

LOCATION (In-Person)

San Joaquin Valley Unified Air Pollution Control District
1990 East Gettysburg Avenue, Fresno, California 93726

or Via Video Conference (2 Locations)

District Northern Region Office
4800 Enterprise Way, Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275, Bakersfield, California 93301

Public Meeting Agenda

REVISED
(5/13/08)

This facility is accessible by public transit. For transit information, call (559) 621-1393, website <http://faxtransit@fresno.gov/> (This facility is accessible to persons with disabilities.)

**TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN
ADVANCE OF THE MEETING GO TO:
<http://www.arb.ca.gov/lispub/comm/bclist.php>**

May 22, 2008
8:30 a.m.

Item #

08-5-1: Presentation by the San Joaquin Valley Air Pollution Control District on Healthy Air Living Initiative

The Board will hear a presentation on actions that individuals and businesses can take to reduce air pollution.

08-5-2: Public Meeting to Consider Approval of the San Joaquin Valley 2008 PM2.5 State Implementation Plan and Provide an Update on the Valley's Ozone Plan Progress

The Board will consider approval of the San Joaquin Valley Air Pollution District's federal attainment plan for the PM2.5 standard. This plan identifies the strategies that will bring the region into attainment by the 2014 deadline. Staff will also present an update to the Board on the Valley's ozone plan progress.

08-5-3: Public Hearing to Consider Approval of Proposition 1B: Grants for FY 2007-08 Funds to Reduce Emissions from Goods Movement

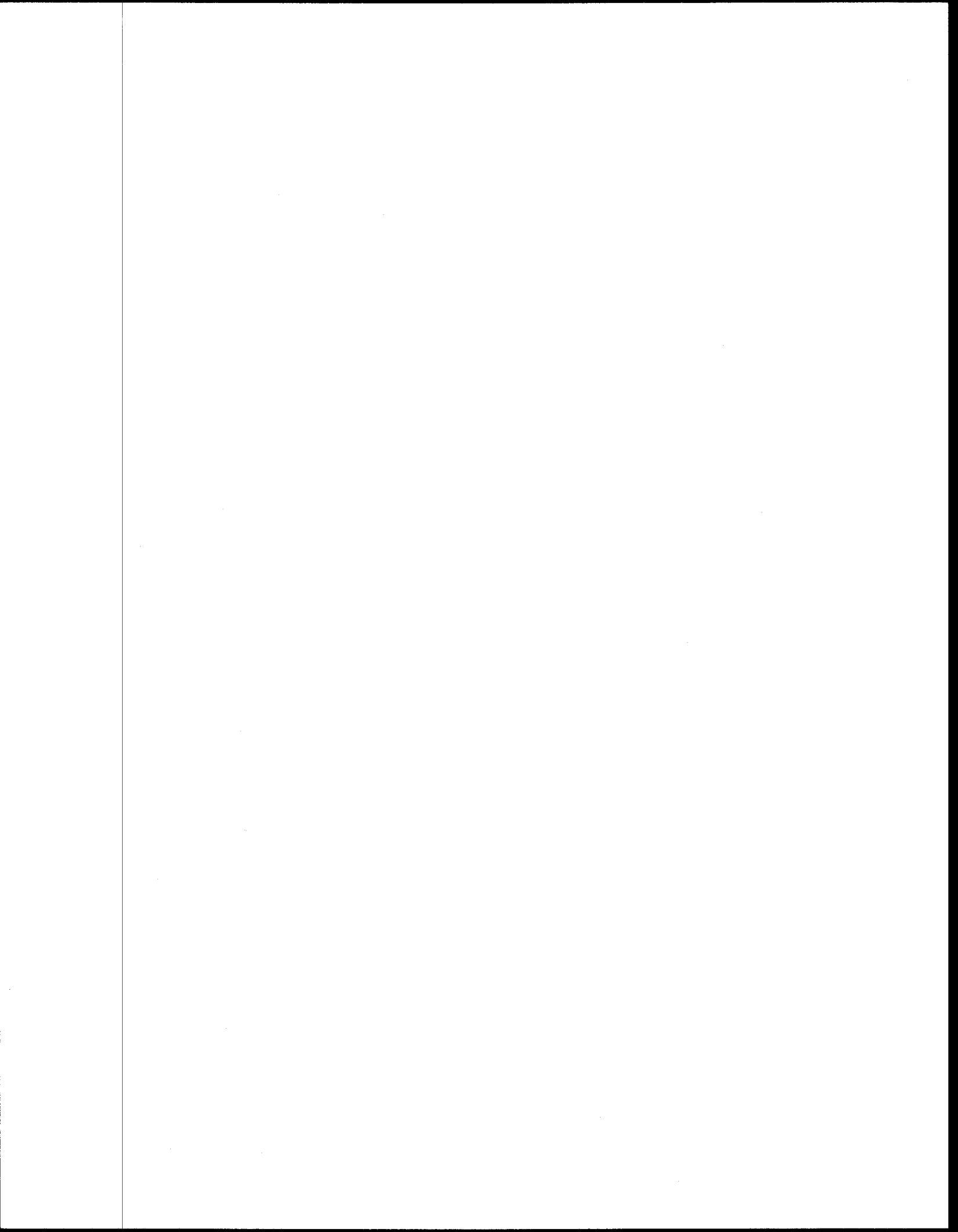
The Board will consider approval of a list of grant awards totaling up to \$225 million in incentive funding for specific local agency projects to reduce freight-related emissions in the four trade corridors.

08-5-4: Public Meeting to Consider a Research Proposal

"Systemic Platelet Activation in Mice Exposed to Fine Particulate Matter," University of California, Davis, \$300,000, Proposal No. 2658-260.

08-5-5: Report to the Board on a Draft Report on New Estimates of Premature Deaths Associated with Long-Term Exposures to PM2.5 in California

Staff will report to the Board on the methodology which provides improved estimates of premature deaths associated with PM2.5 exposures. Staff has developed a revised relationship between long-term exposures to PM2.5 and premature deaths based on the latest literature review. The new methodology used in calculating the estimated deaths has undergone peer review by outside experts. The draft report will be released for public comment following the Board meeting.



08-5-6: Report to the Board on AB 32 Implementation: Update on Land Use, Transportation, and Vehicle Travel

In one of a series of briefings on AB 32 Implementation, staff will brief the Board on the impact of land use and transportation planning on the State's greenhouse gas emissions. Staff will discuss the status of recent efforts to develop a framework for integrating land use and transportation decisions into the State's climate change efforts.

**08-5-7: THIS ITEM WILL BE RECALENDARER AT A LATER DATE:
Report to the Board on the Strategic Plan for Enforcement of Diesel Emission Control Regulations Pursuant to AB 233, Jones (Chapter 592, Statutes of 2007)**

AB 233, Jones requires ARB to review its enforcement of diesel emission control regulations and develop a strategic plan for consistent, comprehensive, and fair enforcement of these regulations. The bill requires that the plan be developed in conjunction with local air districts and the public and be reviewed by the Board in a public hearing. ARB is required to submit this plan to the California Legislature by January 1, 2009, and every 3 years thereafter.

CLOSED SESSION – LITIGATION

The Board will hold a closed session as authorized by Government Code section 11126(e) to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

Central Valley Chrysler-Jeep, Inc. et al. v. Goldstene, U.S. District Court (E.D. Cal. - Fresno) Case No. 1:04-CV-06663-AWI-GWA.

Fresno Dodge, Inc. et. al. v. California Air Resources Board and Goldstene, Superior Court of California (Fresno County), Case No. 04CE CG03498, consolidated with General Motors Corp. et. al. v. California Air Resources Board and Goldstene, Superior Court of California (Fresno County), Case No. 05CE CG02787.

State of California by and through Arnold Schwarzenegger, Governor of the State of California, the California Air Resources Board, and Edmund G. Brown, Jr., Attorney General of the State of California v. U.S. Environmental Protection Agency and Stephen L. Johnson, Administrator, U.S. Court of Appeals (D.C. Cir.) Case No. 07-1457.

State of California by and through Arnold Schwarzenegger, Governor of the State of California, the California Air Resources Board, and Edmund G. Brown, Jr., Attorney General of the State of California v. U.S. Environmental Protection Agency and Stephen L. Johnson, Administrator, U.S. District Court (D.C.) Case No. 07-CV-o2024-RCL.

