

Chapter 4

Classification and Attainment

2015 Plan for the 1997 PM_{2.5} Standard
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Chapter 4: Classification and Attainment

As a Serious nonattainment area, the San Joaquin Valley (Valley) has until December 31, 2015 to attain the 1997 PM_{2.5} national ambient air quality standards (NAAQS) as determined using air monitoring data collected in calendar years 2013 through 2015.¹ Due to the extreme weather conditions experienced in 2013-2014, the Valley will not attain the standards by December 2015. Under federal Clean Air Act (CAA) Title 1, Part D, Subpart 4 (Subpart 4) Section (§) 188(e), upon application by any State, the EPA may grant one extension of the attainment date of up to five years for a Serious nonattainment area beyond the date specified under CAA §188(c)(2). To be granted an extension, an area must show that it cannot attain by 2015, but will attain as expeditiously as possible, and no later than 2020.

The San Joaquin Valley Air Pollution Control District's (District's) *2015 Plan for the 1997 PM_{2.5} Standards (2015 PM_{2.5} Plan)* includes a demonstration that the Valley will not attain the 1997 PM_{2.5} NAAQS by 2015, but will attain the federal standard as expeditiously as practicable. As such, this *2015 PM_{2.5} Plan* includes a request for an extension of the attainment deadline to 2020 with a demonstration of attainment by 2020.

4.1 IMPRACTICABILITY OF ATTAINMENT BY DECEMBER 31, 2015

Design values represent the official metric for assessing air quality improvements and attainment of the NAAQS per the Federal Clean Air Act and EPA regulations. Design value calculations are three-year averages that follow EPA protocols for rounding, averaging conventions, data completeness, sampling frequency, data substitutions, and data validity. The results provide consistency and transparency to determine basin-wide attainment for both components of the 1997 PM_{2.5} NAAQS, including the 24-hour PM_{2.5} standard of 65 µg/m³ and the annual PM_{2.5} standard of 15.0 µg/m³. If any monitoring site within the air basin has either a 24-hour or annual PM_{2.5} design value higher than the respective standard, then the entire air basin is designated nonattainment. EPA provides detailed guidelines and standards for the calculation² and data handling³ methodologies.

For the San Joaquin Valley to attain the 1997 NAAQS for the years 2013-2015, the monitoring data for this period would need to satisfy both the 24-hour average and annual average attainment tests, which are based on 98th percentile values and calendar year averages, respectively. Since the PM_{2.5} monitoring data during this period was heavily influenced by the extreme drought conditions, long periods of

¹ U.S. Environmental Protection Agency (2012, March 2). Memorandum from the Office of Air Quality Planning and Standards: Implementation Guidance for the 2006 24-Hour Fine Particle (PM_{2.5}) National Ambient Air Quality Standards (NAAQS). Pages 14-15. Retrieved from

http://www.epa.gov/ttn/naaqs/pm/pdfs/20120302_implement_guidance_24-hr_pm2.5_naaqs.pdf

² Interpretation of the National Ambient Air Quality Standards for PM_{2.5}, 40 C.F.R. Pt. 50 Appendix N (2012).

Available at <http://ecfr.gpoaccess.gov/cgi/t/text/text->

<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9bdb7a34dcb75892aef9ee60b74da642&rgn=div9&view=text&node=40:2.0.1.1.1.0.1.18.15&idno=40>

³ Environmental Protection Agency [EPA]: Office of Air Quality Planning and Standards. (1999, April). *Guideline on Data Handling Conventions for the PM NAAQS* (EPA-454/R-99-008). Retrieved from

<http://www.epa.gov/ttn/oarpg/t1/memoranda/pmfinal.pdf>

stagnation, and strong inversions experienced during the winter of 2013-2014, as described in more detail below, the Valley cannot demonstrate attainment of either component of the 1997 NAAQS by December 2015.

Meteorology during the Winter Season of 2013-2014

In 2013, California experienced record-low precipitation and snow pack levels at only 20 percent of the normal amount of snow to provide water for the year. Specifically, in the Valley, 2013 represented the driest year since the start of record keeping in 1895.

Extreme weather conditions over the winter of 2013-2014 overwhelmed emissions controls and led to abnormally high PM_{2.5} levels. Because of this, attainment of the 1997 annual and 24-hour PM_{2.5} standards based on 2012-2014 data is impossible. Furthermore, reclassification to Serious will not initially provide an attainment deadline that the Valley can meet, since the Serious deadline is based on 2013-2015 data, which is also heavily affected by the high PM_{2.5} values recorded during the winter period of 2013-2014.

