

# State of California

California Environmental Protection Agency

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**AIR RESOURCES BOARD**

## Staff Report

# **Analysis of the Sacramento Metropolitan Air Quality Management District PM10 Implementation/Maintenance Plan and Redesignation Request for Sacramento County**

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This document has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

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## EXECUTIVE SUMMARY

The Sacramento Metropolitan Air Quality Management District (District) shares the same jurisdictional boundary as Sacramento County (County) and has prepared documentation to demonstrate that the County now meets the remaining federal health standard for particulate matter of 10 microns in diameter or smaller (PM10) and should be redesignated to attainment. On July 1, 1987, the United States Environmental Protection Agency (U.S. EPA) adopted the PM10 national ambient air quality standard (NAAQS or standard) consisting of an annual average standard of 50  $\mu\text{g}/\text{m}^3$ , and a 24-hour standard of 150  $\mu\text{g}/\text{m}^3$ . Subsequently, on December 18, 2006, U.S. EPA revoked the national annual average PM10 standard.

In 1994, U.S. EPA designated the County a moderate nonattainment area, with an attainment deadline of December 31, 2000. Effective March 18, 2002, U.S. EPA officially determined that monitors in the County measured air quality attaining the 24-hour PM10 standard by the moderate area deadline. The District must provide documentation specified in the federal Clean Air Act (the Act) demonstrating the 24-hour PM10 standard can be maintained in order to request that U.S. EPA redesignate the County to attainment.

The District prepared the PM10 Implementation/Maintenance Plan and Redesignation Request for Sacramento County (Sacramento PM10 Plan or Plan) as required. The Plan affirms the County has attained the standard and demonstrates that existing federal, State, and local control measures will maintain the 24-hour PM10 standard in the District. On October 28, 2010, the District Board adopted the Plan at a public hearing.

The Plan contains all elements needed for redesignation to attainment:

- Demonstration that PM10 attainment concentrations measured between 2007 and 2009 will be maintained for ten years after redesignation;
- Commitment that the monitoring network will be maintained to track attainment for at least ten years after redesignation;
- Contingency provisions for correcting any future violations of the PM10 NAAQS;
- Emission inventories for PM10 and nitrogen oxides (NOx);
- Transportation conformity budgets which sets limits for mobile source emissions of PM10 and NOx through 2022.

In addition, eight years after the U.S. EPA redesignates the area as attainment, the District will submit a revised maintenance plan providing for continued attainment for an additional ten years.

ARB staff concurs with the District's Sacramento PM10 Plan and recommends the Board approve the Plan, as a revision to the California State Implementation Plan (SIP), for submittal to U.S. EPA.

## I. BACKGROUND

Sacramento County, as shown in Figure 1, was initially designated as a moderate PM10 nonattainment area in 1994 with an attainment date of December 31, 2000. The County is approximately 994 square miles in size. The population of about 1,443,000 residents has grown rapidly, increasing almost 40 percent in the past twenty years. The urbanized areas are surrounded by agricultural croplands and ranchlands. Four major interstate highways cross the county and the major economic activities are related to government services, retail trade, agriculture, construction materials, and other industrial uses. Despite the changes in land use over time, there have been no violations of the 24-hour average PM10 NAAQS since the mid-1990s.

**Figure 1**  
**Location of Sacramento County**



On March 18, 2002, U.S. EPA determined that Sacramento County had attained the PM10 standard by the 2000 deadline. Based on this clean data finding, certain nonattainment area requirements do not apply, including those for reasonable further progress, an attainment demonstration, reasonably available control measures, and contingency measures, because these provision's sole purpose is to achieve attainment of the standard. On October 28, 2010, the District adopted the Sacramento County PM10 Plan. The Plan officially requests that this area be redesignated to attainment for the PM10 standard and charts the course for continued maintenance of the standard. The State mobile source control strategy and local District rules have resulted in Sacramento County attaining the 24-hour PM10 standard based on both past and current data.