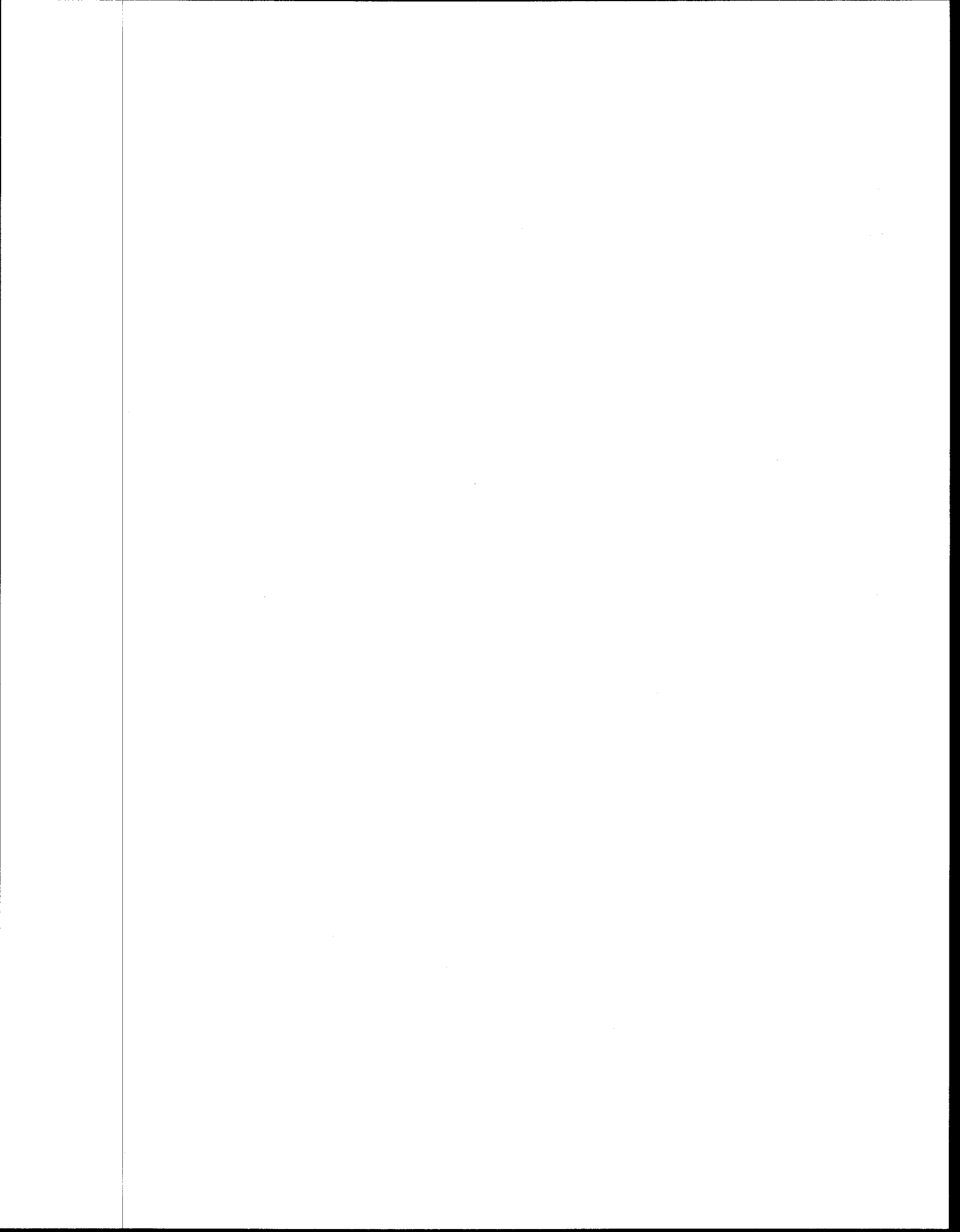
State of California by and through Arnold Schwarzenegger, Governor, and the California Air Resources Board v. U.S. Environmental Protection Agency, and Stephen L. Johnson, Administrator, U.S. Court of Appeals (9th Cir.) Case No. 08-70011.

State of California by and through Arnold Schwarzenegger, Governor of the State of California, the California Air Resources Board, and Edmund G. Brown, Jr., Attorney General of the State of California v. U.S. Environmental Protection Agency, U.S. Court of Appeals (D.C. Cir.) Case No. 08-1178.

Green Mountain Chrysler-Plymouth-Dodge-Jeep, et al. v. Crombie, 508 F.Supp.2d 295, U.S. District Court (Vermont) (2007), appeal to 2nd Circuit Court of Appeals pending, Docket Nos. 07-4342-cv(L) and 07-4360-cv(CON).

Association of International Automobile Manufacturers v. Sullivan, U.S. District Court (Rhode Island), C.A. No. 06-69T, consolidated with Lincoln Dodge, Inc. et al., U.S. District Court (Rhode Island), C.A. No. 06-70T.

Zangara Dodge, Inc. et al. v. Curry et al., U.S. District Court (New Mexico) Case No. CIV 07-1305 ACT/LFG.



OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST.

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD.

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
<http://www.arb.ca.gov/lispub/comm/bclist.php>

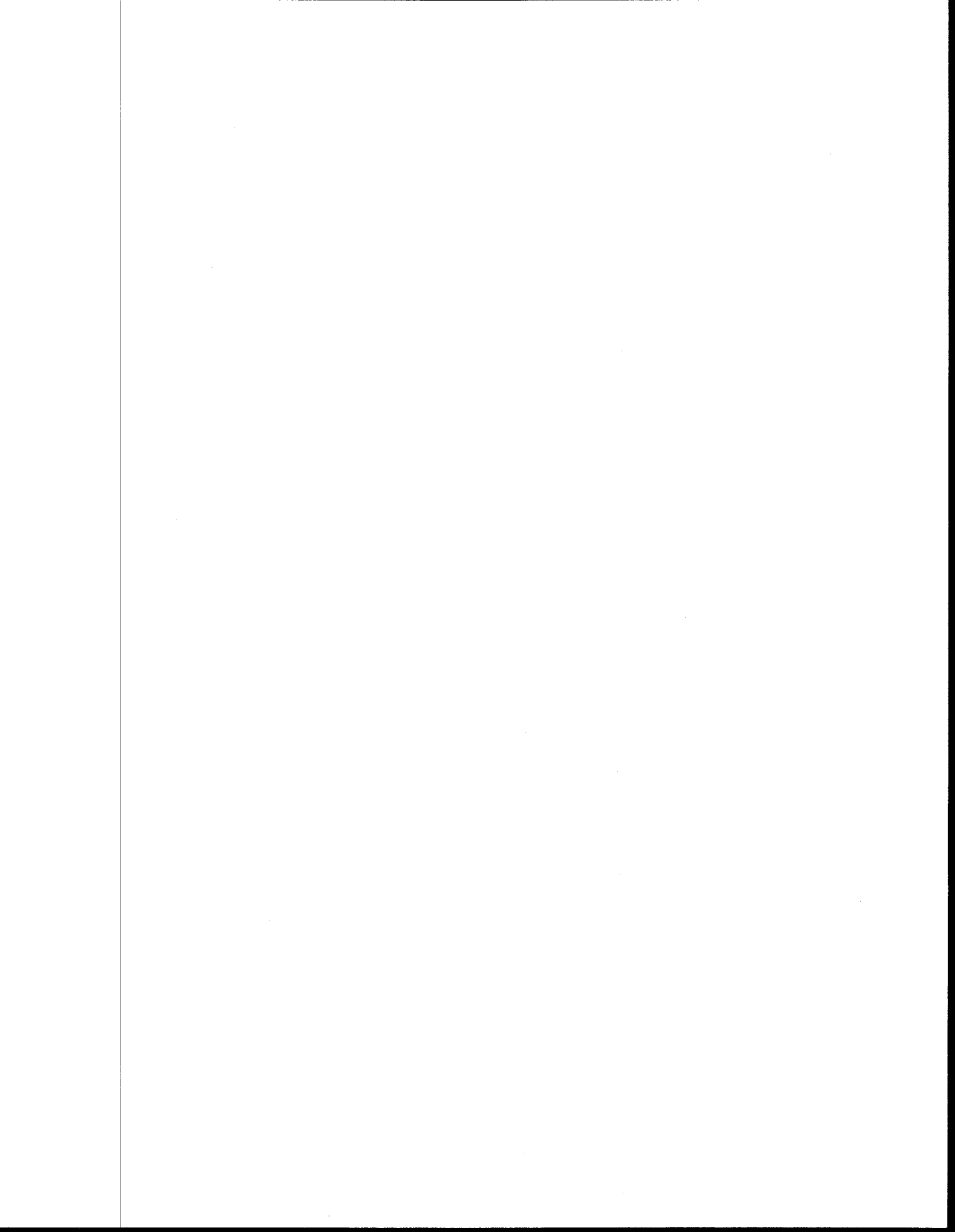
**IF YOU HAVE ANY QUESTIONS,
PLEASE CONTACT THE CLERK OF THE BOARD
1001 I Street, 23rd Floor, Sacramento, CA 95814**

**(916) 322-5594
FAX: (916) 322-3928
ARB Homepage: www.arb.ca.gov**

To request special accommodation or language needs, please contact the following:

- **For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services.**
- **If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.**

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.



LOCATION (In-Person)

San Joaquin Valley Unified Air Pollution Control District
1990 East Gettysburg Avenue, Fresno, California 93726

or Via Video Conference (2 Locations)

District Northern Region Office
4800 Enterprise Way, Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275, Bakersfield, California 93301

PUBLIC MEETING AGENDA

This facility is accessible by public transit. For transit information, call (559) 621-1393, website <http://faxtransit@fresno.gov/> (This facility is accessible to persons with disabilities.)

