

Chapter 1

Introduction



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Chapter 1: Introduction

[Note: The evaluation being conducted to develop this plan is an ongoing work in progress, and will continue to be revised and updated throughout the public process.]

The U.S. Environmental Protection Agency (EPA) periodically reviews and establishes health-based air quality standards (often referred to as National Ambient Air Quality Standards, or NAAQS) for ozone, particulates, and other pollutants. Although the San Joaquin Valley's air quality is steadily improving, the Valley experiences unique and significant difficulties in achieving these increasingly stringent standards. Over the past couple of decades, the San Joaquin Valley Air Pollution Control District (District) has implemented several generations of emissions control measures for stationary and area sources under its jurisdiction, and the California Air Resources Board (ARB) has adopted regulations for mobile sources that greatly contribute to the reduction in Valley's ozone and particulate matter concentrations. Through these efforts, the nation's toughest air pollutant emissions controls are already in place in the Valley. Despite the Valley's significant air quality progress under these regulations and effort by Valley businesses and residents, many air quality challenges remain – including attainment of EPA's most recent standard for PM2.5 (particulate matter that is 2.5 microns or less in diameter).

This *2012 PM2.5 Plan* outlines the San Joaquin Valley's strategy for attaining the 2006 federal national ambient air quality standard (NAAQS) for PM2.5 as expeditiously as possible, and synthesizes the District's strategies for improving air quality and public health in the Valley. To provide overall strategic direction in developing this *2012 PM2.5 Plan*, the District Governing Board adopted the following Guiding Principles at its February 2012 Public Hearing:

1. With public health as our number one priority, meet the federal ambient air quality standards as expeditiously as practicable.
2. Use sound science as the plan's foundation. This includes efforts to assess public health impacts, predict future air quality, determine the extent of emissions reductions needed, and evaluate the availability, effectiveness, and feasibility of emission control measures.
3. Consider the Valley's unique challenges and develop cost-effective strategies that provide adequate operational flexibility and minimize costs to Valley businesses.
4. Consider all opportunities for timely, innovative, and cost-effective emission reductions. Consider traditional regulations, but look beyond traditional regulations to incorporate monetary incentives, policy initiatives, guidance documents, and outreach, including working with cities and counties to incorporate *2012 PM2.5 Plan* principles their general plans.
5. Given that 80% of the Valley's emissions originate from mobile sources, provide a balanced approach to reducing mobile and stationary source emissions.

6. Devise and implement reasonable strategies that involve the public in reducing emissions.
7. Prioritize strategies that contribute to the District's Risk-based Strategy by achieving the greatest public health benefits.
8. Prioritize strategies that contribute to attainment of multiple air quality standards.
9. Recognize that there is no "silver bullet" for attainment. In this plan and upcoming attainment plans, every sector – from the public through all levels of government, businesses, and industry – must continue to reduce emissions.
10. Compel State and Federal agencies to provide adequate resources and regulatory assistance to reduce emissions from sources under their jurisdiction.
11. Address air pollutant transport issues with air districts neighboring the Valley.
12. Provide ample opportunity for public participation and feedback in the design and implementation of these plans. Utilize the planning process to also inform participants of the Valley's air quality challenges and successes as well as actions that can be taken to improve Valley air quality.
13. Build off of the successes of the District's Technology Advancement Program by identifying further opportunities to continue fostering technology advancement, paving the way for new emissions control devices to be increasingly used in the San Joaquin Valley.

1.1 THE VALLEY'S UNIQUE CHALLENGES

The Valley's geography and meteorology exacerbate the formation and retention of high levels of air pollution. Surrounding mountains and consistently stagnant weather patterns prevent the dispersal of pollutants that accumulate within the Valley. The Valley has significant naturally-occurring biogenic emissions. California's natural environment can also allow for air pollutant transport – both within the Valley as well as between the Valley and other air basins. These natural factors will continue to impact the Valley's progress towards attainment of federal air quality standards.