## II. REDESIGNATION REQUIREMENTS

The Act sets the general framework for redesignation requests. In 1992, U.S. EPA provided guidance for processing redesignation requests<sup>1</sup>. ARB staff reviewed the Sacramento PM10 Plan within the context of the Act and the U.S. EPA guidance, which identify the following requirements an area must meet for formal redesignation to attainment:

- A. The PM10 standard has been attained;
- B. The District has an approved State Implementation Plan (SIP) and the State has met all applicable Act requirements for PM10 in the nonattainment area;
- C. The improvement in PM10 air quality is due to permanent and enforceable emission reductions; and
- D. U.S. EPA has approved a Maintenance Plan which includes these elements:
  1. Attainment emission inventory;
  2. Demonstration that PM10 attainment concentrations at federal reference monitoring stations will be maintained for ten years after redesignation;
  3. Commitment to ongoing monitoring network operation;
  4. Continued verification of attainment;
  5. Contingency plan to promptly correct any violation of the PM10 NAAQS that occurs after the area has been redesignated to attainment; and
  6. Transportation conformity budgets for the ten years following the anticipated year of U.S. EPA approval of the submittal.

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<sup>1</sup> A principal source of EPA guidance with respect to redesignations to attainment can be found in a Memorandum from U.S. EPA Office of Air Quality Planning and Standards entitled "Procedures for Processing Requests to Redesignate Areas to Attainment," John Calcagni, Director, Air Quality Management Division, U.S. EPA, Research Triangle Park, North Carolina September 4, 1992.

### **III. EVALUATION OF THE SACRAMENTO PM10 PLAN**

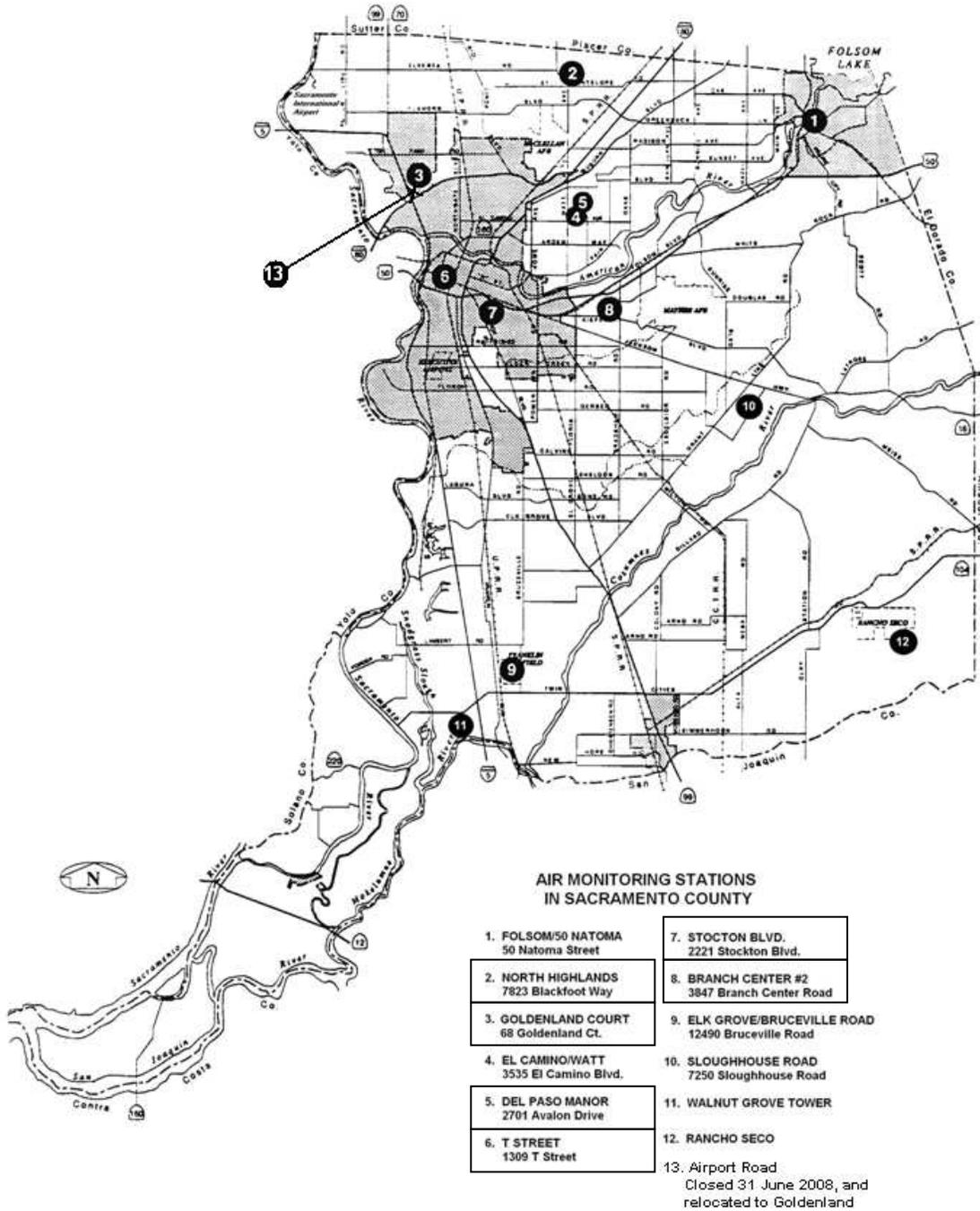
Based on review of the Sacramento PM10 Plan and the District's supporting technical analysis, ARB staff concur that the Plan meets the Act's requirements. The following sections indicate how the Plan meets the redesignation and maintenance plan requirements.

