

## Chapter 2

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# Meeting Federal Requirements for Healthy Air

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## **Chapter 2: Meeting Federal Requirements for Healthy Air**

### **2.1 INTRODUCTION**

Pursuant to the federal Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) sets primary air quality standards to protect public health and secondary standards to protect welfare. Achieving the primary federal standards protects public health, reduces the region's health care costs, and improves the quality of life for Valley residents. This chapter describes PM<sub>2.5</sub> health effects, EPA's process for setting health-based standards, and how regions like the San Joaquin Valley work towards attaining those standards.

### **2.2 HEALTH EFFECTS**

Any particles 10 microns or less are considered respirable. The potential health impacts of particle pollution is linked to the size of the particles, with the smaller particles having larger impacts. PM<sub>10</sub> (which includes PM<sub>2.5</sub>) can reach the alveoli, the gas exchange zone deep in the lungs. PM<sub>2.5</sub> is of special concern to health because it is easily inhaled deep into the lungs, where it can be absorbed into the bloodstream or remain embedded for long periods of time without the ability to be exhaled (ALA 2002). PM can result in airway inflammation, and finer particles may carry toxic and biological materials, which can be absorbed by the blood in the gas exchange tissues of the lungs and carried to other parts of the body.

Numerous studies link PM to a variety of health effects, including aggravated asthma, increased respiratory symptoms (irritation of the airways, coughing, difficulty breathing), decreased lung function in children, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, increased respiratory and cardiovascular hospitalizations, lung cancer, and premature death in people with heart or lung disease. Children, older adults, and individuals with heart or lung diseases are the most likely to be affected by PM. As discussed in Chapter 1, PM<sub>2.5</sub> occurs as a variety of chemical compounds, and there are several possible precursors. The species of PM<sub>2.5</sub> can be a factor in the type and severity of health impacts.

The health impacts carry economic costs as well. In *The Health and Related Economic Benefits of Attaining Healthful Air in the San Joaquin Valley*, researchers Jane V. Hall, Victor Brajer, and Frederick Lurmann report that the economic benefits of meeting the federal standards for both PM<sub>2.5</sub> and ozone (as compared to 2004 air quality) could save an average of nearly \$1,000 per person per year Valley-wide for a total of more than \$3 billion annually (2005 dollars). They report that attaining both standards may result in fewer premature deaths, fewer asthma attacks, fewer cases of bronchitis, fewer

hospital admissions, fewer lost productive work days, and fewer school absences. These effects are attributed to attaining both the PM2.5 and ozone standards, although many of the potential health impacts in Hall's study may be linked to diesel particulates (a component of PM2.5). The Hall report shows (in Table V-2) the total cost of health impacts from only PM2.5 to be approximately \$3.2 billion annually, almost 100 times higher than the cost of ozone health effects (Hall 2006). Hall's study is the first of its kind for the San Joaquin Valley. Future studies will improve our understanding of air pollution effects and costs and affirm the importance of programs that bring the Valley into attainment of federal air quality standards.

#### Health Effects of PM2.5

- Aggravated asthma
- Increased respiratory symptoms – irritation of the airways, coughing, difficulty breathing
- Decreased lung function in children
- Development of chronic bronchitis
- Irregular heartbeat
- Nonfatal heart attacks
- Increased respiratory and cardiovascular hospitalizations
- Lung cancer
- Premature death in people with heart or lung disease

Source: EPA, *Particulate Matter: Health and Environment*, [www.epa.gov/air/particlepollution/health.html](http://www.epa.gov/air/particlepollution/health.html)  
ARB and ALA, *Recent Research: Health Effects of Particulate Matter and Ozone Air Pollution*,  
January 2004, <http://www.arb.ca.gov/research/health/fs/PM-03fs.pdf>

As the Valley's PM2.5 air quality improves, the health impacts will diminish. To communicate the variability of air pollution levels and potential health impacts, air quality agencies provide air quality forecasts and report a daily Air Quality Index (AQI), as specified by EPA. AQI levels and their corresponding colors communicate specific health advisories. Many Valley media outlets include the District's AQI with their weather forecasts. Also, many schools throughout the Valley participate in the Air Quality Flag program sponsored by asthma coalitions, the District, and other local organizations. Through this program, multi-colored flags are flown each day to indicate the forecasted air quality. As of the end of the 2006-2007 school year, 184 schools throughout the Valley participated in this program. Over 40 schools in the southern portion of the Valley participate in a similar program operated by the Kern County Asthma Coalition.

