State of California

California Environmental Protection Agency
AIR RESOURCES BOARD

Staff Report

Proposed Revision to the PM2.5 State Implementation Plan (SIP) for the San Joaquin Valley

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I. INTRODUCTION

The San Joaquin Valley Air Pollution Control District (District) adopted on December 20, 2012 a revision to the State Implementation Plan (SIP or 2012 PM2.5 Plan) to address the 24-hour fine particulate matter (PM2.5) ambient air quality standard of 35 ug/m3. The SIP demonstrates that the San Joaquin Valley (Valley) will attain the 24-hour PM2.5 standard by 2019, with many areas of the Valley reaching attainment well before 2019. The SIP shows that by 2017, approximately 90 percent of Valley residents will be living in communities meeting this air quality standard.

The Air Resources Board's (ARB) mobile source control program will be providing major new emission reductions of oxides of nitrogen (NOx) and particulate matter needed for attainment of the PM2.5 standard. Mobile source PM2.5 and NOx are expected to decrease by almost 50 and 60 percent, respectively, between 2007 and 2019. The District wood burning curtailment program is also an essential measure providing reductions predicted to bring all but one Valley location into attainment prior to 2019. To address this remaining localized area of nonattainment in Bakersfield, the District will develop a rule to further reduce emissions from commercial cooking operations. This measure will provide the final increment of reductions needed to demonstrate attainment at this location by the deadline of 2019.

SIP technical analyses, including air quality modeling, establish and quantify the relative effectiveness of reducing each PM2.5 precursor pollutant. This scientific information is specific to the Valley and indicates that the most important pollutants to reduce for the 24-hour PM2.5 standard are direct PM2.5 and NOx emissions. Ammonia reductions are an order of magnitude less effective than NOx emission reductions, providing only a slight benefit. Nevertheless, since a small reduction in PM2.5 could occur from further reductions in ammonia emissions, the District has included a measure to assess the feasibility of further ammonia controls. The District will also conduct further research on ammonia emissions and implement any feasible and cost-effective mitigation measures identified through this process.

The federal Clean Air Act establishes the SIP requirements for areas that are designated nonattainment for an air quality standard. U.S. EPA first set standards for PM2.5 in 1997, adopting a 24-hour PM2.5 standard of 65 µg/m3 and an annual standard of 15 µg/m3. The key elements of SIPs are a demonstration of attainment of the standard, including identification of the most expeditious date for attainment, determination of the amount of emission reductions needed, and design of the control strategy[1]. In 2006, the 24-hour PM2.5 standard was lowered to 35 µg/m3. This report discusses how the District's 2012 PM2.5 SIP demonstrates attainment of this standard. The District's adopted SIP can be found at: www.valleyair.org/Air_Quality_Plans/PM25Plans2012.htm.

[1] In 2008, ARB and the District submitted a plan to U.S. EPA demonstrating how the San Joaquin Valley would attain the 1997 PM2.5 standards by 2014. U.S. EPA approved this plan in 2011. Although U.S. EPA further revised the annual standard in December 2012, a separate, future planning process will address this new standard.

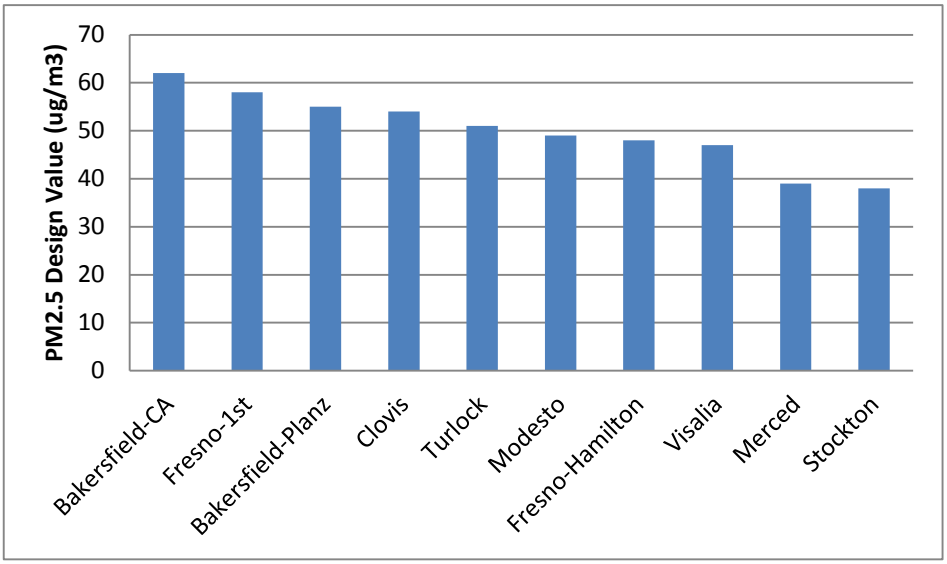
II. NATURE OF THE SAN JOAQUIN VALLEY PM2.5 AIR QUALITY PROBLEM

PM2.5 is a complex mixture of many different species generated from a wide array of sources. Some PM2.5 is emitted directly into the air (primary particles) in the form of soot, smoke or dust. PM2.5 can also be formed in the atmosphere (secondary particles) from the reactions of precursor gases, forming compounds such as ammonium nitrate and ammonium sulfate. The relative mixture of these constituents in a region drives the nature of the needed control strategy.

The San Joaquin Valley is one of the most intensively studied locations in the world, providing a wealth of information regarding the nature of the Valley's PM2.5 problem. ARB and the District operate a comprehensive monitoring network that provides ongoing measurement of PM2.5 concentrations and chemical composition. In addition, numerous special studies have been conducted. The largest of these, the California Regional Particulate Air Quality Study (CRPAQS), was conducted in 1999 through 2001. The study included monitoring at over 100 locations, with results published in peer reviewed publications and presented at national and international conferences. CRPAQS findings continue to provide a strong scientific foundation for planning efforts. The Valley also continues to be a focus of intensive study, with more recent programs including CalNex 2010, and the upcoming DISCOVER-AQ study to be conducted in 2013.

