# 2003 PM10 Plan

San Joaquin Valley
Plan to Attain Federal Standards
for Particulate Matter 10 Microns
and Smaller

San Joaquin Valley
Air Pollution
Control District

**BEFORE THE GOVERNING BOARD OF THE SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT**

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|---|---|
| IN THE MATTER OF:<br><br>ADOPTING THE SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT 2003 PM10 PLAN | RESOLUTION NO. ________________ |

**WHEREAS**, the San Joaquin Valley Unified Air Pollution Control District ("District") is a duly constituted unified district, as provided in California Health and Safety Code sections 40150 to 40161; and

**WHEREAS**, the District is designated by United States Environmental Protection Agency (EPA) as a serious nonattainment area for particulate matter less than 10 microns in diameter (PM10); and

**WHEREAS**, under Section 189(b) of the Federal Clean Air Act (CAA), the District is required to submit a plan demonstrating attainment and implementing best available control measures (BACM) no later than four years after reclassification to serious nonattainment; and

**WHEREAS**, the District submitted the PM10 Attainment Demonstration Plan on May 15, 1997 and subsequently initiated a request to withdraw the plan on February 21, 2002; and

**WHEREAS**, the EPA initiated a sanction clock for failure to submit the PM10 Plan on March 18, 2002 that will result in the imposition of the first sanction, 2 to 1 stationary source offsets, on August 28, 2003, and the imposition of the second sanction, withholding of federal highway funds, on February 28, 2004 unless the District provides a plan to EPA meeting all completeness criteria; and

**WHEREAS**, the District did not achieve the PM10 standard by December 31, 2001 as required by CAA Section 188(c)(2) and no extension was approved by EPA, the District is required to submit plan revisions which provide for attainment and an annual reduction in PM10 or PM10 precursor emissions of not less than 5 percent by December 31, 2002; and

**WHEREAS**, the District prepared the 2003 PM10 Plan (Plan) which contains all required elements and demonstrates attainment of the federal PM10 standards at all monitoring sites in the air basin by 2010; and

**WHEREAS** workshops were held on the Draft 2003 PM10 Plan in April 2003; and written and oral comments that were received were responded to with changes reflected in the Proposed 2003 PM10 Plan text and summarized in a Response to Comments document provided as an attachment to the Plan; and

**WHEREAS**, additional changes that are provided as an addendum to the Plan were made to correct typographic errors, formatting issues and minor revisions of text, and said changes did not alter the control strategy and the attainment demonstration nor did they change the Plan's findings or conclusions and are provided in an addendum to the Plan; and

**WHEREAS**, the Plan includes Transportation Conformity Budgets prepared by the California Air Resources Board for years 2005, 2008, and 2010 that must be met by each of the eight counties in the San Joaquin Valley Air Basin; and

**WHEREAS**, on occasion the Transportation Planning Agencies identify minor errors in the Transportation Conformity Budgets that require adjustment of the budget, yet do not impact the District's attainment plan; and

**WHEREAS**, the California Air Resources Board (ARB) has the authority to make such adjustments to Conformity Budgets subsequent to the adoption of the Plan by the District Governing Board should they be needed; and

**WHEREAS**, the District received comments on the Draft PM10 Plan regarding specific aspects of proposed control measures for Regulation VIII and other source categories that may be infeasible or ineffective under certain conditions; and

**WHEREAS,** specific rule language will be developed during the rule development process that address feasibility issues at a much greater level of detail than was possible during development of the PM10 Plan; and

**WHEREAS**, the specific requirements of the Conservation Management Practice (CMP) Program may also change as additional information becomes available during the rule development process; and

**WHEREAS,** individual control measures may be revised from what is proposed in the Plan, the District is committed to achieving equivalent emission reductions from the overall control strategy in the same time frames as proposed in the Plan; and

**WHEREAS,** the District Governing Board approved a memorandum of understanding (MOU) on June 20, 1996 with California Department of Food and Agriculture (CDFA) and the Natural Resource Conservation Service (NRCS) committing the agencies to cooperate in the development of best available control measures for agricultural sources and said MOU is incorporated herein by reference; and

**WHEREAS,** although current modeling indicates that oxides of nitrogen (NOx) controls are the most effective strategy to reduce ammonium nitrate formation, significant uncertainty remains regarding the effectiveness of ammonia controls on the formation of this pollutant in the San Joaquin Valley; and

**WHEREAS,** the ongoing California Regional Particulate Air Quality Study (CRPAQS) is expected to provide an improved understanding of relationships among the PM10 precursors; and

**WHEREAS**, the District is required to prepare a Reasonable Further Progress (RFP) Plan for submittal to EPA in March of 2006 and this will coincide with the completion of CRPAQS contracts in the fall of 2005 providing the information and the opportunity to perform a mid-course correction should one be needed to revise the attainment demonstration and to implement new controls; and

**WHEREAS**, a public hearing for the adoption of the Plan was duly noticed and held on June 19, 2003, in accordance with California Health and Safety Code Section 40725; and

**WHEREAS**, this Board concurs with the recommendations of its staff;

**NOW, THEREFORE**, be it resolved as follows:

1. The Governing Board adopts the 2003 PM10 Plan. Said Plan and circulated Appendices are attached hereto and incorporated herein as Exhibit "A."

2. The 2003 PM10 Plan has been prepared consistent with the requirements of the Federal Clean Air Act and corresponding guidance of the U.S. Environmental Protection Agency (EPA).

3. The District has completed an Initial Study for said PM10 Plan that indicates the project will not result in any significant adverse effects to the environment, and a Proposed Negative Declaration has been prepared and properly noticed pursuant to the California Environmental Quality Act Guidelines (CEQA). The Governing Board of the District has duly considered said initial study and proposed Negative Declaration. Accordingly, the Governing Board of the District (a) certifies that the Initial Study and Negative Declaration reflect the independent judgment of the District; (b) finds that the above-described project will have a de minimis impact on fish and wildlife resources; and (c) approves and adopts a Negative Declaration for said Plan pursuant to CEQA requirements. In accordance with the provisions of Sections 15075 of the *California Environmental Quality Act Guidelines*, the Executive Director/Air Pollution Control Officer is hereby directed to cause to be filed a Notice of Determination with the County Clerks of each of the counties in the District.

4. The Governing Board hereby finds, based on the evidence and information presented at the hearing upon which its decision is based, all notices required to be given by law have been duly given in accordance with Health and Safety Code section 40725, and the Board has allowed public testimony in accordance with Health and Safety Code section 40726.

5. Adoption of said Plan is necessary to comply with the Federal Clean Air Act and will promote the health and welfare of the residents of the San Joaquin Valley Air Basin. Rule development under the plan will be in accordance with the District's rule development procedure with due consideration of technological feasibility, cost-effectiveness, socio-economic impact, and environmental impact.

6. The Executive Director/Air Pollution Control Officer is hereby directed to forward a copy of this Resolution, the 2003 PM10 Plan, and Appendices to the ARB.

7. District staff is directed to work with stakeholders and EPA to ensure that all rules developed as a result of adoption of the 2003 PM10 Plan address all technical and economic feasibility issues identified during plan development along with those that arise during the rule development process so that the rules are both fair and approvable by EPA.

8. District staff is committed to implementing the CMP Program and Rule 8081 utilizing the best available local research in cooperation with the NRCS, and the CDFA to the benefit of air quality for all citizens of the San Joaquin Valley.

9. District staff is directed to ensure that any mitigation fee that may be developed as part of the Indirect Source Mitigation Program shall take into account the onsite mitigation accomplished by the developer and shall provide an adequate demonstration of the relationship between the air quality impacts of the project and the fee used for measures to mitigate those impacts.

10. The District Board commits to adopt and implement the rules and measures in the 2003 PM10 Plan by the dates specified in Chapter 4 to achieve the emissions reductions shown in Chapter 4, and to submit these rules and measures to the California Air Resources Board within one month of adoption for transmittal to EPA as a revision to the State Implementation Plan. If the total emission reductions from the adopted rules are less than those committed to in the Plan, the District Board

commits to adopt, submit, and implement substitute rules and measures that will achieve equivalent reductions in the same adoption and implementation timeframes.

11. District staff is directed to track progress in meeting the 5% and attainment requirements and to report to the Board as soon as shortfalls are identified. The Board commits to adopt, submit, and implement rules to eliminate any shortfalls within 1 year.

12. District staff is directed to conduct a mid-course review that will include an evaluation of the modeling from CRPAQS and the latest technical information (inventory, data, monitoring, etc.) to determine the level of PM10 and PM10 precursor emission reductions needed to attain the federal PM10 annual and 24-hour standards. The mid-course review will also include a complete reassessment of all Plan elements including the attainment demonstration and control measures. The District will continue to work with ARB, EPA and San Joaquin Valley stakeholders in an open, public process to ensure the mid-course review is a comprehensive and thorough evaluation and to assess possible new control measures. The District commits to adopt and submit by March 31, 2006 a SIP revision based on this mid-course review.

13. District staff is directed to prepare a new PM10 Plan for adoption and submittal through ARB to EPA based on the results of CRPAQS by March 2006.

14. The Governing Board of the District requests that ARB authorize its Executive Officer to include the District's 2003 PM10 Plan, as adopted by the District's Governing Board, in the California State Implementation Plan for submittal to the EPA.

15. District staff is hereby authorized to make any minor typographical and technical changes in the Plan and Appendices that are necessary to correct minor errors or clarify wording, or to satisfy ARB and EPA technical requirements, provided that there are no changes in the conclusions or control requirements in the Plan.

16. **THE FOREGOING** was passed and adopted by the following vote of the Governing Board of the San Joaquin Valley Unified Air Pollution Control District this 19th day of June 2003, to wit:

**AYES:** Watson, Silva, Maggard, Nelson, Worthley, Case, Mayfield, Sieglock and Barba.

**NOES:** None.

**ABSENT:** Armentrout.

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL DISTRICT

By [signature] for
Ronn Dominici, Chair
Governing Board

ATTEST:
Clerk to the Governing Board

By [signature]
Sissy Smith

reso.doc



SJVUAPCD
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**LIST OF REFERENCE DOCUMENTS**

Date: April 21, 2003
Format: MS Access Databases
Availability: on CD upon request

R2. Detailed Seasonal Emissions Inventories
Emissions by pollutant, by year, by county, by EIC/SCC/SIC codes in winter tons per day
Source: ARB
Date: April 21, 2003
Format: MS Access Databases
Availability: on CD upon request

R3. SJVUAPCD Growth Factors
a. Development of Emission Growth Surrogates and Activity Projections Used in Forecasting Point and Area Source Emissions, Final Report
Source: Andrew D. Bollman, E.H. Pechan & Associates, Inc.
Date: February 26, 2001
Format: Various (.txt, Adobe Acrobat, MS Access, MS Excel)
Availability: on CD upon request
b. Overrides from Selected Source Categories
Source: SJVUAPCD
Date: May 15, 2003
Format: MS Word Document
Availability: on CD upon request

R4. SJVUAPCD Control Factors
Contains control factor estimates by county, year, EIC, SCC and SIC for the years 1999, 2002 2005, 2008 and 2010.
Source: ARB
Date: June 5, 2003
Format: MS Access Database
Availability: on CD upon request

R5. Regional Transportation Planning Agency Commitments for Implementation Document
Source: San Joaquin Valley Transportation Planning Agencies Director's Association
Date: April 2003
Availability: viewing in the Fresno Office

R6. Chemical and Meteorological Analysis Applied to the San Joaquin Valley Air Pollution Control District's 2003 PM10 State Implementation Plan
Source: SJVUAPCD
Date: May 29, 2003
Format: MS Word Document

R7. Meteorological Analysis Applied to the San Joaquin Valley Air Pollution Control District's 2003 PM10 State Implementation Plan
Source: SJVUAPCD
Date: May 29, 2003
Format: MS Word Document

R8. CMB Profile Selection Documents
Source: SJVUAPCD
Date: 1st quarter 2003
Format: MS Excel files

R9. CMB Modeling Documentation
Source: ARB
Date: June 3, 2003
Format: MS Word document with Excel file attachments

R10. Rollback Modeling of Additional Episodes
Source: SJVUAPCD
Date: May 29, 2003
Format: MS Excel file

R11 BACM Technical and Economic Feasibility Analysis Support
Memos sent to the District discussing the following:
a. Bulk Material Activity Distribution (dated January 31, 2003)
b. Implements of Husbandry (dated February 12, 2003)
c. Unpaved Road Modeled Impacts (dated March 4, 2003)
d. Construction Activity Distribution (dated January 30, 2003)
e. Paved Road Activity Distribution (dated January 30, 2003)
f. Public Unpaved Road Activity Distribution (dated January 30, 2003)
Source: Earl Withycombe, Sierra Research
Date: 1st quarter of 2003
Format: Hardcopy Documents

R12 Detailed Documentation for Fugitive Dust and Ammonia Emission Inventory Changes for the SJVUAPCD Particulate Matter SIP
Internal working memos used to develop and document changes to the emissions inventory.
Source: ARB
Date: April 2003
Format: Adobe Acrobat

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## LIST OF ACRONYMS, ABBREVIATIONS AND INITIALISMS

| | |
|---|---|
| 1994 OADP | 1994 Ozone Attainment Demonstration Plan |
| ADP | Attainment Demonstration Plan |
| APCD | Air Pollution Control District |
| AQMD | Air Quality Management District |
| ARB | California State Air Resources Board |
| ATCM | air toxic control measure |
| BACM | best available control measure |
| BACT | best available control technology |
| BAM | beta attenuation monitors |
| BAR | Bureau of Automotive Repair |
| BARCT | best available retrofit control technology |
| BMP | best management practice |
| BTU | British thermal unit |
| CAA | Federal Clean Air Act Amendments of 1990 |
| CAAP | Clean Air Action Plan |
| CAFO | confined animal feeding operations |
| CalTrans | California Department of Transportation |
| CART | Classification and Regression Trees |
| CCAA | California Clean Air Act |
| CDFA | California Department of Food and Agriculture |
| CMAQ | congestion mitigation and air quality |
| CMB | chemical mass balance |
| CMP | conservation management practices |
| CSUF | California State University, Fresno |
| CRPAQS | California Regional PM10/PM2.5 Air Quality Study |
| District | San Joaquin Valley Air Pollution Control District |
| DMV | Department of Motor Vehicles |
| DOT | Federal Department of Transportation |
| EI | emission inventory |
| EIR | environmental impact report |
| EMFAC2002 | Emission Factor 2002 |
| EPA | United States Environmental Protection Agency |
| FACES | Fresno Asthmatic Children's Environment Study |
| FIP | Federal Implementation Plan |
| FR | Federal Register |
| HAP | hazardous air pollutant |
| IC | internal combustion |
| IMPROVE | Interagency Monitoring of Protected Visual Environments |
| IMS95 | 1995 Integrated Monitoring Study |
| MPO | Metropolitan Planning Organization |
| NAAQS | National Ambient Air Quality Standards |
| NAMS | National Air Monitoring Stations |
| $NH_3$ | ammonia |

| | |
|---|---|
| NOx | oxides of nitrogen |
| NRCS | Natural Resources Conservation Service |
| OADP | Ozone Attainment Demonstration Plan |
| PAMS | Photochemical Assessment Monitoring Stations |
| PM | particulate matter |
| PM10 | particles with an aerodynamic diameter less than or equal to 10 micrometers (µm); PM10 includes the fine PM2.5 particles as well as coarse particles (2.5-10 µm) |
| PM2.5 | particles with an aerodynamic diameter less than 2.5 micrometers |
| PSA | public service announcement |
| PSI | pollutant standard index |
| SIP | State Implementation Plan |
| SJVAB | San Joaquin Valley Air Basin |
| SJVAPCD | San Joaquin Valley Air Pollution Control District |
| SLAMS | State and Local Air Monitoring Stations |
| SOx | oxides of sulfur |
| TCM | Transportation Control Measure |
| TEOM | tapered element oscillating microbalance |
| TIP | Transportation Improvement Programs |
| TPA | Transportation Planning Agency |
| tpd | tons per day |
| TSP | total suspended particulates |
| RACM | reasonably available control measure |
| RACT | reasonably available control technology |
| RCD | Resource Conservation District |
| REMOVE | Reduce Motor Vehicle Emissions |
| RFP | Reasonable Further Progress |
| ROP | rate of progress |
| RTP | Regional Transportation Plan |
| RTPACID | Regional Transportation Planning Agency Commitments for Implementation Document |
| RWB | residential wood burning |
| UAM | Urban Airshed Modeling |
| USDA | United States Department of Agriculture |
| USFS | United States Forest Service |
| VDE | visible dust emission |
| VMT | vehicle miles traveled |
| VOC | volatile organic compound (similar in meaning to ROG, reactive organic gas) |
| $\mu g/m^3$ | micrograms per cubic meter |

# GLOSSARY

**Air Basin:** An area of the state designated by the CARB pursuant to Subdivision (a) of Section 39606 of the CH&SC that has similar meteorological and geographic conditions.

**Air Monitoring:** The periodic or continuous sampling and analysis of air pollutants in ambient air or from individual pollutant sources.

**Air Pollutants:** Substances which are foreign to the atmosphere or are present in the natural atmosphere to the extent that they may result in adverse effects on humans, animals, vegetation, and/or materials.

**Air Pollution Control District (APCD):** A county agency with authority to regulate sources of air pollution, other than emissions from mobile sources, such as refineries, manufacturing facilities, and power plants within a given county, and governed by a District Air Pollution Control Board composed of elected county supervisors. (Compare AQMD and Unified District)

**Air Pollution Control Officer (APCO):** A person appointed by the APCB given the authority to appoint district personnel for the purpose of observing and enforcing the provisions of Part 4, Division 26 of the CH&SC.

**Air Quality Management District (AQMD):** A group of counties or portions of counties with authority to regulate sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region. An AQMD is established by state legislation. (Compare APCD and Unified District).

**Air Resources Board:** See California Air Resources Board.

**Ambient Air:** Air occurring at a particular time and place outside of structures. Often used interchangeably with outdoor air.

**Anthropogenic:** Of, relating to, or influenced by the impact of humans on nature; human-made.

**Area-wide Sources:** Also known as "area" sources, are those sources which are not large enough to be tracked individually, but when added together can represent a large quantity of pollution. Examples of these sources include multiple stationary emission sources such as water heaters, gas furnaces, fireplaces, gas stations, dry cleaners and woodstoves. Area sources of pollution are identified by Category of Emission Source (CES) codes.

**Attainment:** Achieving and maintaining the air quality standards for a given standard. This is generally accomplished by using monitoring data to demonstrate that ambient pollutant levels do not exceed the appropriate standard.

**Attainment Area:** A geographic area that is in compliance with the National and/or California Ambient Air Quality Standards (NAAQS or CAAQS).

**Attainment Demonstration Plan (ADP):** A plan prepared by air pollution control districts and air quality management districts that proposes and evaluates, through modeling, emission controls deemed necessary to attain ambient air quality standards for specified pollutants such as ozone or PM10.

**Best Available Control Technology (BACT):** The most up to date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration).