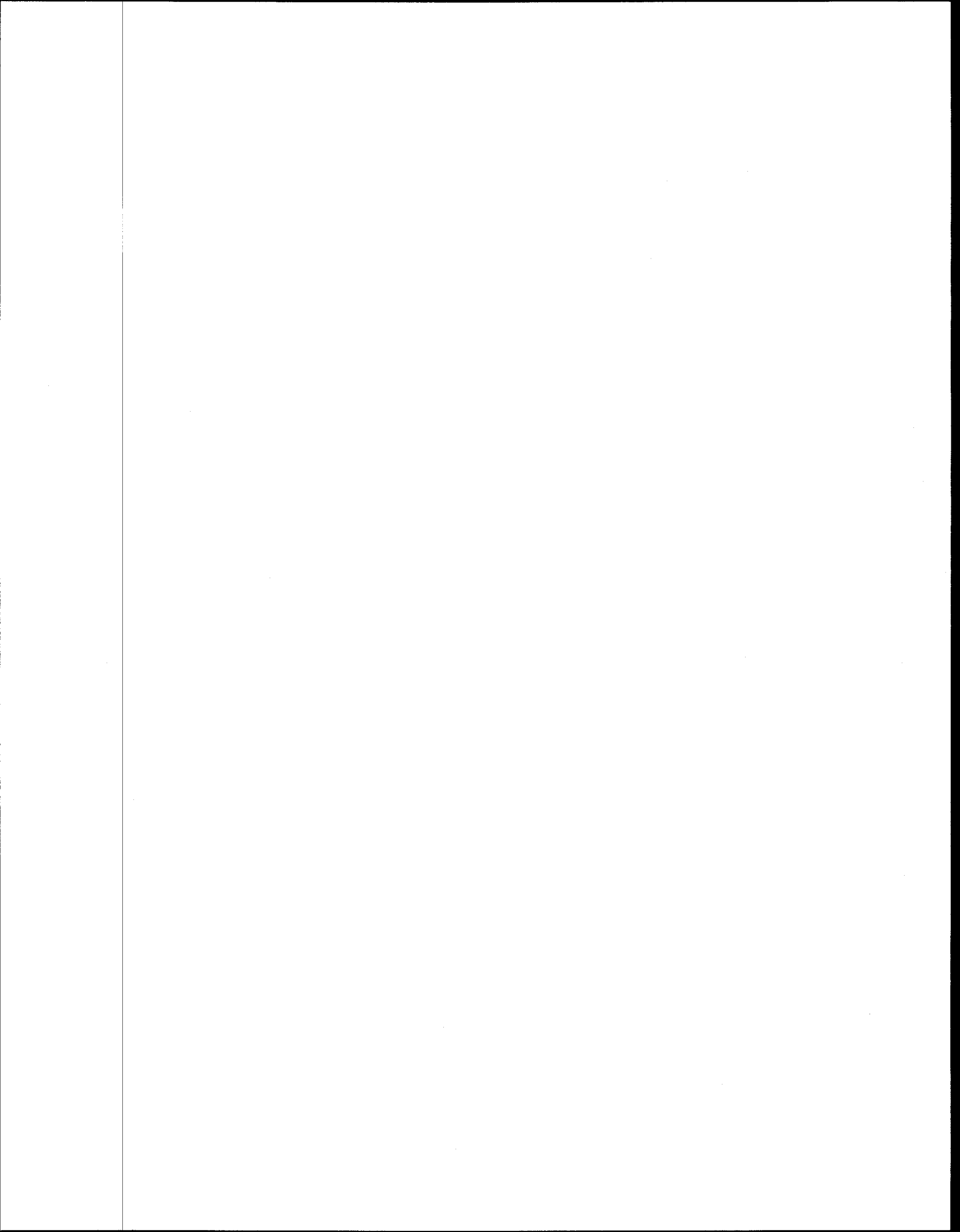
REVISED

This facility is accessible by public transit. For transit information, go to website <http://www.bart.gov/index.asp> (This facility is accessible to persons with disabilities.)

INDEX

**May 22, 2008
8:30 a.m.**

	<u>Pages</u>
08-5-1: Presentation by the San Joaquin Valley Air Pollution Control District on Healthy Air Living Initiative	---
08-5-2: Public Meeting to Consider Approval of the San Joaquin Valley 2008 PM2.5 State Implementation Plan and Provide an Update on the Valley's Ozone Plan Progress	1 - 106
08-5-3: Public Hearing to Consider Approval of Proposition 1B: Grants for FY 2007-08 Funds to Reduce Emissions from Goods Movement	107 - 114
08-5-4: Public Meeting to Consider a Research Proposal	---
08-5-5: Report to the Board on a Draft Report on New Estimates of Premature Deaths Associated with Long-Term Exposures to PM2.5 in California	---
08-5-6: Report to the Board on AB 32 Implementation: Update on Land Use, Transportation, and Vehicle Travel	---
08-5-7: <u>THIS ITEM WILL BE RECALENDARER AT A LATER DATE:</u> Report to the Board on the Strategic Plan for Enforcement of Diesel Emission Control Regulations Pursuant to AB 233, Jones (Chapter 592, Statutes of 2007)	---



CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER THE APPROVAL OF THE SAN JOAQUIN VALLEY 2008 PM2.5 STATE IMPLEMENTATION PLAN AND PROVIDE AN UPDATE ON OZONE

The Air Resources Board (the Board or ARB) will conduct a public meeting at the time and place noted below to consider the approval of the proposed San Joaquin Valley 2008 PM2.5 State Implementation Plan (2008 PM2.5 Plan) to attain the federal standards for fine particulate matter (PM2.5). If approved, ARB will submit these elements to the United States Environmental Protection Agency (U.S. EPA) for its approval as a revision to the California State Implementation Plan (SIP). In this item, the Board will also hear a short update on the San Joaquin Valley's Ozone SIP.

DATE: May 22, 2008

TIME: 8:30 a.m.

PLACE: San Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, California 93726

Or Via Videoconference (2 Locations)

District Northern Region Office
4800 Enterprise Way
Modesto, California 95356

District Southern Region Office
2700 M Street, Suite 275
Bakersfield, California 93301

This item will be considered at an one-day meeting of the Board, which will commence at 8:30 a.m., May 22, 2008. Please consult the agenda for the meeting, which will be available at least ten (10) days before May 22, 2008, to determine the schedule on which this item will be considered.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053.



BACKGROUND

The federal Clean Air Act (the Act) establishes planning requirements for those areas that exceed the health-based National Ambient Air Quality Standards (NAAQS). These nonattainment areas must develop and implement a SIP that demonstrates how they will attain the standards by specified dates.

In July 1997, U.S. EPA promulgated new PM2.5 NAAQS, both an annual and a 24-hour standard. On April 5, 2005, the San Joaquin Valley Unified Air Pollution Control District (District or Valley) was designated nonattainment for the federal PM2.5 standards based on violations of both the annual and 24-hour standards. The Valley is required to submit a SIP demonstrating attainment will occur as expeditiously as practicable, but no later than April 2015. The Act also requires that the SIP include reasonable further progress, reasonably available control measures and technologies, contingency measures, comprehensive emissions inventories, and transportation conformity budgets. The District prepared the 2008 PM2.5 Plan to address these requirements and to attain the PM2.5 standard as expeditiously as practicable. The District Governing Board adopted the 2008 PM2.5 Plan on April 30, 2008.

The 2008 PM2.5 Plan relies on both District and ARB measures to demonstrate attainment. The ARB measures were adopted at the September 2007 Board hearing and include commitments to reduce nitrogen oxides and direct PM2.5 by 76 tons per day and 5 tons per day, respectively, in 2014. In addition, the 2008 PM2.5 Plan establishes county-level on-road motor vehicle emission transportation conformity budgets for each milestone year, as well as for the attainment year. The emissions budgets in the 2008 PM2.5 Plan reflect the latest planning assumptions and were developed with EMFAC2007.

Regarding the ozone update, at the November 15, 2007 ARB meeting, the Board directed staff to provide an update to the Board, by June 2008 at a meeting held in the Valley, on recent activities that may accelerate attainment of the federal ozone standard in the San Joaquin Valley. ARB staff will provide an update as an element of staff's presentation to the Board on this item.

PROPOSED ACTION

ARB staff has reviewed the District's 2008 PM2.5 Plan and concluded that it meets applicable federal requirements. ARB staff has also concluded that the implementation of the 2008 PM2.5 Plan would reduce PM2.5 levels throughout the San Joaquin Valley and result in attainment of the 1997 PM2.5 standards by April 2015. Staff is recommending that the Board approve the 2008 PM2.5 Plan, as well as the transportation conformity budgets, emission inventory, reasonable further progress, reasonably available control measures and technologies demonstration, contingency measures, and attainment demonstration as a revision to the California SIP, and to direct staff forward the 2008 PM2.5 Plan to U.S. EPA.



AVAILABILITY OF DOCUMENTS

ARB staff has prepared a written Staff Report. Copies of the Staff Report may be obtained from the Board's Public Information Office, 1001 "I" Street, 1st Floor, Environmental Services Center, Sacramento, California 95814, (916) 322-2990. This notice, the Staff Report, and the District's 2008 PM2.5 Plan may also be obtained from ARB's internet site <http://www.arb.ca.gov/planning/sip/sjvpm25/sjvpm25.htm>.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and in writing or by e-mail before the meeting. To be considered by the Board, written comment submissions not physically submitted at the meeting must be received **no later than 12:00 noon, May 21, 2008**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Facsimile submittal: (916) 322-3928

The Board requests, but does not require that 30 copies of any written statement be submitted and that written and e-mail statements be filed at least ten (10) days prior to the meeting so that ARB staff and Board members have time to fully consider each comment.