PM2.5 concentrations in the Valley exhibit a strong seasonal pattern, with concentrations over the 24-hour standard occurring primarily during the winter months. Cold temperatures, fog, stagnant airflow, and extended periods without rainfall result in episodes of elevated PM2.5 that can persist for a week or more. Episodic activities such as seasonal wood burning also add to the pollution burden during the winter. As shown in Figure 1, PM2.5 concentrations are generally higher in the central and southern portions of the Valley, with highest values recorded in the urban areas of Fresno and Bakersfield. The high values used for SIP planning purposes are called design values, and are calculated on a three year average.

Figure 1. 2011 24-hour PM2.5 design values



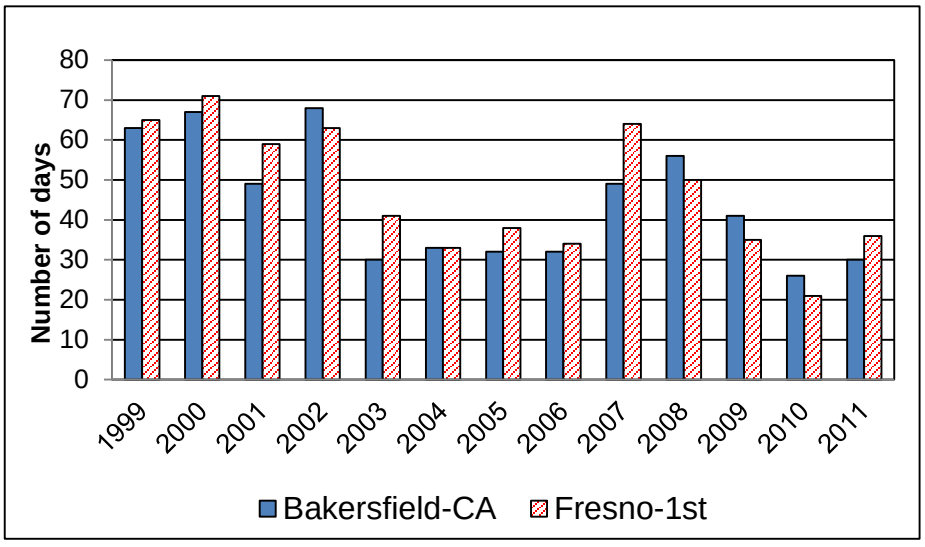
The Valley is making progress in reducing PM2.5 pollution, both annual average and 24-hour PM2.5 concentrations. Between 2001 and 2011, annual average design values have decreased between 30 and 40 percent. The largest decreases occurred in the northern and central portions of the Valley, where most sites now meet the annual standard. While the southern Valley has shown a slower rate of improvement, sites are nearing attainment, with 2011 design values 10 to 20 percent over the annual standard.

With respect to the 24-hour standard, the most pronounced progress occurred between 2001 and 2004. Over this period, the three year average design values show a consistent downward trend. During this timeframe, ammonium nitrate levels were decreasing consistent with implementation of NOx emission reduction strategies in the Valley.

Characterizing the overall design value trend in more recent years is complex. Although the design value is the planning metric used to assess compliance with the standard, evaluation of a variety of air quality indicators provides a broader understanding of the nature of air quality progress. It is also necessary to account for exceptional events and yearly variability in weather conditions, which can strongly affect PM2.5 concentrations. All these indicators and factors must be considered when interpreting air quality trends and the effects of the ongoing control program.

Figure 2 illustrates the year to year variability in the number of days over the 24-hour PM2.5 standard in Bakersfield and Fresno. The large wildfires that occurred in 2008 throughout central and northern California affected the number of exceedance days in that year. In addition, some years have meteorological conditions that are much more conducive to the formation of PM2.5 than others. Analyses of meteorological data show that the years 2000, 2002, 2007, and 2011 were especially conducive to periods of PM2.5 formation and multi-day pollution episodes. These factors can mask the benefit of declining emissions if not accounted for in the analysis of the air quality trend.

Figure 2: Trend in measured days over the 24-hour standard of 35 µg/m^3

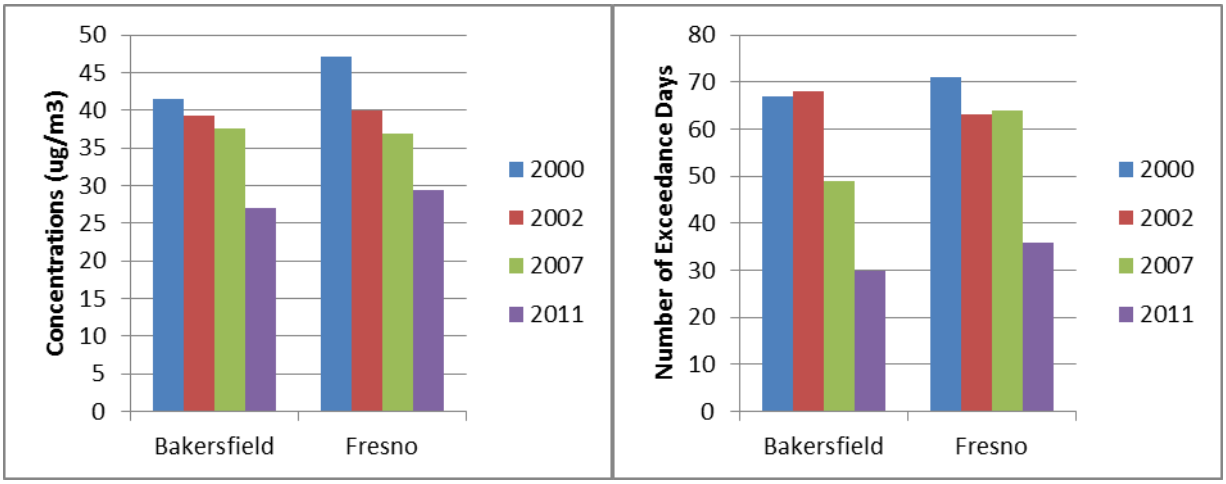


To help understand the interplay between declining emissions and year to year meteorological variability, the years 2000, 2002, 2007, and 2011 were compared for both winter average 24-hour PM2.5 concentrations and the number of days over the standard (Figures 3 and 4).

Despite the adverse meteorology in these four years, there is a general downward trend in both PM2.5 levels and the frequency of exposure as a result of the continuing decline in emissions. In addition, the number of days with the highest concentrations (over 65 ug/m3) has also decreased, dropping from 22 days in Bakersfield in 2000, to 14 days in 2007, and 6 days in 2011.