In addition, the Valley's population increases make it one of the fastest growing regions in the state. Population growth estimates for the Valley and for California as a whole have been under review in 2012 (see Appendix B for more information). The Population Research Unit of the Department of Finance (DOF) released interim revised population growth projections in May 2012¹. Based on these revised DOF data, between 2010 to 2020, the Valley's population is expected to change by 18% (Table 1-1). In contrast, the total population for the State of California is projected to change by 9% over the same time period. Increasing population generally increases air pollutant emissions, due to increased consumer product usage and motor vehicle emissions. Between 2010

¹ DOF Interim Population Projects for California and its Counties, 2010-2050.

<http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php>

and 2020, the Valley's total vehicle miles traveled (VMT) will increase about 21%², consistent with the Valley's population growth. This region also is home to the state's major arteries for goods and people movement, thereby attracting a large volume of vehicular traffic.

Table 1-1 Estimated Valley Population by County, 2010-2020³

County	Estimated 2010	Projected 2020
Fresno	932,926	1,083,889
Kern*	841,609	1,041,469
Kings	152,996	179,722
Madera	151,136	183,176
Merced	256,345	301,449
San Joaquin	686,651	795,631
Stanislaus	515,229	582,746
Tulare	443,567	536,429
Total	3,980,459	4,704,511

*Kern County is separated into two air districts: San Joaquin Valley and Eastern Kern. This data is the Valley-portion of Kern only.

Although reducing mobile source emissions is critical to the Valley's attainment of federal standards, the District does not have direct regulatory authority to reduce motor vehicle tailpipe emissions, which are regulated by the federal EPA and State ARB. As described in Chapter 5 of this plan and in Appendix C, the District must collaborate with interagency partners and utilize innovative approaches to reduce mobile source emissions.

As Chapter 3 of this plan details, the formation and composition of PM2.5 can be complex, where some species are more health impactful than others. Long term trends show that PM2.5 concentrations throughout the San Joaquin Valley have declined since monitoring of this pollutant first began. In addition to declining observed PM2.5 levels, most emissions inventories of the precursors of PM2.5 are also projected downward into the future despite a growing population.

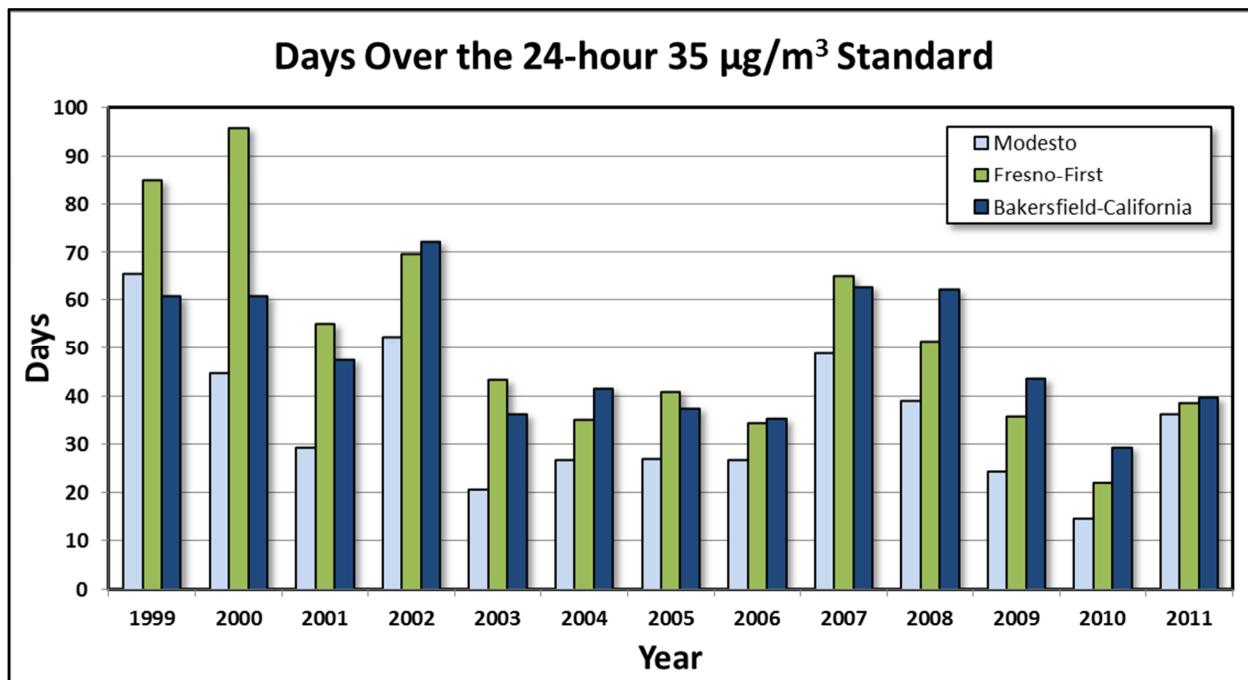
Figure 1-1 shows the trend in days at the Modesto, Fresno-First, and Bakersfield-California air monitoring sites with a 24-hour PM2.5 average over 35 µg/m³. A downward trend is apparent when comparing the early years of 1999 and 2000 to recent years. The current pattern shows that the northern Valley has the fewest days over the standard, followed by the central region in the middle, and with the southern Valley at the end commonly having the maximum number of exceedances.