Please note that under the California Public Records Act (Government Code Section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.



Further inquiries regarding this matter should be directed to Ms. Sylvia Zulawnick, Manager of the Particulate Matter Analysis Section, Planning and Technical Support Division, 1001 I Street, Sacramento, California 95814 or by e-mail at szulawni@arb.ca.gov, or Dr. Patricia Velasco, Staff Air Pollution Specialist, Planning and Technical Support Division at (916) 323-7560, 1001 I Street, Sacramento, California 95814 or by e-mail at pvelasco@arb.ca.gov.

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene
Executive Officer

Date: 4/25/08



State of California



California Environmental Protection Agency

AIR RESOURCES BOARD

Staff Report

**Analysis of the San Joaquin Valley
2008 PM_{2.5} Plan**

Release Date: May 7, 2008

Scheduled for Consideration: May 22-23, 2008

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.

Electronic copies from this document are available for download from the Air Resources Board's Internet site at: <http://www.arb.ca.gov/planning/sip/sjvpm25/sjvpm25.htm>. In addition, written copies may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, 1st Floor, Visitors and Environmental Services Center, Sacramento, California 95814, (916) 322-2990.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053.

For questions, contact:

Ms. Sylvia Zulawnick
Manager, PM Analysis Section
Phone: (916) 324-7163
Email: szulawni@arb.ca.gov

or

Patricia Velasco, Ph.D.
Project Lead
Phone: (916) 323-7560
Email: pvelasco@arb.ca.gov

P.O. Box 2815
Sacramento, California 95812

PRINCIPAL AUTHOR

Patricia Velasco, Ph.D., Project Lead

PROJECT MANAGERS

Sylvia Zulawnick, Manager, Particulate Matter Analysis Section

Karen Magliano, Chief, Air Quality Data Branch

CONTRIBUTORS

Air Quality and Transportation Planning

Kurt Karperos, P.E., Chief, Air Quality and Transportation Planning Branch

Ravi Ramalingam, P.E., Manager, Transportation Strategies Section

Jeff Lindberg, Planning Liaison to the San Joaquin Valley Air Pollution Control District

Kyriacos Kyriacou, Ph.D., Air Resources Engineer

Air Quality Data Branch

Katazyna Turkiewicz, Air Pollution Specialist

Eugene Kim, Ph.D., Air Resources Engineer

Air Quality Modeling

John DaMassa, Chief, Modeling and Meteorology Branch

Vernon Hughes, Manager, Atmospheric Modeling and Support Section

Ajith Kaduwela, Ph.D., Manager, Regional Air Quality Modeling Section

Kathleen Fahey, Ph.D., Air Pollution Specialist

Cheryl Taylor, Air Resources Engineer

Emission Inventory

Karen Buckley, Manager, Emission Inventory Systems Section

Martin Johnson, P.E., Staff Air Pollution Specialist

ACKNOWLEDGMENT

ARB staff thanks the staff of the San Joaquin Valley Unified Air Pollution Control District for the high level of coordination between the agencies in the development of the technical elements of this plan.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	1
I. BACKGROUND.....	1
A. Profile of the San Joaquin Valley	1
B. PM2.5 Health Effects and Federal Air Quality Standards	3
C. Air Quality.....	3
D. California Regional Particulate Matter Air Quality Study (CRPAQS).....	6
II. AIR QUALITY PLANNING.....	8
A. Air Quality Planning Background.....	8
B. Recent Air Quality Planning.....	8
C. General Planning Requirements.....	9
III. PLAN EVALUATION	10
A. Overview of the San Joaquin Valley PM2.5 Plan.....	10
B. Emission Inventory.....	11
1. Estimating Emissions.....	11
2. Summary of Baseline Emissions.....	12
C. Air Quality Modeling.....	15
1. Grid-based Photochemical Modeling.....	15
2. Weight of Evidence.....	16
3. Demonstrating Attainment.....	17
4. Attainment Date	19
D. Control Strategy.....	20
1. New District Measures.....	21
a. Rule Development Commitment.....	21
b. Incentive-based Strategies	25
2. Adopted State Strategy	26
E. Reasonable Further Progress.....	28
F. Contingency Measures.....	28
G. Reasonably Available Control Measure Analysis	29
1. District RACM.....	29
2. Metropolitan Planning Organizations RACM.....	29
H. Transportation Conformity Budgets	30
I. Environmental Impacts.....	31
IV. STAFF RECOMMENDATION.....	31

APPENDIX A - Regional Air Quality Modeling

APPENDIX B - Weight of Evidence

EXECUTIVE SUMMARY

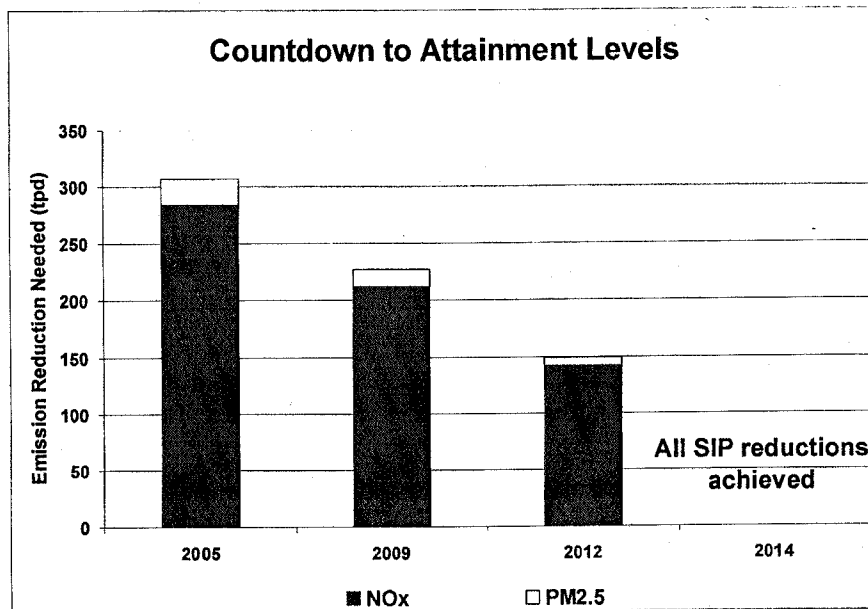
On April 30, 2008, the San Joaquin Valley Air Pollution Control District (District) adopted a PM_{2.5} Attainment Plan showing how the region will comply with the federal PM_{2.5} air quality standards set by the U.S. Environmental Protection Agency (U.S. EPA) in 1997. The staff of the Air Resources Board (ARB or Board) has reviewed the Plan and recommends that the Board approve it as a State Implementation Plan (SIP) revision to be submitted to U.S. EPA. The Plan shows that the region now meets the daily (24-hour) standard, and demonstrates how the more challenging annual standard will be met by 2014. The Plan documents that emissions of PM_{2.5} particles, and the pollutants that form PM_{2.5}, are decreasing each year. A mid-course review of plan implementation will be done in 2011 as required by U.S. EPA

The Plan consists of adopted measures that provide increasing benefits each year, along with new emission reduction commitments from both ARB and the District. The Valley's particle pollution problem is well studied as a result of the \$27 million invested in the California Regional Particulate Matter Study. This study provides the scientific foundation for the PM_{2.5} SIP by identifying the pollutants most important to formation of PM_{2.5} pollution. The results indicate that the key pollutants to reduce are NO_x, SO_x, and directly emitted PM_{2.5} particles. The Plan addresses these three pollutants consistent with U.S. EPA guidance. Emissions of VOC are also being reduced in the region as part of the ozone attainment strategy but are not required to be included in this SIP.

Overall, between 2005 and 2014, NO_x emissions will decrease by almost 300 tons per day (tpd), direct PM_{2.5} emissions by over 20 tpd, and SO_x by almost 3 tpd. Two thirds of the NO_x and SO_x reductions and one half of the PM_{2.5} reductions come from already adopted measures. A significant portion of the new commitments come from the ARB's State Strategy that was adopted in September 2007. The State Strategy provides an additional 76 tons of NO_x reductions and 5 tons of PM_{2.5} reductions in 2014. The District has accelerated several measures in its 2007 Ozone Plan that are also part of the PM_{2.5} attainment strategy, and targeted a number of categories of PM_{2.5} for additional emission reductions, including residential wood burning and commercial cooking. Past District efforts to reduce impacts from residential wood burning have proven to be very effective, and continued reductions in this source category are expected to contribute significantly to further progress.

As emissions have decreased each year, parts of the Valley are already meeting the annual standard. The air quality modeling indicates that attaining the annual standard in the southern Valley is the biggest challenge, but all areas are projected to attain the standard by 2014. The Plan will also bring the region much closer to meeting a new federal PM_{2.5} standard that will apply to future SIP planning efforts. SIP planning for the newer standard will occur after U.S. EPA designates nonattainment areas and develops implementation rules.

The Plan demonstrates the rate of emission reductions that will occur between now and the attainment year. As shown below 307 tons per day of reductions are needed between 2005 and 2014. The Plan outlines how these reductions will be achieved. While the majority of the reductions are NOx, it is important to recognize that the PM2.5 reductions are also essential because air quality modeling shows each ton of direct PM2.5 is approximately nine times more effective ton per ton in the attainment year.