Figure 3. Change in winter average 24-hour PM2.5 concentrations in years with PM2.5 conducive weather

Figure 4. Change in days over the 24-hour PM2.5 standard in years with PM2.5 conducive weather



This air quality progress is driven by decreases in the key chemical constituents that make up the PM2.5 mass and the associated emission reductions from sources that contribute to those constituents. During the winter, ammonium nitrate is the largest contributor to PM2.5, especially in the central and southern portions of the Valley, where it comprises approximately 60 percent of the PM2.5 mass. Carbonaceous compounds (organic and elemental carbon) are the next largest contributor. Together, ammonium nitrate and carbon comprise 85 to 90 percent of the PM2.5 mass.

Routine measurements of these chemical constituents have been collected at four locations in the Valley since 2002. Between 2002 and 2011, winter-average 24-hour concentrations of organic carbon have decreased by approximately 50 percent and ammonium nitrate by approximately 40 percent. The major sources of winter-time organic carbon in the Valley are mobile sources, residential wood burning, and commercial cooking. During that same time period, PM2.5 emissions from mobile sources decreased by nearly 25 percent due to ongoing implementation of ARB's mobile source control program. In addition, the decrease in organic carbon reflects substantial benefits from the implementation of the District rule prohibiting residential wood-burning on high PM2.5 days. Through a series of rule amendments, the threshold

for curtailing burning was tightened to 30 µg/m^3 in 2008. As a result, PM2.5 emissions from residential wood burning decreased 60 percent. Although a District rule controls emissions from certain commercial cooking operations, as a result of population growth, PM2.5 emissions from commercial cooking have decreased only modestly (approximately 10 percent).

Ammonium nitrate is formed in the atmosphere from chemical reactions of NOx, volatile organic compounds (VOCs), and ammonia. It is therefore important to understand which precursor controls have been most effective in reducing ammonium nitrate concentrations. A number of different methods can be used to assess this, including evaluation of emissions inventories, review of monitoring data, and air quality modeling.

Evaluation of both emissions inventory and monitoring data suggest that in the Valley's ammonia-rich conditions, NOx, rather than ammonia controls are more effective in reducing wintertime PM2.5 concentrations. In addition, air quality modeling has shown that while large reductions in NOx lead to commensurate reductions in ammonium nitrate, comparable reductions in ammonia are much less effective. On a per ton basis, reductions in NOx are approximately an order of magnitude more effective than reductions in ammonia. Finally, air quality modeling has indicated that VOC emission reductions produce no PM2.5 benefit, and in some instances may actually lead to a very small disbenefit.

As a result, programs aimed at reducing NOx emissions have played an important role in reducing ammonium nitrate concentrations. Between 2002 and 2011, Valley NOx emissions decreased by about 38 percent, with a commensurate reduction in both gaseous NOx concentrations and ammonium nitrate concentrations. Major NOx reductions during this time period have resulted from the ongoing implementation of both new vehicle standards for passenger and heavy-duty diesel vehicles and equipment, as well as rules accelerating the turnover of the legacy diesel fleet. District rules have also resulted in ongoing reductions in stationary source NOx emissions over this time period.

III. DEMONSTRATING ATTAINMENT

A. Attainment Demonstration

1. Grid-Based Modeling

Consistent with U.S. EPA guidelines, ARB staff conducted air quality modeling to predict future PM2.5 concentrations at each monitoring site in the San Joaquin Valley. This modeling was used to identify the most expeditious attainment date, the relative benefits of controlling different PM2.5 precursor pollutants, and the magnitude of emission reductions needed from each pollutant. Following U.S. EPA's guidance, the modeling addressed the most severe air quality days, which relies on characterization of episodic daily emissions.

For the 2012 PM2.5 Plan, 2007 was chosen as the base year for the air quality modeling. The design values recorded in 2007 were some of the highest in recent years

and analysis indicates that the meteorology was one of the most conducive to PM2.5 formation. Thus, the selection of 2007 represents a health protective approach to the attainment demonstration modeling.

The attainment demonstration incorporates modeling that includes the benefits of all adopted regulations plus additional scenario and sensitivity runs. Continued implementation of ARB and District ongoing control programs provide new emission reductions each year, resulting in a forecasted 55 percent decrease in NOx emissions, and about a 30 percent decrease in PM2.5 emissions between 2007 and 2019. Modeling these reductions showed attainment of the 24-hour PM2.5 standard by 2019 in all counties except Kings and Kern.

ARB staff then modeled a new scenario reflecting the ongoing control program coupled with an enhanced wood burning curtailment program designed to prevent burning on days that may lead up to a PM2.5 exceedance. The modeling results for this scenario indicate that this regional control would bring almost the entire Valley into attainment by 2019, with only the Bakersfield-California Street site a remaining localized area of nonattainment. The predicted design values from this modeling are shown in Table 1. The substantial improvement in design values reflect ammonium nitrate concentrations that are predicted to decrease by nearly 45 percent, organic carbon concentrations by approximately 65 percent, and elemental carbon concentrations by nearly 80 percent.

Table 1. 2019 modeled 24-hour PM2.5 design values with ongoing programs and enhanced wood burning curtailment

Monitoring Site	2007 Design Value	2019 Modeled Design Value ($\mu g/m^3$)
Bakersfield - California	66	35.7
Bakersfield - Planz	68	32.9
Corcoran - Patterson	61	32.1
Visalia - N. Church	58	29.4
Fresno - Hamilton	61	28.6
Fresno-1st	63	30.5
Clovis	58	28.6
Merced	48	22.6
Modesto	55	24.7
Stockton	45	21.4

In order to determine the emission reductions needed to bring the final site into attainment, ARB staff conducted additional modeling sensitivity runs to assess the relative efficacy of further reductions in different PM2.5 precursors in Kern County. This modeling demonstrated that on a relative basis, the greatest benefits are achieved from reductions in directly emitted PM2.5, followed by NOx, with PM2.5 emission reductions approximately eight times more effective than NOx.