**Best Available Control Measure (BACM):** A term used to describe the “best” measures (according to EPA guidance) for controlling small or dispersed sources of particulate matter and other emissions from sources such as roadway dust, woodstoves, and open burning.

**Best Available Retrofit Control Technology (BARCT):** An emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source (Section 40406 CH&SC).

**Biogenic:** Produced by living organisms other than humans or human activity (see anthropogenic). For air pollution, this term usually refers to hydrocarbons emitted by vegetation; once emitted, these hydrocarbons participate in atmospheric photochemical reactions with anthropogenic pollutants to form ozone. Biogenic emissions are important to this plan because of the predominance of agriculture in the San Joaquin Valley and the presence of forested areas in the foothills and mountains of the San Joaquin Valley Air Basin.

**Bureau of Automotive Repair (BAR):** An agency of the California Department of Consumer Affairs responsible for the implementation of the motor vehicle inspection and maintenance program (smog check).

**California Air Resources Board (CARB):** The State's lead air quality agency consisting of an eleven-member Governor appointed board and supporting staff fully responsible for motor vehicle pollution control, and having oversight authority over California's air pollution management program.

**California Clean Air Plan (CCAP):** A plan formerly proposed by the California Air Resources Board to help meet state and federal ozone standards throughout California; not currently active.

**California Environmental Quality Act (CEQA):** A California law that sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires the elimination or reduction of environmental impacts associated with a proposed project and the implementation of mitigation measures to reduce or remove those impacts.

**California Regional PM10/PM2.5 Air Quality Study:** CRPAQS is a multi-year effort of meteorological and PM10/PM2.5 air quality monitoring, emission inventory development, data analysis, and air quality simulation modeling. CRPAQS monitoring occurred during a 14-month study period, between December 1999 and February 2001.

**Carbon Monoxide (CO):** A colorless, odorless gas resulting from the incomplete combustion of fossil fuels. Motor vehicles produce over 80 percent of the CO emitted in urban areas. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria pollutant.

**Central California Ozone Study (CCOS):** A research study undertaken in 2001 to collect observations related to formation of ozone at the surface and aloft for a large area of central California.Supporting activities include collecting activity and emissions data and conducting analysis and modeling.

**Chemical Mass Balance:** a computer modeling technique used to simulate the behavior of particulate matter in the atmosphere; it uses chemical analysis of collected air monitoring samples and information about the chemical composition of contributing sources to evaluate the link between observed conditions and emission sources.

**Conformity:** A demonstration of whether a federally-supported activity is consistent with the State Implementation Plan (SIP) – per section 176(c) of the FCAA. Transportation conformity refers to plans, programs, and projects approved or funded by the Federal Highway Administration or the

Federal Transit Administration. General conformity refers to projects approved or funded by other federal agencies.

**Consumer Products:** Products such as detergents, cleaning compounds, polishes, personal care products, and automotive specialty products which are part of our everyday lives and, through consumer use, may produce air emissions that contribute to air pollution.

**Criteria Air Pollutant:** An air pollutant for which acceptable levels of exposure can be determined and for which a federal or state ambient air quality standard has been set. Examples include: Ozone, Carbon Monoxide, Lead, Nitrogen Dioxide, Sulfur Dioxide, and $PM_{10}$.

**Department of Motor Vehicles (DMV):** The state agency responsible for registering drivers and vehicles as well as collecting state and local motor vehicle fees.

**Design Value**: The air quality design value at a given monitoring site is defined as the pollutant concentration which when reduced to the numeric level of the standard ensures that the site meets the standard. For a concentration-based standard, the design value is simply the standard-related test statistic. Air quality managers use the design value as the basis for determining attainment of an air quality standard.

**Emission Factor:** For stationary sources, the relationship between the amount of pollution produced and the amount of raw material processed or burned. For mobile sources, the relationship between the amount of pollution produced and the number of vehicle miles traveled. By using the emission factor of a pollutant and specific data regarding the activity level for a given source (e.g., quantity of raw material processed or number of vehicle miles traveled) quantities of material used by a given source, it is possible to compute emissions for the source.

**Emission Inventory:** An estimate of the amount of pollutants emitted into the atmosphere from major mobile, stationary, area-wide, and natural source categories over a specific period of time such as a day or a year.

**Emission Offset:** Actual enforceable emission reductions from existing sources sufficient to offset anticipated emission increases associated with new or modified stationary sources. A rule-making concept whereby approval of a new stationary source of air pollution or increase of emissions from an existing source of air pollution is conditional on the equal or greater reduction of emissions from other existing stationary sources of air pollution. This concept is utilized in addition to reduction in emissions by employing BACT.

**Emission Projecting:** Utilizing information and growth and control estimates to approximate future emissions.

**Emission Reduction Credit (ERC):** Credits given for actual emission reductions that are real, enforceable, permanent, quantifiable, and surplus (beyond the required reduction). An actual credit is certified via a District-issued document that specifies the date of issuance, expiration date of credit, type of pollutant, and legal owner of emission reduction credits. In some cases, ERCs can be transferred to another owner or banked for future use.

**Emission Standard:** The maximum amount or rate of a pollutant permitted to be discharged from a polluting source such as an automobile or smoke stack.

**Emissions Inventory:** An estimate of the quantity of pollutants emitted into the atmosphere over a specific period such as a day or a year. Considerations that go into the inventory include type and location of sources, the processes involved, and the level of activity.

**Environmental Protection Agency (EPA):** The United States Environmental Protection Agency is a federal agency charged with protecting human health and safeguarding the natural environment—air, water, and land--upon which life depends. EPA promulgates national ambient air quality standards and implements other federal programs designed to improve air quality.

**Exceedance:** A measured pollutant level that is greater than the numeric value of the corresponding ambient air quality standard for the time period specified in the standard.

**Federal Clean Air Act (FCAA):** A federal law passed in 1970 and significantly amended in 1977 and 1990 that forms the basis for the national air pollution control efforts. Basic elements of the Act include national ambient air quality standards for major air pollutants, air toxics standards, acid rain control measures, and enforcement provisions.

**Federal Clean Air Act Amendments of 1990:** The 1990 amended version of the FCAA that mandates attainment of the National Ambient Air Quality Standards (NAAQS) by specified dates for nonattainment areas. For ozone nonattainment, urban areas are now sorted into categories (marginal, moderate, serious, severe, and extreme) with deadlines established ranging from three years for marginal areas to twenty years for extreme areas.

**Federal Implementation Plan (FIP):** In the absence of an approved State Implementation Plan (SIP), a plan prepared by the EPA that provides measures that nonattainment areas must take to meet the requirements of the FCAA.

**Federal Motor Vehicle Control Program (FMVCP):** This program establishes the tailpipe emissions standards that are implemented by the Federal Government.

**Hydrocarbon (HC):** any of a large number of compounds containing various combinations of hydrogen and carbon atoms. They may be emitted into the air as a result of fossil fuel combustion and fuel volatilization, and are a major contributor to smog.

**Indirect Source:** Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor) for which there is a state or federal ambient air quality standard. Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, educational institutions, commercial and industrial developments, and parking lots and garages.

**Indirect Source Review (ISR):** Indirect source review refers to a process under which new development (see indirect source above) is reviewed to determine its indirect air quality impacts for the purposes of arriving at a mitigation fee to offset impacts from the new development. The mitigation fees from individual developments could in turn be placed in a fund that would be used to pay for the most cost-effective projects to reduce emissions.

**Inspection and Maintenance Program (I & M):** A motor vehicle inspection program implemented by the Bureau of Automotive Repair. The purpose of the I&M program is to reduce emissions by assuring that vehicles are running properly. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. The program was enacted in 1979 and strengthened in 1990.

**Internal Combustion Engine (IC):** A heat engine in which the combustion generates the heat inside the engine proper instead of in a furnace. An example of an IC engine is an automobile engine.

**Inversion:** A layer of warm air in the atmosphere that lies over a layer of cooler air, trapping pollutants.

**Memorandum of Understanding (MOU):** An agreement made among agencies for the purposes of jointly accomplishing a goal, program, etc. The governing boards of the involved agencies must ratify this agreement.

**Mobile Sources:** Sources of air pollution that are not stationary by nature such as automobiles, motorcycles, trucks, off-road vehicles, boats, and airplanes.

**National Ambient Air Quality Standards (NAAQS):** Standards set by the Federal Environmental Protection Agency for the maximum levels of air pollutants that can exist in the ambient air without unacceptable effects on human health or public welfare.

**New Source Review (NSR):** The mechanism to assure that new and modified stationary sources will not interfere with the attainment or maintenance of any ambient air quality standard, or prevent reasonable further progress towards the attainment or maintenance of any ambient air quality standard. A program used in a non-attainment area to permit or site new industrial facilities or modifications to existing industrial facilities that emit non-attainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Offsets.

**Nonattainment Area**: An area identified by the EPA and/or CARB as not meeting either the NAAQS or CAAQS for a given pollutant.

**Oxides of Nitrogen (NOx):** A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide ($NO_2$), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation, acid deposition, and secondary particulate matter. $NO_2$ is a criteria pollutant, and may result in numerous adverse health effects.

**Ozone ($O_3$):** A reactive gas consisting of three oxygen atoms. In the troposphere, it is a product of the photochemical process involving the sun's energy. It is a secondary pollutant that is formed when nitrogen oxides ($NO_x$) and reactive organic gases (ROG) react in the presence of sunlight. Ozone at the earth's surface causes numerous adverse health effects and is a criteria pollutant. It is a major component of smog. In the stratosphere, ozone exists naturally and shields life on earth from harmful incoming ultraviolet radiation.

**Particulate Matter (PM10):** A major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and mists. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the air sacs deep in the lungs where they may be deposited to result in adverse health effects. $PM_{10}$ also causes visibility reduction and is a criteria air pollutant.

**parts per billion (ppb):** Standard of measurement of concentration that represents one part (usually volume) of pollutant per billion parts (usually volume) of air.

**parts per hundred million (pphm):** Standard of measurement of concentration by which ozone or other atmospheric gases may be measured. One pphm is equal to ten ppb.

**parts per million (ppm):** Standard of measurement of concentration by which ozone or other atmospheric gases may be measured. Represents one part (usually volume) of pollutant per million parts (usually volume) of air. One ppm is equal to 100 pphm or 1000 ppb.

**Photochemical Reaction:** A term referring to chemical reactions brought about by the energy of the sun. Photochemical reactions create harmful air pollutants such as ozone.

**Public Workshop:** A workshop held by an air district for the purpose of informing the public and obtaining its input on the development of a regulatory action or control measure by that agency.

**Precursors:** Chemicals such as volatile organic compounds and nitrogen oxides, occurring either naturally or as a result of human activities, that contribute to the formation of ozone (a major component of smog) and secondary particulate matter. They are emitted directly from sources into the atmosphere.

**Rate of Progress (ROP)**: The Federal Clean Air Act Amendments [Section 182(c)(2)] require ozone nonattainment areas designated as “serious” or above to demonstrate post-1996 volatile organic compound emission reductions of three percent per year, averaged over a 3-year period. The U.S. Environmental Protection Agency refers to these reductions as the rate-of-progress requirement.

**Reactive Organic Gas (ROG):** A photochemically reactive chemical gas, composed of non-methane hydrocarbons, that may contribute to the formation of smog by their involvement in atmospheric chemical reactions. Also sometimes referred to as Non-Methane Organic Gases (NMOGs). VOC emissions are a subset of ROG emissions.

**Reasonable Further Progress (RFP):** The Federal Clean Air Act (Section 189(c) requires PM10 nonattainment areas to include quantitative milestones, which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress (RFP) toward attainment by the applicable date. Areas must show that their emission reductions meet specified percentages in specified time frames depending on the severity of the problem. For particulate matter, the District is required to achieve emissions reductions of 5% per year of PM10 or PM10 precursors until attainment is reached (2010). For ozone, refer to Rate of Progress above.

**Regional Transportation Planning Agencies (RTPAs)** The eight governmental bodies in the San Joaquin Valley primarily responsible for transportation planning in compliance with federal and state requirements. Also referred to as Valley Transportation Planning Agencies (TPAs).

**Reasonably Available Control Technology (RACT):** Devices, systems, process modifications, or other apparatus or techniques that are reasonably available taking into account the necessity of imposing such controls in order to attain and maintain a national ambient air quality standard; the social, environmental, and economic impact of such controls; and alternative means of providing for attainment and maintenance of such standard.

**Reid Vapor Pressure (RVP):** The absolute vapor pressure of volatile crude oil and volatile nonviscous petroleum liquids, except liquified petroleum gases (see ASTM D 323-94).

**San Joaquin Valley Air Basin (SJVAB):** An air basin established by the California Air Resources Board under the provisions of section 39606 of the California Health and Safety Code. Areas included within a given basin are characterized by similar meteorological and geographic conditions. The SJVAB consists of all of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties, and the Valley portion of Kern County.

**San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD or District):** The SVJUAPCD is an eight county unified district formed under the provisions of the California Health and Safety Code section 40151. Also known as the "Valley Air District", it consists of eight member counties: Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare Counties, and the Valley portions of Kern County. The SJVUAPCD is responsible for the developing the overall attainment strategy for its respective geographic area (see SJVAB above) and has the authority to regulate stationary sources, some area sources, and some aspects of mobile sources.

**Smog:** A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds, which, under various conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. A primary source of smog is automobiles.

**Smog Check Program:** A motor vehicle inspection program implemented by the Bureau of Automotive Repair. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. The program was enacted in 1979 and strengthened in 1990. Also known as the Inspection and Maintenance Program (I & M).

**State Implementation Plan (SIP):** A document prepared by each state describing existing air quality conditions and measures that will be taken to attain and maintain national ambient air quality standards.

**Stationary Sources:** Non-mobile sources such as power plants, refineries, and manufacturing facilities that emit air pollutants.

**Transportation Control Measure (TCM):** Any control measure to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. TCMs can include encouraging the use of carpools and mass transit.

**Transportation Planning Agency (TPA):** See Regional Transportation Planning Agency.

**Unified Air Pollution Control District:** A specialized APCD in which two or more contiguous counties merge their county districts into one. A unified district is formed by action of the member counties. The San Joaquin Valley Unified Air Pollution Control District is a Unified District pursuant to Division 26, Part 3, Chapter 11 of the CH&SC. (Compare APCD and AQMD)

**United States Environmental Protection Agency (EPA):** The United States agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

**Urban Airshed Model (UAM):** a computer model for simulating the behavior of particulate matter in the atmosphere on a regional scale. This tool is especially useful for understanding the formation of secondary particulate matter in the atmosphere through chemical reactions of precursors. Results are used in conjunction with receptor modeling to enhance the accuracy and reliability of predicted effects of emissions trends and adopted and proposed control measure reductions of secondary precursors.

**Valley:** All references to the "Valley" in this plan refer to the San Joaquin Valley.

**Valley Transportation Planning Agencies (TPAs):** The eight governmental bodies in the San Joaquin Valley primarily responsible for transportation planning in compliance with federal and state requirements. Also referred to as Regional Transportation Planning Agencies (RTPAs).

**Vehicle Miles Traveled (VMT):** A measure of both the volume and extent of motor vehicle operation; the total number of vehicle miles traveled within a specified geographical area over a given period of time.

**Volatile Organic Compounds (VOC):** Hydrocarbon compounds that can be emitted into the ambient air. VOCs contribute to the formation of smog and secondary particulate matter, and also may be toxic air contaminants. VOCs do not include methane and a limited number of other hydrocarbons for which research has shown demonstrate little photochemical reactivity. Examples of VOCs include fumes from gasoline, paint solvents, and alcohol.

# EXECUTIVE SUMMARY

## Plan Purpose

The 2003 PM10 Plan (PM10 Plan) is the San Joaquin Valley Air Pollution Control District's (District) strategy for achieving the National Ambient Air Quality Standards (NAAQS) for particulate matter measuring less than 10 microns in diameter (PM10). The plan is designed to meet the requirements of the federal Clean Air Act (CAA) and contains measures needed to attain the NAAQS at the earliest possible date. The PM10 Plan will become part of the State Implementation Plan (SIP) for the San Joaquin Valley.

## Description of PM10 and its Health Impacts

PM10 pollution is a serious health issue in the San Joaquin Valley Air Basin (SJVAB). Particulate matter (PM) is a generic term used to describe a complex group of air pollutants that vary in size and composition, depending upon the location and time of its source. The PM mixture of fine airborne solid particles and liquid droplets (aerosols) include components of nitrates, sulfates, elemental carbon, organic carbon compounds, acid aerosols, trace metals, and geological material. Some of the aerosols are formed in the atmosphere from gaseous combustion by-products such as volatile organic compounds (VOCs), oxides of sulfur (SOx) and nitrogen oxides (NOx). The size of PM can vary from coarse wind blown dust particles to fine particles directly emitted or formed from chemical reactions occurring in the atmosphere. PM10 comprises particles with an aerodynamic diameter less than or equal to a nominal 10 microns[1]. Aerodynamic diameter is defined as the product of the geometric diameter and the square root of the specific gravity of a particle.

Particle size determines the deposition points along the respiratory system. Particles larger than 10 microns in aerodynamic diameter are deposited almost entirely in the nose and throat area, whereas fine and ultrafine particles are able to reach the alveoli (air spaces) deep in the lungs.

Air quality standards are based on the fraction of PM that measures at less than 10 microns in aerodynamic diameter (in comparison, human hair is about 60 to 75 microns in diameter). This fraction of particulate matter is commonly referred to as PM10. PM10 can be inhaled through the upper respiratory airways, and deposited in the lungs causing serious health problems and the increased likelihood of death from other causes. Some of the particles that measure less than 10 microns can penetrate and deposit deeply in the lungs without an ability to be exhaled. This smaller fraction, commonly referred to as PM2.5, is of special concern to health. These particles are based on the fraction of PM10 that measures at less than 2.5 microns in diameter. These finer particles are easily inhaled deeply into the lungs

[1] The official term is micrometer or one millionth of a meter; however, micron is still in common use.

where they can be absorbed into the bloodstream or remain embedded for long periods of time.

Populations at general risk for suffering adverse health effects from exposures to particulate matter include children, people of all ages with asthma, and the elderly with illnesses like bronchitis, emphysema and pneumonia. Patients with chronic obstructive pulmonary disease, such as emphysema and bronchitis, are also potentially susceptible to mortality because of their vulnerability to physical and chemical stimuli and the absence of an adequate ventilatory reserve.[2] A more complete description of PM10 health impacts is found in Chapter 1.

**PM10 Planning History**

On July 1, 1987, the EPA revised the NAAQS for particulate matter (52 FR 24672), replacing standards for total suspended particulates (TSP) with new standards applying only to PM10. The new standards for PM10 reflected the knowledge that the fraction of TSP less than 10 microns in size has the greatest health impacts. The CAA Amendments of 1990 introduced air quality planning requirements for PM10.

The CAA required areas that exceeded the new PM10 standards (150 $\mu g/m^3$ for 24 hours and 50 $\mu g/m^3$ annually) to submit a Moderate Area PM10 Attainment Plan in 1991. The District submitted a plan that contained reasonably available control measures (RACM) required for moderate areas, but was unable to demonstrate attainment by the moderate area deadline of December 31, 1994.