Stable meteorology during the winter season can increase PM_{2.5} concentrations to high levels by providing strong temperature inversions and low wind speeds. When this occurs, the PM_{2.5} concentrations during the winter months of November to February can climb to very high levels. The winter of 2013-2014 experienced the strongest average atmospheric stability over the last 15 years creating conducive conditions for the formation and retention of high PM_{2.5} concentrations. This was the result of a persistent strong high pressure over the eastern Pacific that effectively blocked weather disturbances from entering California, which inhibited dispersion during November, December, and January.

In addition to the historically strong atmospheric stability, the winter of 2013-2014 also experienced record low precipitation totals, with some locations breaking records over 100 years old. These unprecedented dry conditions exacerbated the air quality challenge during the winter of 2013-2014. As a result of the extreme meteorology, the PM_{2.5} concentrations experienced in the Valley were the highest recorded in over a decade.

4.1.1 1997 Annual PM_{2.5} NAAQS

As background, the 1997 annual average PM_{2.5} standard was set at 15.0 µg/m³. The design value (DV) for the annual PM_{2.5} standard, which is the official EPA metric used to determine whether an area is in attainment of a standard, is defined as the 3-year average of annual averages over three consecutive years. Each individual annual average is calculated as the average among the four quarterly averages throughout the year. For example, the 2015 design value would be calculated as the average among the annual averages for the years 2013, 2014, and 2015, where the average of each of these individual years is calculated as the average among their respective quarterly averages. If the final annual average DV for all of the regulatory PM_{2.5} monitoring sites for the 3-year period is less than or equal to 15.0 µg/m³, then the area would be in attainment of the standard.

Because both 2013 and 2014 PM_{2.5} concentrations were influenced by the extreme weather of the 2013-14 winter season, the 2015 annual averages would have to be improbably low in the southern portion of the Valley in order for the 2013-2015 period to satisfy the annual average attainment test. To show this improbability, the District determined the maximum annual PM_{2.5} average needed in 2015 to bring each air quality monitoring site into attainment during the 2013-2015 period. This determination was made by first estimating the 2014 values with the best available information. On January 16, 2015 the District pulled data from the EPA Air Quality System (AQS) to estimate the 2014 values. Most values in the “2014 Estimated” column of Table 4-1 were determined using 2014 AQS data when available, and preliminary data was used for the remainder of the year. Sites marked with an asterisk were calculated using 4th Quarter 2013 PM_{2.5} Data because 4th Quarter 2014 filter data was unavailable at the time of this *2015 PM_{2.5} Plan*. The maximum annual PM_{2.5} average in 2015 needed to bring each site into attainment during the 2013-2015 period was then subsequently calculated. These results are displayed in Table 4-1.

The sites in Hanford, Visalia-Church, and Bakersfield-California would all have to have a 2015 annual average under 10 µg/m³. With the 2013 and 2014 PM_{2.5} data from Bakersfield-Planz, the site is already out of attainment of the annual standard, without including the 2015 data. In addition, historical data demonstrates that the Valley is not likely to achieve these annual averages for 2015. Based on this impossibility, the Valley cannot reach attainment of the annual average portion of the 1997 PM_{2.5} standard during the 2013-2015 period. This demonstrates the long reaching ramifications that one season of unusually high values due to the extreme weather can have on a region’s ability to reach attainment.

Table 4-1 Maximum Allowable PM_{2.5} Annual Averages Needed in 2015 to Reach Attainment of Annual Standard in 2013-2015

Site	2013 Measured Actuals	2014 Estimated	2015 Max Allowable for Attainment
Stockton-Hazelton	17.7	12.3	15.0
Manteca	11.6	9.9	23.5
Modesto	14.3	11.6	19.1
Turlock	15.0	12.6	17.4
Merced-M*	13.5	13.6	17.9
Merced-Coffee	13.3	10.9	20.8
Madera-City	17.8	14.2	13.0
Clovis	15.9	15.3	13.8
Fresno-Garland	16.8	15.3	12.9
Fresno-Winery*	15.9	16.8	12.3
Tranquility	8.3	7.9	28.8
Corcoran*	15.6	16.6	12.8
Hanford	18.2	17.2	9.6
Visalia-Church	18.9	16.7	9.4
Bakersfield-California	20.0	17.9	7.1

Site	2013 Measured Actuals	2014 Estimated	2015 Max Allowable for Attainment
Bakersfield-Planz*	22.8	24.6	-2.4

*Calculated using 4th Quarter 2013 PM2.5 Data, 2014 4th Quarter filter data unavailable at this time. All other sites, used 2014 AQS data when available, preliminary data was used for the remainder of the year.