Because the remaining nonattainment problem is very localized, ARB staff examined the emissions inventory in the area surrounding the Bakersfield-California Street

monitoring site. This analysis identified commercial cooking, residential fuel combustion, and on-road motor vehicles as the top three sources of directly emitted PM2.5. Although a District rule controls emissions from some commercial cooking operations, emissions from this category are forecasted to increase slightly into the future due to population growth. Therefore, further control of PM2.5 emissions from commercial cooking operations was identified as the most effective approach to meet the standard at the remaining nonattainment location. The final attainment demonstration for Bakersfield-California, the Valley design site is shown in Table 2.

Table 2. Attainment demonstration for the Bakersfield-California design value site.

2007 Design Value ($\mu g/m^3$)	2019 Design Value with Wood Burning Program Enhancement ($\mu g/m^3$)	2019 Final Design Value ($\mu g/m^3$)
65.6	35.7	35.3

Note: The benchmark for attainment is a design value that is equal to or less than 35.4 $\mu g/m^3$.

The final attainment demonstration for Bakersfield-California includes two new District measures, the enhanced wood burning program and commercial cooking controls. The forecasted 2019 design value for Bakersfield-California with implementation of ongoing control programs and an enhanced residential wood burning curtailment program is 35.7 ug/m3. Model sensitivity analysis of commercial cooking controls shows a 0.6 ug/m3 reduction, bringing the predicted design value to 35.1 ug/m3. However, due to a small increase in motor vehicle emissions resulting from use of updated vehicle activity data, the projected design value was adjusted upward by 0.2 ug/m3. The new data from the San Joaquin Valley Metropolitan Planning Organizations (MPOs) represents about a one percent increase in Valleywide NOx emissions. A modeling sensitivity run served as the basis for this adjustment to the design value. In total, with reductions from existing programs, further wood burning restrictions, new controls on commercial cooking, and updated MPO data, the predicted design value is 35.3 ug/m3. As a result, the attainment demonstration meets U.S. EPA's requirement for an attainment design value of no greater than 35.4 ug/m3.

2. PM2.5 Attainment Plan Precursors

As discussed earlier, ambient PM2.5 is comprised of many different constituents and as a result there are multiple precursor pollutants that lead to PM2.5 formation (directly emitted PM2.5, NOx, SOx, VOCs, and ammonia). U.S. EPA's PM2.5 implementation rule (Rule) specifies that a precursor is considered "significant" for control strategy development purposes when a significant reduction in the emissions of that precursor pollutant leads to a significant decrease in PM2.5 concentrations. Such pollutants are

known as “PM2.5 attainment plan precursors”.[2] The Rule also establishes a presumption that PM2.5, SOx and NOx are attainment plan precursors, while VOCs and ammonia are not significant precursors. U.S. EPA noted in the Rule that the uncertainties in ammonia emission inventories and efficacy of ammonia control measures did not provide enough evidence to consider ammonia as a mandatory PM2.5 attainment plan precursor.

The U.S. EPA Rule does not define significance nor define a quantitative test for determining significance. When it approved the Valley’s annual PM2.5 plan in 2011, U.S. EPA determined that while ammonia reductions provided a small benefit, they were not significant when compared to the benefits of reducing NOx. The only PM2.5 attainment plan precursors identified and approved by U.S. EPA for the annual standard are PM2.5, NOx, and SOx.

In developing the PM2.5 SIP for the 24-hour standard, precursor sensitivity modeling was again done based on the most recent data. This modeling showed that a 25 percent reduction in NOx and PM2.5 would reduce the 2019 design value at Bakersfield by 10 to 12 percent respectively, while a similar reduction in ammonia would reduce the design value by only one percent. On a per ton basis, reductions in the required attainment precursors - NOx, SOx, and PM2.5 - are ten to forty times more beneficial than ammonia reductions. This modeling also indicates that reductions in VOCs have no benefit, and may in some cases cause a very slight increase in PM2.5. Based on the current science showing the relative effectiveness of precursor reductions, the appropriate attainment plan precursors for PM2.5 remain PM2.5, NOx, and SOx.

While ammonia has not been shown to be a significant precursor for PM2.5, ARB staff supports the District ammonia feasibility measure to conduct further research on ammonia emissions and implementation of any feasible and cost-effective mitigation measures identified through this process. This approach is consistent with U.S. EPA’s Rule which enable states to focus on the most effective control strategies by distinguishing among PM2.5 precursors on the basis of significant contribution to attainment.

3. Attainment Date

Nonattainment areas must attain the PM2.5 standards as expeditiously as practicable, but no later than 2019. Looking at the modeled design values and rates of emission reductions, by 2017, approximately 90 percent of the population in the Valley is predicted to live in areas that meet the standard, and the 2012 PM2.5 Plan demonstrates full attainment in 2019 at the last remaining site in Bakersfield. The District assessed whether attainment at this last site could be accelerated, and calculated that emission reductions sufficient to achieve about a 1 ug/m3 decrease in design value would be needed in order to accelerate attainment at this location by one year.

As discussed, reductions in PM2.5 and NOx emissions are the most effective in reducing PM2.5 concentrations. ARB regulations and California’s incentive programs

[2] (72 FR 20586).

are reducing mobile source NOx and PM2.5 emissions as expeditiously as possible, with increasingly stringent new engine standards and the early turnover of legacy fleets. In addition, new District control measures addressing residential wood burning and commercial cooking will be implemented in advance of 2019 to provide early emission reductions.

In looking for other potential ways to accelerate attainment by one year at the remaining nonattainment site, modeling sensitivity runs were evaluated. The modeling showed that to achieve a 1 ug/m3 decrease in the design value at the Bakersfield site all ammonia emissions in Kern County would need to be eliminated. On a Valleywide basis a 34 percent reduction in ammonia emissions would be needed. Reductions on this scale in this timeframe were not found to be feasible. Ammonia is currently being controlled through the District Confined Animal Feeding Operations rule, and research is currently underway to provide an improved characterization of ammonia emissions and the potential for further mitigation. Given the need for further research, completion of the ammonia feasibility study is needed prior to determination of whether further ammonia emission control could accelerate attainment.

4. Weight of Evidence

U.S. EPA's modeling guidance requires that the modeled attainment demonstration be accompanied by a weight of evidence analysis to provide a set of complementary analyses. Examining an air quality problem in a variety of ways provides a more informed basis for the attainment strategy as well as a better understanding of the overall problem and the level and mix of emissions controls needed for attainment.

