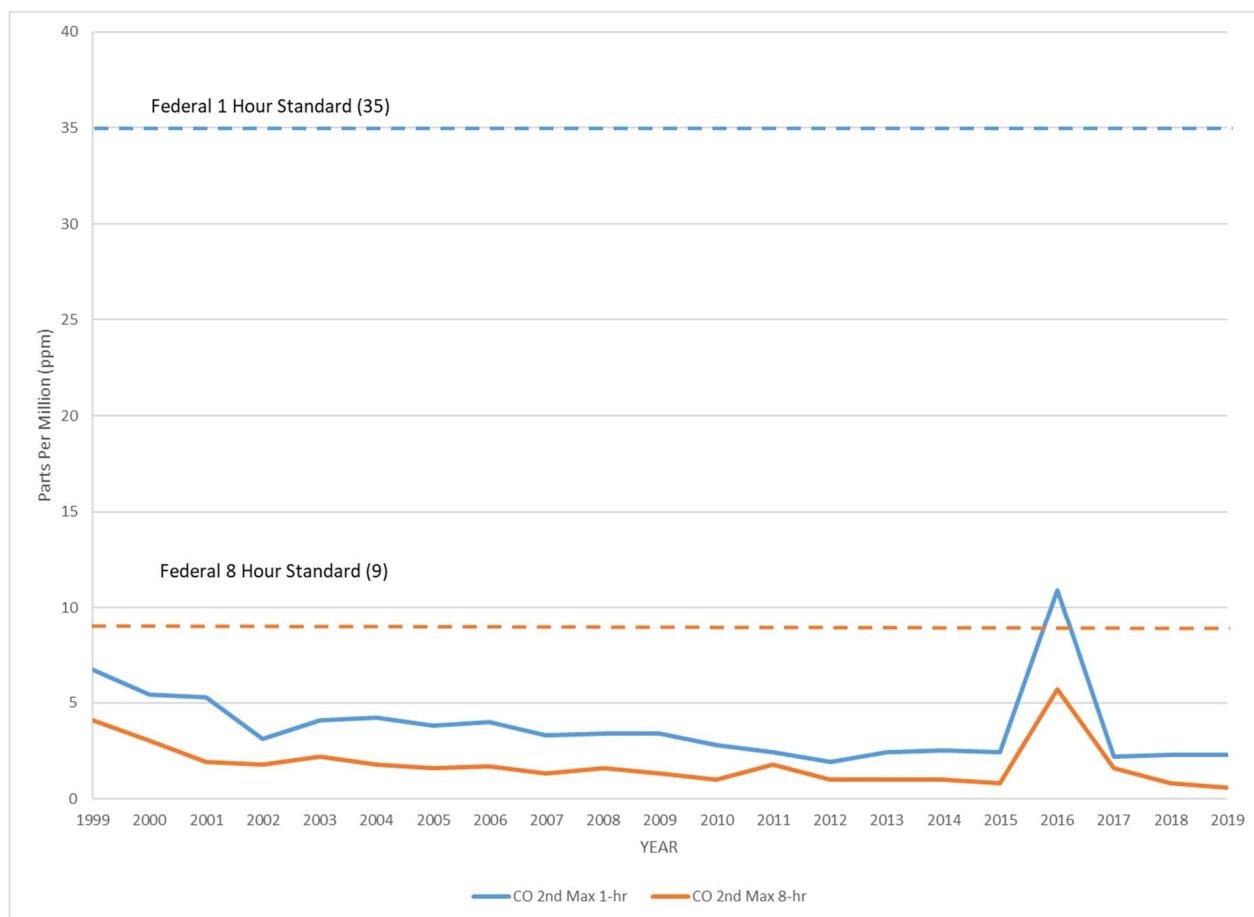


FIGURE 5-6: MEASURED SULFUR DIOXIDE LEVELS (PARTS PER BILLION)¹



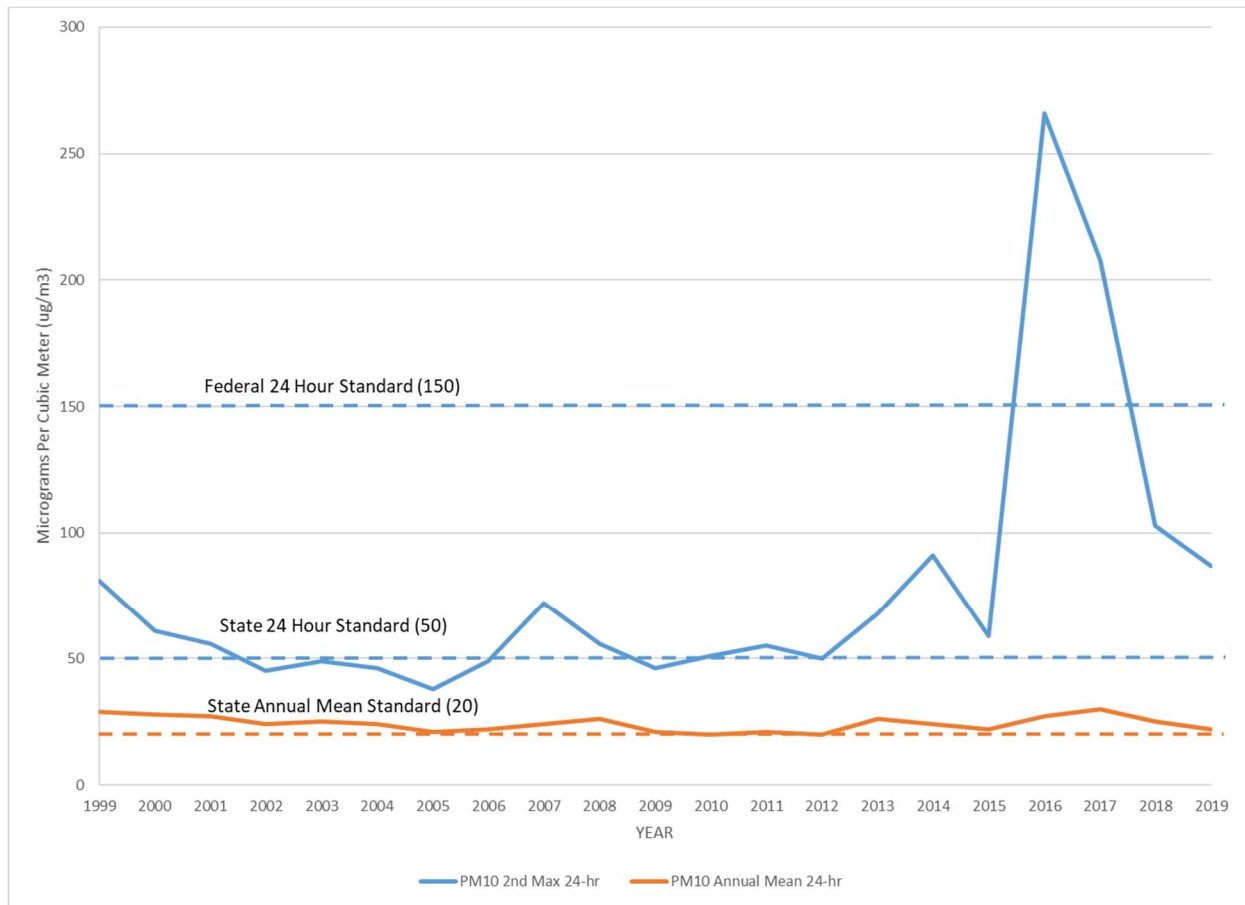
¹ High SO₂ levels recorded in 2012 were related to a release at the stationary source facility at Las Flores Canyon.

FIGURE 5-7: MEASURED CARBON MONOXIDE LEVELS (PARTS PER MILLION)¹



¹ High CO values recorded in 2016 were the result of the Sherpa wildfire burning near the Las Flores Canyon monitoring station.