The SJVAB was one of five areas that could not demonstrate attainment by this deadline and was reclassified as a Serious Nonattainment Area effective February 8, 1993. Nine other areas were given additional time to allow them to address such issues as international transport and the potential to attain the standard on schedule. The new serious areas were required to submit a plan that would implement best available control measures (BACM) no later than four years after re-classification to serious (February 8, 1997). The District submitted a Serious Area PM10 Plan containing a BACM commitment on September 13, 1994.

The next CAA requirement for serious nonattainment areas was to submit an attainment demonstration plan within four years after re-classification. The District submitted its PM10 Attainment Demonstration Plan on May 15, 1997. This plan predicted that the SJVAB would attain the annual standard by the December 31, 2001 deadline for serious areas, but requested an extension until 2006 to attain the 24-hour standard at all monitoring sites.

Late in 2001, EPA indicated that it intended to disapprove the 1997 PM10 Attainment Demonstration Plan, because it did not include an adequate BACM demonstration and a most stringent measures (MSM) demonstration required for

[2] Controlling Fine Particulate Matter Under the Clean Air Act: A Menu of Options; State and Territorial Air Pollution Program Administrators and Association of Local Air Pollution Control Officials, DRAFT, February 1996, p. 2-12.

approval of an extension. The District realized that there was insufficient time to correct these deficiencies and withdrew the 1997 PM10 Plan in order to avoid an immediate freeze on transportation funding that would result from disapproval. This action led EPA to file a Notice of Failure to Submit the 1997 PM10 Plan and started a CAA sanction clock. If the District fails to correct this deficiency, EPA will implement the first sanction (2 to 1 stationary source offsets) on August 28, 2003. The second sanction (withholding federal transportation funds) would go into effect on February 28, 2004. The second sanction deadline also coincides with the date when EPA would be required to promulgate a federal implementation plan (FIP).

Since an extension was not approved, the District also missed the December 31, 2001 attainment deadline for serious areas. EPA made a final finding of failure to attain the PM10 standard on July 23, 2002 and final finding of failure to submit a five percent attainment plan by December 31, 2002 on March 21, 2003. Sanction clocks were started for each of these deficiencies; however, the earlier sanction clock for failure to submit the 1997 PM10 Plan would go into effect first and the same corrective action would stop all sanction clocks. The sanction clocks are stopped by the submittal of a complete PM10 Plan. EPA must find a plan complete within 60 days but not later than six months after receipt. EPA must approve, disapprove, partially approve or conditionally approve the plan within one year of finding the plan complete.

**Table ES-1**
**PM10 Plan History and Sanction Clocks**

| Date | Event |
|---|---|
| November 7, 1991 | District Board approves the Moderate Area PM10 Attainment Plan |
| January 8, 1993 | District reclassified as a Serious Nonattainment Area |
| September 14, 1994 | District Board approves the Serious Area PM10 Plan |
| May 15, 1997 | District approves the PM10 Attainment Demonstration Plan |
| February 21, 2002 | District initiates request to withdraw the PM10 Attainment Demonstration Plan |
| March 15, 2002 | EPA makes proposed finding of failure to attain federal PM10 standards |
| March 18, 2002 | EPA finds that the District did not submit a PM10 Attainment Demonstration Plan; started sanction clock effective February 28, 2002 with first sanction imposed August 28, 2003 |
| July 23, 2002 | EPA finds that the SJVAB did not attain the 24-hour and annual PM10 standards by December 31, 2001 |
| March 21, 2003 | EPA finds that the SJVAB failed to submit a 5% PM10 Attainment Plan by December 31, 2002 starting 18-month and 24-month sanction clock |

## PM10 Plan Required Elements

The following requirements apply to areas classified as serious nonattainment under the CAA. The third bullet requiring five percent per year reductions applies only to serious areas that have failed to achieve attainment by the deadlines specified in the CAA. The PM10 Plan contains all required elements.

- Demonstrate attainment at earliest practicable date
- Implement Best Available Control Measures/Technology (BACM/BACT) for all significant sources of PM10 or PM10 precursors
- Provide annual reductions of at least five percent of PM10 or PM10 precursor emissions based on the most recent inventory until attainment
- Provide quantitative milestones for reasonable further progress
- Adopt contingency measures to assure that emission reductions are in place that can be implemented if a milestone is not achieved on schedule

**Extent of the PM10 Problem**

The SJVAB exceeds both the federal 24 hour standard of 150 $\mu g/m^3$ and the annual standard of 50 $\mu g/m^3$. Table ES-2 (Column A) displays the highest ambient levels recorded at monitoring sites for the SJVAB based on the period 1999 to 2001. These values are used to determine the “design value” for each monitoring site. The design value is the benchmark used to determine whether a site attains the standard and to provide a starting point for demonstrating attainment in the future after the control strategy is implemented. Table ES-2 (Column B) displays the design value for the annual standard based on the same years. This period was chosen because it includes the most recent years having complete quality controlled data and is consistent with EPA guidance for determining attainment status. PM10 levels exceeded the standard in all three regions of the SJVAB.

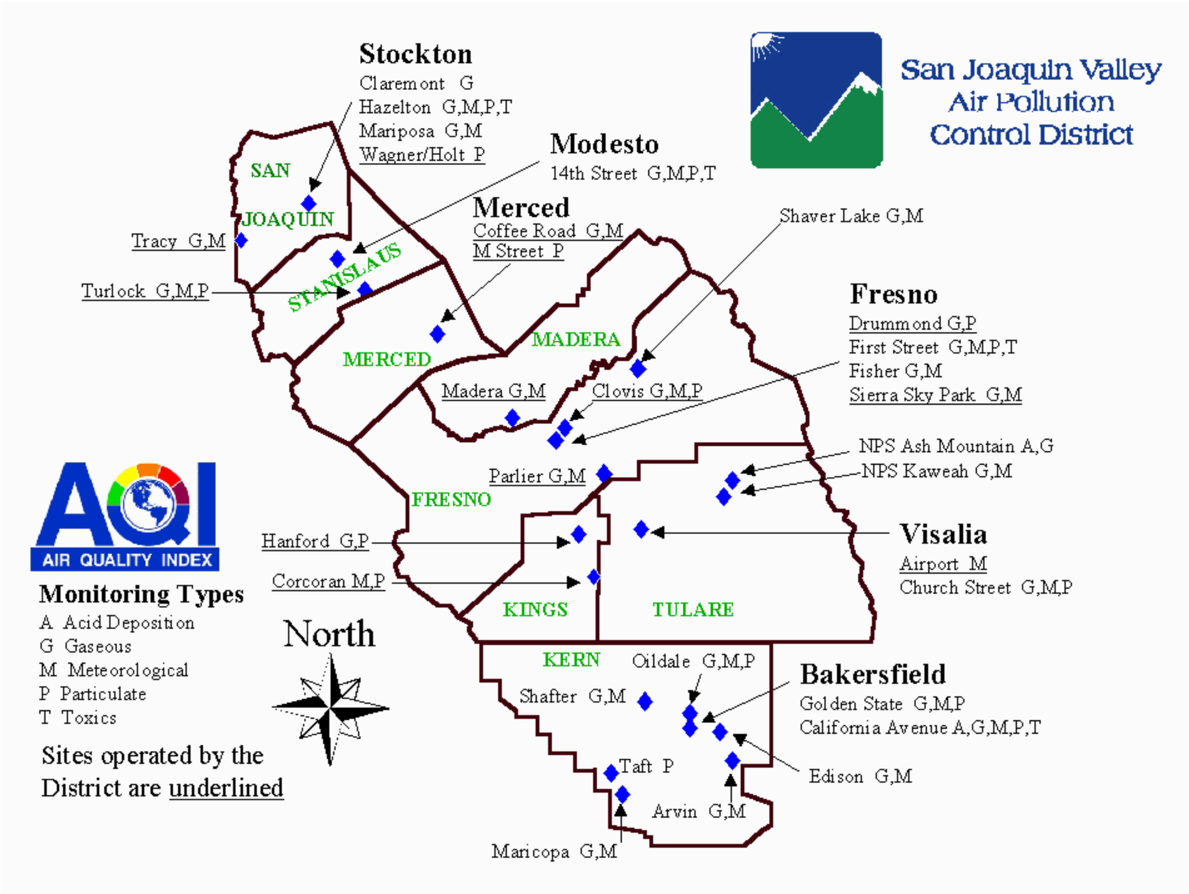
**Table ES-2**
**Design Values (µg/m3)**
**Based on 1999-2001 Data**

| **Site Name** | **SJVAB PM10 Design Value** Column A | **Annual Average PM10 Design Values** Column B |
|---|---|---|
| Bakersfield, California Ave. | **190** | 48 |
| Bakersfield-Golden #2 | **205** | **57** |
| Clovis | **155** | 43 |
| Corcoran, Patterson Ave. | **174** | 49 |
| Fresno-Drummond | **186** | 50 |
| Fresno-First | **193** | 42 |
| Hanford, Irwin St | **185** | **53** |
| Merced-M Street | 134 | 40 |
| Modesto, 14th Street | **158** | 37 |
| Oildale, 3311 Manor St | **158** | 46 |
| Stockton, Hazelton-HD | 150 | 35 |
| Stockton, Wagner-Holt | 119 | 30 |
| Taft, College | 128 | 36 |
| Turlock, 900 Minaret Street | **157** | 39 |
| Visalia, Church Street | 152 | **54** |

Column A: Values in bold font exceed the 24-hour standard.
Column B: Values in bold font exceed the annual standard.

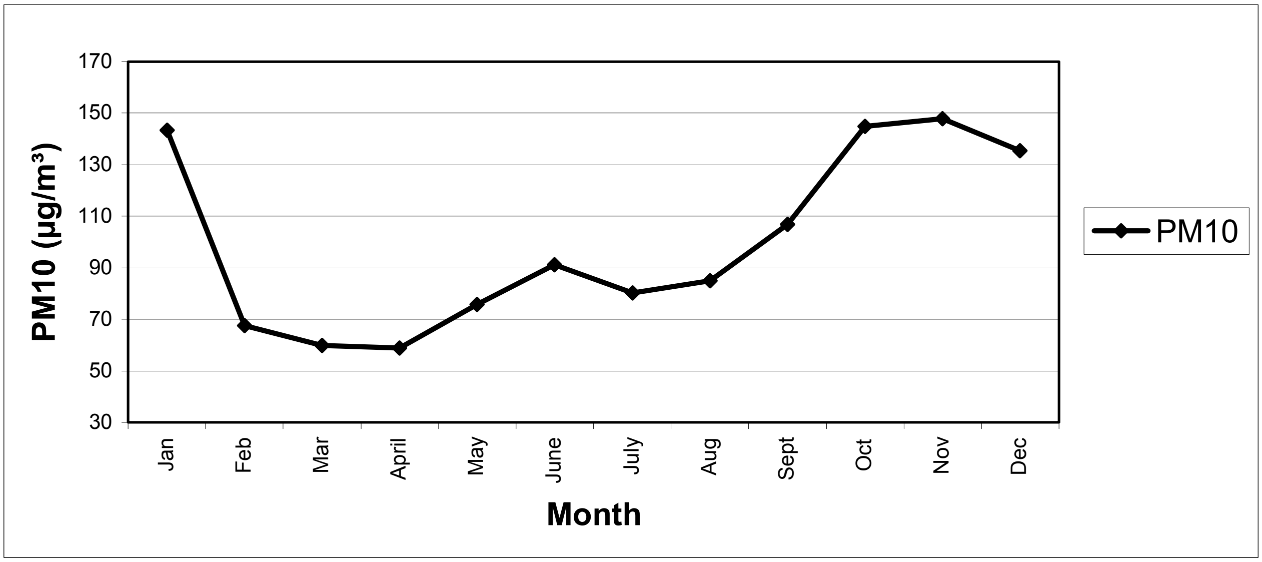
The highest levels and greatest numbers of exceedances were recorded at monitoring stations in the Fresno metropolitan area, the Bakersfield metropolitan area, and the City of Corcoran. Other areas that have experienced exceedances during the last three years include the City of Modesto, the City of Turlock, the City of Hanford, and the City of Visalia. Three monitoring stations exceeded the annual standard. They are Bakersfield, Hanford, and Visalia. A map displaying the location of the San Joaquin Valley's air monitoring sites is provided in Figure ES-1.

**Figure ES-1**
**San Joaquin Valley Air Monitoring Sites**
**1999**



PM10 emissions vary significantly from season to season. Figure ES-2 displays the seasonal variation. The highest peak concentrations occur during October through January. Spring and summer experience the lowest peak concentrations.

**Figure ES-2**
**Average of Peak PM10 Monthly Concentrations, 1998-2001**




Average of 1998 to 2001 peak readings from the highest site for each month.

Ambient PM10 levels and the number of days over the standard have declined substantially over the last decade. During the early 1990s a 24-hour reading of 439 was recorded at Kettleman City and a value of 279 µg/m³ was recorded at the Corcoran monitoring site. These two exceedances were dominated by geologic material and occurred during the fall season. The highest reading during the last three years was a 205 µg/m³ at the Bakersfield Golden State monitoring site in 2001. This exceedance was nitrate dominated and occurred during the winter season. Since 24-hour samples are only collected every sixth day at most sites, each observed exceedance of the standard is assumed to mean that a single monitored exceedance equals six probable exceedances. During the early 1990s an average of 35 days were estimated to have exceeded the 24-hour standard each year. During the three year period 1999-2001, between 0 and 12 days were over the standard based on every 6-day and 3-day monitoring for some sites. Figure ES-3 displays the trend in PM10 levels between 1989 and 2001. Figure ES-4 shows the number of days over the standard at the worst site in the Valley for each year between 1989 and 2001.

Three of the eight counties (San Joaquin, Merced, and Madera) are in attainment of the 24-hr PM10 standards and five of the eight (San Joaquin, Stanislaus, Merced, Madera, and Fresno) are in attainment of the annual standard. Between 1999 and 2001, Fresno had one observation over the 24-hr standard each year, Stanislaus had two in three years, Kern had five in three years and Tulare had none over the standard.

**Figure ES-3**

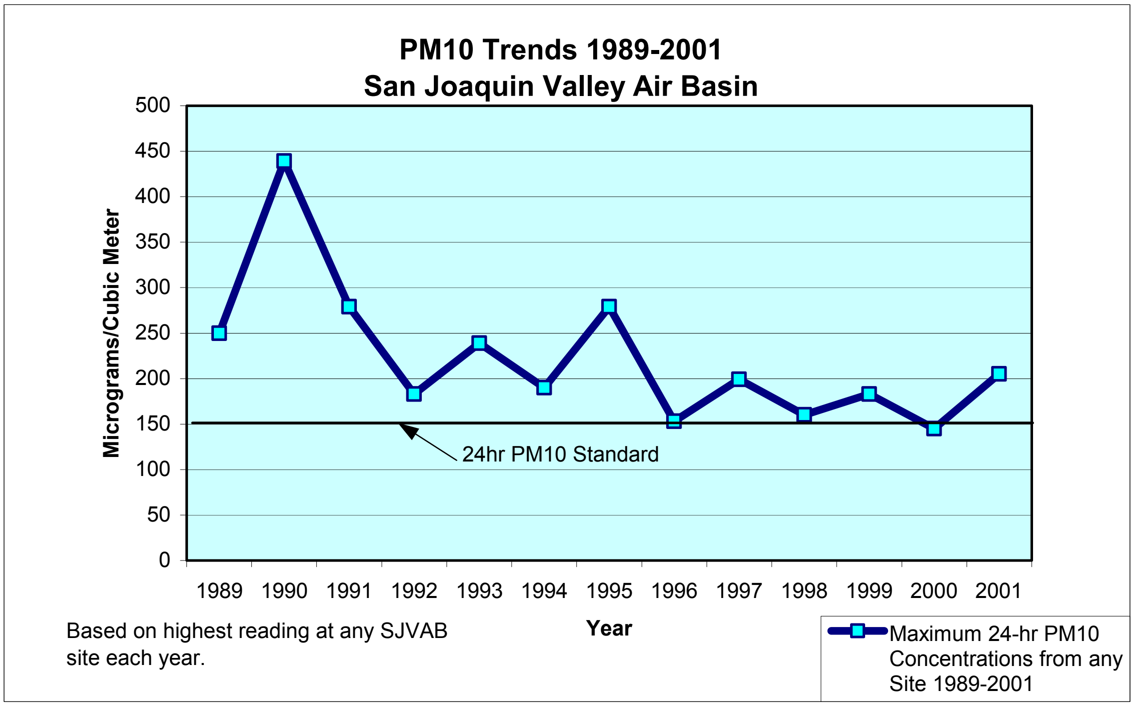
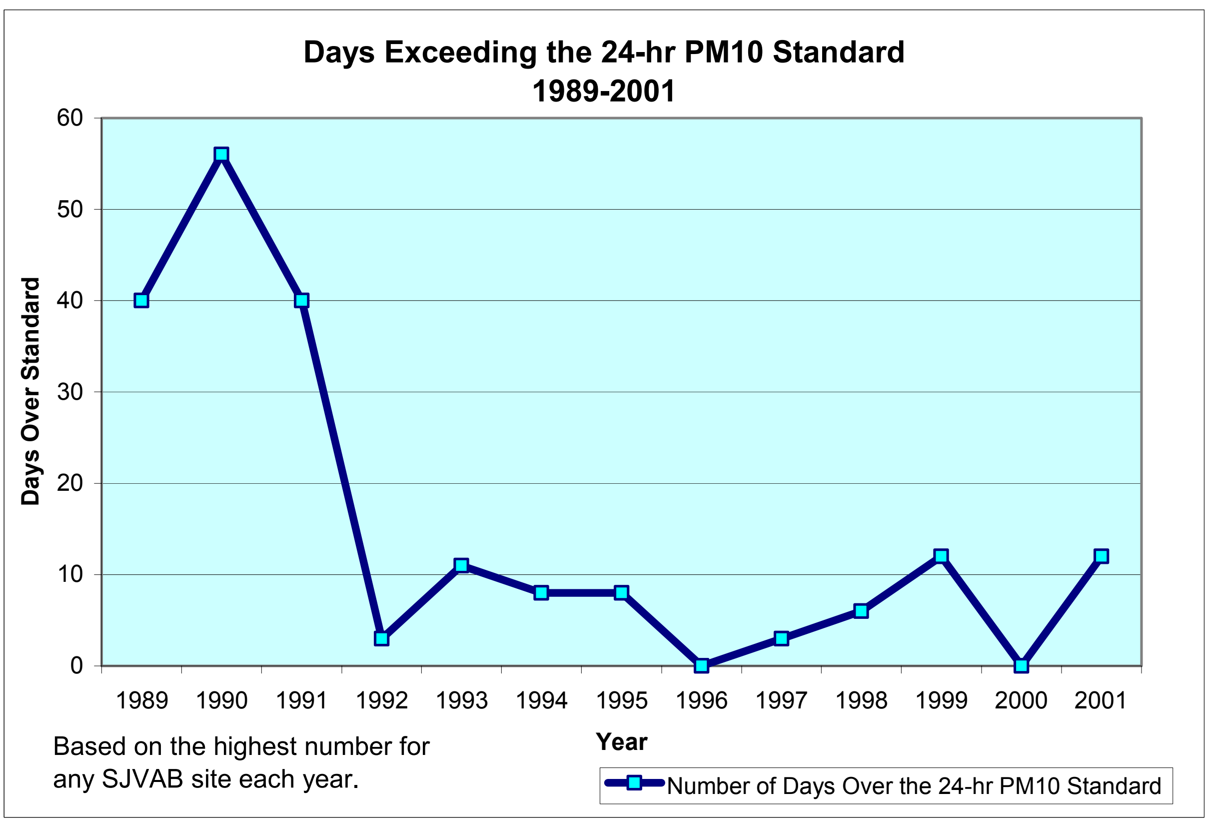