Appendix G of the 2012 PM2.5 Plan provides the weight of evidence analysis conducted by ARB staff. Following U.S. EPA guidance, this includes assessment of trends in air quality and emissions, source-receptor models and other diagnostic analyses, additional modeling evaluations, and description of a conceptual model of PM2.5 in the Valley. The weight of evidence analysis draws upon the wealth of data collected in the Valley over the years, both from the routine monitoring network, as well as special studies. The substantial continuing reductions that will result from implementation of the ongoing control program, coupled with new measures addressing residential wood burning and cooking are consistent with past progress and the results predicted in the modeled attainment demonstration and support the selected control approach and the associated attainment date of 2019.

B. Control Strategy

Attainment of the 24-hour PM2.5 standard in the Valley will require the combined efforts of ARB and District control programs. As a result of these programs, NOx emissions are forecasted to decrease by 55 percent and PM2.5 emissions by about 30 percent by 2019. The following sections highlight ARB's ongoing control programs and new District measures that provide the emission reductions included in the attainment demonstration.

The 2012 PM2.5 Plan is built upon the District's adopted strategy that is the foundation for the 8-hour ozone and annual PM2.5 plans approved by U.S. EPA in 2011. In

addition, the District has committed to pursue five new regulatory control measures to further reduce PM2.5 and NOx emissions as outlined in Table 3.

Table 3. District regulatory control measures.

Rule	Amendment Date	Compliance Date	Emission Reductions
Rule 4308 Boilers, Steam Generators, and Process Heaters 0.075 to <2 MMBtu/hr	2013	2015	TBD
Rule 4692 Commercial Charbroiling	2016	2017	0.4 tpd PM2.5
Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters	2016	2016	1.5 tpd of PM2.5
Rule 4905 Natural Gas-Fired, Fan-Type Residential Central Furnaces	2014	2015	TBD
Rule 9610 SIP-Creditability of Incentives	2013	2013	TBD

Two rule amendments focus on reducing directly emitted PM2.5 and are key elements of the attainment control strategy. This includes expanding the scope of Rule 4692 for commercial charbroiling to include under-fired charbroilers, similar to the commitment made by the South Coast Air Quality Management District (South Coast). The South Coast and the District continue to partner in efforts to evaluate and advance technologies for this source sector. In addition, the District has committed to further strengthening the successful residential wood burning curtailment program under Rule 4901. Compliance dates for these measures are intended to provide early emission reductions.

Other rules will reduce NOx emissions from residential central furnaces, and boilers, steam generators, and process heaters, with benefits to be quantified as part of the rulemaking. No reductions were included in the attainment demonstration. Working with U.S. EPA, the District also plans to pursue a new rule to allow SIP credit for emission reductions from incentives.

The 2012 PM2.5 Plan also identifies seven further study measures which upon completion could result in opportunities for additional emission reductions. These study measures seek to explore where and how addition reductions may be achieved in the future. The District is committing to release study reports by the dates listed in Table 4.

Table 4. District further study measures.

Control Measure	Description	Completion Date
Rule 4103 Open Burning	Evaluate the feasibility of postponed burning activities every 5 years, as outlined in the current rule.	2015
Rule 4106 Prescribed Burning	Examine the feasibility of implementing a biomass removal program similar to the Placer County program.	2013
Rule 4311 Flares	Review flare minimization plans and annual reports for further emission reduction opportunities.	2013
Rule 4550 CMPs	Analyze existing studies and support new studies to establish a more accurate inventory of PM2.5 emissions and identify potential addition emission reduction opportunities.	2014
Rule 4570 Confined Animal Facilities	Analyze existing studies on ammonia at dairies and evaluate potential ammonia controls for their effectiveness in reducing PM2.5 concentrations in the Valley.	2017
SC 001 Lawn Care Equipment	Evaluate emissions inventory and technology demonstration efforts to identify potential emission reduction opportunities.	2013
SC 005 Asphalt/Concrete Operations	Examine feasibility of warm-mix asphalt as a potential emission reduction opportunity.	2013

Over the past five years, ARB adopted a number of regulations aimed at reducing emissions of diesel particulate matter and oxides of nitrogen from freight transport sources like heavy-duty diesel trucks, and off-road sources like large construction equipment. Phased implementation of these regulations will produce increasing emission reduction benefits over time, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

ARB's longstanding programs to reduce emissions from passenger vehicles along with the smog check program provide continuing benefits needed for attainment of the 24-hour PM2.5 standard. Implementation of the ARB 2007 State Strategy approved by U.S. EPA[3] is providing new reductions included in the PM2.5 SIP for the San Joaquin Valley. Since development of the 2007 State Strategy, the ARB measures listed in Table 5 have been adopted and improvements to California's smog check and vehicle retirement programs have been made.

[3] Approval and Promulgation of Implementations Plans; California; 2008 San Joaquin Valley PM2.5 Plan and 2007 State Strategy-Federal Register Vol. 76, No. 217, Page 69896

Table 5. Measures in the 2007 State Strategy

Passenger Vehicles
Smog Check Improvements
Expanded Vehicle Retirement (AB 118)
Modifications to Reformulated Gasoline Program
Trucks
Cleaner In-Use Heavy-Duty Trucks
Goods Movement Sources
Auxiliary Ship Engine Cold Ironing & Other Clean Tech
Cleaner Main Ship Engines and Fuel
Port Truck Modernization
Clean Up Existing Harbor Craft
Off-Road Equipment
Cleaner In-Use Off-Road Equipment
Other Off-Road Sources
Enhanced Vapor Recovery for Above-Ground Storage Tanks
Additional Evaporative Emission Standards
Areawide Sources
Consumer Products Program
Pesticide Regulation (adopted by Department of Pesticide Regulation)

Clean New and In-Use Heavy-Duty Trucks

A central control element of ARB's 2007 State Strategy is increasingly stringent standards for new trucks as shown in the Table 5. New heavy-duty trucks sold since 2010 must emit 98 percent less NOx and PM2.5 than new trucks sold in 1986.

Table 5: Phase-in of truck engine standards.