Staff's review indicates that the Plan meets the requirements of the Clean Air Act (Act) and U.S. EPA's PM2.5 implementation rule. The SJV 2008 PM2.5 Plan demonstrates attainment as expeditiously as practicable, no later than 2014, as required by the Act. The Plan also includes reasonable further progress calculations, reasonably available control measures and technologies, contingency measures, emission inventories, transportation conformity budgets, and a commitment for a SIP update in 2011. Additional reductions from adopted ARB measures will provide NOx reductions for contingency purposes should the region not attain in 2014.

The PM2.5 Plan is the result of a two year effort to update the emission inventories for each mobile, stationary, and area source category, conduct air quality modeling and data analysis, and to develop new control strategies. The 2011 SIP update will provide an important opportunity to assess air quality progress, update emission inventories, and check on the progress in achieving emission reductions.

Recommendations: Staff recommends that the Board approve the District's 2008 PM2.5 attainment Plan.

I. BACKGROUND

A. Profile of the San Joaquin Valley

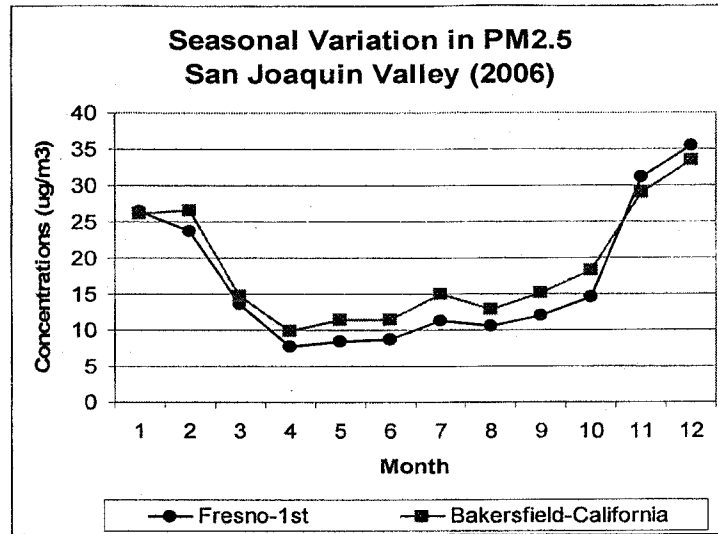
Covering nearly 25,000 square miles, the San Joaquin Valley is one of the dominant features in California's landscape. One of the fastest growing regions in the State, the Valley is home to more than 3.6 million people. The Valley has four large cities, Stockton, Modesto, Fresno, and Bakersfield, each with a population greater than 200,000. Numerous smaller cities and towns in the Valley are separated by large expanses of agricultural lands. With urbanization, agricultural lands continue to be converted to non-agricultural uses.

The San Joaquin Valley Air Basin is a lowland area bordered by the Sierra Nevada Mountains to the east, the Pacific Coast range to the west, and the Tehachapi Mountains to the south. The mountains act as air flow barriers, with the resulting stagnant conditions favoring the accumulation of emissions and pollutants. As a result, PM_{2.5} concentrations are higher in the southern and central portions of the Valley, where geography, emissions, and climate pose significant challenges to air quality progress.

PM_{2.5} is a complex mixture of many different species generated from a wide array of sources. PM_{2.5} can be either emitted directly into the air (primary particles) in forms such as soot, smoke, and the tiniest specs of dust, or it can be formed in the atmosphere (secondary particles or aerosol droplets) from the reactions of precursor gases, nitrogen oxides (NO_x), sulfur oxides (SO_x), reactive organic gases (ROG), and ammonia. NO_x and ROG are also precursors of ozone pollution. Understanding the nature of the PM_{2.5} problem is key to designing an effective control strategy.

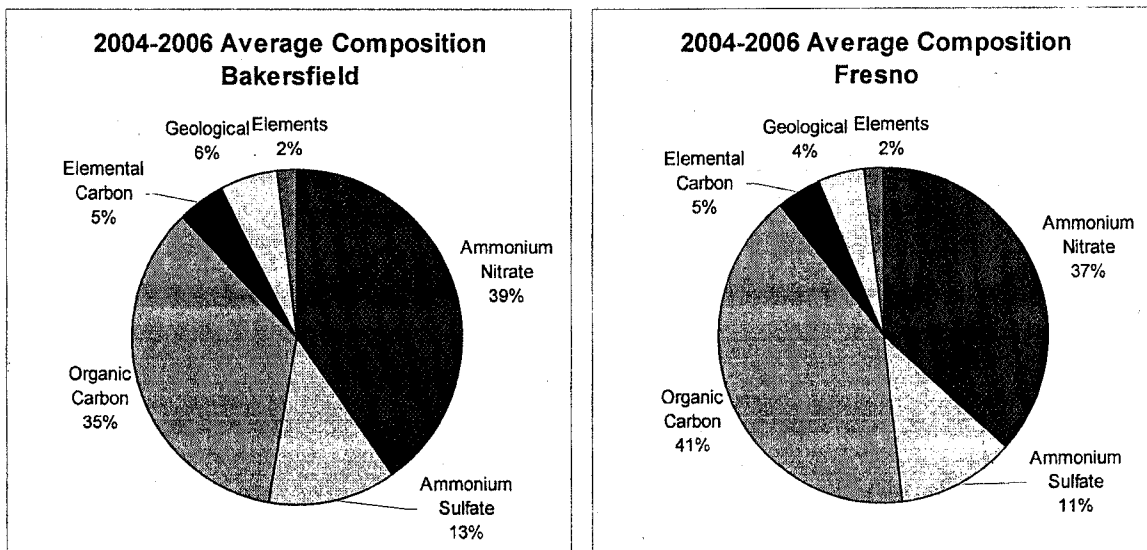
In the Valley, the levels and nature of PM_{2.5} concentrations typically differ by season (Figure 1). Higher PM_{2.5} concentrations occur during the winter, between late November and February during extended periods of stagnant weather with cold, damp, foggy conditions, which are conducive to the formation of secondary ammonium nitrate particulates. At these times, PM_{2.5} is dominated by ammonium nitrate formed from NO_x and ammonia emissions, and directly emitted particles, such as wood smoke and other combustion sources.

Figure 1. Seasonal Variation in PM2.5 Concentrations in the San Joaquin Valley.



The elevated winter PM2.5 concentrations drive the annual average PM2.5 levels. On an annual basis, PM2.5 in the Valley consists mostly of ammonium nitrate, organic carbon, and ammonium sulfate (Figure 2). Ammonium nitrate is formed from chemical reactions of NOx emitted from motor vehicles and stationary combustion sources with ammonia. Burning activities, such as residential wood combustion, cooking, and direct tailpipe emissions from mobile sources are major sources of organic carbon. Ammonium sulfate is also formed in the atmosphere from chemical reactions of SOx emitted from combustion sources and ammonia. To a lesser extent, elemental carbon resulting from mobile and stationary combustion sources, and geological material from roads and other dust producing activities also contribute to PM2.5.

Figure 2. PM2.5 Composition in the San Joaquin Valley



B. PM2.5 Health Effects and Federal Air Quality Standards

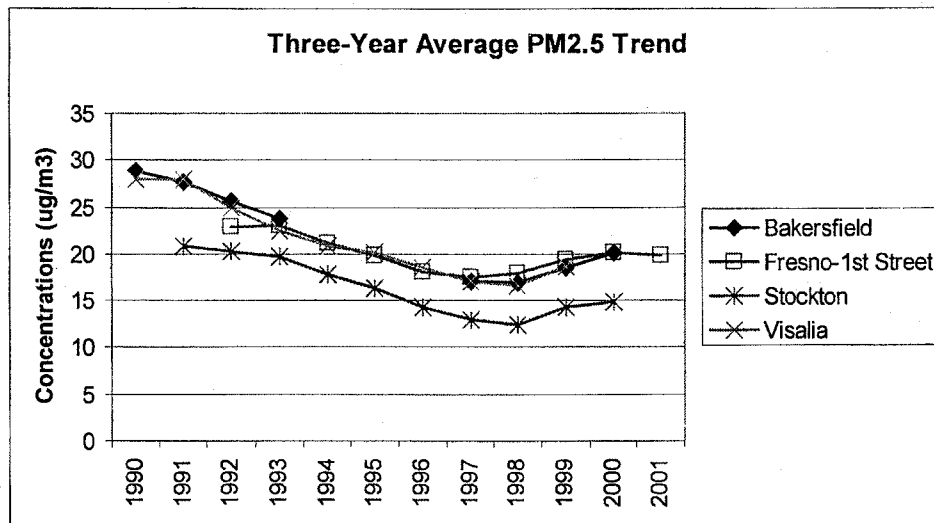
Extensive research over the last two decades has investigated the effects that breathing PM2.5 has on people's health. Research studies have consistently found a link between PM2.5 exposure and premature death in people with existing cardiac or respiratory disease. Studies of large populations have found that exposure to PM2.5 is associated with increased hospital admissions and emergency room visits due to frequent and severe asthma attacks, pneumonia, and acute and chronic bronchitis, primarily in people with chronic heart or lung diseases. Long-term exposure to PM2.5 has also been linked to an increase in lung cancer mortality risk. Those most at risk of experiencing adverse effects with PM2.5 exposure include infants, children, the elderly, and persons with pre-existing cardiopulmonary disease.