² Data from CEPAM: 2009 Almanac – Population and Vehicle Trends Tool.

http://www.arb.ca.gov/app/emsinv/trends/ems_trends.php

³ Data from DOF: Interim Population Projects for California and its Counties, 2010-2050.

<http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php>

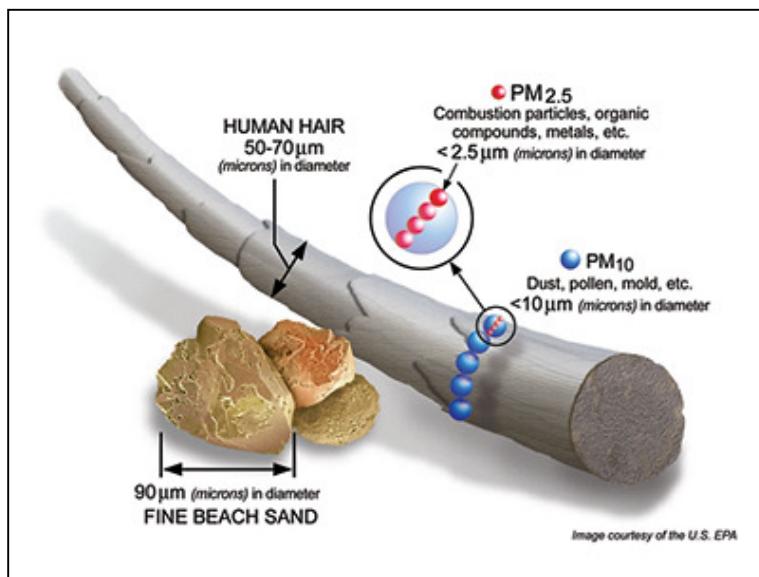
Figure 1-1 Trends in Exceedances of the 24-hour PM2.5 Standard

Despite the magnitude of the challenges described above, the Valley has a history of success in reducing emissions and improving air quality. The Valley must continue to reduce air pollutant emissions to improve air quality and to improve public health Valley-wide.

1.2 PM2.5 AND ASSOCIATED HEALTH IMPACTS

Particulate Matter (PM) is a mixture of solid particles and liquid droplets in the air. PM can be emitted directly into the atmosphere. “Secondary particulates” can form in the atmosphere through the photochemical reactions of precursors, where chemical reactions are generated by the energy provided by sunlight. PM is thus made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. PM10 is PM that is 10 microns or less in diameter, and the PM2.5 subset includes smaller particles that are 2.5 microns or less in diameter (Figure 1-2).