4.1.2 1997 24-Hour PM2.5 NAAQS

The 1997 24-hour average PM2.5 standard was set at 65 $\mu\text{g}/\text{m}^3$. The DV for the 24-hour average PM2.5 standard, is defined as the 3-year average of annual 98th percentile values over three consecutive years. Each individual annual 98th percentile value is calculated by ranking the 24-hour average values within a year and selecting the value corresponding with the 98th percentile. The 98th percentile values for each individual year over the 3-year period are averaged to produce the final DV. For example, the 2015 design value would be calculated as the average among the 98th percentile values for the years 2013, 2014, and 2015. If the final annual average DV for all of the regulatory PM2.5 monitoring sites for the 3-year period is less than or equal to 65 $\mu\text{g}/\text{m}^3$, then the area would be in attainment of the standard.

The maximum 98th percentile 24-hour average PM2.5 concentrations in 2015 needed to bring each air quality monitoring site into attainment during the 2013-2015 period were calculated using a methodology similar to that discussed in Section 2.1.1. First, the 2014 values were estimated using data pulled from the EPA AQS on January 16, 2015. Most values in the “2014 Estimated” column of Table 4-2 were determined using 2014 AQS data when available, and preliminary data was used for the remainder of the year. Sites marked with an asterisk were calculated using 4th Quarter 2013 PM2.5 Data because 4th Quarter 2014 filter data was unavailable at the time of this 2015 PM2.5 Plan. The maximum 98th percentile 24-hour average PM2.5 concentrations in 2015 need to bring each site into attainment during the 2013-2015 period was then subsequently calculated. Refer to Table 4-2 for the results of this analysis.

As with the annual average data, because both 2013 and 2014 were influenced by the extreme weather of 2013-2014, the 2015 averages would have to be improbably low in the southern portion of the Valley. The Bakersfield-Planz air monitoring site would need to have a 98th percentile 24-hour PM2.5 concentration of 15.9 $\mu\text{g}/\text{m}^3$ for 2015 to show attainment for the three year average. Historical data demonstrates that the Valley is extremely unlikely to achieve these averages for 2015. Based on this impossibility, the Valley cannot reach attainment of the 24-hour average portion of the 1997 PM2.5 standard during the 2013-2015 period.

Table 4-2 Maximum Allowable 98th Percentile 24-Hour Average PM2.5 Concentrations Needed in 2015 to Reach Attainment of 24-Hour Standard

Site	2013 Measured Actuals	2014 Estimated	2015 Max Allowable for Attainment
Stockton-Hazelton	56.3	44.5	95.4
Manteca	40.2	40.0	116.0
Modesto	56.4	49.5	90.3
Turlock	55.4	51.0	89.8
Merced-M*	67.3	57.2	71.7
Merced-Coffee	42.3	43.9	110.0
Madera-City	54.6	56.1	85.5
Clovis	56.2	59.0	81.0
Fresno-Garland	63.8	65.5	66.9
Fresno-Winery*	71.6	71.6	53.0
Tranquility	35.7	31.2	129.3
Corcoran*	66.0	71.0	59.2
Hanford	67.6	82.0	46.6
Visalia-Church	62.5	74.0	59.7
Bakersfield-California	71.8	80.0	44.4
Bakersfield-Planz*	96.7	83.6	15.9

*Calculated using 4th Quarter 2013 PM2.5 Data, 2014 4th Quarter filter data unavailable at this time. All other sites, used 2014 AQS data when available, preliminary data was used for the remainder of the year.

4.2 REQUEST FOR SERIOUS NONATTAINMENT AREA ATTAINMENT DEADLINE EXTENSION⁴

The District also requested an extension of the Serious area attainment date by up to five years as allowed under CAA Subpart 4 §188(e). Before EPA may extend the attainment date for a Serious area under CAA Subpart 4 §188(e), California must satisfy specific requirements. Table 4-3 summarizes those requirements and where in the *2015 PM2.5 Plan* those requirements are demonstrated.