When conditions warrant, the District also issues health advisories. This information and the daily AQI are available on the District's website at [www.valleyair.org/aqinfo/forecast.htm](http://www.valleyair.org/aqinfo/forecast.htm). The daily AQI, available for each of the 8 Valley counties, is also available in both English and Spanish on the District's toll free number, 1-800-SMOG-INFO.

**Figure 2-1 AQI Values and Corresponding Air Quality, Colors, and Health Advisories**

Air Quality Index (AQI) Values	Air Quality	Colors	Health Advisory
<i>When the AQI is in this range:</i>	<i>...air quality conditions are:</i>	<i>...as symbolized by this color:</i>	<i>... the health advisory is:</i>
<b>0 to 50</b>	<b>Good</b>	<b>Green</b>	<b>None.</b>
<b>51 to 100</b>	<b>Moderate</b>	<b>Yellow</b>	<b>Unusually sensitive people should consider reducing prolonged or heavy exertion.</b>
<b>101 to 150</b>	<b>Unhealthy for Sensitive Groups</b>	<b>Orange</b>	<b>People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.</b>
<b>151 to 200</b>	<b>Unhealthy</b>	<b>Red</b>	<b>People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.</b>
<b>201 to 300</b>	<b>Very Unhealthy</b>	<b>Purple</b>	<b>People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else avoid prolonged or heavy exertion.</b>

### 2.2.1 Other Effects of PM<sub>2.5</sub>

In addition to affecting health, air pollution also affects public welfare. PM can be transported long distances to create regional haze, with PM<sub>2.5</sub> from sources hundreds of miles away contributing to visibility problems at remote locations, such as the Sierra Nevada Mountain Range or national parks. As PM settles out of the air, it can make lakes and streams acidic, change an ecosystem's nutrient balance, and affect ecosystem diversity. PM can affect vegetation by damaging foliage, disrupting the chemical processes within plants, reducing light adsorption, and disrupting photosynthesis. This can impact green spaces as well as crops. PM can also stain and damage stone and other materials. As the Valley progresses towards attainment of EPA's health-based standards, there will also be less impact to public welfare.

## 2.3 HEALTH-BASED STANDARDS

Since the federal PM<sub>10</sub> standards were established in 1987, a large number of studies have been published on PM health effects, such as premature mortality, hospital

admissions, and respiratory illnesses. Based on health studies, PM<sub>2.5</sub> is considered to be more adverse to human health than any other pollutant. Based on human health and environmental considerations, the State and the federal government each set ambient air quality standards for PM<sub>2.5</sub>. An air quality standard includes pollution concentration levels, guidelines for calculating the attainment tests for designation and classification, and other requirements. This section outlines the types of standards, the current levels of the standards, and how the standards are set.

### **2.3.1 State Standards**

California standards are set to protect public health. The California ambient air quality standards are considerably more stringent than the federal standards and are more protective of human health. California has no specific dates by which state air quality standards must be attained. State implementation plans (SIPs), such as this PM<sub>2.5</sub> plan, focus on federal standards. California Health and Safety Code (CH&SC) Section 39602 says, "Notwithstanding any other provision of this division, the state implementation plan shall only include those provisions necessary to meet the requirements of the [federal] Clean Air Act." As such, SIPs are limited to those measures necessary to attain the federal standards. However, progress towards federal standards also brings areas closer to the lower, State standards. ARB set the first state standard for PM<sub>2.5</sub> in 2002. The level of this standard is shown in Table 2-1.

### **2.3.2 Federal Standards**

The EPA's "primary standards" are set to protect public health with a margin of safety. Federal "secondary standards" are established to protect public welfare in issues such as crop damage, material degradation, haze, and environmental effects. The primary and secondary standards for PM<sub>2.5</sub> are equivalent.

When EPA reviews the national ambient air quality standards (NAAQS) for a pollutant such as PM<sub>2.5</sub>, it develops a "criteria document," a compilation and scientific assessment of health and environmental effects studies. EPA develops a staff paper on the information available that is compiled by technical staff who interpret the most relevant information in the criteria document to be used in making policy decisions. The staff paper also contains staff recommendations to the EPA Administrator regarding any revisions to the standards needed to protect public health and welfare.

Both the criteria document and staff paper are based on thousands of peer-reviewed scientific studies and are part of an extensive scientific assessment process that includes rigorous scientific peer review and public comment. Before these documents become the basis for policy decisions, they undergo repeated, detailed reviews by the scientific community, industry, public interest groups, the general public, and the Clean Air Scientific Advisory Committee, a Congressionally mandated group of independent scientific and technical experts.<sup>1</sup> As part of its mandate, the Clean Air Scientific

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<sup>1</sup> EPA's December 7, 2006 changes to the NAAQS review process modified the role of CASAC in the standard-setting process.