Any particles 10 microns or less are considered respirable, meaning they can be inhaled into the body. PM10 can generally pass through the nose and throat and enter the lungs. PM2.5 can be inhaled more deeply into the gas exchange tissues of the lungs, where it can be absorbed into the bloodstream and carried to other parts of the body.

Figure 1-2 PM10, PM2.5, Human Hair, and Fine Beach Sand

The potential health impacts of particle pollution are linked to the size of the particles, with the smaller particles having larger impacts. Numerous studies link PM2.5 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. Children, older adults, and individuals with heart or lung diseases are the most likely to be affected by PM2.5.

A 2008 study used the Regional Human Exposure Model (REHLEX) to quantify some of the benefits of attaining EPA's 2006 PM2.5 standard⁴. Attaining this standard would help the Valley prevent:

- 814 premature deaths
- 384,554 cases of respiratory symptoms and bronchitis
- 584 non-fatal heart attacks
- 289 hospital admissions for cardio/respiratory issues
- 440 ER visits for children's asthma
- 386,340 minor restricted activity days
- 68,740 work loss days

Air pollutant health impacts carry economic costs as well. The 2008 study estimated that the economic benefits of meeting EPA's 2006 PM2.6 standard to be about \$5.6 billion. This estimate encompasses premature death, respiratory symptoms and bronchitis, non-fatal heart attacks, respiratory and cardio hospital admissions, children's asthma ER visits, minor restricted activity days, and work loss days. The applied

⁴ Jane V. Hall, et. al. (November 2008). "The Benefits of Meeting Federal Clean Air Act Standards in the South Coast and San Joaquin Valley Air Basins."

economic values were based on the cost of treating illness and the expressed value people place on avoiding illness and premature death. The study recognizes that some known effects of pollutant exposure cannot yet be quantified in economic terms, so the actual economic benefits of attainment are likely higher than the study's reports.

In addition to particle size, the chemical composition of PM2.5 is also a factor in the type and severity of health impacts. There are several PM2.5 species, or chemical compounds, summarized in Table 1-2.

Table 1-2 PM2.5 Species

Species	Description
Organic Carbon	Directly emitted, primarily from combustion sources (ex: residential wood combustion). Also smaller amounts attached to geologic material, road dusts. May also be emitted directly by natural (biogenic) sources.
Elemental Carbon	Also called soot or black carbon; incomplete combustion (ex: diesel engines)
Geologic material	Road dust and soil dust that get into the air from activity, such as soil disturbance or airflow from traffic
Trace metals	Identified as components from soil emissions or found in other particulates having been emitted in connection with combustion from engine wear, brake wear, and similar processes. Can also be emitted from fireworks.
Sea salt	Sodium chloride in sea spray where sea air is transported into the Valley
Secondary Organic Aerosol	Secondary particulates formed from photochemical reactions of organic carbon
Ammonium Nitrate	Reaction of ammonia and nitric acid, where the nitric acid is formed from nitrogen oxide emissions, creating nitric acid in photochemical processes or nighttime reactions with ozone.
Ammonium Sulfate	Reaction of ammonia and sulfuric acid, where the sulfuric acid is formed primarily from sulfur oxide emissions in photochemical processes, with smaller amounts forming from direct emissions of sulfur.
Combined water	A water molecule attached to one of the above molecules

Understanding various PM2.5 species, including how each forms, how much each contributes to the Valley's total PM2.5 concentrations, and how each is linked to different public health impacts, is of the utmost importance for the development of an effective, health-protecting control strategy (see Chapter 2). For example, ammonium nitrate is estimated to comprise about 40% of the Valley's total PM2.5 concentrations, but it is generally regarded as having relatively low toxicity as compared to other types of PM2.5. In contrast, metals have higher health impacts, but are found in relatively low concentrations in the Valley. Bioaerosols, such as mold spores, bacteria, pollen, and endotoxins, carry significant health risks for sensitive individuals. Ultrafine particles (PM0.1) are small enough to effectively deliver harmful chemicals into the lungs, bloodstream, and the brain, but typically comprise a small portion of the Valley's total airborne PM mass.