#### **A. Sacramento County Attains the 24-Hour PM10 Standard**

Currently, PM10 concentrations are measured at six monitoring sites using federal reference method monitors (FRMs). These filter-based, high-volume, size-selective inlet samplers collect PM10 samples on an hourly basis, for a 24-hour period, every six days. Figure 2 shows the location of all the ambient air monitors in Sacramento County with the FRMs for PM10 outlined in the key.

Table 1 lists the highest 24-hour average PM10 concentration during each year for the three-year period of 2007-2009. The 24-hour PM10 standard is met when the estimated number of exceedances measured over a three-year period averages one or less per year. The FRMs' data demonstrate that the County attains the 24-hour PM10 standard.

**Figure 2**  
**PM10 Monitoring Stations in Sacramento County**



**Table 1**  
**FRM PM10 Data from 2007 to 2009**

Monitoring Station Name	Maximum 24-hour Average Concentration ( $\mu\text{g}/\text{m}^3$ )			Three-year Total Number of Days Exceeding the Standard
	2007	2008	2009	
Branch Center Road	56	89	76	0
Del Paso Manor	70	71	45	0
Goldenland Court*	--	56	48	0
North Highlands	56	97	33	0
Stockton Blvd	56	88	45	0
T Street	53	73	47	0

\* The Goldenland Court monitor replaced the Airport Road monitor starting in October 2008.

### **B. The State Has Met Applicable Act Requirements**

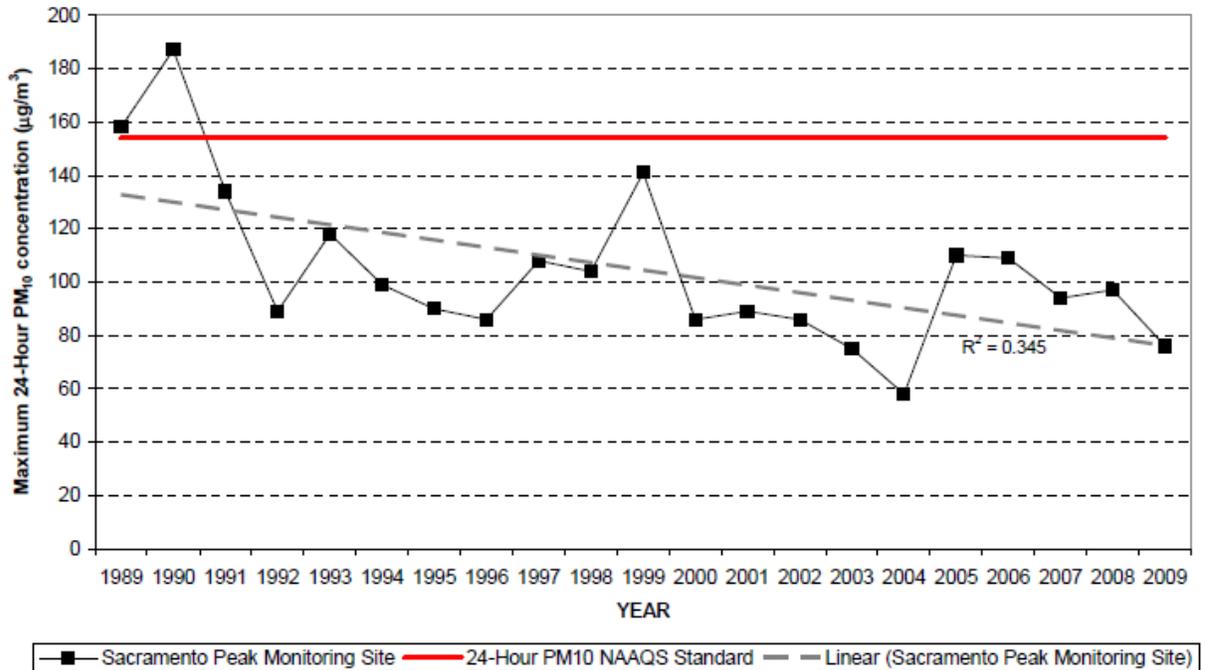
The Sacramento PM10 Plan serves both the implementation and maintenance plan functions prescribed by the Act, since U.S. EPA determined that the PM10 standard was met by the 2000 deadline. ARB and the District have also met all of the Act requirements applicable for a moderate PM10 nonattainment area to be considered for redesignation to attainment.