**Figure ES-4**



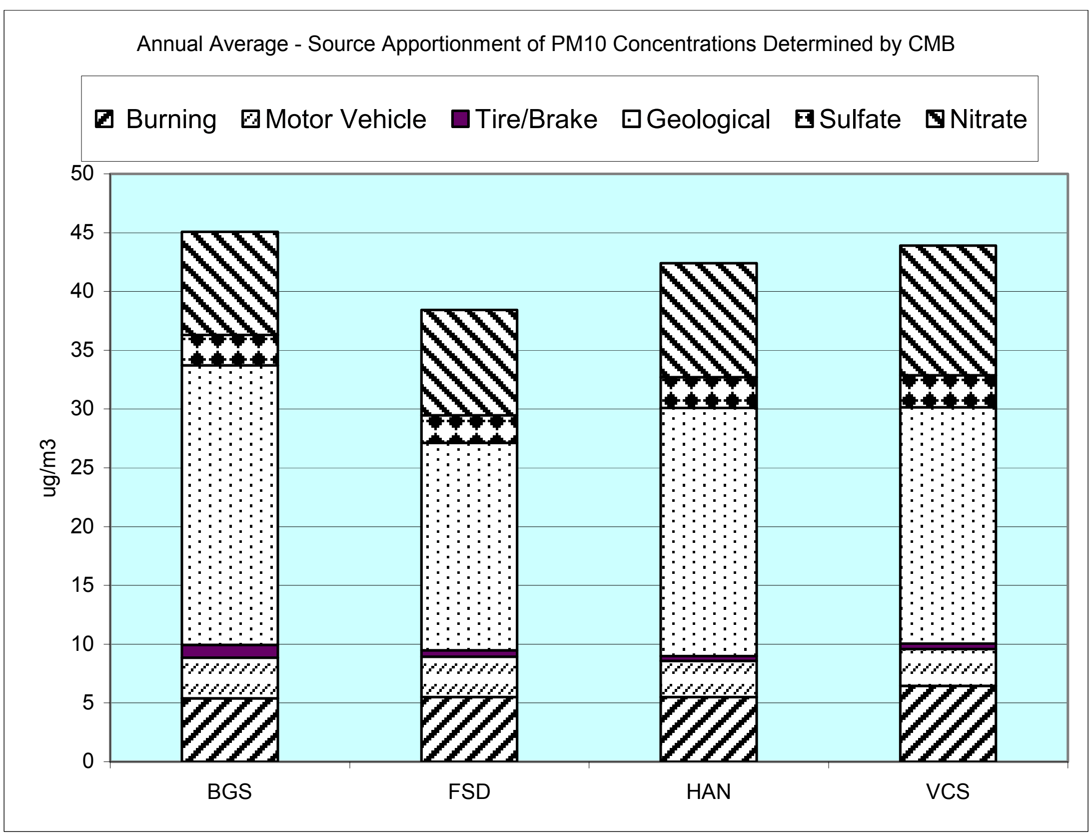

Source: California Air Resources Board, http://www.arb.ca.gov/aqd/aqd.htm

## Causes of the San Joaquin Valley's PM10 Problem

The causes of the San Joaquin Valley's PM10 problem are complex, but our understanding has benefited through investment in air quality research focused on the region. The District, state government, federal government and industry have allocated nearly $30 million to understand the causes of the SJVAB's PM10 problem. The Integrated Monitoring Study 1995 (IMS95) and California Regional Particulate Air Quality Study (CRPAQS) field studies collected PM10 samples during intensive monitoring periods in 1995 and 2000-2001 respectively. Although the data analysis phase of these studies is not complete, some findings were available to assist in developing this PM10 Plan. When final results are released, the District is committed to incorporating any new findings into a future update of the PM10 Plan. In addition to the study data, the District's monitoring network collects samples on an every six-day cycle (Corcoran has co-located monitors that collect samples every three days). The District monitoring sites are the official source of data for determining the SJVAB attainment status.

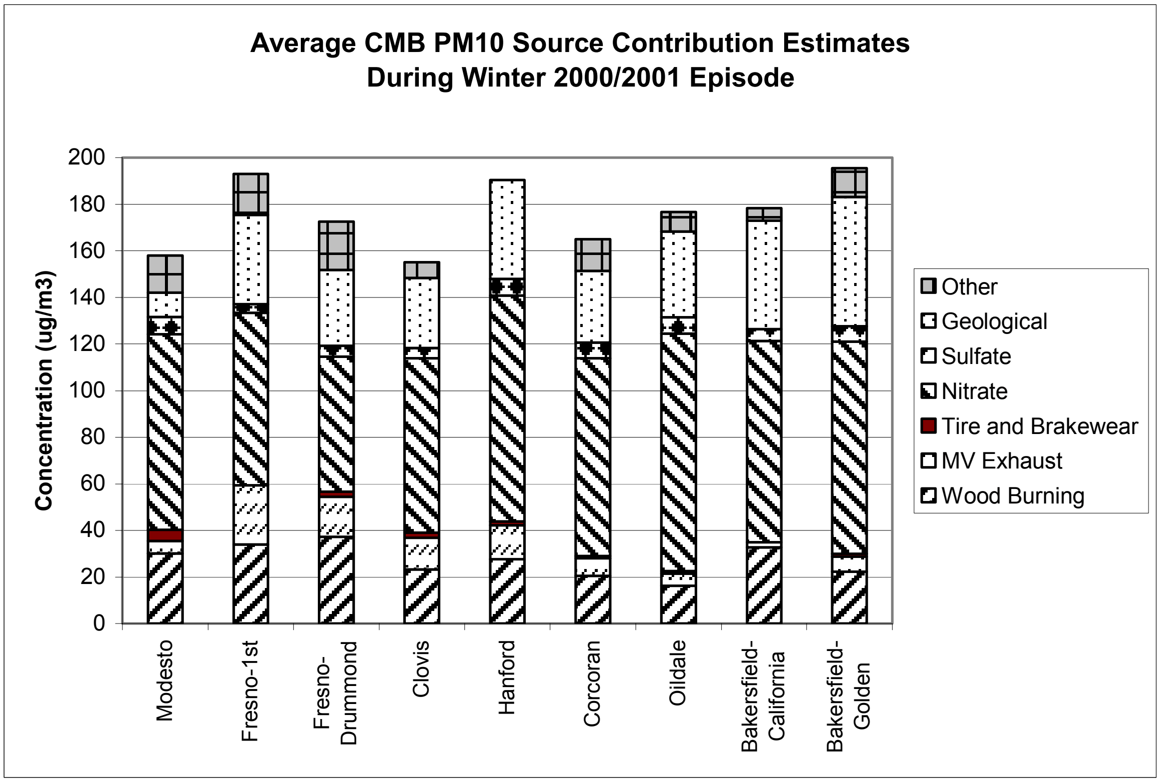
PM10 samples from the different sites have been analyzed to determine the various chemical components. The results of this analysis are presented in Figures ES-5 and ES-6.

**Figure ES-5**
**Sources of PM10 in the San Joaquin Valley Air Basin**
**Monitoring Stations over the Annual Standard**




BGS = Bakersfield Golden State, FSD = Fresno First St., HAN = Hanford, VCS = Visalia Church St.

**Figure ES-6**




The SJVAB experiences the highest PM10 concentrations during the fall and winter seasons. The largest fraction of material responsible for fall exceedances is fugitive dust; however, there was only one fall episode over the standard recorded during the last three years (October 21, 1999). Ammonium nitrate comprises the largest fraction during winter episodes. Geologic material is the second largest contributor in most winter episodes, but carbon particles from wood combustion can also be high during periods when fireplace and woodstove use is high. The worst episodes occur during long periods of stagnant conditions with light winds. Wind related PM10 events are rare but possible when conditions are right. None of the exceedances recorded during the last three years were wind related.

## CART Analysis

In order to verify the understanding of the effect of meteorology on the SJVAB PM10 problem, the ARB prepared an analysis using Classification and Regression Trees (CART). CART is a powerful, statistically based model that establishes relationships between dependent air quality (i.e. PM10 or PM2.5) variables, and independent meteorological variables, such as relative humidity, temperature, stability, precipitation, visibility, etc. The output provides diagrams in the form of "trees" that illustrate which meteorological variables contribute to PM concentrations and provides the relevancy of each meteorological variable. The results of the CART Analysis are provided in Appendix L.

CART results reveal that stability is by far the most important meteorological parameter in defining high PM concentrations for either PM10 or PM2.5. This is unlike other serious nonattainment areas such as Phoenix, Arizona, Clark County, Nevada, and Coachella Valley, California where high wind speed is the most important determinant of high PM concentrations. Other important parameters include minimum and maximum temperature, visibility, and only rarely relative humidity and wind speed. PM concentration means below 20 $\mu g/m^3$ were reported for the more favorable meteorological regimes (in most cases, defined by low stability, higher minimum temperatures, higher wind speed, and normal relative humidity). The winter analysis indicated that there is a little more spread of variables that are important; while stability is still quite important, minimum temperature and visibility take on a greater importance. Results of the fall seasonal runs indicate more dependence on visibility than stability, as was the case for the winter analysis.

**Emissions Inventory**

Another tool used to identify the source of pollutants is the emissions inventory (EI). The emissions inventory is an air pollutant accounting system. The inventory is a compilation of emission rates multiplied by activity levels for each anthropogenic source of pollution in the air basin. The pollutants in the inventory are distributed geographically in a grid system when used in air quality modeling. The quality of the emission inventory varies a great deal from source category to source category. In general, emissions from vehicles, engines, and industrial processes are reasonably well understood and have agreed upon measurement techniques. Fugitive dust and ammonia emissions on the other hand are highly variable due to environmental conditions and are difficult to measure. This difference should be kept in mind when comparing emission source categories.

The inventory for the SJVAB is further complicated by the need to examine sources of directly emitted PM10 as well as sources of PM10 precursors. As was shown in Figure ES-6, during the worst PM10 episode in January 2001 over 50 percent of the particles were secondary nitrate and sulfate particles formed by precursor gases. The inventory of directly emitted PM10 is more seasonably variable than the precursor inventory.

The emissions inventory for the PM10 Plan has many improvements over the inventory submitted with the 1997 PM10 Attainment Demonstration Plan. These improvements were the result of extensive coordination between the District, ARB, and EPA. In addition, dozens of meetings were held with stakeholders to ensure that the best, most accurate, San Joaquin Valley specific data are included in the emission inventory. Chapter 3 describes the inventory in greater detail. The inventory is a joint responsibility of the District and the ARB.

The emission estimates for a particular source of PM10 emissions is not necessarily proportional to the impact on ambient PM10 levels. Particles fall out of the atmosphere at different rates depending on their size and chemical composition and on meteorological variables such as wind speed and relative humidity. Under stable conditions and a wind speed of 1 meter per second, 10-micron particles are estimated to travel a mean distance of 1.1 kilometers[3]. A large source of directly emitted PM10 that is found primarily in locations away from urban areas or is widely dispersed in areas with few other sources is likely to have less impact than a smaller source category in an urban area where many sources are located. The concentration of sources and the intensity of activity at those sources (source density) is the primary consideration for fugitive dust impacts. PM10 precursors, on the other hand, tend to be more regional in nature and can impact areas far from their source. The inventory is used to estimate the emissions coming from each source of pollution and as an indicator of which sources need to be controlled.

The PM10 Plan includes inventories for volatile organic compounds (VOC), oxides of nitrogen (NOx), oxides of sulfur (SOx), ammonia, and PM10 for the years 1999, 2002, 2005, 2008, and 2010. More information on the emission inventory can be found in Chapter 3, which also includes inventory summaries for each of these pollutants and years. The year 1999 is used as the baseline inventory because it has the most complete data. 2002 is used as the base year from which to calculate all future year milestones (i.e., 5% per year requirement, and reasonable further progress).

**PM10 Air Quality Modeling**

The EPA requires PM10 attainment plans to use air quality modeling techniques to apportion the causes of the problem to the appropriate sources and to predict the effectiveness of reducing pollutants from the sources on attainment. The PM10 Plan uses four modeling techniques. They are chemical mass balance (CMB) with speciated roll-back, a grid-based aerosol model, box modeling, and dispersion modeling. For a complete description of these models, see the Modeling Protocol in Appendix K and Chapter 5. These modeling techniques meet or exceed all EPA standards and guidance for the development of PM10 plans.

<u>UAM-Aero Modeling</u>

The District in consultation with ARB selected the Urban Airshed Model-Aerosol (UAM-Aero) to model the formation of secondary particles in the atmosphere. UAM-Aero was developed by the ARB and has been used on SIPs in several nonattainment areas.

ARB modeling staff ran sensitivity tests using UAM-Aero to determine the effect of reducing the emissions of various precursors to PM10. The results of these tests are used to guide the development of an appropriate precursor control strategy. The tests compared the effects of controlling NOx, VOC, and ammonia emissions. The modeling used data sets from work accomplished for the IMS-95 field study (the most complete data available). The dataset was not ideal. It covered only the southern part of the Valley, and as sometimes happens during air quality field studies, the field-monitoring period experienced relatively low PM10 levels. No site exceeded the PM10 standard during the period. The episode modeled occurred

[3] "Evaluation of Dust Particulate Matter Suspension Time and Travel Distance in Ambient Air -Draft." Tony Servin, P. E. January 13, 1995

during January 4-6, 1996. Although not ideal, the IMS-95 data covers the area of the SJVAB that experiences the highest PM10 levels. Monitoring data collected during CRPAQS and regular District monitoring confirms that the relative contribution of the secondary particles is consistent with that collected during IMS-95. Results of the sensitivity testing provide several important findings that will be described below.

NOx emission reductions of 50 percent are effective throughout the domain (the domain is the geographic area that the modeling covers). Results show that reductions correlate well with the peak simulated base case ammonium nitrate concentrations; i.e., reducing NOx reduces nitrate where nitrate is high. Consequently, an expeditious attainment strategy must contain significant NOx emission reductions.

VOC emission reductions of 50 percent had little impact throughout the domain. Comparing the effects of reductions with the simulated base case ammonium nitrate shows that reducing domain-wide VOC emissions have little impact on nitrate concentrations, and no impact where nitrate is highest. Therefore, an expeditious strategy does not include VOC reductions.

Ammonia emission reductions of 50 percent had mixed and uncertain results. The January 5 results indicate that ammonia controls may be somewhat effective in the mountains east of Bakersfield. The January 6 results showed some impact on the Valley floor south of Bakersfield. However, when you compare the effects of reductions with the simulated base case ammonium nitrate, the ammonia impact occurs in regions of low nitrate concentrations.

ARB staff further evaluated the potential effectiveness of ammonia controls in reducing nitrate by examining the relative abundance of ammonia, ammonium, sulfate, nitrate, and nitric acid in ambient data measured during the modeled episode. The analysis showed that unused ammonia remained after complete conversion to nitrate of the measured constituents. Thus, the ambient data indicate that nitrate formation was not limited by the availability of ammonia. This contradicts the modeling results. As a result, it is unclear from the data currently available whether an expeditious attainment strategy requires ammonia reductions. And at this time, ammonia reductions have not been shown to be an effective precursor control strategy.

<u>CMB with Speciated Rollback</u>

The District and ARB used CMB with speciated rollback as the primary model to demonstrate attainment of the annual and 24-hour PM10 standards. Speciated rollback uses chemical analysis of collected air monitoring samples and information about the chemical composition of contributing sources to evaluate the link between collected samples and emission sources. Figures ES-5 and ES-6 displayed earlier in this chapter provide a graph of CMB results for the base year.

The CMB model links the speciated chemical composition of the filter sample at the site to emissions inventories that represent the emissions at the time of the 24-hour observation, or that represent seasonal or annual average values as appropriate. Where emission information is lacking for a particular component (e.g., seasonally resolved mineral dust emissions) rollback can still be applied to other components. To demonstrate attainment the inventories are “rolled back,” reflecting all controls identified in the control strategy. When controls reduce emissions sufficiently, the model shows that ambient levels will be lower than the NAAQS

**PM10 Plan Control Strategy**

Air pollution control is a shared responsibility of the EPA, California Air Resources Board (ARB) the District, and local government agencies. The EPA is responsible for federal motor vehicle, certain off-road engines, trains, planes, ships, and fuel regulations. The ARB regulates California vehicles and fuels and consumer products. The District regulates stationary sources and has limited authority to implement transportation control measures and indirect source control programs. The local agencies possess authority to regulate land use, to implement transportation control measures, and to use their budget authority to implement measures that reduce emissions directly. Each of these entities is contributing to the overall attainment strategy.

The PM10 Plan control strategy consists of existing measures already adopted by each entity, new measures needed to fulfill the BACM/BACT requirement, and other new feasible measures needed to reach attainment at the earliest practicable date. Because of previous air quality planning efforts for PM10 and ozone, the vast majority of controls needed to attain the PM10 standards have already been adopted and implemented in the SJVAB. The new measures are mostly incremental improvements to controls on previously regulated sources. The most significant new control strategy is the Agricultural Conservation Management Practices (CMP) Program. Prior to this plan, no controls on agricultural production were in place, although voluntary participation in conservation practices and incentive programs has been noteworthy. A summary of the emission reductions obtained from adopted rules and regulations and new plan commitments is provided below.

**Table ES-3**
**Emission Reduction Summary for 2010**

| | 2002 Inventory (tons/day) | Emission Reductions in 2010 (tons/day) |
|---|---|---|
| New PM10 Reductions | 329.4 | 66.4 |
| Adopted PM10 Reductions | | -20.7 |
| New NOx Reductions | 519.8 | 37.9 |
| Adopted NOx Reductions | | 118.2 |
| New VOC Reductions | 413.0 | 20.8 |
| Adopted VOC Reductions | | 48.0 |
| New SOx Reductions | 31.8 | 6.3 |
| Adopted SOx Reductions | | -1.5 |

Note that benefits of NOx and VOC controls are primarily from measures already adopted for ozone control and benefits from PM10 and SOx reductions are from new commitments. Negative numbers in Table ES-3 indicate that the inventory is expected to grow for that pollutant unless additional controls are adopted. Most of the new measures for NOx and VOC are commitments recently included in the 2002 and 2005 Ozone Rate of Progress Plan that are also included in the PM10 Plan. Measures that rely on fleet turnover, i.e., mobile source measures, accrue air quality benefits slowly over time and so show benefits well into the future. Most stationary source measures and prohibitory measures are quickly implemented and achieve their maximum benefit in a few years. These measures show a quick drop in emissions when implemented and then the emissions are flat or begin growing if the source category is expected to grow. In addition, because NOx and VOC controls have been adopted for the District's ozone strategy, more stationary and area source controls are now in place for these pollutants. Stationary source SOx and PM10 emissions were not identified as significant sources of PM10 in the District's previous PM10 Plan submittals; therefore, no new controls for these pollutants from stationary sources were adopted in recent years.