In addition to affecting human health, air pollution also affects the health of the natural environment. PM2.5 can be transported from sources hundreds of miles away to contribute 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 human-health-based PM2.5 standards, there will also be less impact to the surrounding environment.

1.3 NATIONAL AMBIENT AIR QUALITY STANDARDS

1.3.1 EPA's Standard Setting Process

Clean Air Act (CAA) Sections 108 and 109 require EPA to set health-based standards for six "criteria pollutants," such as PM2.5. EPA periodically reviews existing standards to consider the most recent health studies. These reviews are to be conducted every five years, though in the past, some standard revisions did not meet the 5-year deadline. The review process starts as the Clean Air Scientific Advisory Committee (CASAC) analyzes available science and then, if supported by research, suggests to EPA a range of revised standards that would protect public health from the adverse effects of air pollution. The EPA Administrator appoints CASAC members, who are non-EPA experts in the fields of science, engineering, or the social sciences. The committee is to provide objective, independent advice to EPA on the technical basis for the standard. Thousands of peer-reviewed scientific studies are considered as EPA formulates its proposed standard, which is made available for scientific peer review and public comment. EPA then sets the standard.

In evaluating and setting new standards, federal law prohibits EPA from taking into account economic feasibility. Economic feasibility issues can be considered as EPA promulgates the implementation rules that establish the deadlines for meeting the standards and in devising individual control measures aimed attaining the standards.

Once a standard is set, EPA designates an area as attainment or nonattainment based on the most recent three years of air quality data available. For some pollutants, EPA classifies nonattainment areas as marginal, moderate, serious, severe, and extreme. The classification sets the attainment deadline and other planning requirements. The classification is to be based on certain air quality parameters, though areas can request reclassification with adequate documentation.

EPA also adopts implementation rules to guide states and local air districts as they prepare state implementation plans (SIPs) to bring areas into attainment with the standard. While EPA cannot consider costs or difficulty in setting the standards, costs and difficulty are inescapable for local air districts as they determine the best way to bring areas into attainment. That said, local air districts must meet planning and attainment requirements to avoid federal sanctions and to improve public health.

There are a number of serious penalties and risks associated with any failure to submit approvable attainment strategies for meeting federal standards. Upon development of

an attainment strategy, an area submits the plan to EPA for approval. If EPA finds that an area fails to submit an approvable plan on time or fails to implement plan commitments after the plan has been approved, then the following sanctions may be applied:

- 2:1 offset requirement for major sources, leading to a de-facto ban on new and expanding business
- Loss of federal highway funds, which would cost the Valley an estimated \$250 million per year
- A federal implementation plan (FIP), which would result in a loss of local control

Once EPA approves a SIP, that plan becomes federally enforceable. The plan can then be enforced by the public or EPA through lawsuits. In addition, failure to reach attainment by the deadline would result in the assessment of Section 185 penalty fees.

1.3.2 Federal PM2.5 Standards and Implementation

EPA set the first PM2.5 standard in 1997 and designated the San Joaquin Valley (Valley) as nonattainment of the 1997 standard in 2005. The 1997 standard has two components: an annual average of 15 µg/m³ and a 24-hour average of 65 µg/m³ (see Appendix A for information on the applicable attainment calculations). The District adopted the *2008 PM2.5 Plan* in April 2008 to document its regulatory commitments, demonstrate the anticipated effectiveness of its PM2.5 strategy in bringing the Valley into attainment of the 1997 PM2.5 standard no later than April 2015 (based on 2012–2014 data), and meet other federal requirements. EPA approved the *2008 PM2.5 Plan* in 2011.

EPA revised the 24-hour average PM2.5 standard to 35 µg/m³ in October 2006 (71 FR 61143). EPA designated the Valley as nonattainment of the 2006 PM2.5 standard in 2009, effective December 14, 2009.⁵ The effective date of designation triggers the plan due date and the District's attainment plan must subsequently to EPA (through ARB as part of the state implementation plan) by December 14, 2012. Foundational analysis has been in progress for several months. The technical analysis is ongoing as of this June 2012 draft.