### **C. Improvement in Sacramento PM10 Air Quality is Due to Permanent and Enforceable Reductions in Emissions**

Current District rules controlling emissions of particulate matter and precursor gases (NOx, sulfur oxides (SOx), and reactive organic gases (ROG)) from stationary sources, and ARB-adopted measures governing mobile sources, have all resulted in emission reductions. In addition, the District adopted a residential wood-burning measure that curtails wood smoke during winter months, when residential wood smoke contributes to PM10 levels. The adopted measures are fully enforceable and are explained in detail in the Plan.

The benefit of these emissions reductions are indicated by the downward trend of the highest average 24-hour concentration each year at the peak Sacramento monitoring site as shown in Figure 3. These measures have provided for continuous attainment of the 24-hour PM10 standard in the region since the early 1990s. Based on analyses of long-term meteorological variables, including precipitation, wind speed and direction, temperature, and stagnation, the District found that meteorological conditions during the 2007-2009 period were not unusually favorable to lower PM10 levels. Therefore, air quality improvements leading to PM10 attainment in the District are due to emission reductions from adopted, fully enforceable control measures.

**Figure 3  
Peak 24-Hour Average PM<sub>10</sub> Concentrations  
Sacramento County 1989-2009**



*Note: The peak 1999 concentration of 141 µg/m<sup>3</sup> occurred on July 5<sup>th</sup> at the Del Paso Manor monitoring site, and was likely impacted by emissions from the Fourth of July fireworks.*

#### **D. Maintenance Plan**

The Sacramento PM<sub>10</sub> Plan includes the following components: attainment emission inventory; maintenance demonstration; commitment to continue monitoring network operation; commitment for verification of continued attainment; a contingency plan; and transportation conformity budgets.

##### **1. Attainment Emission Inventory**

The Plan must demonstrate that the PM<sub>10</sub> standard is attained and maintained, despite future growth in the emissions inventory. The emissions inventory is a systematic listing of the sources of air pollutants along with the amount of pollutants emitted from each source or category over a given period of time. The inventory is a critical tool used to indicate trends, measure control efficacy, and evaluate air pollution mitigation. To determine the expected emissions in future years, projected emission inventories incorporate the effects of growth and existing regulations on a baseline inventory. Emission inventories are estimates of the air pollutant emissions released into the environment – they are not direct ambient concentration measurements. However, if the inventory is reviewed in conjunction with the actual pollutant concentrations measured by the monitoring network, proportional relationships can be developed to

predict future concentrations of pollutants. This exercise, detailed in the Plan, demonstrates continued attainment of the standard into the future.

In Sacramento County, the emissions inventory was analyzed for directly-emitted PM10 and NOx (as a precursor to ammonium nitrate). The District prepared seasonal emission inventory projections for a winter day since 24-hour PM10 average concentrations have historically been the highest during this time. The main emissions source types contributing to winter PM10 air quality in the County are secondary ammonium nitrate particles and directly emitted particles from motor vehicle exhaust and wood smoke. Typical wintertime weather conditions in Sacramento County include high atmospheric stability, low wind dispersion, and colder temperatures which are conducive to PM10 pollutant build-up, especially for ammonium nitrate particles.