Areas classified as serious nonattainment for PM10 are required to implement BACM and BACT on all significant sources of PM10 or PM10 precursor emissions. EPA defines significant sources as those contributing more that 5 $\mu g/m^3$ to a violation of the 24-hour PM10 standard or 1 $\mu g/m^3$ to a violation of the annual PM10 standard. BACM/BACT is defined as the maximum degree of emission reduction considering technical and economic feasibility and environmental impacts of the control. BACM/BACT must be implemented independent of attainment requirements. This means that BACM/BACT must be implemented even if it is not needed to attain the standards by the applicable attainment date since it would allow for an earlier attainment date. However, EPA guidance[4] allows for pursuing only precursor pollutants that would be effective in reducing ambient PM10 levels.

The District conducted BACM and BACT analyses of its existing controls and regulations. The analyses were intended to demonstrate that BACM/BACT has been implemented on all significant sources and to identify sources that needed tighter regulation or had additional potential for cost-effective emission reductions. The analyses compared District regulations with those adopted most recently in other serious nonattainment areas. Most of the District's existing regulations were found to meet the BACM/BACT definition. Sources identified as candidates for new or upgraded controls are listed in Chapter 4. The complete BACM and BACT Analysis reports are found in Appendix G.

As was indicated in the modeling section, air quality modeling using UAM-Aero identified several findings important for the PM10 precursor control strategy. First, the most effective strategy to reduce ammonium nitrate formation across the basin is to reduce the PM10 precursor oxides of nitrogen (NOx). Second, reducing the PM10 precursor volatile organic compounds (VOC) had little or no effect in reducing

[4] General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, Section III(1)(g), April 16, 1992.

ambient nitrate concentrations in the SJVAB. Although the available modeling indicates that VOC reductions are ineffective, the possibility remains that they may be effective under some circumstances. This uncertainty is not critical since the District is pursuing all feasible VOC controls as part of its ozone control strategy. VOC controls adopted and proposed by the District meet the PM10 BACM/BACT requirement even if they are not needed for the PM10 attainment strategy. Third, it is unclear from the data currently available whether an expeditious attainment strategy requires ammonia reductions, and at this time, ammonia reductions have not been shown to be an effective precursor control strategy.

No ammonia controls are proposed for immediate implementation in the PM10 Plan; however, the District is committed to pursuing an expeditious ammonia control strategy. In light of the uncertainty regarding ammonia emission controls to achieve attainment, the PM10 Plan includes a strategy to further assess and develop any needed control for ammonia sources, especially dairies. Implementation of any controls would depend on further analysis of the Valley's ammonia chemistry as part of CRPAQS. As the results of that study become available, the District commits to adopting ammonia control measures that have been demonstrated as technologically and economically feasible and necessary for the San Joaquin Valley.

In the near term, the District expects to propose controls for dairy lagoons and livestock waste as part of the Ozone Plan that is under development. Although the primary purpose of those controls is to reduce VOCs, ammonia will also be considered.

District staff has investigated the current implementation of ammonia controls for Concentrated Animal Feeding Operations (CAFO) in other districts with a primary focus on dairies. No other District has adopted ammonia controls, and controls proposed for the 2003 South Coast Air Quality Management District (SCAQMD) SIP appear to be infeasible for the San Joaquin Valley. Manure generated by SCAQMD dairies is typically transported off-site, primarily due to high land costs in the area. Most dairy operators have no cropland near their dairies available to dispose of the manure and liquid waste as fertilizer. San Joaquin Valley dairies on the other hand, nearly all have large acreages available for on-site disposal. This means that dairy design and waste management practices employed are not comparable.

Another conclusion from the modeling work relevant to the control strategy is that the concentration of many different PM10 sources in urban areas leads to the highest ambient levels at urban area monitoring sites. Therefore, controls on pollutants emitted in the urban area and regional pollutants will have the greatest effect on the PM10 problem. This does not eliminate the need for rural controls. People living near activities that produce large quantities of PM10 can be exposed to unhealthy levels.

Chapter 4 provides a summary of each control measure including emission reductions and cost-effectiveness estimates.

**Attainment Demonstration and Measures of Reasonable Further Progress**

The air quality modeling conducted for the PM10 Plan identified the earliest practicable attainment date as 2010. There were no feasible measures identified that would result in an earlier attainment date. Substantial reductions in NOx and mobile source PM10 will occur after 2010 due to federal on-road diesel engine standards that will be phased in beginning in 2007. The benefits of these standards accrue over time as vehicle fleet managers retire old vehicles and purchase new cleaner ones. New off-road engine standards have not been adopted as of the time of this writing, but EPA is discussing a 2010 implementation date. The results of the rollback analysis are presented in Table ES-4 and ES-5.

**Table ES-4**
**Projected 24-Hour PM10 Values**

| Site Name | Design Value | 2010 |
|---|---|---|
| Bakersfield - California Ave. | **190** | 137 |
| Bakersfield - Golden #2 | **205** | 151 |
| Clovis | **155** | 120 |
| Corcoran - Patterson Ave. (two different events with the same 174 value) | **174** | 143<br>138 |
| Fresno - Drummond | **186** | 140 |
| Fresno – First | **193** | 144 |
| Hanford – Irwin St | **185** | 143 |
| Modesto – 14th Street | **158** | 121 |
| Oildale - 3311 Manor St | **158** | 120 |
| Turlock – 900 Minaret Street | **157** | 116 |

**Table ES-5**
**Projected Annual PM10 Values**

| Site Name | Design Value | 2010 Projected Value |
|---|---|---|
| Bakersfield - Golden #2 | **57** | 49 |
| Fresno - Drummond | 50 | 45 |
| Hanford - Irwin St | **53** | 47 |
| Visalia - Church Street | **54** | 46 |

The plan demonstrates that the control strategy will achieve the five percent per year reduction of PM10 or PM10 precursors until attainment. Table ES-6 summarizes the results. Table ES-7 provides an alternative calculation method that also successfully achieves the five percent requirement.

## Table ES-6
## Five Percent per Year Milestone Demonstration
## Annual Inventory

| Year | NOx Emissions Tons/day | Percent NOx Reduced % | PM10 Emissions Tons/day | Percent PM10 Reduced % | Percent reduction NOx + PM10 (running average) |
|---|---|---|---|---|---|
| **2002** | **519.8** | | **329.4** | | |
| **2003** | 493.5 | 5.1 | 329.4 | 0.0 | 5.1 |
| **2004** | 479.5 | 2.7 | 312.1 | 5.3 | 6.5 |
| **2005** | 461.8 | 3.4 | 285.5 | 8.0 | 8.1 |
| **2006** | 441.0 | 4.0 | 285.8 | -0.1 | 7.1 |
| **2007** | 420.1 | 4.0 | 285.4 | 0.1 | 6.5 |
| **2008** | 403.6 | 3.3 | 280.1 | 1.6 | 6.2 |
| **2009** | 389.1 | 2.8 | 284.5 | -1.3 | 5.5 |
| **2010** | 363.7 | 4.9 | 283.7 | 0.2 | 5.5 |

## Table ES-7
## Five Percent per Year Milestone Demonstration – Alternative Method
## Annual Inventory

| Year | NOx Emissions Tons/day | Percent NOx Reduced % | Percent NOx Carried Forward % | PM10 Emissions Tons/day | Percent PM10 Reduced % | Percent PM10 Carried Forward | Percent reduction NOx + PM10 (running average) |
|---|---|---|---|---|---|---|---|
| **2002** | **519.8** | | | **329.4** | | | |
| **2003** | 493.5 | **5.0** | **0.1** | 329.4 | 0.0 | 0.0 | 5.1 |
| **2004** | 479.5 | 0.0 | 2.8 | 312.1 | **5.0** | 0.3 | 6.5 |
| **2005** | 461.8 | 0.0 | 6.2 | 285.5 | **5.0** | 3.3 | 8.1 |
| **2006** | 441.0 | **5.0** | 5.2 | 285.8 | 0.0 | 3.2 | 7.1 |
| **2007** | 420.1 | **5.0** | 4.2 | 285.4 | 0.0 | 3.3 | 6.5 |
| **2008** | 403.6 | **5.0** | 2.4 | 280.1 | 0.0 | 4.9 | 6.2 |
| **2009** | 389.1 | **5.0** | 0.2 | 284.5 | 0.0 | 3.6 | 5.5 |
| **2010** | 363.7 | **5.0** | 0.1 | 283.7 | 0.0 | 3.8 | 5.5 |

Bold percentages indicate the year and the pollutant used to meet the annual 5 percent requirement.

## Expeditious Attainment of the PM10 Standards

The PM10 Plan provides for attainment of the PM10 standards by 2010. To show that this date represents expeditious attainment, the District must demonstrate that an earlier attainment date is not possible. The attainment strategy primarily relies upon reductions in directly emitted PM10 and NOx. The three most significant source categories of directly emitted PM10 are addressed by Regulation VIII Fugitive PM10 Prohibitions, the Agricultural Conservation Management Practices Program, and Rule 4901 – Residential Wood Combustion. These rules and regulations will be fully implemented between 2003 and 2006. Most of the reductions from these measures will be obtained in the first few years of implementation. Exceptions are actions included in these rules and regulations that accrue benefits over time like unpaved road paving programs that add new paving each year and changeout of non-EPA certified woodburning devices at the time of sale. NOx reductions are obtained during the entire 2003-2010 period, but stationary source measures under the District's authority are nearly all implemented prior to 2006. Later stationary source measures have a high degree of uncertainty in their emission reductions and typically need additional emission inventory work prior to implementation. The bulk of the emission reductions scheduled for after 2006 are from adopted and committed state and federal mobile source measures that rely on fleet turnover at purchase of the vehicle or equipment. These regulations cannot be moved forward by the District, and because mobile sources represent a large part of the NOx inventory, attainment cannot be projected until 2010.

The monitoring sites with the highest design values in Fresno and Bakersfield attain the annual and 24-hour standards in 2010, but other SJVAB nonattainment sites with lower design values are expected to attain the standard earlier. Sites currently in attainment of the standard will benefit from the attainment strategy and are expected to stay well below the annual and 24-hour PM10 standards.

## Contingency Measures

The CAA section 172(c)(9) requires attainment plans to provide for the implementation of specific measures to be undertaken if an area fails to make reasonable further progress (RFP). Contingency measures must take effect without any further action by the State or the EPA. The Addendum to the General Preamble Section VII(B)(4) states that EPA will require the submittal of a plan revision within nine months after failure to achieve a milestone that assures that the area will achieve the next milestone. This action would also necessitate the implementation of contingency measures. The District proposes several contingency measures to meet this requirement that are described below.

The first measure is the development of additional requirements for the District's Conservation Management Practice (CMP) Program. Under this contingency measure, the number of CMPs required per farm will be increased or the CMPs demonstrated to be least effective could be removed from the eligible CMP list. The amount of any increase or change in measures can be set to the level needed to make up any CMP Program shortfall. Rule development is scheduled to begin in the second quarter of 2003.

A second contingency measure is additional local measures. If the cause of the failure to achieve RFP is related to failure to meet local commitments, the local agencies will be required to identify and fund projects under their jurisdiction and budget authority that will reduce emissions prior to the next RFP milestone date. Since it is not possible to forecast future budgets with a high degree of accuracy, this measure must consider budgetary conditions at the time the reductions are needed. In fact, the reason for not meeting a local commitment may be budgetary constraints. The District will work with local jurisdictions to track progress and to identify alternative funding sources if needed.

The final contingency measure is developing additional changes to Regulation VIII, Fugitive PM10 Prohibitions. During the BACM analysis, several measures were rejected due to excessive cost. If an RFP milestone is not achieved, contingency measures must be implemented. The actual contingency measure provisions will be determined during rule development along with the other upgrades to Regulation VIII. That will provide an opportunity for public input and more detailed analysis of specific measure provisions.

The District has not identified contingency measures for NOx and VOC emissions. Since attainment of the PM10 standard by 2010 will require the implementation of all feasible NOx measures currently identified, no additional measures are available for contingencies. UAM-Aero modeling indicates that VOC reductions do not appear to significantly advance attainment of the PM10 standards and so contingency measures would also not be effective. The further study measures listed below may result in the adoption of measures that could be considered to be contingency measures; however, analysis and research is needed prior to their adoption that may result in their elimination from further consideration.

**Further Study Measures**

In some cases, information now available is inadequate to justify pursuit of a control measure. For those measures, the District proposes specific analysis or research that will be accomplished to determine if control is warranted. See Chapter 4 for additional information regarding further study measures.

The District received comments that leaf blowers should be regulated to prevent fugitive dust emissions from both the emissions created by the use of the machine and the emissions from the exhaust of the 2-cycle engine that powers the machine. Leaf blower PM10 emissions are not currently in the District’s emission inventory, but a preliminary analysis conducted for this Plan indicates that it could be a small but possibly significant source of emissions. No other air district has been identified that has adopted leaf blower regulations. Several local jurisdictions have adopted ordinances limiting the use of leaf blowers, primarily to address neighborhood noise concerns. The District will work with ARB to develop an emission inventory for this source and will attempt to identify a feasible control strategy should one be warranted.

One stationary source category was identified as significant; however, additional research is needed to determine if existing controls are BACT. The source category is Solid Fuel-Fired Boilers, Steam Generators, and Process Heaters. If more stringent controls are identified as technologically and economically feasible, the District will pursue an amendment to Rule 4352.

The District is committed to implementing technically and economically feasible controls on CAFOs as research is completed. The National Academy of Sciences final report “Air Emissions from Animal Feeding Operations: Current Knowledge, Future Needs” concludes that current emission estimation methods are not appropriate for most substances. The report identifies research needed to develop process based emission estimates for CAFOs that will provide a more valid basis for developing controls. Research on agricultural ammonia sources is ongoing. The District’s Agricultural Technical Advisory Committee, Dairy Subcommittee is completing a Dairy Research Action Plan that identifies specific research needs regarding emission factors for ammonia, VOC, and PM10 and potential control strategies. The County of Merced has initiated work in this area with a $600,000 project “Air Emission Mitigation Techniques and Technologies for California Dairies.” The state has allocated funding for the project and a contract is in process with the University of California, Davis. ARB and the District have contributed to recent research projects on ammonia and VOCs from dairies and can be expected to continue this effort.

To assure that issues related to ammonia and VOCs are addressed, the District commits to:

- Ongoing improvement in the VOC and ammonia emission inventories from livestock waste, primarily dairies,
- Continued development of aerosol modeling capability under CRPAQS and the evaluation of the effectiveness of ammonia reductions, and the
- Development of multi-pollutant emission reduction strategies to support SJVAB ozone and PM attainment.

**California Regional Particulate Air Quality Study (CRPAQS)**

The $30 million CRPAQS project is entering the data analysis and reporting phase that is expected to provide additional scientific basis to support the District’s attainment demonstration and control strategy. Preliminary reports should be available in 2004. Final reports should be completed during 2005. If the results indicate that reductions of ammonia will result in more expeditious attainment than the current NOx control strategy, the District commits to implement technically and economically feasible ammonia controls. This schedule coincides with the timeframe that the District will be preparing its PM10 Reasonable Further Progress Plan. That plan development process provides an opportunity to adopt new control measures for ammonia if needed and to re-evaluate commitments for other pollutants.

# PLAN OVERVIEW AND INTRODUCTION

## PLAN PURPOSE AND APPROACH

The San Joaquin Valley Air Pollution Control District (District) PM10 Plan (Plan) is designed to meet the requirements of the federal Clean Air Act (CAA) for areas classified as serious nonattainment of the national ambient air quality standards (NAAQS) for PM10, which is measured and expressed as the amount of particles 10 microns (µm) in diameter or less contained in a cubic meter of air ($\mu g/m^3$). The Plan contains all required components and demonstrates attainment of the federal PM10 standards at the earliest possible date. The Plan is divided into eight chapters. Supporting documents to sections of these chapters are provided as appendices or as reference documents. The following table provides a brief description of the information contained in each of the PM10 Plan chapters and key appendices.

**Table 1-1**
**Contents of PM10 Plan**

| PM10 Plan Chapter or Appendix | Chapter Features |
|---|---|
| Chapter 1 | This chapter provides background information on the regulatory requirements for serious PM10 nonattainment areas and regulatory responsibilities of all agencies involved in reducing PM10. This chapter also introduces PM as a pollutant and addresses the health effects to PM exposure. It also discusses the PM10 and PM2.5 NAAQS, and cities supporting documentation for the standards. In addition, demographic statistics are presented. The focus of this chapter is the District's Plan development chronology, and the reason for preparing this Plan. |
| Chapter 2 | This chapter provides background information regarding the geographical and meteorological features of the District. It discusses the District's monitoring network and the type of pollutant readings taken at the various monitoring sites, including annual and daily exceedances of the federal air quality standards. It concludes with an air quality analysis of these readings. |
| Chapter 3 | The emissions inventory for PM10 is presented here. |
| Chapter 4 | This key chapter of the PM10 Plan presents the types of controls the District is proposing to attain the PM10 NAAQS. The information in this chapter is the culmination of information from emission inventory work, modeling analysis, and BACM studies. |
| Chapter 5 | Modeling protocols and methodology is presented here. Information from chapters 3, 4 and 5 are used in the presentation of information in this chapter. |
| Chapter 6 | This chapter presents attainment projections for the annual and the 24-hour PM10 standards. |
| Chapter 7 | The chapter satisfies the Reasonable Further Progress requirement. There is brief discussion on the District's position regarding the CAA requirement of a five percent annual emission reduction. |
| Chapter 8 | The final chapter presents on-going District activities and special research projects that intend to improve the PM10 emissions inventory and future modeling efforts. |
| Appendices | Information too lengthy or detailed to be included in the plan text is provided as an appendix. They include a SIP completeness checklist, inventory tables, growth factor tables, an emission reduction credit list, the Best Available Control Measure/Technology Demonstration, and others. Consult the list of appendices in the table of contents for the complete listing. |

## MULTI-LAYERED REGULATORY RESPONSIBILITY

The reduction of PM10 and PM10 precursor emissions in the District requires the cooperation of local and/or regional, state, and federal governments.

### Federal

At the federal level, the United States Environmental Protection Agency (EPA) is responsible for setting the NAAQS and establishing federal motor vehicle emission standards. The EPA is also responsible for reducing emissions from locomotives, aircraft, heavy duty vehicles used in interstate commerce, and other sources such as off-road engines that are either preempted from state control or best regulated at the national level.
The EPA has the authority under the CAA to require states to prepare air quality plans. EPA is the final reviewing agency and may approve or disapprove state air quality plans. State implementation plans (SIPs) prescribe specific pollution control strategies for each federal nonattainment area in the state. The state compiles plans prepared by regional and county air pollution control districts and air quality management districts from all nonattainment areas for submittal as the SIP. SIPs demonstrate to the EPA that the state will achieve quantifiable emission reductions and meet the federal NAAQS throughout the state by a specific date. Appendix A is a checklist of criteria used by the EPA to make a completeness determination for plan submittals.