U.S. Environmental Protection Agency (U.S. EPA) adopted national ambient air quality standards (NAAQS) for PM2.5 in 1997, with a 24-hour PM2.5 standard of 65 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and an annual standard of 15 $\mu\text{g}/\text{m}^3$. State Implementation Plans (SIPs) for areas designated nonattainment for these standards are due to U.S. EPA in 2008. The San Joaquin Valley is currently designated as nonattainment for the 1997 PM2.5 standards and the 2008 SJV PM2.5 Plan addresses these standards. In 2006, U.S. EPA adopted a new 24-hour PM2.5 standard that will apply to future SIP planning efforts. SIP planning for the newer standard will occur after U.S. EPA designates nonattainment areas and develops implementation rules

C. Air Quality

While the San Joaquin Valley has one of the most severe PM2.5 problems in the nation, PM2.5 air quality has shown considerable improvement. Initial efforts to monitor PM2.5 began in 1990. Annual average PM2.5 concentrations decreased between 20 to 30 percent during the period of 1990 through 2001. Due to the marked and complex variability in the Valley's meteorological conditions, some years are far more conducive to PM2.5 formation and accumulation than others. However, overall concentrations show a downward long-term trend (Figure 3).

Figure 3. Long-term Trends in PM2.5 Concentrations in the San Joaquin Valley



Since 1999, when monitoring for compliance with the federal PM2.5 standards began, PM2.5 annual average concentrations have dropped a further 19 to 29 percent. When the San Joaquin Valley was first designated nonattainment for the federal PM2.5 standards, the basin exceeded both the annual and the 24-hour PM2.5 standards. However, based on 2004-2006 data, the San Joaquin Valley now meets the federal 24-hour PM2.5 standard of 65 ug/m³. Thus, this SIP focuses on what more is needed to attain the annual standard.

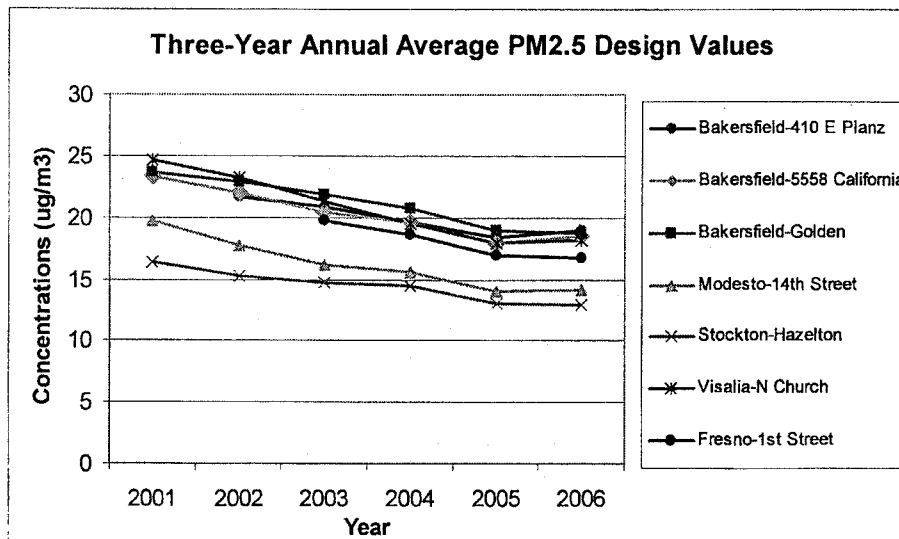
For planning purposes, U.S. EPA recommends using the average of the mean annual PM2.5 concentrations measured over a three year period. This is referred to as the "design value" and reduces the year to year variability. Table 1 provides the 2006 annual standard design values and the annual average values for 2004, 2005, and 2006 for each monitoring site with complete data. The northern portion of the Valley meets the annual PM2.5 standard, as indicated by the design values at Stockton, Modesto, and Merced. The highest PM2.5 annual design values are located in the southern and central portions of the basin, including Bakersfield and Visalia.

Table 1. PM2.5 Annual Average Concentrations and 2006 Design Values

Monitor	Annual Average (ug/m ³)			2006 3-year Annual Average Design Value (ug/m ³)
	2004	2005	2006	
Clovis-N Villa Avenue	15.8	16.0	16.8	16.2
Bakersfield-410 E Planz Road	17.4	19.9	19.3	18.9
Bakersfield-5558 California Avenue	19.0	17.9	18.7	18.5
Bakersfield-Golden State Highway	18.1	18.9	18.6	18.5
Corcoran-Patterson Avenue	17.3	17.6	16.7	17.2
Fresno-1st Street	16.4	16.9	16.8	16.7
Fresno-Hamilton and Winery	17.0	16.9	17.6	17.2
Merced-2334 M Street	15.3	14.1	14.8	14.7
Modesto-14th Street	13.6	13.9	14.8	14.1
Stockton-Hazelton Street	13.2	12.5	13.1	12.9
Visalia-N Church Street	17.0	18.8	18.8	18.2

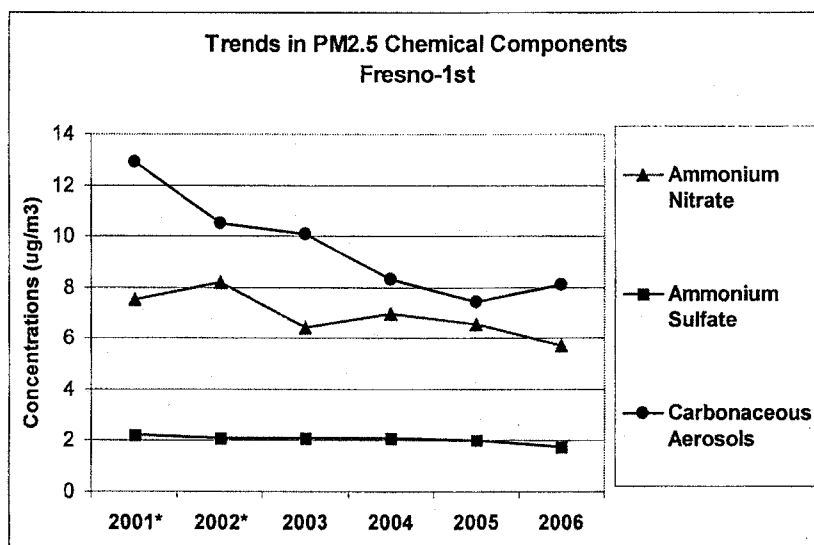
Trends in annual PM2.5 design values show that considerable progress has occurred in the San Joaquin Valley over the last five years (Figure 4). In 2001, all monitoring sites in the Valley had annual design values greater than 16 ug/m³, with the Visalia site at approximately one and a half times the level of the standard. By 2006, design values decreased throughout the Valley, and only those sites in the southern and central portions of the Valley still have design values greater than 16 ug/m³. Bakersfield-Planz is the current high site, with a design value which is 26 percent above the standard. The greatest rate of progress has occurred in the northern and central basin. These trends underscore the challenge the Valley faces in attaining the annual standard in the southern portions of the Valley. The surrounding mountains combined with the Valley's prevalent cold, damp, stagnant winters, create an environment very conducive to PM2.5 formation and buildup, especially in the southern end of the Valley.

Figure 4. Trends in Annual PM2.5 Design Values in the San Joaquin Valley



In addition to looking at trends in average concentrations of PM2.5, it is also useful to look at the trends of the different components that make up PM2.5. As stated earlier, PM2.5 is a complex mixture dominated by ammonium nitrate, organic carbon, and ammonium sulfate. Analysis of the trends in the different components of PM2.5 shows that over the last five years, decreases in carbonaceous aerosols and ammonium nitrate have had the greatest impact on declining PM2.5 levels. In Fresno, carbonaceous aerosols have declined by 37 percent and ammonium nitrate concentrations by 24 percent (Figure 5), while in Bakersfield, carbonaceous aerosols (organic plus elemental carbon) have declined by 16 percent and ammonium nitrate concentrations by 23 percent. During this same period, PM2.5 and NOx emissions, as well as NOx levels measured in the air also decreased. Longer-term records show concomitant decreases between ambient NOx and ammonium nitrate as well as between ambient SOx and ammonium sulfate. The combined downward trends in PM2.5 components, precursor concentrations, and emissions all indicate that the ongoing control program has had substantial benefits in improving air quality and that the reductions from measures in this Plan will provide continuing progress towards and attainment of the federal PM2.5 standards.

Figure 5. Trends in PM2.5 Key Chemical Components.