Advisory Committee also makes recommendations to EPA on the adequacy of the standards. By reaching the federal health-based standards for PM<sub>2.5</sub>, we will greatly reduce the negative health impacts of this pollutant.

EPA adopted the first national air quality standards for the fine fraction of particulates, PM<sub>2.5</sub>, in July 1997 (62 *FR* 38651-38701). EPA set the annual PM<sub>2.5</sub> standard at 15 µg/m<sup>3</sup> and the 24-hour PM<sub>2.5</sub> standard set at 65 µg/m<sup>3</sup>. EPA designated the Valley as nonattainment for PM<sub>2.5</sub> based on ambient air quality data collected from 2001-2003. The Valley's 2004-2006 air quality is within the 1997 24-hour standard, but not the annual standard. The District must show how the Valley will attain the 1997 PM<sub>2.5</sub> standards in the *2008 PM2.5 Plan*.

On October 17, 2006, EPA issued its final rule to revise the PM<sub>10</sub> and PM<sub>2.5</sub> NAAQS in the Federal Register (71 *FR* 61143-61233). This rule revoked the annual PM<sub>10</sub> standard and retained the existing 24-hour PM<sub>10</sub> standard of 150 µg/m<sup>3</sup>. EPA also retained the existing annual PM<sub>2.5</sub> standard of 15 µg/m<sup>3</sup>, but lowered the 24-hour PM<sub>2.5</sub> standard to 35 µg/m<sup>3</sup>. EPA will designate areas under the new standard by November 2009, effective April 2010, and state implementation plans for the 2006 standards will be due to EPA in the 2012-2013 timeframe. Areas must attain the 2006 standards within five years of the effective date of EPA designations (which should be finalized effective 2009-2010), though up to a five year extension is possible. Although the plan focused on the 2006 PM<sub>2.5</sub> standards is not due to EPA until 2012-2013, the control measures in the *2008 PM2.5 Plan* will help bring the Valley closer to the 2006 standard, and feasibility measures in the plan may result in control measures that might be used in future PM<sub>2.5</sub> Plans.

Both the 1997 and 2006 PM<sub>2.5</sub> NAAQS are shown in Table 2-1.

**Table 2-1 Federal and State Ambient Air Quality Standards for PM<sub>2.5</sub>**

Standard		Level of the Standard
Federal (1997)	24-hour	65 µg/m <sup>3</sup>
	Annual	15 µg/m <sup>3</sup>
Federal (2006)	24-hour	35 µg/m <sup>3</sup>
	Annual	15 µg/m <sup>3</sup>
California	24-hour	NA
	Annual	12 µg/m <sup>3</sup>

## 2.4 DESIGNATIONS AND REQUIREMENTS

On January 5, 2005 (70 *FR* 943-1019), EPA promulgated air quality designations for all areas for the national ambient air quality standards (NAAQS) for fine particles, signed

on December 14, 2004 and effective April 5, 2005. The San Joaquin Valley Air Basin is designated nonattainment for the 1997 PM<sub>2.5</sub> NAAQS, and the PM<sub>2.5</sub> State Implementation Plan (SIP) is due to EPA by April 5, 2008.

Unlike the 8-hour ozone and PM<sub>10</sub> standards, the PM<sub>2.5</sub> NAAQS does not use a nonattainment area classification system (i.e., moderate, serious, severe, and extreme). While CAA Subpart 1, Section 172(a)(1) allows for a classification system, a classification system is not required. Not using a nonattainment classification system simplifies the attainment year as well as other planning requirements. The 1990 CAA Amendments do not include any subpart for PM<sub>2.5</sub> because the PM<sub>2.5</sub> standards were not yet established at that time. Therefore, the nonattainment area plan provisions in CAA Section 172 of subpart 1 apply. CAA 172(c) requires RACT, RACM, RFP, contingency measures, emission inventory, and NSR, and these requirements are discussed in further detail in the *Clean Air Fine Particle Implementation Rule, Final Rule* (72 FR 20586-20667). Consistent with CAA Section 172(b), SIPs are due within 3 years of area designations, so SIPs for the 1997 PM<sub>2.5</sub> standards are due by April 5, 2008 (72 FR 20599). Federal CAA requirements for PM<sub>2.5</sub> plans are summarized in Table 2-2.