### State

The California Air Resources Board (ARB) is the lead state agency for air quality. It is responsible for preparing and submitting a SIP to the EPA. In preparing a state plan, the ARB reviews and approves county and regional air quality plans and incorporates them into the SIP. Under state authority, ARB also establishes emission standards for on-road motor vehicles and some off-road sources. The ARB also establishes fuel specifications and develops “consumer product” standards for meeting air quality goals in California. ARB develops air quality models, conducts and funds air quality research, develops emission inventories, and provides other assistance to local air districts. Other state agencies such as the Department of Pesticides, California Department of Transportation (CalTrans), and the Bureau of Automotive Repair also have responsibility for certain emission sources within their jurisdiction.

### Local

Air pollution control districts and/or air quality management districts are responsible for developing the overall attainment strategy in their respective geographic areas. Districts have authority to regulate stationary sources and some area sources of emission. They also cooperate with Regional Transportation Planning Agencies (TPAs) to develop transportation control measures (TCMs) that are included in a SIP. In turn, the TPAs coordinate control measure commitments of the cities and counties that will be included in the local or regional air quality plan.

The San Joaquin Valley Unified Air Pollution Control District is an eight county unified district formed under the provisions of the California Health and Safety Code section 40151.

## SERIOUS AREA CLASSIFICATION AND FEDERAL PLANNING REQUIREMENTS

The CAA contains several requirements applicable to the SIP for an air district classified as a serious nonattainment area for PM10, such as the District. Table 1-2 outlines these requirements.

**TABLE 1-2**
**Requirements for Serious PM10 Nonattainment Areas[1]**

| General Requirements | Description |
|---|---|
| **Major Stationary Source** | Include any stationary source or group of sources located within a contiguous area and under common control that emits, or has the potential to emit, at least 70 tons per year of PM10 or PM10 precursors |
| **Attainment and Reasonable Further Progress (RFP) Demonstrations** | The State is required to submit a demonstration (including air quality modeling) that provides for attainment by the applicable date (December 31, 2001). Best Available Control Measures to control PM10 must be implemented no later than four years after the area is reclassified to serious. The attainment demonstration shall contain quantitative milestones, which are to be achieved every three years until an area is designated attainment and which demonstrates reasonable further progress (RFP). Demonstration needs to show volatile organic compound emissions reductions from the baseline emissions by at least 3 percent each year. |
| **Precursor Control** | The control requirements applicable to major stationary sources of PM10 shall also apply to major stationary sources of PM10 precursors, except where the Administrator determines that such sources do not contribute significantly to PM10 levels, which exceed the standard in the area. |
| **Failure to Attain** | Serious PM10 nonattainment areas in which the standard is not attained by the applicable date (December 31, 2001) shall submit plan revisions which provide for attainment and from the date of submission until attainment, for an annual reduction in PM10 or PM10 precursors within the area of not less than five percent of the amount of such emissions as reported in the most recent inventory prepared for such area. |

[1] CAA Section 189

## Federal Clean Air Act Sanctions

The EPA has the authority under the CAA to impose sanctions on any area that fails to comply with the requirements of the law. The two mandatory sanctions they may impose consist of the following: (1) increased emissions offsets for major stationary sources, and (2) a prohibition on the use of federal highway funds. The offset sanction applies to major stationary sources. In a serious nonattainment area, a major source is defined as any source that emits, or has the potential to emit, 70 tons per year or more of VOC or NOx.

The first sanction[2] is as follows: the owner/operator of a major source must obtain construction and operation permits from the District for constructing a new major source or for making a major modification to an existing source. To obtain these permits, the source must reduce emissions within the District by more than the emissions created by the new or modified source on a 1.3 to 1 ratio. If the mandatory offset sanction is imposed, the offset ratio will become 2 to 1, which means that for every one ton of emissions produced, two tons must be reduced from an applicable source in the District.

The highway sanction (the second sanction available to the EPA), prohibits the federal Secretary of Transportation from approving or awarding transportation projects or grants, except for projects designed to improve a demonstrated safety problem or intended to minimize air pollution. Air quality exceptions to this sanction include the following types of programs: (1) programs for public transit, (2) bus and high-occupancy lanes, (3) employer trip reduction programs, (4) ramp metering and signalization, (5) parking facilities for multiple occupancy vehicles, (6) road use charges, (7) programs for breakdown and accident scene management, and (8) other programs improving air quality.

### Conformity

Conformity requirements date back to the 1977 amendments to the CAA, but the 1990 Amendments to the CAA substantially broadened their coverage and made them more specific. Under the conformity requirements, the Valley TPAs cannot approve any Regional Transportation Plan (RTP) or Transportation Improvement Program (TIP) unless it conforms to the SIP's purpose of eliminating the severity and number of violations of the federal standards and achieving expeditious attainment of these standards.

Transportation plans, commonly referred to as Regional Transportation Plans (RTPs), are prepared and adopted by Transportation Planning Agencies. A RTP is normally a 20-year master plan for each county that provides policies, actions, and financial projections to guide investment decisions. Transportation programs, commonly referred to as Transportation Improvement Programs (TIP), are financially constrained sets of highway and transit projects to be funded over a multi-year period. The TIP includes all projects requiring federal funding, permits, or other approvals, as well as regionally significant, non-federally funded projects. A transportation project is any highway or transit project that is included in the RTP and TIP, which requires federal funding or

[2] Title I, Part D, Section 173(a)

action, or is regionally significant, and is submitted to the TPAs for project review and fund application approval.

## DISTRICT PM10 PLAN CHRONOLOGY

When the 1990 amendments to the CAA were initially promulgated, the District was designated nonattainment for PM10 and was classified as a “moderate” area for PM10. The District was required to adopt a PM10 SIP by November 15, 1991. The District submitted a plan that contained reasonably available control measures (RACM) required for moderate areas, but was unable to demonstrate attainment by the moderate area deadline of December 31, 1994. This resulted in reclassification to “serious” nonattainment effective February 8, 1993.

The serious classification required the District to implement more stringent regulatory requirements as part of the SIP within 18 months after the re-classification and to demonstrate attainment of NAAQS by December 31, 2001. The District submitted a 1994 Serious Area Plan containing BACM commitments on September 13, 1994. On May 15, 1997 the District submitted a PM10 Attainment Demonstration Plan (ADP). Late in 2001, the EPA indicated that it intended to disapprove the 1997 PM10 ADP because it failed to provide an adequate BACM demonstration and a most stringent measures (MSM) demonstration. The MSM demonstration was required for an approval of a one-time, five-year extension to the attainment date. In addition, the ADP predicted attainment of the annual PM10 NAAQS by the December 31, 2001 and several monitoring sites had exceeded this standard in the previous three years.

Prior to the EPA’s final disapproval, the District withdrew its 1997 ADP in order to avoid an immediate freeze on local transportation funding that would have resulted from the disapproval of a Plan. This action led the EPA to file a “Notice of Failure to Submit the 1997 PM10 Plan” and started a CAA sanction clock. If the District fails to correct this deficiency, the EPA will implement the first sanction regarding offsets on August 28, 2003. The second sanction, which is the withholding of federal transportation funds, would go into effect on February 28, 2004.

The EPA made a final finding of failure to attain the PM10 standard on July 23, 2002 (effective August 22, 2002). This finding indicated that the District was required to submit an attainment plan update by December 31, 2002 that included a five percent per year reduction of PM10 or PM10 precursors. On March 21, 2003, EPA made a finding of failure to submit the “five-percent plan” by December 31, 2003 starting a second sanction clock. This finding resulted in no additional consequences because the earlier sanction clock for failure to submit the PM10 Plan would go into effect first and the same corrective action would stop both sanction clocks. The EPA must find a Plan complete within 60 days, but no later than six months after receipt. The EPA must approve, disapprove, partially approve, or conditionally approve the plan within one year of finding the Plan complete.

Table 1-3 presents an abbreviated historical chronology of the District's plan submittals and actions taken.

**TABLE 1-3**
**District Plan Chronology**

| Date | Event |
|---|---|
| November 7, 1991 | District Board approves the Moderate Area PM10 Attainment Plan |
| January 8, 1993 | District reclassified as a Serious Nonattainment Area |
| September 14, 1994 | District Board approves the Serious Area PM10 Plan |
| May 15, 1997 | District approves the PM10 Attainment Demonstration Plan |
| February 21, 2002 | District initiates request to withdraw the PM10 Attainment Demonstration Plan |
| March 15, 2002 | EPA makes proposed finding of failure to attain federal PM10 standards |
| March 18, 2002 | EPA finds that the District did not submit a PM10 Attainment Demonstration Plan; started sanction clock effective February 28, 2002 with first sanction imposed August 28, 2003 |
| July 23, 2002 | EPA finds that the SJVAB did not attain the 24-hour and annual PM10 standards by December 31, 2001 |
| March 21, 2003 | EPA finds that the SJVAB failed to submit a 5% PM10 Attainment Plan by December 31, 2002 starting 18-month and 24-month sanction clock |

## DEMOGRAPHICS

The San Joaquin Valley Air Basin (SJVAB) is comprised of eight counties located in the southern portion of the Great Central Valley (Valley) of California. The Valley is a major geographic, population, and agricultural sub-region of California. Agriculture and agriculture-related businesses have thrived as a result of the Valley's climate, excellent soil, extensive irrigation network, and its location between the San Francisco Bay Area and Southern California markets.

The SJVAB represents approximately 16 percent of the geographic area of California. It extends from the northern boundary of SJVAB south through the Valley to the SJVAB portion of Kern County (not including Eastern Kern County). From east to west, the SJVAB extends from the crest of the Sierra Nevada Mountains including the entire San Joaquin River watershed, down across the valley floor and up to the crest of the Coast Range Mountains.

The SJVAB is California's largest air basin in land area. It has a population of approximately 3.3 million persons with expected growth projections of nearly 30 percent in a period of twenty years. As a result of this population growth, activities associated with an increased population base, particularly the major population centers within the SJVAB represent a significant contributor to the high levels of pollutants in the area.

Increased population growth, in itself, is a source of PM. New residents generate PM emissions directly and indirectly through such activities as new construction of housing and businesses, increased vehicle miles traveled, fuel combustion, and increased residential wood combustion. The most recent published estimates of population levels and projections within the SJVAB are shown in Table 1-4.

The Valley is the home of the nation's most productive agriculture industry. According to the California Department of Food and Agriculture (CDFA)[3], eight of the top ten agricultural producing counties in the United States are located in California and six of California's top ten counties are located in the SJVAB. The top two counties, Tulare and Fresno, produced over $6.7 billion in commodities in 2001. Over 27,000 farms are located in the region. Harvested acreage exceeds 5.1 million acres per year. Another 5.4 million acres is used as rangeland and irrigated pasture. Although farmland is being reduced by urbanization, agriculture will remain the region's economic engine for many years to come.

**Table 1-4**
**SJVAB Population and Land Area**

| County | 2000[1] | July 2005 Projection[1] | % Change[2] | July 2010 Projection[1] | % Change[2] | Land Area[3] |
|---|---|---|---|---|---|---|
| Fresno | 816,400 | 893,300 | 9.4% | 970,900 | 18.9% | 5,968 |
| Kern[4] | 563,155 | 640,179 | 13.7% | 723,428 | 28.5% | 5,584 |
| Kings | 134,500 | 149,600 | 11.2% | 165,300 | 22.9% | 1,396 |
| Madera | 127,700 | 152,600 | 19.5% | 178,900 | 40.1% | 2,145 |
| Merced | 214,400 | 239,900 | 11.9% | 266,700 | 24.4% | 1,981 |
| San Joaquin | 573,600 | 645,600 | 12.6% | 727,800 | 26.9% | 1,414 |
| Stanislaus | 454,600 | 522,700 | 15.0% | 587,600 | 29.3% | 1,511 |
| Tulare | 375,100 | 422,000 | 12.5% | 469,800 | 25.2% | 4,844 |
| Total | 3,259,455 | 3,665,879 | 12.5% | 4,090,428 | 25.5% | 24,843 |

[1] As of June 2001. State of California, Department of Finance, Demographic Research Unit, Interim County Population Projections, Estimated July 1, 2000 and Projections for 2005, 2010, 2015, and 2020.
[2] Percent change from the 2000 population figure.
[3] Area in square miles.
[4] Kern County has portions located outside of the San Joaquin Valley Air Basin. Populations are adjusted based upon a 17% total population reduction to account for the portion of Kern County outside of the air basin.

[3] California Department of Food and Agriculture, *Agricultural Statistical Review, California Department of Food and Agriculture Resource Directory 2002*, page 31.

## PARTICULATE MATTER

### Background

Particulate matter (PM) is a generic term used to describe a complex group of air pollutants that vary in size and composition, depending upon the location and time of its source. It is any material, except pure water, that exists in the solid, liquid or semi-volatile state in the atmosphere. The PM mixture of fine airborne solid particles and liquid droplets (aerosols) include components of nitrates, sulfates, elemental carbon, organic carbon compounds, acid aerosols, trace metals, and geological material. Some of the aerosols are formed in the atmosphere from gaseous combustion by-products such as volatile organic compounds (VOCs), oxides of sulfur (SOx) and nitrogen oxides (NOx).

The size of PM can vary from coarse wind blown dust particles to fine particles directly emitted or formed from chemical reactions occurring in the atmosphere. PM10 comprises particles with an aerodynamic diameter less than or equal to a nominal 10 microns. Particulate matter represents a broad class of chemically and physically diverse substances.

In addition to characterizations by size, particles can be described by their formation mechanism or origin, chemical composition, physical properties, and in terms of what is measured by a particular sampling technique. The EPA document, "Air Quality Criteria for Particulate Matter," contains an extensive analysis of PM10 scientific information.

Particle size determines the deposition points along the respiratory system. Particles larger than 10 microns in aerodynamic diameter are deposited almost entirely in the nose and throat area, whereas fine and ultrafine particles are able to reach the alveoli (air spaces) deep in the lungs. Generally, the smaller the particle, the greater the likelihood that it will penetrate deeply into the airways.[4]

Air quality standards are based on the fraction of PM that measures at less than 10 microns in aerodynamic diameter (in comparison, human hair is about 60 to 75 microns in diameter). This fraction of particulate matter is commonly referred to as PM10. PM10 can be inhaled through the upper respiratory airways, and deposited in the lungs causing serious health problems and the increased likelihood of death from other causes. Some of the particles that measure less than 10 microns can penetrate and deposit deeply in the lungs without an ability to be exhaled. This smaller fraction, commonly referred to as PM2.5, is of special concern to health. These particles are based on the fraction of PM10 that measures at less than 2.5 microns in diameter. These finer particles are easily inhaled deeply into the lungs where they can be absorbed into the bloodstream or remain embedded for long periods of time.[5] Finer particles may be aerosol carriers of toxic and biological

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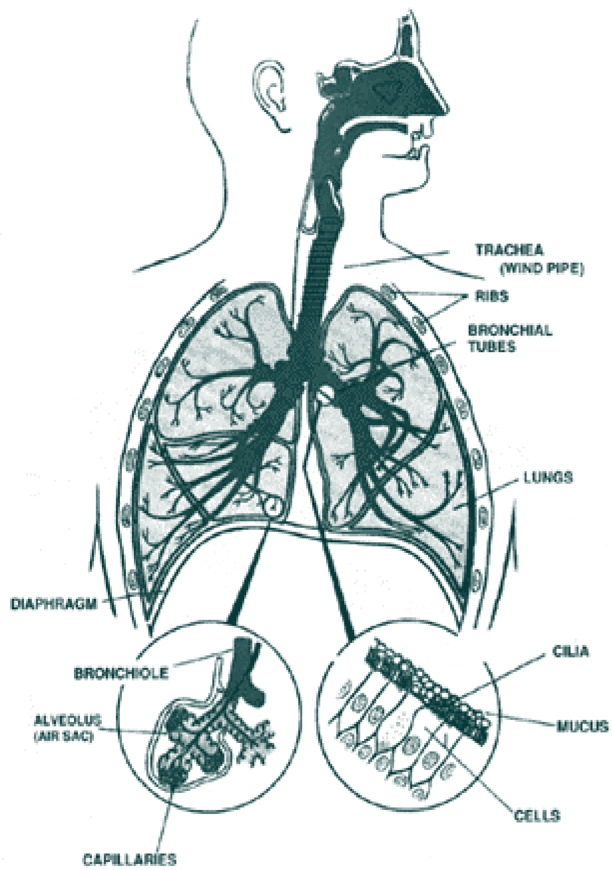
[4] Health Effects Institute, *HEI Perspectives, Insights from HEI's Research Programs*, April 2002, HEI, Boston , MA, p.4, www.healtheffects.org.

[5] American Lung Association State of the Air 2002, ALA Fact Sheet Particulate Matter Air Pollution, http://www.lungusa.org/air/pm_factsheet99.html.

materials, which can be absorbed by the blood in the gas exchange tissues of the lungs and carried to other parts of the body. See Figure 1-1 for the major components of the human respiratory system.

Components of PM10 include finely divided solids or liquids such as dust, fly ash, soot, smoke, aerosols, fumes, mists and condensing vapors that can be suspended in the air for extended periods of time. Particles originate from a variety of stationary and mobile sources and may be directly emitted (primary emissions) or formed in the atmosphere (secondary emissions) by transformation of gaseous emissions such as sulfur oxides (SOx), nitrogen oxides (NOx), ammonia, and volatile organic compounds (VOC). These pollutants are known as precursors to secondary PM10 formation.

**Figure 1-1: Respiratory System[6]**




The complex chemical and physical properties of PM10 complicate our ability to understand and control PM10, since they vary greatly with time, region, meteorology, and source category. Primary and secondary fine particles can remain in the atmosphere for up to several days before being removed by gravitational settling, rainout (attached to water droplets as they fall to the ground), and washout

6 www.on.lung.ca/yourlungs/yourlungs.html

(absorbed by water molecules in clouds and later falls to the ground with rain). Particles can condense or re-enter the gas phase under different environmental conditions.

In addition, the differences in the composition and sources of PM10 may have varying implications for health effects. Particles larger than 2.5 microns are often referred to as the coarse fraction, while those particles at 2.5 microns and smaller are referred to as the fine fraction. The fine particles are so small that several thousand of them could fit on the "period" at the end of a sentence. Coarse particles (larger than 2.5 microns) come from a variety of sources, including geological and general mechanical operations (e.g., automobile tire wear), industrial processes (e.g., cutting and grinding), and the re-suspension of particles from the ground or road surfaces by wind and human activities.