D. California Regional Particulate Matter Air Quality Study (CRPAQS)¹

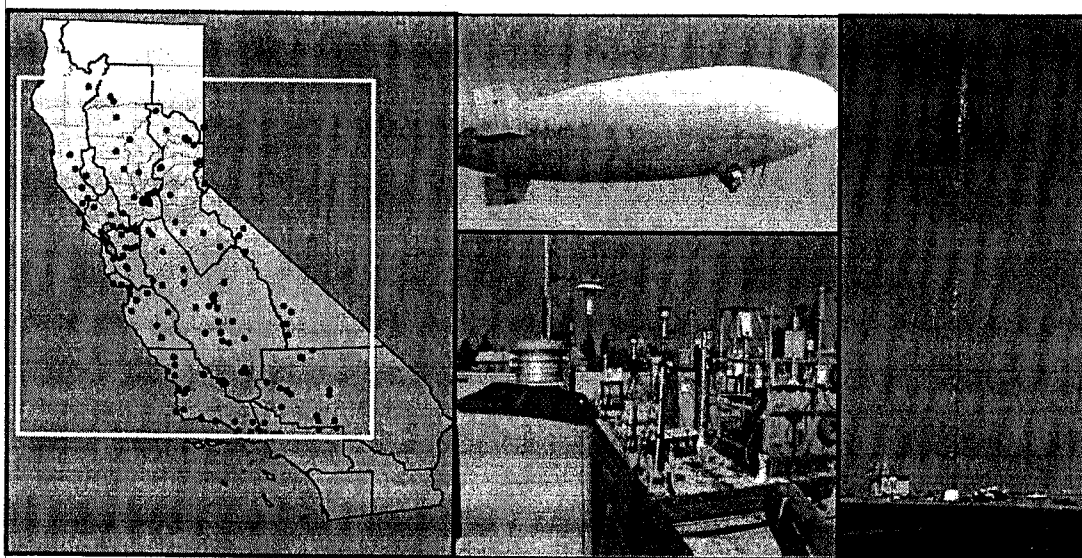
The California Regional Particulate Air Quality Study (CRPAQS) provides the scientific foundation upon which the PM2.5 SIP planning efforts are built. CRPAQS is a collaborative effort between the public and private sector designed to: 1) develop an improved understanding of particulate matter in central California; and, 2) provide

¹ <http://www.arb.ca.gov/airways/ccaq.htm>

decision-makers with the tools needed to identify equitable and efficient control methods. The study is a comprehensive multi-year effort of meteorological and air quality monitoring, emission inventory development, data analysis, and air quality simulation modeling. The study reflects an investment of nearly 27 million dollars, coupled with extensive in-kind support from study sponsors, extending over a 15-year period. The resulting data and analytical tools are providing the most advanced scientific understanding available for SIP development.

CRPAQS is intended to evaluate the Valley's particulate matter challenges with respect to both the federal and State air quality standards for particulate matter smaller than 10 micrometers in diameter (PM10) and PM2.5. CRPAQS was designed to address annual particulate levels as well as fall and winter episodic conditions. Numerous teams of experts participated in the study. Data was collected for 14 months (December 1999 through February 2001) throughout the Valley and surrounding regions. The extensive field monitoring program collected data at the surface from hundreds of monitoring sites located throughout the study domain, and aloft with appropriately equipped air planes, blimp, specialized balloons, and towers (Figure 6). The effort resulted in millions of data records which have been housed in a world class data base. Focused efforts have also improved the emission inventory for the region. Finally, state-of-the-science air quality models have been tested with the extensive CRPAQS data base and are used in the CRPAQS and SIP modeling tasks.

Figure 6. CRAPQS Monitoring Program



II. AIR QUALITY PLANNING

A. Air Quality Planning Background

The federal Clean Air Act Amendments of 1990 (Act) establish the planning requirements for those areas that routinely exceed the health-based NAAQS. These nonattainment areas must adopt and implement a State Implementation Plan (SIP) that demonstrates how they will attain the standards by specified dates. Federal law holds each state responsible for implementing the provisions of the Act. California law assigns air quality planning responsibilities within the State. In the San Joaquin Valley, those responsibilities are shared among the San Joaquin Valley Air Pollution Control District (District), the Valley's metropolitan planning organizations, and the Air Resources Board (ARB).

In the air quality management process, many regulatory agencies in California work together to reduce air pollution levels. Each of these agencies is responsible for achieving emission reductions from a part of the inventory. ARB has primary regulatory authority over California's mobile sources, fuels, and consumer products. U.S. EPA sets new engine standards for sources including large farm and construction equipment and locomotives. Air districts have primary authority over stationary emission sources, including industrial and commercial equipment and area sources. The metropolitan planning organizations are responsible for developing the regional transportation plans that are used to estimate mobile source emissions. These transportation plans can also impact land use patterns, and the availability and attractiveness of transit alternatives.

The air districts develop and adopt local air quality plans. In this case, the District approved the SJV 2008 PM_{2.5} Plan on April 30, 2008. Upon approval by the ARB, SIPs are submitted to U.S.EPA for approval. Once approved by U.S. EPA, SIPs become enforceable.

B. Recent Air Quality Planning

Over the past decade, the District and ARB have adopted a series of regulations and measures to improve air quality in the Valley. New mobile source requirements, cleaner fuels, and multiple consumer products regulations have been adopted and are being implemented today. And, while California continues to face serious air quality challenges, it is important to recognize the progress made as a result of California's landmark air pollution control programs.

The District has implemented a successful PM₁₀ attainment plan which has resulted in the Valley coming into attainment of the federal PM₁₀ standard. U.S. EPA concurred with the District's attainment assessment, and on March 19, 2008, published a final affirmation of attainment of the PM₁₀ standard for the Valley². In addition, on

² Federal Register: March 19, 2008 (Volume 73, Number 54, pages 14687-14713)

April 25, 2008³, U.S. EPA proposed approval of the District's plan to maintain the PM10 standard.

On April 2007, the District adopted the 2007 Ozone Plan. The ozone plan charts the course to attainment of the federal 8-hour ozone NAAQS in the Valley. ARB approved the ozone plan and submitted it to U.S. EPA as a SIP revision. Many of the measures in the PM10 and ozone plans are providing progress towards attainment of the PM2.5 standards.

On September 27, 2007, ARB adopted the 2007 State Strategy to achieve new emission reductions needed to bring areas of the State into attainment of both the federal PM2.5 and ozone air quality standards. The commitment for 2014 in the State Strategy includes reductions needed to attain the PM2.5 standards and provide progress towards meeting the ozone standard.

C. General Planning Requirements

On April 25, 2007, U.S. EPA finalized its implementation rule for PM2.5⁴. The rule outlines the planning elements that the PM2.5 SIP must address. These include:

- base year and future year emission inventories for manmade sources of air pollution in the nonattainment area;
- air quality modeling that demonstrates attainment of the PM2.5 standards as expeditiously as practicable;
- weight of evidence - supplemental analysis of air quality, emission data, and trends supporting the primary modeled attainment demonstration;
- control strategies capable of meeting attainment;
- reasonable further progress (RFP) plan;
- contingency measures in the event the controls fall short of achieving needed reductions;
- demonstration that all reasonably available control technology (RACT) and reasonably available control measures (RACM) have been applied to existing sources;
- transportation conformity emission budgets to ensure transportation plans and projects are consistent with the SIP; and
- commitment for mid-course review.

³ Federal Register: April 25, 2008 (Volume 73, Number 81, pages 22307-22318)

⁴ Federal Register: April 25, 2007 (Volume 72, Number 79, pages 20586-20587)

III. PLAN EVALUATION

A. Overview of the San Joaquin Valley PM2.5 Plan

The SJV 2008 PM2.5 Plan provides the technical foundation and control strategy for attaining the federal PM2.5 standards. The Plan demonstrates the Valley will attain the standards as expeditiously as practicable, no later than the 2014 deadline.

The Plan consists of adopted measures that provide increasing benefits each year, along with new emission reduction commitments from both ARB and the District. The Valley's particle pollution problem is well studied as a result of the \$27 million invested in the California Regional Particulate Matter Study. This study provides the scientific foundation for the PM2.5 SIP by identifying the pollutants most important to formation of PM2.5 pollution. The results indicate that the key pollutants to reduce are NOx, SOx, and directly emitted PM2.5 particles. The Plan addresses these three pollutants consistent with U.S. EPA guidance. Emissions of VOC are also being reduced in the region as part of the ozone attainment strategy but are not required to be included in this SIP.

Overall, between 2005 and 2014, NOx emissions will decrease by almost 300 tons per day (tpd), direct PM2.5 emissions by over 20 tpd, and SOx by almost 3 tpd. Two thirds of the NOx and SOx reductions and one half of the PM2.5 reductions come from already adopted measures. A significant portion of the new commitments come from the ARB's State Strategy that was adopted in September 2007. The State Strategy provides an additional 76 tons of NOx reductions and 5 tons of PM2.5 reductions in 2014. The District has accelerated several measures in its 2007 Ozone Plan that are also part of the PM2.5 attainment strategy, and targeted a number of categories of PM2.5 for additional emission reductions, including residential wood burning and commercial cooking. Past District efforts to reduce impacts from residential wood burning have proven to be very effective, and continued reductions in this source category are expected to contribute significantly to further progress.

As emissions have decreased each year, the entire Valley already meets the daily standard and parts of the Valley are already attaining the annual standard. The air quality modeling indicates that attaining the annual standard in the southern Valley is the biggest challenge, but all areas are projected to attain the standard by 2014. The Plan will also bring the region much closer to meeting a new federal PM2.5 standard that will apply to future SIP planning efforts. SIP planning for the newer standard will occur after U.S. EPA designates nonattainment areas and develops implementation rules.