The Plan used 2008 as the base year from which emission inventories were projected into the future for 2012 and 2022. The 2008 emissions inventory is the most recent available. The future years of 2012 and 2022 bracket the ten-year maintenance period which would start in 2012, the first year after U.S. EPA's anticipated approval of redesignation to attainment. The District inventory updates include the latest point and area source emissions information; ARB's EMFAC mobile source emission outputs; and planning assumptions in the Sacramento Area Council of Governments' (SACOG) most recent Regional Transportation Plan. Emissions reduction credits established prior to 2008 through the regulatory control measures to offset future growth were included in the emissions inventory forecasts, so as not to underestimate future emissions for the maintenance demonstration for the years 2012 and 2022.

## **2. Maintenance Demonstration**

The Act requires the District to show that the PM10 24-hour standard can be maintained for at least 10 years after the redesignation request is approved by U.S. EPA. The District analyzed the future mix of sources and emission rates and used proportional rollback modeling to show that the emissions would not result in a violation of the standard during the maintenance planning period years, 2012-2022. The premise of proportional rollback is that changes in emissions from individual pollution sources over time are directly proportional to the change in associated ambient concentrations due to that individual source.

The source categories were determined by receptor modeling using the Chemical Mass Balance (CMB) model and the apportionment determined for the winter season in Sacramento.<sup>2</sup> The PM10 component species were matched to the appropriate emission inventory categories in the rollback analysis. The PM10 and precursor emissions source categories were assumed to vary directly with the matching CMB ambient PM10 speciation categories, thereby determining the proportional contributions to overall mass measured at a typical monitor. The emissions inventory projections for these source categories include the effects of adopted and enforceable controls of ARB,

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<sup>2</sup> Motallebi, Nehzat. "Wintertime PM<sub>2.5</sub> and PM<sub>10</sub> Source Apportionment at Sacramento California". Air and Waste Management Association 1999: 25-34.

the District, and other local measures already in place. They also take into account an additional 1.5 tons of PM10 in 2022 which can be added to the inventory projections for transportation conformity purposes when the planning horizon for regional transportation plans exceed the maintenance plan period.

Table 2 shows the 2012 and 2022 projected maximum 24-hour average PM10 concentration compared with the base year 2008. The projected changes in peak concentration reflect the projected changes in the emissions inventory. The predicted peak PM10 average daily concentrations do not exceed 150  $\mu\text{g}/\text{m}^3$ . This demonstrates continued attainment of the 24-hour PM10 NAAQS in Sacramento County.

**Table 2**  
**Projected Maintenance of 24-hour PM10 NAAQS in Sacramento County**

<b>PM10 CMB Analysis</b>	<b>Percent of PM10 Mass</b>	<b>Peak Monitored Value Concentration</b>	<b>2012 Projected Peak Concentration</b>	<b>2022 Projected Peak Concentration</b>
<b>Source Category</b>	<b>(% total)</b>	<b>(<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>(<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>(<math>\mu\text{g}/\text{m}^3</math>)</b>
Ammonium Nitrate	24.4%	26.6	23.7	18.1
Motor Vehicles	24.5%	26.7	24.9	20.7
Wood Smoke	17.8%	19.4	18.1	20.0
Fugitive Dust	15.1%	16.5	16.7	18.6
Ammonium Sulfate	1.3%	1.4	2.2	2.4
Unidentified Other	16.9%	18.4	18.2	18.9
<b>TOTAL PM10</b>	<b>100.0%</b>	<b>109*</b>	<b>104</b>	<b>99</b>

\* 109  $\mu\text{g}/\text{m}^3$  was the peak monitored value in Sacramento County from the three-year period ending in the 2008 base year, using ambient air monitoring data from the T Street monitor in 2006.

### 3. PM10 Monitoring Network

The District commits to continue PM10 monitoring to verify sustained attainment of the PM10 standard in the County. The existing PM10 monitoring network in Sacramento includes six FRM monitors (Figure 2). The minimum number of monitors required is two to four monitors based on the population of the Metropolitan Statistical Area containing Sacramento County<sup>3</sup>. Therefore, the current number of monitors within the County is greater than the PM10 monitoring network requirement for the area. The District commits to continue to maintain and operate a PM10 ambient monitoring network in Sacramento County that meets or exceeds the minimum monitoring requirements.