Model Year	**Applicable Standard g/bhp-hr**	
	NOx	**PM**
1986 and older	10.7	0.60
1987-2006	From 6.0 to 2.0	From 0.6 to 0.10
2007-2009	1.1	0.01
2010	0.2	0.01

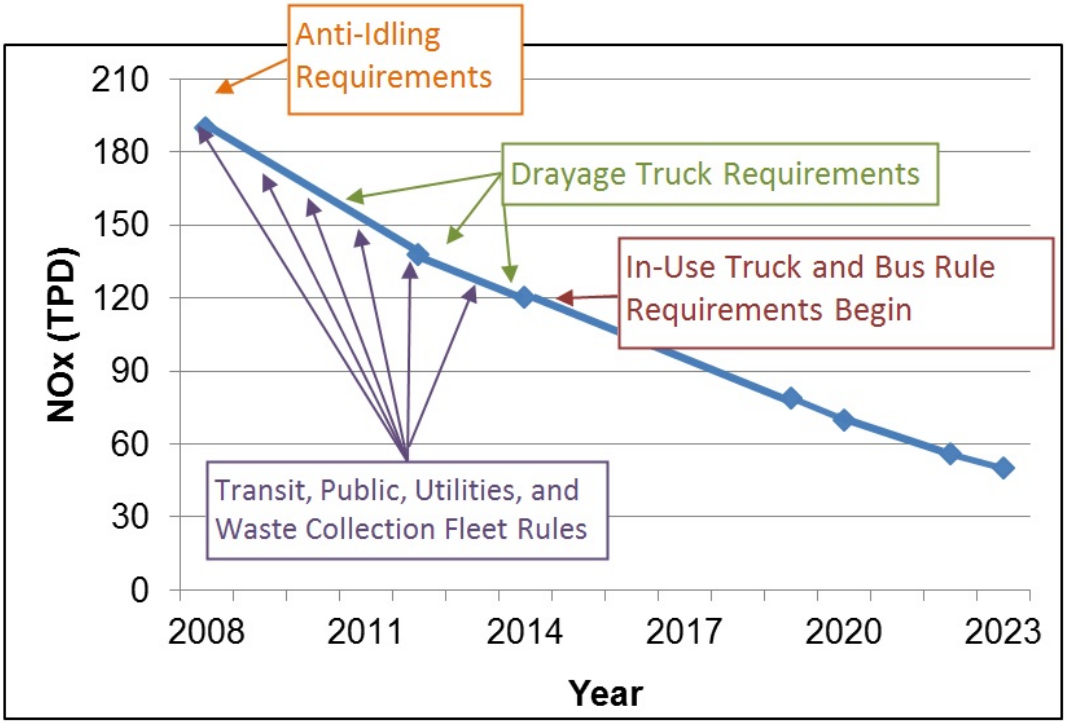
However, older, higher-emitting trucks with long service lives would stay on the road for many years to come. With attainment of the PM2.5 standards required soon after the cleanest trucks were introduced, the typically slow replacement of older trucks on the road with the latest models would not provide emission reduction benefits soon enough.

To address this, ARB developed the Cleaner In-use Heavy-duty Truck SIP measure. This measure leverages the benefits provided by new truck emission standards by accelerating introduction of the cleanest trucks. The Truck and Bus Regulation was adopted in December 2008, and amended in December 2010 to account for the reduced emissions resulting from the economic effects of the recession. This rule represents a multi-year effort to turn over the legacy fleet of engines and replace them with the cleanest technology available.

Starting in 2012, the Truck and Bus Regulation phases in requirements so that by 2023 nearly all vehicles will meet 2010 model year engine emissions levels. The regulation applies to nearly all diesel fueled trucks and buses with a gross vehicle weight rating greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-state or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles.

Figure 5 below portrays reductions in NOx from in-use trucks within the San Joaquin Valley, and shows the benefits of ARB's mobile strategy.

Figure 5. Truck and bus regulation implementation.



In addition to the Truck and Bus Regulation, separate regulations reduce emissions from other public fleets, solid waste collection trucks and transit buses. Trucks that transport marine containers must comply with the drayage truck regulation.

Cleaner In-Use Off-Road Equipment

As with trucks, the control strategy for off-road equipment is based on increasingly stringent new off-road diesel engines. As a result, new construction, mining, industrial and oil drilling equipment will become progressively cleaner. The requirements vary according to the power rating of engines. Table 6 shows the schedule for phasing in tiered requirements for new off-road engines with a power rating between 175 and 300 horsepower (hp). Beginning in 2014, new Tier 4 construction equipment with the power rating shown below must emit about 96 percent less NOx and PM than new Tier 1 equipment sold in the year 2000.

Table 6: Phase-in of off-road engine standards

Model year	Level of Control	Applicable Emission Standard for New Off-road Engines 175<hp<300 g/bhp-hr	
		NOx	PM
1996-2002	Tier 1	6.9	0.4
2003-2005	Tier 2	4.9*	0.15
2006-2010	Tier 3	3.0*	0.15
2011-2013	Tier 4 interim	1.5	0.015
2014+	Tier 4 final	0.3	0.015

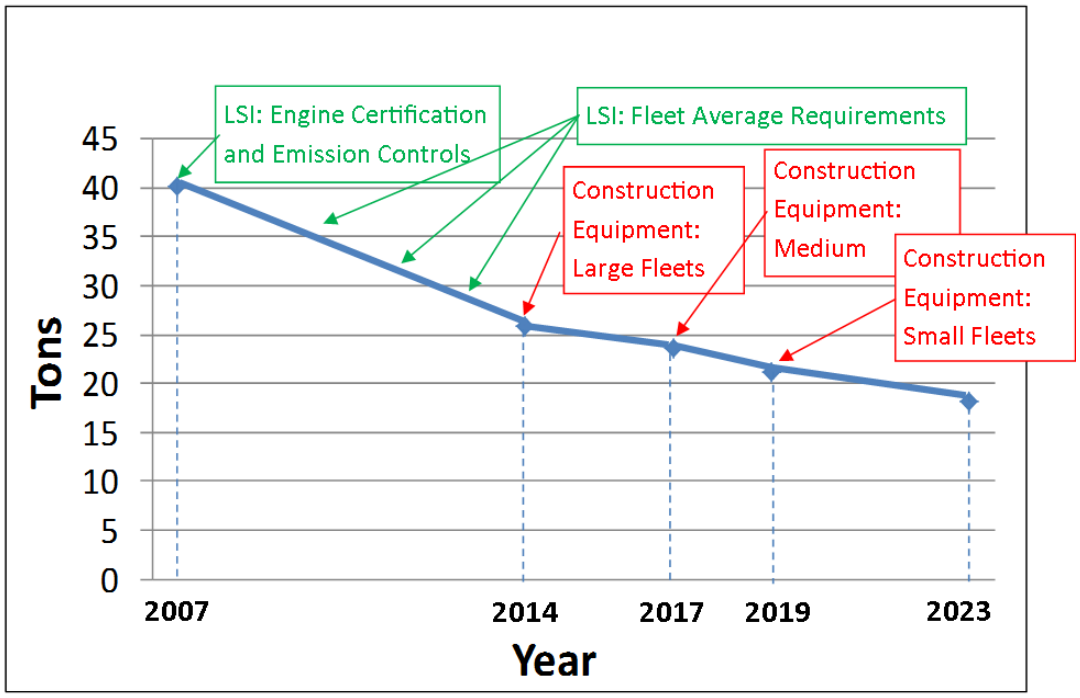
*Reflects combined limit for non-methane hydrocarbons and NOx