Areas must attain the 2006 standard within five years of the effective date of EPA designations, though up to a five year extension is possible. This sets initial attainment dates at December 14, 2014, with an extension up to December 14, 2019, if needed. This *2012 PM2.5 Plan* will demonstrate that the Valley will attain the 2006 standard as expeditiously as practicable, with all feasible measures and strategies being considered to accomplish this goal.

Designation under the federal PM2.5 standard (unlike the ozone standard) does not use a nonattainment area classification system (i.e., moderate, serious, severe, and extreme). Therefore, attainment planning requirements are the same for all PM2.5

⁵ EPA (November 14, 2009). Air Quality Designations for the 2006 PM2.5 NAAQS, Final Rule. www.epa.gov/pmdesignations/2006standards/documents/2009-10-08/FR-11-13-2009.pdf

nonattainment areas. EPA finalized the Clean Air Fine Particle Implementation Rule in April 2007 to provide rules and guidance on the CAA requirements for attainment plans required under the 1997 PM2.5 standard (79 FR 20586). On March 2, 2012, EPA issued its “Implementation Guidance for the 2006 24-hour PM2.5 NAAQS.”⁶ This memo confirmed the continued appropriateness 2007 implementation rule framework for PM2.5 attainment planning and provided additional guidance where needed. Table 1-3 summarizes PM2.5 attainment planning requirements and where those requirements will be met in this plan.

As the District compiles and implements this plan for the 2006 PM2.5 standard, EPA has revised the PM2.5 standard yet again, which will require new planning and strategy development when newer standards are established. In fact, EPA published a proposed new annual PM2.5 standard of 12 or 13 micrograms per cubic meter on June 14, 2012, with the new standard projected to be finalized by December 2012. Local planning and regulatory processes can be confounded by these overlapping federal standards and planning requirements (Table 1-4).

However, efforts to reduce PM2.5 and PM2.5 precursors under one PM2.5 standard will help the Valley to start progressing towards more stringent PM2.5 standards on the horizon. This is already occurring with the 1997 and 2006 PM2.5 standards. The emissions reductions strategy being implemented under the plan for the 1997 PM2.5 standard will continue to achieve additional emissions reductions as fully implemented over the next couple of years, and these reductions will contribute to improvements in 24-hour average PM2.5 concentrations, bringing the Valley closer to the 2006 standard. Building off the 2007 Ozone Plan and 2008 PM2.5 Plan, the District is coordinating emissions reductions strategies whenever possible to address multiple standards, to maximize efficiency for staff as well as stakeholders, and to maximize health benefits.

⁶ http://www.epa.gov/ttn/naaqs/pm/pdfs/20120302_implement_guidance_24-hr_pm2.5_naaqs.pdf

Table 1-3 Federal Requirements for PM2.5 Nonattainment Areas

General Requirements	Federal CAA	PM2.5 Implementation Rule	Description	2012 PM2.5 Plan
Attainment Demonstration Due Date	172(b)	72 FR 20599	PM2.5 SIPs are due to EPA by December 14, 2012, 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. EPA may extend the attainment date to up to 10 years from the designation date, considering severity of nonattainment and availability and feasibility of control measures.	Chapter 8*
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 4*
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 8*
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 G*
Other measures	172(c)(6)	72 FR 20599	The SIP must include enforceable emission limitations, other control measures and techniques, and compliance schedules to provide for attainment by the applicable deadline.	Chapters 4 through 7*

*Full discussion forthcoming in future plan drafts.