<sup>3</sup> "Network Design Criteria for Ambient Air Quality Monitoring", 40 CFR Part 58, Appendix D.

#### **4. Verification of Continued Attainment**

To verify continued attainment of the PM10 standards, the District commits to reevaluate the Plan in accordance with requirements for maintenance plans found in the Act. The District will review the assumptions and data for the PM10 maintenance demonstration in 2015 and 2018 to fulfill the verification and tracking requirements. Eight years after the County has been redesignated to attainment, the District will submit to U.S. EPA the required revision to the Plan demonstrating maintenance of the standard for the following ten-year period. On a regular basis, the District will continue to analyze PM10 data from FRMs and compare daily PM10 values to the level of the 24-hour standard. This includes tracking the indicator for triggering the maintenance contingency plan. In addition, the District may also evaluate data from continuous monitors to aid in the analysis of air quality trends.

#### **5. Contingency Plan**

The Act requires a maintenance plan to include contingency provisions for prompt correction of any PM10 standard violation that might occur after the area has been redesignated to attainment. The maintenance plan is not required to contain fully adopted contingency control measures that will go into effect without further state action as is required in attainment SIPs. Instead, for maintenance plans, the area must have a plan to ensure that contingency actions occur once they are triggered. The Plan identifies the specific indicator or trigger which will be used to determine when contingency provisions should be implemented.

The trigger will be any violation of the 24-hour PM10 standard at a PM10 monitor, verified through filter sampling, weighing and processing. If the data point cannot be flagged and approved as an exceptional event, then the District will analyze the event to determine the possible causes and whether applicable emissions reductions from existing measures due to be implemented would be sufficient to prevent future PM10 violations. If not, the District would proceed with selecting specific measures for adoption and implementation to address the PM10 problem. The Plan contains a timeline for this process along with a suggested list of reasonably available control measures that may provide cost-effective, particulate matter emissions reductions benefits, according to the circumstances associated with the violation.

#### **6. Transportation Conformity Budgets**

The Act requires that transportation plans, programs, and projects receiving federal funding or requiring federal approval must be found to be fully consistent with the SIP. The federal Transportation Conformity Rule<sup>4</sup> requires SIPs to specify on-road motor vehicle emission budgets (transportation conformity budgets) that are consistent with the attainment and maintenance demonstrations in the SIP. The conformity regulation requires metropolitan planning organizations (MPO) to demonstrate that emissions from regional transportation plans and programs do not exceed these emissions budgets.

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<sup>4</sup> The Transportation Conformity Regulation is found at 40 CFR Parts 51 and 93.

The MPO for Sacramento County is SACOG, whose forecasts of vehicle miles travelled (VMT) were developed from the MPO's projections of future population, dwelling units, and employment. These VMT forecasts were used to develop the transportation conformity budgets for future years for PM10 and NOx using ARB's latest on-road mobile source emission factor model EMFAC2007 and transportation activity data from the August 2009 Metropolitan Transportation Improvement Program analysis. SACOG's travel demand model predicts that growth in vehicle trips and vehicle miles traveled will be slightly lower than the population growth rate for the Sacramento region through 2035.

The transportation conformity budgets reflect emission reductions from control measures already adopted through federal, State and District regulations applied to projected growth in emissions from re-entrained dust from travel on paved and unpaved roads, vehicular exhaust, and road construction. The Transportation Conformity Rule requires that PM10 from construction-related fugitive dust be included in the budget because it was identified as a contributor to the non-attainment problem. NOx is the only precursor included in the budgets, because ammonium nitrate was shown to contribute significantly to peak PM10 concentrations.

Table 3 shows the proposed transportation conformity budgets for NOx and PM10 average winter day emissions for Sacramento County. If U.S. EPA determines these budgets to be adequate, future transportation plan amendments and updates in Sacramento County will need to conform to these budgets. SACOG must ensure that the aggregate transportation wintertime emissions in the County do not exceed these levels when approving new metropolitan transportation plans and transportation programs, even if the mix of projects changes or growth increases. These budgets will remain in effect until other budgets are found adequate through approval by U.S. EPA.