However, large diesel off-road equipment typically remains in use for long periods of time. As with heavy-duty trucks, this long life means that newer, lower-emitting engines would be introduced into fleets relatively slowly. The impact of this is that emission reductions and associated health benefits from these cleaner engines would also be fairly slow to materialize. To address this, the 2007 SIP included the Cleaner In-use Off-road Equipment measure.

First approved in 2007, the Off-Road Regulation was amended in 2010 in light of the impacts of the economic recession. Affected off-road equipment is used in construction, manufacturing, the rental industry, road maintenance, airport ground support and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

Figure 6 portrays reductions in NOx emissions from off-road equipment within the San Joaquin Valley, and shows the benefits of ARB's mobile strategy.

Figure 6. Off-Road Regulation NOx emission reductions.



The Off-Road Regulation will significantly reduce emissions of diesel PM and NOx from the over 150,000 in-use off-road diesel vehicles that operate in California by requiring their owners to modernize their fleets and install exhaust retrofits. The regulation affects dozens of vehicle types used in thousands of fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls.

The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The regulation also requires that all vehicles be reported to ARB and labeled, restricts the addition of older vehicles into fleets, and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

Passenger Cars

The Board established California's Low Emission Vehicle (LEV) program in 1990, and the LEV2 program in 1998. Additionally, ARB's Zero Emission Vehicle (ZEV) regulation which affects passenger cars and light-duty trucks, has spurred movement towards commercialization of advanced clean cars and light-duty trucks. As a result, many new gasoline engines now emit extremely low emission levels of smog forming emissions. Conventional hybrid electric vehicles have been commercialized, and the number of models offered for sale is quickly expanding. Recently, battery electric vehicles and plug-in hybrid electric vehicles have been introduced for sale, and fuel cell electric vehicles are expected to follow.

ARB's Advanced Clean Cars (ACC) Program, approved in January 2012, is a pioneering approach of a 'package' of regulations, that although separate in construction, are related in terms of the synergy developed to address both ambient air quality needs and climate change. The ACC program combines the control of smog, soot causing pollutants and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. The program assures the development of environmentally superior cars that will continue to deliver the performance**,** utility, and safety vehicle owners have come to expect.

The ACC program approved by ARB in January 2012 included amendments affecting the current ZEV regulation through the 2017 model year in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. The ZEV amendments for 2018 and subsequent model years in the ACC program approved by ARB in January 2012 are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions.

The ACC Program will produce increasing benefits over time as new cleaner cars enter the fleet displacing older and dirtier vehicles. In this manner, the benefits in 2023 will be realized through the cumulative reduction in emissions achieved by new cars entering the fleet in 2017 through 2023. This program will continue to provide benefits well after 2025 as vehicles meeting the new standards replace older, higher-emitting vehicles.

Many additional programs are currently in place to reduce emissions from the passenger car legacy fleets and accelerate fleet turn over. The Smog Check Program ensures that passenger vehicles stay clean as they age and on-board diagnostic systems identify smog control problems. The Smog Check Program is continuously being improved to provide additional emission reductions such as requiring stricter inspection standards and annual inspection of older vehicles. ARB is also active in encouraging consumers with older dirtier vehicles to retire them early. Replacing older dirtier vehicles with cleaner new vehicles provides permanent emission reductions.

IV. OTHER CLEAN AIR ACT REQUIREMENTS

In addition to the elements related to the attainment demonstration, the Clean Air Act also requires that SIPs contain the following information:

- Base year emission inventories and future year forecasts for manmade sources of air pollution in the nonattainment area;
- Demonstration that all reasonably available control technology/reasonably available control measures (RACM/RACT) have been applied to existing sources;
- Reasonable Further Progress (RFP) towards attainment;
- Contingency measures in the event the controls fall short of achieving needed reductions; and
- Transportation conformity emission budgets to ensure transportation plans and projects are consistent with the SIP.

A. Emissions Inventory

SIPs must contain base-year inventories for PM2.5 and all precursor emissions as well as future year forecasts for all pollutants identified as PM2.5 attainment plan precursors. An emission inventory consists of a systematic listing of the sources of air pollutants with an estimate of the amount of pollutants from each source or source category over a given period of time.

ARB and District staff worked jointly to prepare an updated emission inventory for the 2012 PM2.5 Plan. This included a category-by-category review and update to the growth profiles using sector specific forecasts based on the most recent economic information available. Extensive effort also went into developing an inventory for use in the air quality modeling that appropriately represented the nature of episodic emissions during the winter months. Additional information on the emission inventory methodologies and resulting base and future year emissions can be found in Appendix B of the 2012 PM2.5 Plan.

B. Reasonably Available Control Measure Analysis

As specified in the Clean Air Act, SIPs shall provide for the implementation of all RACM as expeditiously as practicable, including at minimum RACT. U.S. EPA has interpreted RACM as those measures that are technologically and economically feasible and when considered in aggregate, would advance the attainment date by at least one year.