All areas are to attain the standard as expeditiously as practicable, but by an initial attainment deadline of April 5, 2010 (based on 2007, 2008, and 2009 data, making 2009 the compliance year). Areas demonstrating that attainment is impracticable by 2009 can receive an extension of up to five years, making the final attainment deadline April 5, 2015 (based on 2012, 2013, and 2014 data, with 2014 as the compliance year). To be granted an extension, areas must:

- Submit an attainment demonstration showing that attainment by 2009 is impracticable due to the severity of the nonattainment problem, the lack of available control measures, and any other pertinent information.
- Show that the area will attain the standard by an alternative date that is as expeditious as practicable. A full extension to 2015 is not automatic, and some areas may obtain shorter extensions.
- Must demonstrate that all local control measures that are reasonably available and technically feasible for the area are currently being implemented.
- Show that implementation of all RACM and RACT local control measures for the area were considered (72 FR 20601).

Once the federal government sets a standard, states and air districts with nonattainment areas are required to adopt plans, rules, and programs that reduce emissions to bring the area into attainment of the standard. In California, air pollution control districts and/or air quality management districts are responsible for developing the overall attainment strategy in their respective geographic areas. Plans, such as the *2008 PM<sub>2.5</sub> Plan*, are the first step in the local process. To develop a plan, areas evaluate air quality data, emissions inventory data, and computer modeling results to determine the rules and programs that are needed to reach the federal standards by the deadlines specified in the CAA. The rules and programs in a plan are then implemented over time

to reduce the emissions that go into the air, reducing unhealthful concentrations of air pollutants and helping areas reach federal air quality standards.

The state reviews all of the air quality plans for the state's nonattainment areas and, if they meet federal requirements, approves them and sends them on to EPA for approval into the California SIP. During the regional planning process, ARB develops and applies air quality models, conducts and funds air quality research, develops emissions inventories, develops emission control measures for statewide applicability, and provides other assistance to local air districts.

Periodic plan revisions may be necessary to ensure reasonable further progress and to reflect the latest science. Once an area's ambient air quality data meets the federal standard, the area will request a finding of attainment. Then a maintenance plan and other requirements must be met before an area can be officially redesignated to attainment.

#### *References*

American Lung Association (ALA) (2002). *ALA Fact Sheet Particulate Matter Air Pollution*. <[www.lungusa.org/air/pm\\_factsheet99.html](http://www.lungusa.org/air/pm_factsheet99.html)>.

Hall, Jane V; Brajer, Victor; and Lurmann, Frederick W. (March 2006). "The Health and Related Economic Benefits of Attaining Healthful Air in the San Joaquin Valley." Institute for Economic and Environmental Studies.

Table 2-2 Federal Requirements for PM2.5 Nonattainment Areas

General Requirements	Federal CAA	PM2.5 Implementation Rule	Description	2008 PM2.5 Plan
Attainment Demonstration Due Date	172(b)	72 FR 20599	PM2.5 SIPs are due to EPA by April 5, 2008, which is three years from the designation date.	NA
Attainment Date	172(b)(2)	72 FR 20601	Nonattainment areas should reach attainment as expeditiously as practicable, but no later than 5 years from the designation date, except that the Administrator may extend the attainment date for a period of no greater than 10 years from the designation date, considering the severity of nonattainment and the availability and feasibility of control measures.	Chapter 9
RACT/RACM	172(c)(1)	72 FR 20609-20633	SIP provisions should provide for the implementation of reasonably available control measures (RACM), including, at minimum, reasonably available control technologies (RACT).	Chapter 6, Chapter 7
RFP	172(c)(2)	72 FR 20633-20642	SIP provisions must provide for reasonable further progress.	Chapter 8
Contingency Provisions	172(c)(1)	72 FR 20642-20645	The SIP must provide for the implementation of specific measures that would take effect without further action by the State and that would be undertaken if the area fails to make RFP or attainment on time.	Chapter 9
Emissions Inventory	172(c)(3)	72 FR 20647-20651	The SIP must include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutants in the area.	Appendix B
NSR	172(c)(4-5)	72 FR	The SIP must identify and quantify the emissions of pollutants that will be allowed (in accordance with section 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in the area. The SIP must require permits for new or modified stationary sources.	Appendix D
Other measures	172(c)(6)	72 FR 20599	The SIP must include enforceable emission limitations and other such control measures and techniques, including schedules for compliance to provide for attainment by the applicable attainment date.	Chapter 6