⁴ Designation of Areas for Air Quality Planning Purposes; California; San Joaquin Valley; Reclassification as Serious Nonattainment for the 1997 PM2.5 Standards. 80 Fed. Reg. 7, pp. 1482-1491. (2015, January 12). <http://www.gpo.gov/fdsys/pkg/FR-2015-01-12/pdf/2015-00309.pdf>

Table 4-3 Requirements for an Extension of the Serious Area Attainment Date

Description	2015 PM2.5 Plan
Apply for an extension of the attainment date beyond the statutory attainment date	Executive Summary
Demonstrate that attainment by the statutory attainment date is impracticable	Chapter 2
Demonstrate that the State has complied with all requirements and commitments pertaining to the area in the implementation plan	Chapter 3 Appendix C
Demonstrate to the satisfaction of the Administrator that the plan for the area includes the most stringent measures that are included in the implementation plan of any State or are achieved in practice in any State, and can feasibly be implemented in the area	Chapter 3 Appendix C
Submit a demonstration of attainment by the most expeditious alternative date practicable	Chapter 2 Appendix A

4.3 ATTAINMENT OUTLOOK

Attaining federal health-based air quality standards is an important milestone for improving public health. This *2015 PM2.5 Plan* demonstrates that the Valley will attain the federal 1997 PM2.5 standard as expeditiously as possible, with all feasible measures and strategies being implemented to accomplish this goal. Through ongoing implementation of the control strategy contained in the Plan, the Valley will come into attainment of the 24-hour standard by 2018, and the annual standard by 2020.

4.3.1 The Role of NOx Reductions in Assisting Valley Reach Attainment

Given the significant contribution of ammonium nitrate to the Valley's PM2.5 concentrations, reductions in NOx emissions are particularly important. To achieve the NOx reductions critical for reaching attainment in the Valley, ARB has adopted regulations that will significantly reduce NOx emissions from various mobile sources. Achieving this level of emissions reductions requires adequate time and carries a tremendous cost.

The District's "no stone unturned" evaluation of emissions sources and emissions controls demonstrate that the most stringent measures, which includes all reasonably available emission reduction opportunities and best available control measures, are in place in the Valley.

The attainment demonstration for this *2015 PM2.5 Plan* includes the benefits of ARB and District control programs that provide ongoing emission reductions. Continued implementation of these control programs provides new emission reductions each year, resulting in a forecasted 38 percent decrease in NOx emissions and a five percent decrease in PM2.5 emissions between 2012 and 2020.

The NOx reductions result from ongoing implementation of both new vehicle standards for passenger and heavy-duty diesel vehicles and equipment, as well as rules

accelerating the turnover of legacy diesel fleets. Implementation of stringent requirements for new off-road engines and in-use off road equipment lead to further NOx reductions, along with District rules addressing stationary source NOx emissions. PM2.5 emission reductions result from ongoing implementation of diesel on- and off-road equipment measures as well as the District's recently strengthened rule for wood-burning fireplaces and heaters.

4.3.2 Attainment Demonstration Modeling

The attainment demonstration approach for this *2015 PM2.5 Plan* is based on modeling conducted for the 2008 PM2.5 Plan, which also addressed the 1997 annual and 24-hour PM2.5 standards. The atmospheric dynamics and associated response to emission reductions represented in this modeling, coupled with 2013 design values (DV) and chemical composition, was used to project future (2020 for the annual standard and 2018 for the 24-hour standard) design values.

To assess the representativeness of the 2008 SIP modeling for capturing the dynamics and response to emission reductions for the updated attainment demonstration, ARB evaluated both the meteorological characteristics, as well as the chemical composition used in the two modeling efforts and found that they are very similar. Therefore, the 2008 PM_{2.5} SIP modeling response to emission reduction, applied to 2013 DVs, provides a suitable basis for the updated attainment demonstration.

To ensure consistency with the approved 2008 PM2.5 SIP modeling, the current effort uses a single DV representing 2013 based on ambient measurements during 2011-2013. The base emission year is the middle year of 2012, with future emission years of 2020 for the annual standard attainment demonstration, and 2018 for the 24-hour standard demonstration.