In contrast, particles smaller than 2.5 microns are mostly derived from fuel combustion sources, such as automobiles, trucks, and other vehicle exhaust, as well as from stationary combustion sources, such as power plants. These fine particulates are either directly emitted or they are formed in the atmosphere from gases that are emitted. Some geologic components, such as sea salt may also be present in amounts varying by geographic location.[7] More detailed information on the origins, sources, and particle properties can be found in Chapter 5

**Effects on the Environment**

The fine particles that are linked to serious health effects are also a major cause of visibility impairment (regional haze) in many national parks. The term regional haze means haze that impairs visibility in all directions over a large area. Regional haze consists of sufficient smoke, dust, moisture, and vapor suspended in air to impair visibility. Particulate matter that is formed when gaseous pollutants react in the atmosphere also causes regional haze. These particles often grow in size as humidity increases, further impairing visibility. Sources hundreds or even thousands of miles away can contribute to visibility problems at remote locations, such as the Sierra. In many parts of the United States, the range of visibility has been reduced 70 percent from natural conditions. In the west, the visual range has been reduced to over 60 percent. Haze currently reduces natural visibility from approximately 140 miles to between 33 and 90 miles.[8]

**Significant Primary and Secondary PM10 Sources**

Primary PM10 sources are derived from both human and natural activities. A significant portion of PM10 sources is generated from a variety of human (anthropogenic) activity. These types of activities include agricultural operations, industrial processes, combustion of wood and fossil fuels, construction and demolition activities, and entrainment of road dust into the air. Natural (nonanthropogenic or biogenic) sources also contribute to the overall PM10 problem. These include windblown dust and wildfires.

[7] SJVUAPCD 1997 PM10 Plan; SCAQMD Proposed 2003 AQMP for South Coast Air Basin
[8] www.epa.gov/oar/oaqps/regusmog/infhaze.html; Last updated on Thursday, June 6th, 2002.

Secondary PM10 sources directly emit air contaminants into the atmosphere that form or help form PM10. Hence, these pollutants are considered precursors to PM10 formation. These secondary pollutants include SOx, NOx, VOCs, and ammonia. Control measures that reduce PM10 precursor emissions tend to have a beneficial impact on ambient PM10 levels.

## HEALTH STANDARDS AND CONCERNS

### Introduction

Since 1996, there have been more than 800 new scientific studies published that associate the effects of airborne particulates on human health. Overall, the studies validate earlier research and confirm the relationship between particulate air pollution, illness, hospitalization, and premature death. Recent research supports the results of previous major long-term studies and confirms mortality effects found in short-term national and international studies. New analyses also show that lives may be shortened by months or years, rather than days, and they affirm that infants and children, particularly asthmatic children, are especially sensitive to the effects of fine particle pollution.[9]

In short, the inhalation of particulate matter, especially fine particles, is associated with a series of significant health problems, including premature death; respiratory-related hospital admissions and emergency room visits; aggravated asthma; acute respiratory symptoms, including aggravated coughing and difficulty in breathing; chronic bronchitis; decreased lung function (shortness of breath); and work and school absenteeism. Those who are most at risk from the exposure to fine particles include the elderly, sensitive individuals with pre-existing heart or lung disease, and children.

Past studies estimate that tens of thousands of elderly people die prematurely each year from exposure to ambient levels of fine particles. Breathing fine particles can also adversely affect individuals with heart disease, emphysema, and chronic bronchitis by causing additional medical treatment. Children are the most susceptible to such air pollutants because their respiratory systems are still developing and they breathe 50 percent more air per pound of body weight than adults. Exposure to fine particles is associated with increased frequency of childhood illnesses, which are of concern both in the short run, and for the future development of healthy lungs in the affected children. Fine particles are associated with increased respiratory symptoms and reduced lung function in children, including symptoms such as aggravated coughing and difficulty or pain in breathing. These can result in school absences and limitations in normal childhood activities.[10]

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[9] American Lung Association, *Selected Key Studies on Particulate Matter and Health: 1997-2001, New Studies Confirm that Current Levels of Particulate Air Pollution are Harmful to Human Health*, Updated March 5, 2001
[10] www.epa.gov/ebtpages/airairpolparticulatematterpm.html

Asthmatics and asthmatic children are at the greatest health risks from fine air particulates, and Fresno County leads the state in childhood asthma, with one in six children having lung disease.[11] More and more people are being diagnosed with asthma every year. Nationally, fourteen Americans die every day from asthma, a rate three times greater than just 20 years ago. Children make up 25 percent of the population, but comprise 40 percent of all asthma cases. Breathing fine particles, alone or in combination with other pollutants, can aggravate asthma, causing greater use of medication and resulting in more medical treatment and hospital visits.[12]

**Who Is At Risk?**

Airborne particulate matter causes an estimated 50,000 to 60,000 premature deaths nationwide each year, or three percent of the total deaths.[13] Populations at a higher risk of experiencing adverse health effects from exposures to particulate matter include children, people of all ages with asthma, and the elderly with illnesses like bronchitis, emphysema and pneumonia.[14] Patients with chronic obstructive pulmonary disease, such as emphysema and bronchitis, are also potentially susceptible to mortality because of their vulnerability to physical and chemical stimuli and the absence of an adequate ventilatory reserve.[15]

Overall, the most susceptible population segment at risk at low-level exposures consists of elderly individuals with pre-existing cardiovascular and respiratory diseases, the majority of which are either current or former smokers. Smoking is an important risk factor, since it is the major cause of chronic obstructive pulmonary disease. Smoking may also be a key contributor to any low-level particulate matter exposure-induced exacerbation of respiratory infections among other adults and children and to any increased cancer mortality attributable to chronic ambient particulate matter exposures.[16]

Studies of respiratory illness resulting from PM exposures have concluded that children, particularly asthmatics, are at greatest risk. Respiratory illness is particularly important in children because many studies have indicated that respiratory illness events in childhood (mostly viral) are important determinants for future risk of chronic respiratory symptoms in adult life.[17]

Asthmatic individuals also appear to be more sensitive than healthy individuals to the effects of acid aerosols on lung function. Adolescent asthmatics may be more sensitive than adults, and may experience small decreases in lung function in

[11] Anderson, B. "Funds for Child Asthma Study Renewed," The Fresno Bee, Tuesday, December 17, 2002, www.fresnobee.com/local/story/5621985p-6598174c.html
[12] www.epa.gov/ebtpages/airairpolparticulatematterpm.html
[13] Dockery, D.W., "Air Pollution in Typical U.S. Cities Increases Death Risk," a press release, Environmental Epidemiology Program, Harvard School of Public Health, Boston, May 13, 1991, p.1.
[14] Controlling Fine Particulate Matter Under the Clean Air Act: A Menu of Options; State and Territorial Air Pollution Program Administrators and Association of Local Air Pollution Control Officials, DRAFT, February 1996, p. 2-12.
[15] Ibid, p.2-12.
[16] Ibid, p.2-12.
[17] Ibid, p.2-12.

response to sulfuric acid at exposure levels only slightly above peak ambient levels.[18]

**Health-Based Federal and State Standards**

Based on health considerations, both the state and the federal government set ambient air quality standards for PM10, and more recently, these standards have been revisited to address the health-related concerns regarding PM2.5. In general, the air quality standards developed were determined by level of exposure to an airborne pollutant without experiencing adverse health effects.

The health- and welfare-based standards for particulate matter were last revised in 1987. The NAAQS for PM10 replaces older particulate standards based on total suspended particulates (TSP) in the atmosphere. In 1987, the EPA replaced the TSP standards because particulate matter of less than 10 microns diameter contained in a cubic meter of air ($\mu g/m^3$) that can be inhaled deeply into the lungs has greater health effects than larger particles. Under certain circumstances some particles less than 10 microns may never be removed from the lungs by exhaling, and such particles may be carriers of other toxic materials which can be absorbed by the blood and carried to other parts of the body.[19] The federal health standard for PM10 is set at 150 $\mu g/m^3$ averaged over a 24-hour period, and 50 $\mu g/m^3$ for an annual average.

The California 24-hour and annual average standards are considerably more stringent than the federal 24-hour and annual average standards. The ARB revised the standard for the annual average in 2002, pursuant to the Children's Environmental Health Protection Act. The 24-hour PM10 standard is 50 $\mu g/m^3$ (however, ARB is currently reviewing the standard) and the revised annual standard is 20 $\mu g/m^3$ (changed from 30 $\mu g/m^3$). In addition, the ARB adopted a standard for PM2.5, set at 12 $\mu g/m^3$ for an annual average.

The ARB and the State Department of Health Services adopted the more stringent standards because serious health effects were found to occur at PM10 levels well below the national 24-hour standard. The standards were developed with the intention of preventing excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory disease. In addition, the state standards were developed with the intent to prevent excess seasonal declines in pulmonary function, especially in children.

In developing these standards, the ARB and the Department of Health Services reviewed many sources of health effects data, including epidemiological, biochemical, and clinical studies of controlled human exposures, animal toxicology, and short-term bioassay. The development of the final standards focused primarily on epidemiological studies.

[18] Ibid, p. 2-12

[19] Health Effects Institute, *HEI Perspectives, Insights from HEI's Research Programs*, April 2002, HEI, Boston, MA, p.4, www.healtheffects.org.

**New Health-Based Ambient Air Quality Standards**

Since the PM10 standards were established in 1987, a large number of important new studies have been published on the health effects of particulate matter. Many of these studies suggested that significant effects, such as premature mortality, hospital admissions, and respiratory illnesses, occurred at concentrations below the 1987 standards. In July 1997, the EPA adopted new air quality standards for ozone and particulate matter. After reviewing hundreds of peer-reviewed scientific studies, the EPA determined that these changes were necessary to protect public health and the environment. The EPA established annual and 24-hour standards for the fine fraction of particulates. It revised the primary (health-based) PM standards by adding a new annual PM2.5 standard set at 15 $\mu g/m^3$ and a new 24-hour PM2.5 standard set at 65 $\mu g/m^3$. Based on health studies conducted, PM2.5 is considered to be more adverse to human health than any other pollutant.

The EPA will retain the current annual PM10 standard of 50 $\mu g/m^3$ and adjust the PM10 24-hour standard of 150 $\mu g/m^3$ by changing the form of the standard. The EPA has yet to promulgate the air quality designations of the various regions for the new PM2.5 standard.[20]

The EPA also revised the secondary (welfare-based) standards by making them identical to the primary standards. The purpose of the secondary standards in combination with the federal regional haze program is intended to provide protection against the major PM related welfare effects, such as visibility impairment, soiling and materials damage. Other recent changes made by the EPA include rules to address the monitoring network design for the new PM2.5 standards and to improve visibility by requiring states to develop programs to help reduce regional haze.[21]

The State of California also recently reviewed its PM standards. On June 20, 2002, the ARB passed new, stricter standards for particulate matter that include the following changes:

- Updated PM10 annual average standard of 20 $\mu g/m^3$, reduced from the previous standard of 30$\mu g/m^3$
- New PM2.5 annual average standard of 12$\mu g/m^3$
- Retention of the 24-hour PM10 standard of 50$\mu g/m^3$; and
- Retention of the sulfates 24-hour average standard of 25$\mu g/m^3$

**The Federal Air Quality Standard Development Process**

When EPA reviews national ambient air quality standards for a pollutant such as PM, it develops a "criteria document" that represents a compilation and scientific assessment of all the health and environmental effects information available. The EPA develops a "staff paper," which is compiled by technical staff that interprets the most relevant information in the "criteria document" to be used in making policy

[20] SCAQMD, Proposed 2003 AQMP for the South Coast Air Basin
[21] www.epa.gov/ebtpages/airairpolparticulatematterpm.html

decisions. It also contains staff recommendations to the EPA Administrator regarding any revisions needed to the standards to protect public health and welfare.

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

**Acute Health Effects Considerations**

In developing the short-term (24-Hour) health-based standards for PM10, the EPA considered health effects reported in the literature, including mortality and various morbidity indicators such as reduced lung function. Mortality refers to death, while morbidity refers to occurrence of disease. Studies of short-term or acute respiratory disease examine the rates of upper respiratory illness, lower respiratory illness and increased coughing. Respiratory illness is particularly important in children because many studies have indicated that respiratory illness events in childhood (mostly viral) are important determinants for future risk of chronic respiratory symptoms in adult life. A large number of studies have been conducted on the effects of pollution mixes on children in the US and Europe. These studies either include PM among the mix of pollutants or focus specifically on the health effects PM. As a group they provide clear evidence that exposure to PM increases the risk of respiratory illness in children, particularly asthmatics.

For example, a 1982 study in Steubenville, Ohio[22] examined the response of school children to episodes of elevated particulate matter. It found a possible risk of small, reversible changes in lung function, which persisted on average for 2 or 3 weeks, at levels of PM10 ranging from 140-250 $\mu g/m^3$. A similar study of school children in the Netherlands[23] found comparable results. An update of the data, published in 1994, found PM10, as well as other measures of PM, to be strongly associated with incidence of lower respiratory symptoms, such as coughing, wheezing, and phlegm, in elementary school children, even though daily PM10 levels remained below the current federal standard of 150 $\mu g/m^3$.

A 1991 study in Provo, Utah, found similar results. Statistically significant associations between elevated PM10 levels and reductions in lung function, increases in symptoms of respiratory disease, and increased medication use among asthmatics were seen even after the only pollution episode that violated daily

[22] Dockery, D.W., J.H. Ware. B.G. Ferris, Jr., F.E. Speizer, N.R. Cook, S.M. Herman. 1982. "Change in pulmonary function in children associated with air pollution episodes, " Journal of Air Pollution Control Associations. 32: 937-942.

[23] Dassen, W., B. Brunekreef, G. Hoek, P. Hofschreuder, B. Staatsen, H. De Groot, E. Schouten, K. Biersteker. 1986. "Decline in Children's Pulmonary Function During an Air Pollution Episode," Journal of Air Pollution Control Associations. 36: 1223-1227.

standards was excluded from the data and the highest recorded daily PM10 concentration was 114 $\mu g/m^3$. A study of hospital admissions in Provo found increases in admissions of children and adults for asthma and bronchitis in central Utah during months of high PM10 levels. These results were also significant because no other significant air pollutants, such as $SO_2$ and acid aerosols, were present. In another study conducted in Utah Valley in 1989 and 1991, it was observed that hospital admissions of children for respiratory disease dropped by over 50 percent during the winter of 1986-87 compared to adjacent years. During this winter, a strike at the local steel mill led to much lower PM-10 concentrations (a mean of 51 $\mu g/m^3$ and maximum of 113 $\mu g/m^3$ compared to a mean of 90 $\mu g/m^3$ and a maximum of 365 $\mu g/m^3$ in the previous year). A 1992 follow-up study in the Utah Valley showed an increased risk of non-asthmatic children for both upper and lower respiratory symptoms of 1.30 and 1.39, respectively, for an increase of 50 $\mu g/m^3$ in PM10.

A 1995 study of African-American asthmatic children in central Los Angeles[24] found that both PM10 and ozone were associated with increased shortness of breath, although the authors could not separate the effect of the two pollutants. Studies in the Netherlands and Switzerland have also demonstrated increased risks of cough and upper respiratory symptoms for incremental increases in PM10 of 50 to 100 $\mu g/m^3$.

**Chronic Health Effects Considerations**

The annual standards are based upon studies of long-term particulate exposure. Several studies have noted a correlation between mortality rates and long-term particulate pollution levels. Such long-term exposure mortality studies include (1) population-based cross-sectional mortality studies and (2) prospective mortality studies. The former employ averages across various geopolitical units to examine the relationship between mortality and levels of particulate matter. Such community-based studies seek to define the average community characteristics that are associated with its overall average health status in this case, annual mortality rate. Prospective mortality studies consider data on the relative survival rates of individuals, as affected by age, sex, race, smoking habits, and certain other individual risk factors. There is some advantage to the prospective studies, since the identification of the actual decedents allows classification according to important risk factors such as smoking. These studies have concluded possible premature mortality due to particulate pollution; however, study results have been given less weight due to methodological shortcomings. Results of these studies were considered during margin-of-safety evaluations of the annual PM10 standard.

The data relating to morbidity that were most influential in the development of the federal annual average PM10 standard were published by Ware et al (1986) and involved approximately 10,000 six-to-nine-year-old children in six U.S. cities. The study concluded that an association existed between particulate pollutant levels and coughing, bronchitis, and respiratory illness.

[24] “A Sensitivity Analysis of Mortality/PM-10 Associations in Los Angeles,“ 7: 59-69.

Because of the limited scope and number of longer-term quantitative studies, qualitative data from epidemiological and annual studies were also considered in the development of the standard. These studies justify concern for sensitive groups including asthmatics, bronchitic individuals and the elderly.

In 1997, the EPA announced the establishment of new NAAQS for fine particles (PM2.5). This endeavor required the EPA to complete a review of the standards by July 2002. To increase scientific understanding of PM and health effects, the EPA also increased funding for research studies on particulates. Since the EPA last issued its "Air Quality for Particulate Matter," in 1996, numerous scientific papers and research reports have been written. In March 2001, the American Lung Association provided a summary of selected key studies on PM and health as annotated bibliography that presents these post-1996 findings of some of the "most significant new research studies that advance understanding of the harmful health effects of particulate air pollution."[25]

**Local Health Studies and Research**

In January 2002, a local study conducted by the Kaiser Foundation Research Institute, under ARB sponsorship, completed its research entitled, *Particulate Air Pollution and Morbidity in the California Central Valley*. The final report was issued on July 12, 2002. The purpose of the study was to investigate the relationship between particulate and other air pollutants and acute cardiopulmonary morbidity. The primary objective was to conduct time-series studies to assess how daily ambient measures of PM10, PM2.5, and selected PM chemical components, $NO_2$, and ozone were correlated with daily hospital admissions and emergency room visits for cardiovascular, chronic respiratory and acute respiratory diseases. A multiple time-series approach was used to incorporate an exposure assignment protocol that assigned exposure to account for daily variation over time and space in the study area. The study population was the Kaiser Permanente, Northern California membership who resided in the San Joaquin Valley. The study period was from January 1, 1996 to December 31, 2000.

In summary, researchers of the Kaiser study found strong and consistent air pollution effects and acute and chronic respiratory hospitalizations and emergency room visits among its Kaiser Permanente members living in the Central Valley. These associations were consistent across type of analysis and type of admission (hospitalization or emergency room visit). Of the pollutants studies, researchers found consistent associations with PM10 and PM2.5. To a lesser extent CO and $NO_2$ were associated with adverse outcomes. In addition, their results for cardiovascular admissions were less impressive and they found inconsistent results with the pollutants studied.[26]

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[25] American Lung Association, *Selected Key Studies on Particulate Matter and Health: 1997-2001, New Studies Confirm that Current Levels of Particulate Air Pollution are Harmful to Human Health*, Updated March 5, 2001
[26] Final Report (Contract 97-303), Particulate Air Pollution and Morbidity in the California Central Valley: A High Particulate Pollution Region. Kaiser Permanente, et al, 12 July 2002.