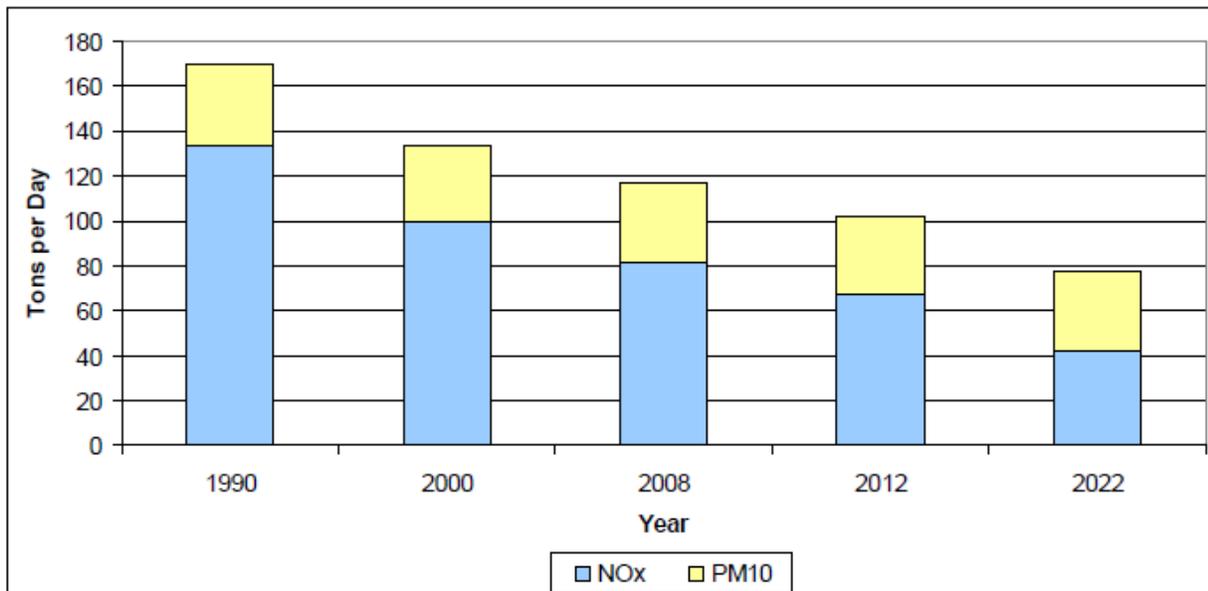
**Table 3  
Motor Vehicle Emission Budgets for Maintenance of the 24-hour PM10 NAAQS**

Sacramento County	2008		2012		2022	
	NOx	PM10	NOx	PM10	NOx	PM10
<b>Average Emissions in Tons per Winter Day</b>	50	15	38	15	19	17

For transportation conformity purposes, an additional 1.5 tons per day of PM10 were added to the 2022 budget to account for potential emissions increases in dust from paved roads and construction. This accommodation is only allowed for transportation conformity purposes when the emissions forecasts and budgets will be lower than the emissions level needed to provide continued maintenance of the standard. These emissions are also accounted for in the maintenance emissions inventory forecasts. Figure 4 illustrates that the future NOx emissions inventory is projected to decrease at a considerably faster rate than projected growth in the PM10 inventory, thereby

maintaining emissions at a level that will not result in a violation of the 24-hour PM10 NAAQS.

**Figure 4**  
**PM10 and NOx Precursor Emissions for Sacramento County 1990-2022\***



\* Data for 1990, 2000, and 2008 are historical, while data for 2012 and 2022 are projections

#### **IV. STAFF RECOMMENDATION**

ARB staff has reviewed the Plan prepared by the District and consulted with the District staff during this review. ARB staff concurs with the District's Plan and finds that the Plan meets all applicable Act requirements. ARB staff believes that implementation of this Plan will continue to maintain PM10 levels below the national air quality standard in Sacramento County. Therefore, ARB staff recommend that the Board approve the Sacramento PM10 Plan, including the transportation conformity budgets for the County, as a revision to the California SIP for submittal to U.S. EPA. In addition, ARB staff recommends that the Board approve the District's request to U.S. EPA that Sacramento County be redesignated from nonattainment to attainment for the national PM10 standard.