Table 1-4 Federal Air Quality Standards and Valley Status for PM2.5

LEVEL OF THE STANDARD	PM2.5 Standards and Timelines		
	1997 PM2.5	2006 PM2.5	2012 PM2.5
1997	24-hr: 65 µg/m ³ annual: 15 µg/m ³	24-hr: 35 µg/m ³ annual: 15 µg/m ³	To be determined
1998 – 2004	EPA sets standard		
2005	EPA finalizes attainment designations		
2006		EPA sets standard	
2007	EPA implementation rule		
2008	Attainment plan due (SJV's 2008 PM2.5 Plan)		
2009		EPA finalizes attainment designations	
2010			
2011	EPA approved SJV plan		
⇒ 2012			Proposed annual standard of 12 or 13µg/m ³ : June 2012 Attainment plan due (SJV's 2012 PM2.5 Plan)
2014		Initial attainment deadline	Final standard to be issued: December 2012.
2015	Final attainment deadline		EPA attainment designations: December 2014.
2016 & beyond		Final attainment deadline: 2019	Attainment plan due date, and attainment deadline to be determined

1.3.3 State Standards

California also sets ambient air quality standards for several pollutants, including PM2.5. The California ambient air quality standards are considerably more stringent than the federal standards and are more protective of human health. California's annual average PM2.5 standard is currently 12 µg/m³. There is no California standard for 24-hour average PM2.5 concentrations.

California has no specific attainment date for state air quality standards, nor does it require attainment plans. In fact, 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." Federal standards thus provide the framework for SIPs, such as this PM2.5 plan. However, progress towards federal standards also brings areas closer to the lower, California standards.

1.4 PUBLIC PROCESS OF PLAN DEVELOPMENT

To ensure that the public has the opportunity to be meaningfully involved in reviewing and commenting on the plan, the District intends to utilize the following tentative timeline for the public process (Table 1-5).

Table 1-5 Proposed 2012 PM2.5 Plan Development and Public Process Timeline

Ongoing	Outreach on plan process and findings: presentations/discussions with stakeholders at various meetings
April 27th and 30th 2012	Public workshops and commenting period.
June 2012	Public workshops and public commenting on revised plan draft
August 2012	Public workshops and public commenting on revised plan draft
September 2012	Post proposed draft of the plan
October 18, 2012	District Governing Board hearing to adopt the plan
November 15-16, 2012	ARB hearing to adopt the SJV plan and the state strategy
December 14, 2012	Plan due to EPA

The District has held a number of meetings and workshops throughout development of this plan to seek public input. These meetings have been well-attended by members of the public, and a number of questions have been raised and discussed. The District has discussed the *2012 PM2.5 Plan* at numerous Governing Board, Citizens Advisory Committee (CAC), Environmental Justice Advisory Group (EJAG), and other meetings (including an April meeting with the Central Valley Air Quality Coalition). The following summarizes the recent April public workshops:

April 30, 2012 2012 PM2.5 Plan Workshop

The District hosted a Public Workshop on the general direction and first draft components of the *2012 PM2.5 Plan*. Attendees included District staff, ARB staff and a number of members of the public. District staff presented an overview of federal planning requirements, the District's Guiding Principles for the plan, draft emissions inventory trends, ambient PM2.5 trends, and the District's approach for analyzing control measure opportunities.

April 27, 2012

2012 PM2.5 Plan Technical Symposium

The District and ARB staff co-hosted a Technical Symposium on the scientific basis of air quality modeling being conducted for the *2012 PM2.5 Plan*. Attendees included District staff, ARB staff, EPA staff, and a number of members of the public. The meeting, which was hosted in Fresno, could be attended via VTC in the District's Modesto and Bakersfield offices, or attended via webcast. Presenters representing District staff, ARB staff, and UC Davis researchers addressed the scientific basis of modeling for the plan, the nature of PM2.5 species and formation in the Valley, a review of modeling results from CRPAQS (the California Regional Particulate Air Quality Study), modeling for State Implementation Plan purposes, and the technical approach for *2012 PM2.5 Plan* modeling. These presentations and the discussions that followed provided a valuable opportunity to improve understanding of how PM2.5 is formed and retained in the Valley, as well as how these processes are analyzed in the plan.