The District RACM/RACT demonstration includes a comparison of stationary source measures the District has implemented or plans to implement with U.S. EPA's list of suggested PM2.5 control measures along with other local district measures and comments received during the public process. Based on this, the District determined that four rules could be strengthened to provide reductions needed to attain the PM2.5 standard in the Valley. No additional feasible measures were identified that could in aggregate accelerate attainment by one year, as discussed previously in the attainment date section.

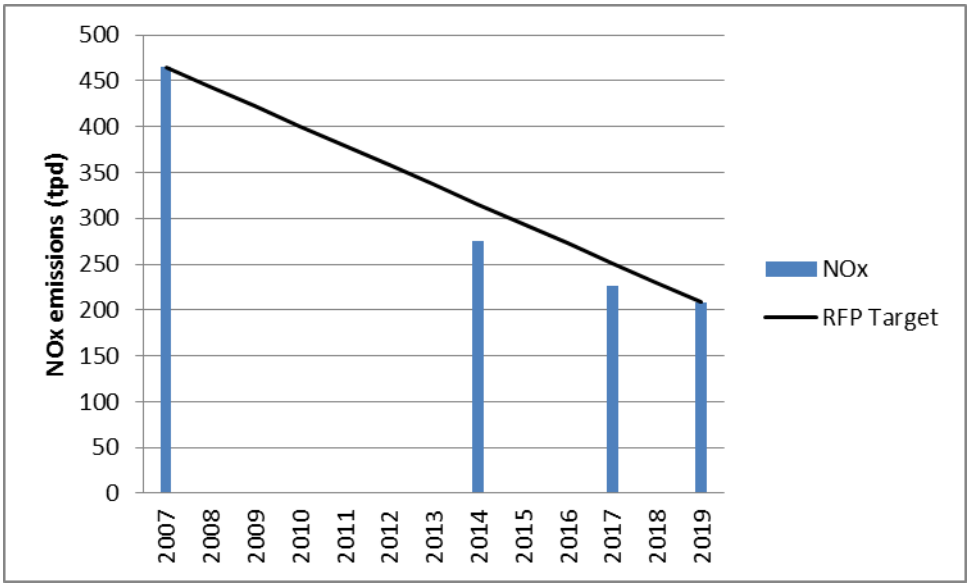
California's comprehensive mobile source program continues to be RACM as it expands and further reduces emissions. Given the significant emission reductions needed for attainment in California, ARB has adopted the most stringent control measures nationwide for on-road and off-road mobile sources and the fuels that power them. These measures provide a significant amount of emission reductions needed for the Valley to attain the PM2.5 standard. The complete RACM and RACT assessment is provided in Chapter 9 and Appendix D of the 2012 PM2.5 Plan.

C. Reasonable Further Progress

SIPs must also provide for steady progress in reducing emissions during the years leading to attainment. The pace of ARB and District control programs, as well as the early introduction of the District's wood burning and commercial cooking measures fully meets the RFP requirements. Figure 7 shows projected NOx emission levels along with

the RFP linear target. As shown in the figure, NOx emission levels are projected to be well below the level of required linear progress, ensuring early emission reductions towards attainment.

Figure 7. NOx emission reductions compared to RFP target.



D. Contingency Measures

Contingency measures provide additional emission reductions in the event a nonattainment area fails to achieve RFP targets or attain the PM2.5 standard by its attainment date. These contingency measures are to take effect without further ARB or District action. As shown above in the example in Figure 7, early reductions from the control strategy beyond those needed for RFP provide for interim year contingency. In addition, reductions that accrue between 2019 and 2020 provide the majority of the attainment contingency reductions. Additional Valleywide reductions from the commercial cooking and enhanced wood burning curtailment rules beyond those needed for localized attainment, as well as a contingency trigger in the residential wood burning rule provide the remaining contingency reductions. Additional discussion of contingency measures is provided in Chapter 9 of the 2012 PM2.5 Plan.

E. Transportation Conformity Budgets

Under section 176(c) of the Clean Air Act, transportation activities that receive federal funding or approval must be fully consistent with the SIP. U.S. EPA's transportation conformity rule[4] details requirements for establishing motor vehicle emission budgets (budgets) in SIPs for the purpose of ensuring the conformity of transportation plans and programs with the SIP.

[4] U.S. EPA maintains online information on its transportation conformity program, including access to relevant rulemakings, policy guidance, and reports at: http://www.epa.gov/otaq/transp/traqconf.htm

The 2012 PM2.5 Plan establishes county-level on-road motor vehicle emission budgets for each RFP milestone year, as well as for the attainment year. Emission budgets for direct PM2.5 and NOx were calculated using EMFAC2011 and reflect winter average emissions. The emission budgets established in the 2012 PM2.5 Plan fulfill the requirements of the Clean Air Act and U.S. EPA regulations to ensure that transportation projects will not interfere with progress and attainment of the annual PM2.5 standard. Additional detail on the on-road motor vehicle emission budgets can be found in Appendix C of the 2012 PM2.5 Plan.

V. ENVIRONMENTAL IMPACTS

To meet the requirements of the California Environmental Quality Act (CEQA), the District prepared a Draft Negative Declaration because the Initial Study showed there is no substantial evidence, in light of the whole record, that the 2012 PM2.5 Plan may have a significant effect on the environment. On November 8, 2012, the District issued a Notice of Intent to Adopt a Negative Declaration along with the Initial Study[5]. Comments on the Initial Study and Draft Negative Declaration were accepted from November 9, 2012 to December 8, 2012. The written comments received were reviewed and considered by the District Governing Board prior their adoption of the Final Negative Declaration and approval of the 2012 PM2.5 Plan at a public meeting held on December 20, 2012.

VI. STAFF RECOMMENDATION

ARB staff recommends that the Board:

1. Adopt the San Joaquin Valley 2012 PM2.5 Plan, including the emission inventory, local control strategy, attainment demonstration, identification of PM2.5 attainment plan precursors, attainment deadline request, reasonable further progress plan, contingency measures, RACT/RACM demonstration, and transportation conformity emission budgets, as revisions to the California SIP.

2. Direct the Executive Officer to submit the San Joaquin Valley 2012 PM2.5 Plan to U.S. EPA for approval.

[5] http://www.valleyair.org/notices/Docs/2012/11-18-12PM25/Notice_of_Intent-NegativeDeclaration.pdf