Due to the differences in base years (2005 for the *2008 PM2.5 Plan* vs. 2012 for the *2015 PM2.5 Plan*) and future years (2014 vs. 2018 or 2020), the RRFs calculated for the 2008 modeling cannot be used directly in the current Plan. Thus, the updated modeling uses scaled RRFs presented in the following equation.

$$RRF_{12-20} = \left[1 - (1 - RRF_{05-14}) \times \frac{\% \Delta E_{12-20}}{\% \Delta E_{05-14}} \right]$$

Here,

$$\% \Delta E_{12-20} = \frac{E_{12} - E_{20}}{E_{12}} \times 100\% \text{ and } \% \Delta E_{05-14} = \frac{E_{05} - E_{14}}{E_{05}} \times 100\%,$$

where, E_j is the total emissions for a given emissions component for year j ($= 2005, 2012, 2014, \text{ and } 2020$). That is, quantities in the above equation represent percent emissions changes for the current and 2008 Plans. Similarly, RRF_{i-k} represents RRF values for the current (2012-2020) and 2008 Plans (2005-2014).

4.3.3 Modeling Results

Eight of the fifteen sites in the Valley recorded 2013 DVs over the annual PM_{2.5} standard of 15 µg/m³. The higher DVs occurred in the Valley's southern region (including the Bakersfield and Visalia as well as Hanford) and the central region (around the Fresno urban area and Madera). Only one site in the northern region (Turlock) measured a 2013 DV over the standard. All sites in the SJV recorded 2013 DVs at or below the 24-hour standard of 65 µg/m³. In 2020, all sites in the Valley are projected to attain the annual standard. For those sites that exceeded the standard, the projected 2020 DVs range from 12.5 µg/m³ to 15.0 µg/m³.

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Table 4-4 Projected 2020 Annual and 2018 24-hour Design Values

Monitoring Site	AQS Site ID	Type	Speciation	2013 Ann. DV ¹	2020 Ann. DV with Rules ¹	2013 24-hr DV ²	2018 24-hr DV with Rules ²
Bakersfield - California Street	060290014	FRM	Bakersfield-California	16.4	13.7	64.6	51.6
Bakersfield - 410 E Planz	060290016	FRM	Bakersfield-California	17.0 ³	14.3	55.8 ³	44.9
Clovis - N Villa Avenue	060195001	FRM	Fresno-1 st	16.4 ⁴	13.3	57.6 ⁴	45.3
Fresno - 1st Street/Garland ⁵		FRM	Fresno-1 st	15.4 ⁵	12.5	62.0 ⁵	49.3
Fresno - Hamilton and Winery	060195025	FRM	Fresno-1 st	14.7	12.0	63.5	50.3
Hanford-S Irwin Street	060311004	FEM-BAM	Visalia - N Church	17.0	13.9	60.2	45.8
Madera	060392010	FEM-BAM	Fresno-1 st	18.1	15.0	52.3	41.4
Manteca-530 Fishback Rd	060772010	FEM-BAM	Modesto 14 th	10.2	8.7	36.7	32.1
Merced - 2334 M Street	060472510	FRM	Modesto 14 th	11.1	9.2	49.2	40.3
Merced – S Coffee Ave	060470003	FEM	Modesto 14 th	13.3	11.0	41.8	34.8
Modesto - 14 th Street	060990005	FRM	Modesto 14 th	13.6	11.5	50.6	42.2
Stockton - Hazelton Street	060771002	FRM	Modesto 14 th	13.8	12.0	45.0	39.0
Tranquility	060192009	FEM-BAM	Fresno-1 st	7.9	6.6	30.0	23.9
Turlock-S Minaret Street	060990006	FEM-BAM	Modesto 14 th	15.7	13.2	52.7	43.8
Visalia - N Church Street	061072002	FRM	Visalia - N Church	16.6	13.5	55.7	42.5

1 Design values equal to or less than 15.0 $\mu\text{g}/\text{m}^3$ attain the annual $\text{PM}_{2.5}$ standard

2 Design values equal to or less than 65.4 $\mu\text{g}/\text{m}^3$ attain the 24-hour $\text{PM}_{2.5}$ standard

3 Does not include 167.3 $\mu\text{g}/\text{m}^3$ measured on May 05, 2013 (supporting documentation provided in Attachment B)

4 Clovis 2013 DV is based on combined FRM/FEM BAM data

5 2013 DV is based on 2011 data for Fresno-1st (060190011) and 2012/2013 data for Fresno-Garland (060190008)

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