ARB staff has reviewed the 2008 PM2.5 Plan and the District's technical analysis and agrees that the Plan meets federal requirements. The following sections describe the major elements of the Plan.

B. Emission Inventory

An emission inventory consists of a systematic list of the sources of air pollutants with an estimate of amount of pollutants from each source or source category over a given period of time. The inventories used in this Plan were developed using the most recent planning assumptions and the best available technical information.

Air quality plans rely on emission inventories to help identify sources to control and as inputs to the photochemical models required for attainment demonstrations. Planning inventories which are aggregated by source type and inventory sector focus on anthropogenic sources and are expressed as annual average day and average seasonal day. In the case of PM_{2.5}, ambient concentrations are highest in the winter so the planning inventory includes an estimate of average winter day emissions. This helps planners identify what source categories have the highest emissions during those periods when the PM_{2.5} ambient values are highest. Modeling inventories include both emissions from human activities (anthropogenic sources) and from natural sources (non-anthropogenic sources). Emissions are both spatially distributed geographically and represent hourly estimates for each grid cell in the modeling domain. The emission estimates also include the effects of climatic factors such as temperature and humidity. The models relate current air quality to current emissions levels of PM_{2.5} and its precursors, and simulate future air quality based on changes to the emissions as the result of new control measures. The current or baseline inventories used in the Plan reflect District and ARB controls adopted through 2006 and assume an estimated 24 percent growth in population and 14 percent growth in vehicle miles traveled in the estimated future year inventories. Baseline inventories do not include potential reductions from the new District measures identified in the SJV 2008 PM_{2.5} Plan or ARB measures in the adopted 2007 State Strategy.

1. Estimating Emissions

In California, computer models developed by ARB are used to estimate the emissions from on- and off-road mobile sources. Stationary source emissions estimates are developed by the Districts and derived from permit data. Area-wide emissions are estimated based on emission factors and information on expected activity from these diverse sources. Area-wide and off-road source emissions are estimated by ARB and the District. Emission inventories undergo routine reevaluation to ensure that they remain up to date and accurate.

Emission estimates used in the SJV PM_{2.5} 2008 Plan take into account emission data, expected growth in activity, and ARB regulations and District rules adopted by December 2006. Mobile source emission inventories used in the Plan were developed using EMFAC2007, California's on-road motor vehicle emission factor model and OFFROAD2007 for emissions from mobile off-road vehicles and equipment. Transportation activity data was provided by the eight Valley Councils of Government (COGs) from their Regional Transportation Plans.

The District worked with ARB staff to update emission estimates from stationary and area source categories for which new and improved data became available. Improvements targeted the day-specific modeling inventory as well as the annual and winter planning inventories. Annual and winter planning inventory adjustments included District methodology revisions and impacts of adopted rules (e.g., open burning, wood burning fireplaces and heaters, cooking, manufacturing and industrial fuel combustion). A summary of a major District revision, as well as ARB updates follows:

- Non-point source manufacturing and industrial natural gas combustion.
District staff refined the methodology for estimating emissions from industrial natural gas combustion sources that are too small to fall into the District's permitting program. Using data from the California Energy Commission on natural gas deliveries, District staff estimates 2005 NOx emissions are 25 tpd less than previously estimated and in 2014 they are 29 tpd less.
- PM2.5 size fractions for fugitive dust sources.
ARB staff updated the estimates of dust in the PM2.5 size fraction based on PM size fraction profiles developed by the Western Regional Air Partnership (WRAP)^{5,6} and PM2.5/PM10 ratios obtained from air quality measurements in California. Previously used profiles for dust emitting categories (e.g., paved and unpaved roads, construction and demolition, agricultural tilling) overestimated the amount of dust in the PM2.5 size fraction.
- Paved Road Dust
ARB staff refined PM2.5 emission estimates from paved road dust by subtracting PM2.5 emissions from vehicle exhaust, tire wear, and brake wear to avoid double counting. These emissions are already accounted for in the on-road motor vehicle emission inventory. In addition, ARB staff revised the rate at which emissions are grown from the base year to a future year to reflect projected lane miles of new road.

2. Summary of Baseline Emissions

Emission sources in the San Joaquin Valley are diverse. The San Joaquin Valley is an important transportation corridor for moving goods and people inside the State and beyond. In addition, it is one of the most productive agricultural regions in the world, as well as home to industrial and commercial activities. All of these sources contribute to the concentrations of pollutants in the Valley.

The following discussion focuses on the annual planning inventory used in the SJV 2008 PM2.5 Plan. Appendix B of the SJV 2008 PM2.5 Plan includes detailed

⁵ Cowherd, C. *Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust*, Final Report. October 12, 2005. Midwest Research Institute. MRI Project No. 110397.

http://www.wrapair.org/forums/dejf/documents/fffd/Final_Fractions_Dust_Report.pdf

⁶ Cowherd, C., *Proposed Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors*. November 7, 2005. Midwest Research Institute. MRI Project No. 110397

annual average and winter average daily planning inventories for directly emitted PM2.5, and the precursors NOx and SOx for 2005 and for each year from 2009 to 2014.

Table 2 lists the baseline annual planning inventory for 2005 and 2014 for directly emitted PM2.5, NOx, and SOx precursors in the San Joaquin Valley in 2005 and emissions projected for the 2014 attainment year split by source category.

**Table 2. San Joaquin Valley Air Basin
Baseline Emission Trends^{a,b}**
(Annual Planning Inventory in tons per day, tpd)

Pollutant	Emissions	Source Category			
		Stationary and Area-Wide	On-Road Vehicles	Off-Road Vehicles and Equipment	Total ^b
PM2.5	2005 (tpd)	64.9	12.1	9.0	86.0
	2014 (tpd)	59.5	8.9	6.6	75.0
	Change (tpd)	-5.4	-3.2	-2.4	-11.0
	Change (%)	-8%	-26%	-27%	-13%
NOx	2005 (tpd)	93.6	327.9	153.9	575.4
	2014 (tpd)	67.3	206.7	102.2	376.2
	Change (tpd)	-26.3	-121.2	-51.7	-199.2
	Change (%)	-28%	-37%	-34%	-35%
SOx	2005 (tpd)	21.3	2.6	2.4	26.4
	2014 (tpd)	22.9	0.7	0.8	24.5
	Change (tpd)	+1.6	-1.9	-1.6	-1.9
	Change (%)	+7%	-73%	-67%	-7%

a. Baseline emissions include State control measures and District controls adopted through 2006.
b. Numbers may not add up exactly due to rounding.

In summary, baseline PM_{2.5}, NO_x, and SO_x emissions from all sources in the Valley show an overall downward trend due to already adopted regulations and programs. The slight increase in SO_x from stationary sources is addressed in the Plan. Although motor vehicle miles traveled in the basin continue to increase, on-road vehicle emissions are dropping because of more stringent vehicle emission standards and fleet turnover. This trend will be strengthened between 2005 and 2014 as newer, lower-emitting vehicles become part of the fleet.

C. Air Quality Modeling

Air quality modeling guides the selection of the most effective pollutants to control and the magnitude of emission reductions needed from each of the pollutants. U.S. EPA's modeling guidance requires the use of air quality modeling to relate current PM_{2.5} levels to emissions (of PM_{2.5} and PM_{2.5} precursors) and meteorology in a region, and to simulate future air quality based on changes in emissions. PM_{2.5} air quality modeling uses day-specific grid-based emission inventories and meteorological measurements to establish this relationship. Model predictions combined with observed concentrations of PM_{2.5} and its individual components provide the foundation for the U.S. EPA-recommended attainment demonstration (Speciated Modeled Attainment Test). Rather than using air quality model predicted PM_{2.5} concentrations results directly, U.S. EPA Guidance calls for using models in a relative sense to develop relative response factors (RRFs) for each of the PM_{2.5} chemical species. The RRFs are calculated as the ratios of the future-year to reference-year model-simulated concentrations of PM_{2.5} species at a specific location. The impact that emission reductions have on the future-year modeled PM_{2.5} species is assumed to be proportional to the impact on the base-year PM_{2.5} design value. The attainment test provides reconciliation between speciated and bulk mass concentration measurements, and is the basis for a connection between observations, modeled PM_{2.5} concentrations, and the air quality standard.

ARB staff conducted the grid-based photochemical modeling used in the SJV 2008 PM_{2.5} Plan with input from the District. The modeling analysis is based on data acquired from the \$27 million state-of-the-science CPRAQS study. Modeling procedures followed U.S. EPA guidelines. A brief summary is provided below with more information on the air quality modeling conducted by ARB staff in Appendix A to this report and Appendix F of the SJV 2008 PM_{2.5} Plan.

1. Grid-based Photochemical Modeling

Grid-based photochemical modeling supports attainment demonstrations of the annual and the 24-hour PM_{2.5} standards in the San Joaquin Valley. The modeling platforms and chemical mechanism used in the photochemical modeling are summarized below.

U.S. EPA's Community Multiscale Air Quality Modeling System (CMAQ) was selected to simulate air quality in the San Joaquin Valley. CMAQ is a state-of-the-science "one-atmosphere" system that treats major atmospheric and land processes and a range of