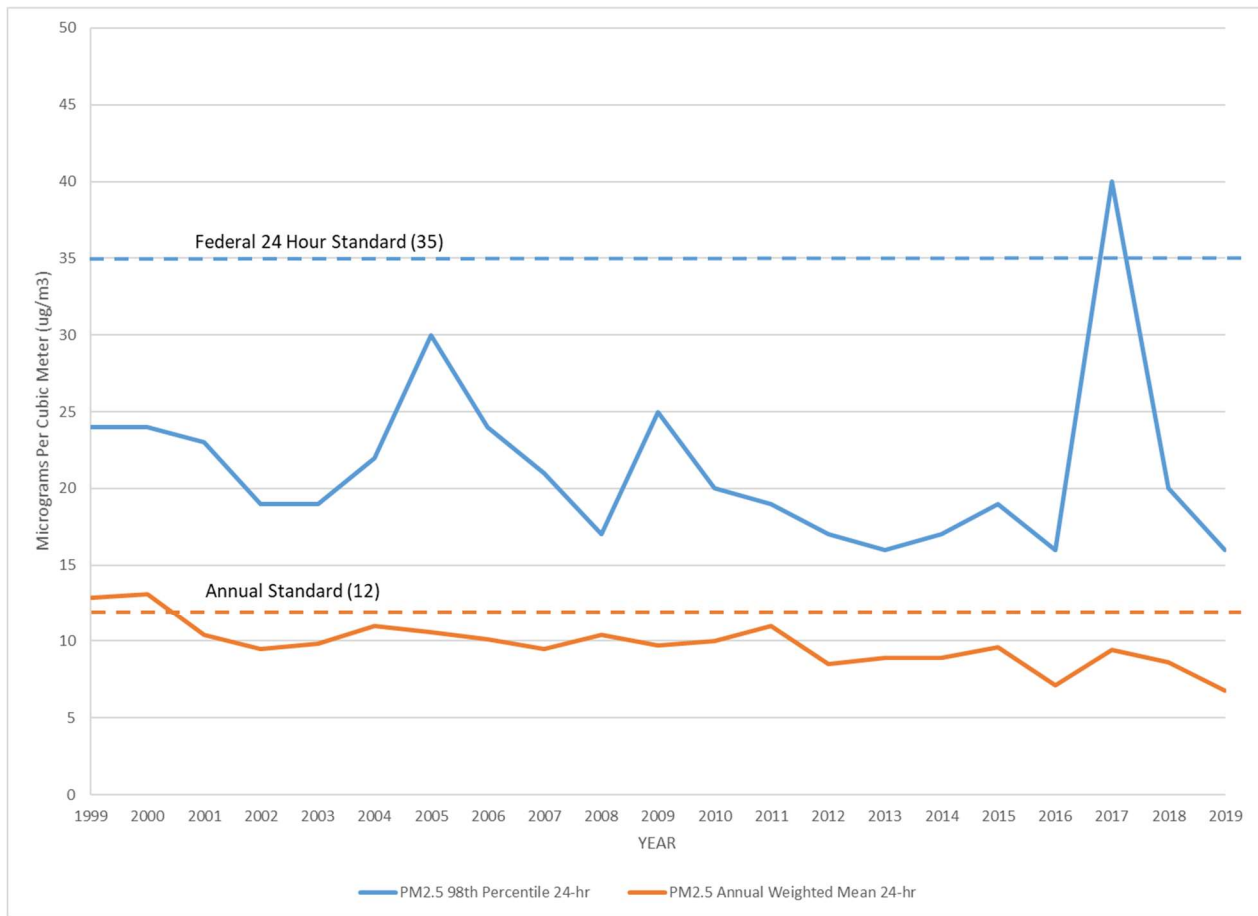
FIGURE 5-8: MEASURED PM₁₀ LEVELS ($\mu\text{g}/\text{m}^3$)^{1,2}



¹ Prior to 2006, samples were collected every 6 days. By 2010 all samples were continuous.

² High PM₁₀ values recorded in 2016 and 2017 were the result of wildfires.

FIGURE 5-9: MEASURED PM_{2.5} LEVELS ($\mu\text{g}/\text{m}^3$)^{1,2}



¹ Prior to 2006, samples were collected every 6 days. By 2010 all samples were continuous.

² High PM_{2.5} values recorded in 2016 and 2017 were the result of wildfires.

APPENDIX A

Ambient Air Quality Standards						
Pollutant	Averaging Time	California Standards		National Standards		
		Concentration ³	Method ⁴	Primary ^{3,5}	Secondary ^{3,6}	Method ⁷
Ozone (O ₃) ⁸	1 Hour	0.09 ppm (180 µg/m ³)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m ³)		0.070 ppm (137 µg/m ³)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m ³	Gravimetric or Beta Attenuation	150 µg/m ³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m ³		—		
Fine Particulate Matter (PM2.5) ⁹	24 Hour	—	—	35 µg/m ³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m ³	Gravimetric or Beta Attenuation	12.0 µg/m ³	15 µg/m ³	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m ³)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m ³)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m ³)		9 ppm (10 mg/m ³)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m ³)		—	—	
Nitrogen Dioxide (NO ₂) ¹⁰	1 Hour	0.18 ppm (339 µg/m ³)	Gas Phase Chemiluminescence	100 ppb (188 µg/m ³)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m ³)		0.053 ppm (100 µg/m ³)	Same as Primary Standard	
Sulfur Dioxide (SO ₂)	1 Hour	0.25 ppm (655 µg/m ³)	Ultraviolet Fluorescence	75 ppb (196 µg/m ³)	—	Ultraviolet Fluorescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m ³)	
	24 Hour	0.04 ppm (105 µg/m ³)		0.14 ppm (for certain areas)	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)	—	
Lead ^{12,13}	30 Day Average	1.5 µg/m ³	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m ³ (for certain areas) ¹²	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m ³		
Visibility Reducing Particles	8 Hour		Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m ³	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m ³)	Ultraviolet Fluorescence			
Vinyl Chloride ¹²	24 Hour	0.01 ppm (26 µg/m ³)	Gas Chromatography			

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1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above $150 \mu\text{g}/\text{m}^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.
8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.
9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from $15 \mu\text{g}/\text{m}^3$ to $12.0 \mu\text{g}/\text{m}^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at $35 \mu\text{g}/\text{m}^3$, as was the annual secondary standard of $15 \mu\text{g}/\text{m}^3$. The existing 24-hour PM10 standards (primary and secondary) of $150 \mu\text{g}/\text{m}^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.
10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.
11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.
Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard ($1.5 \mu\text{g}/\text{m}^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

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