The Fresno Asthmatic Children's Environment Study (FACES), which began in the fall of 2000, is a large epidemiological study of the effects of air pollution on children with asthma. Over 250 asthmatic children who reside in the Fresno and Clovis areas will be studied to determine the effects of different components of PM, including PM10 and PM2.5, in combination with other ambient air pollutants, on the natural history of the asthma in young children. The study consists of a variety of measurements taken over the course of five years. Measurements taken include skin testing for allergies, lung function testing, and extensive questions about the child's health and home environment. Research staff will also visit the child's home to collect indoor air and dust samples. Children will keep a journal of activities and time spent in different locations throughout the day, as well as symptoms and medication use. Portable spirometers will be used to measure lung function at home. The FACES project is a five-year collaborative effort sponsored by the ARB. The research is being conducted by a number of researchers from various organizations lead by the University of California, Berkeley. Study results are expected in 2005.[27]

**Health-Based Costs Associated with PM10**

Adverse health effects related to PM10 result in a number of economic and social consequences, including medical costs, work loss, increased burdens for caregivers, as well as other social and economic costs. In 1996, the American Lung Association completed a study entitled, "Dollars and Cents: The Economic and Health Benefits of Particulate Matter Reductions in the United States." The study results suggested that the United States could save an estimated annual 10.9 billion or more dollars in health benefits from prevented negative PM10 health effects if the nationwide PM10 standards are reduced to the California PM10 standards.[28]

[27] F.A.C.E.S., ARB website, www.arb.ca.gov/research/faces/faces.htm, also see California Environmental Protection Agency News Release, September 27, 2001, http://www.arb.ca.gov/newsrel/nr092701.htm
[28] Dollars and Cents: The Economic and Health Benefits of Particulate Matter Reductions in the United States, American Lung Association, June 1995, p. S-4.

# SAN JOAQUIN VALLEY AIRSHED

## INTRODUCTION

This chapter describes the naturally occurring determinants of air quality in the San Joaquin Valley Air Basin (SJVAB) relative to PM10. There are numerous factors that influence the effects of pollutants in the air, including the topographical and meteorological characteristics of the SJVAB. This chapter provides a description of the basin and its typical meteorological conditions, discusses the PM10 air quality monitoring network, and summarizes the available ambient air quality data.

## AIR BASIN TOPOGRAPHY

The SJVAB is a major geographic, population, and agricultural subregion of California. It includes the counties of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and the Valley portion of Kern County. Comprising nearly 25,000 square miles, it represents approximately 16 percent of the geographic area of California. The SJVAB has a population of over 3.3 million people, with major urban centers in Bakersfield, Fresno, Modesto and Stockton.

The SJVAB consists of a continuous inter-mountain valley approximately 250 miles long and averaging 80 miles wide. On the western edge is the Coast Mountain range, with peaks reaching 5,020 feet, and on the east side of the valley is the Sierra Nevada range with some peaks exceeding 14,000 feet. The Tehachapi Mountains form the southern boundary of the valley. This mountain range includes peaks over 6,000 feet, and contains mountain passes to the Los Angeles basin and the Mojave Desert.

## METEOROLOGY AND CLIMATE

### General Weather Types and Seasons

The SJVAB has an "inland Mediterranean" climate, which is characterized by hot, dry summers and cool, rainy winters. The most significant single control of the weather pattern is the semi-permanent subtropical high-pressure belt, often referred to as the “Pacific High”. It is located off the west coast of North America and is a cell in which air descends almost continuously. The descending air is compressed, thereby raising its temperature and lowering the relative humidity. Major storms and region-wide precipitation are not typical when this pressure cell is dominant. This belt of high pressure migrates north and south seasonally. The SJVAB is under its influence almost continuously during summer months. In winter, the influence of the Pacific High is intermittent, giving rise to alternate periods of stormy, unsettled weather and periods of stable, rainless conditions. The SJVAB averages over 260 sunny days per year. Annual rainfall totals vary from north to south, with northern counties experiencing as much as eleven inches of rainfall and southern counties experiencing as little as four inches per year. Air pollutants are generally transported from the north to the south and in a reverse flow in the winter due to these influences. Strong temperature inversions occur throughout the SJVAB in the summer, fall and winter. According to air quality monitoring data, exceedances of the federal 24-hour PM10 standard are generally seasonal, occurring usually during fall and winter months.

**Precipitation**

Precipitation in the SJVAB is confined primarily to the winter months with some occurring in late fall and early spring. Nearly 90 percent of the annual precipitation in the SJVAB falls between the months of November through April. Average annual rainfall for the entire SJVAB is about 10 inches on the valley floor. There are north-south and east-west regional differences, with higher rainfall occurring in the northern and eastern parts of the SJVAB. Historical evaluations have correlated increased annual rainfall to decreased PM10 concentrations.

**Temperature**

The valley floor is characterized by warm to hot, dry summers and cooler winters. The average mean temperature over a 30-year period is 65°F. Daily high temperature readings in summer average 95°F in the valley. Over the last 30 years, the SJVAB averaged 106 days per year 90°F or hotter, and 40 days a year 100°F or hotter. The daily summer temperature variation can exceed 30°F.

Winter temperatures in the SJVAB are generally mild. Temperatures will drop below freezing occasionally, but throughout the valley, winter daytime highs are around 55°F, with lows around 35°F. Despite the latitudinal extent of the valley, the variation of temperature in winter is small. The average January temperature is about 44°F, with little difference between the northern and southern portions of the valley. Surface temperatures are dependent on elevation, with colder temperatures on the mountain ridges both east and west of the valley floor.

**Inversion Layers**

Inversion layers exist when the air temperature increases with elevation above the ground. The strength, altitude of, and duration of inversions determine the amount of vertical atmospheric mixing which occurs, which subsequently contributes to PM10 concentrations in the SJVAB. Temperature inversions occur in a stable atmosphere of warm air over cooler air hindering the upward dispersion of pollutants. Mixing ceases at the base of the inversion, which is also known as the mixing height. The SJVAB experiences two common types of inversions: radiation inversions and subsidence inversions.

Nocturnal cooling of an air layer near the SJVAB surface causes radiation inversions. It extends upward several hundred feet and occurs during the evening and early morning hours. During a radiation inversion, little vertical mixing occurs near the surface. The inversion dissipates when solar radiation warms the ground, which in turn heats the lower layers of the atmosphere. This heating causes the surface-based inversion to weaken, and finally dissipate, which allows vertical mixing through a greater depth in the atmosphere. Inversions are more persistent (stable) during the winter months, when inversions occur from 50 to 1,000 feet above the SJVAB floor. Studies in the southern part of the SJVAB indicate more frequent and persistent early morning radiation inversions than in the northern part of the valley due to the lack of marine air intrusion.

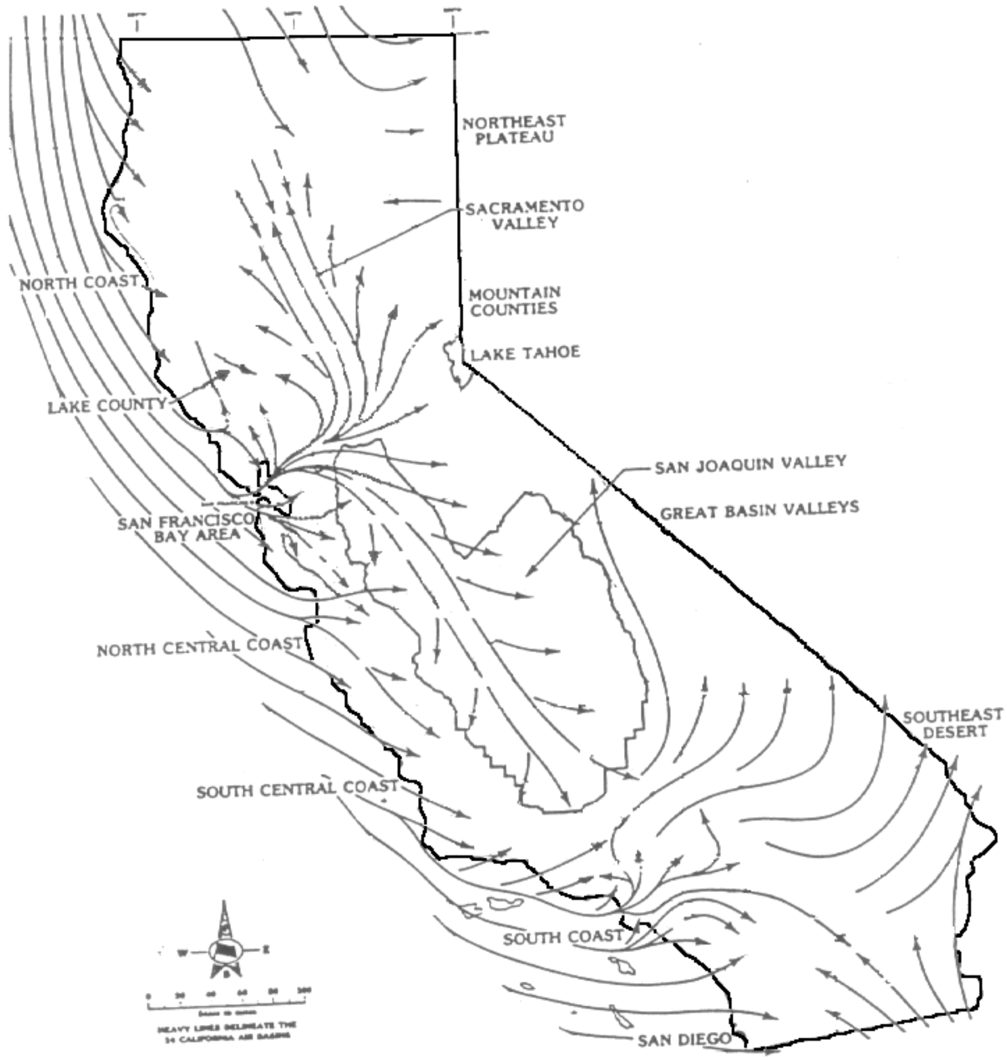
Subsidence inversions are caused by downward vertical motion in the atmosphere. As air descends, it warms due to compression, and as a result becomes warmer than the air beneath it. This is common when the semi-permanent Pacific High pressure system is located off the west coast, which typically occurs during the summer months.

**Horizontal Mixing and Dispersion**

In addition to vertical mixing, horizontal mixing, or transport, is also important in the dispersal of air pollutants. The greater the velocity of wind in the mixing layer, the greater the amount of mixing (dispersion) and transport of pollutants. Wind speed and direction play an important role in dispersion and transport of air pollutants. Wind at the surface and aloft can disperse pollution by vertical mixing and by transporting it to other locations. Wind speed and direction data indicate that during the summer the light and variable winds usually result from an influx of air from the Pacific Ocean through the Bay Area delta region, entering the north end of the valley. The wind generally flows in a south-southeasterly direction through the valley, through the Tehachapi Pass, and into the Southeast Desert Air Basin portion of Kern County.

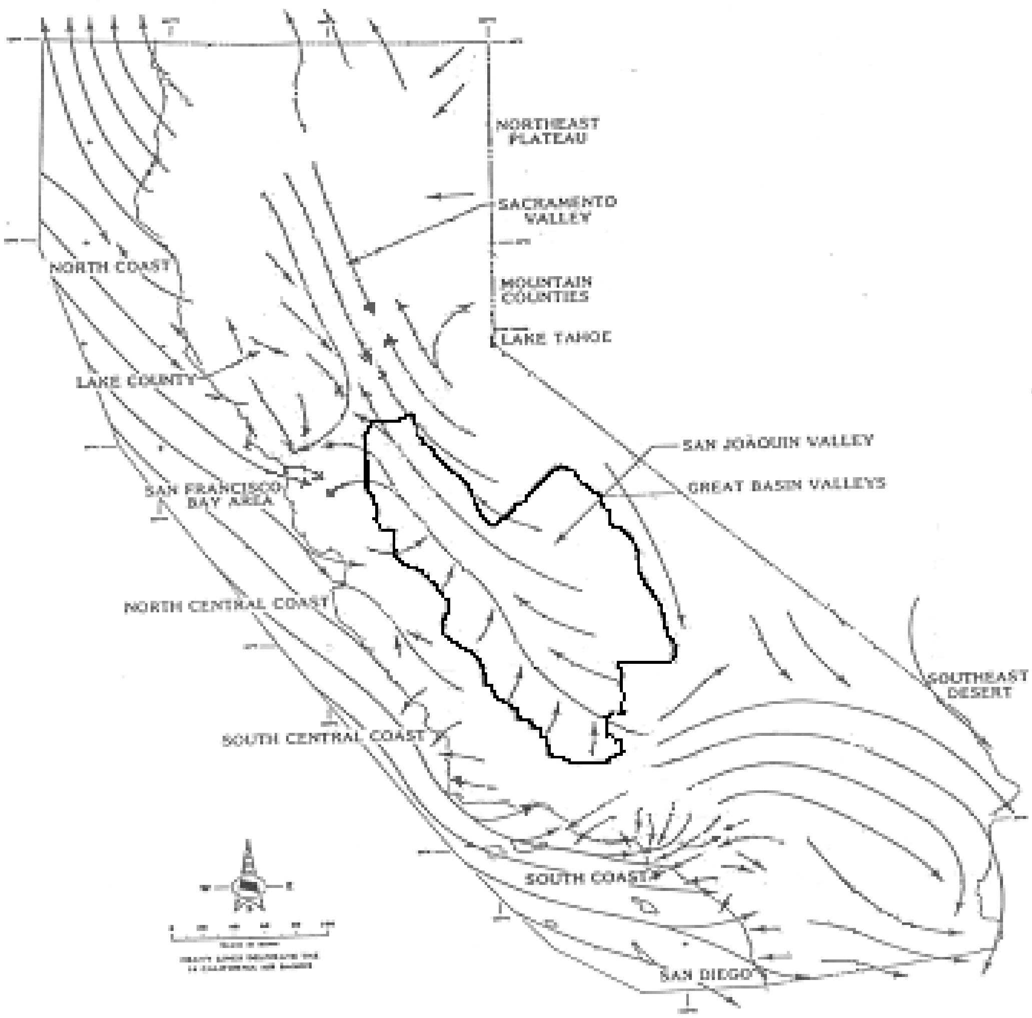
See Figure 2-1 for the wind flow entries and exits during the valley's summer months.

**Figure 2-1**




During the winter, wind speed and direction data indicate that wind occasionally varies from the south-southeasterly direction, and originates from the south end of the Valley, flowing in a north-northwesterly direction. Also during the winter months, the Valley experiences light, variable winds of less than 10 mph. Low wind speeds, combined with low-lying inversion layers in the winter, create a climate conducive to the formation of high PM10 concentrations. See Figure 2-2 for winter wind patterns.

Figure 2-2




PM10 geologic dust emissions in the SJVAB do not follow the conventional assumption that wind erosion is the dominant factor. Average wind velocity is the lowest in the nation for an area this large. Winds normally exceed erosive velocity levels at a site for only 30 to 50 days per year and sometimes less. Sites along the southeastern edge of the SJVAB have a significantly lower number of erosive wind days than the western edge due to the mountain ranges, which act as wind barriers adjacent to these areas. Over 75 percent of the winds with enough velocity to cause erosion occur in the spring and summer seasons in the Air Basin when PM10 levels in the ambient air are among the lowest. This suggests that these winds are effective in dispersing PM10 concentrations and/or transporting PM10 out of the SJVAB.

Other factors such as soil type and soil moisture content prevent these winds from entraining a large amount of PM10 during this period. Erosive winds are defined as having a velocity of 13 mph at a height of one foot above the ground or eighteen miles per hour at a height of approximately thirty-three feet above the ground; these two wind speeds are considered equivalent. Erosive wind speeds can be much lower for some soil conditions[1].

PM10 originating from or going to other air basins, referred to as pollutant transport, has not been definitively quantified. PM10 readings in the SJVAB are most severe during the fall and winter periods when wind speed and direction are not conducive to interregional transport. Monitoring and speciation techniques currently available are not able to identify the origin of PM10 sources with sufficient detail to indicate if the SJVAB is experiencing transport from outside the air basin or contributing transport of PM10 to other air basins.

## MONITORING NETWORK

### PM10 Monitoring Network Requirements

The EPA requires that the state and the San Joaquin Valley Air Pollution Control District (District) measure the ambient levels of air pollution to determine compliance with the NAAQS. The District and the state operate the ambient monitoring network in order to comply with this mandate. The ARB and the District currently operate fifteen sites throughout the SJVAB. In addition, the agencies operate numerous co-located monitors to measure the precision and accuracy of data collected from the monitoring sites.

Air quality monitoring for PM10 is performed at State and Local Air Monitoring Stations (SLAMS) within the District, including National Air Monitoring Stations (NAMS) and Photochemical Assessment Monitoring Stations (PAMS). The EPA uses data from NAMS sites to develop national air quality trends.

Federal regulations require SLAMS networks to meet four basic monitoring objectives:

- Monitoring the highest concentration of a pollutant
- Monitoring representative concentrations in areas of high population density
- Monitoring the impact of major pollutant sources, and
- Monitoring pollutant background concentrations.

The physical location of an air monitoring station must achieve a spatial scale of representativeness that is consistent with the monitoring objective. Spatial scales of representativeness are categories of sampling exposure. The spatial scale for each site results from the physical location of the site with respect to the pollutant sources and the population or area that is to be represented by the monitoring site. The

[1] NRCS Field Office Technical Guidelines and National Agronomy Manual, Second Edition, Part 502, Wind Erosion, US Department of Agriculture, Soil Conservation Service, March 1988

categories are classified by the size of the area surrounding the monitoring site which experiences uniform pollutant concentrations.

The categories of spatial scale range from microscale, which is an area of uniform pollutant concentrations with a radius ranging from several meters up to 100 meters, to *Regional Scale* – which is a very large area that has a radius from tens to hundreds of kilometers.

Monitoring for PM10 and finer particulate matter is focused primarily on monitoring representative population exposure concentrations. Thirteen of the fifteen current PM10 monitoring stations are at the neighborhood scale. The Bakersfield-California and Oildale-Manor stations are designed for middle scale.

According to Title 40, Code of Federal Regulations, Part 58, Appendix D, section 3.7, the District is required to operate a minimum of three PM10 NAMS in the Stockton, Fresno, and Bakersfield urbanized areas and a minimum of one in the Modesto urbanized area based on 2000 census population figures and because the District is characterized by high concentrations of PM10.

**SLAMS/NAMS PM10 Monitoring Network**

Table 2-1 lists the SLAMS/NAMS PM10 monitoring network for the SJVAB.

**Table 2-1**
**SJVAB SLAMS/NAMS PM10 Monitoring Network**

| Station Name | Scale | Monitoring Objective | Type | Agency |
|---|---|---|---|---|
| Bakersfield-California | Middle | Representative Concentration | SLAMS | ARB |
| Bakersfield-Golden State | Neighborhood | High Concentration | SLAMS | SJVAPCD |
| Clovis-Villa | Neighborhood | Representative Concentration | NAMS | SJVAPCD |
| Corcoran-Patterson | Neighborhood | High Concentration | SLAMS | SJVAPCD |
| Fresno-Drummond | Neighborhood | Representative Concentration | NAMS | SJVAPCD |
| Fresno-First Street | Neighborhood | High Concentration | NAMS | ARB |
| Hanford-Irwin | Neighborhood | Representative Concentration | SLAMS | SJVAPCD |
| Merced-2334 M Street | Neighborhood | Representative Concentration | SLAMS | SJVAPCD |
| Modesto-14$^{th}$ Street | Neighborhood | Representative Concentration | SLAMS | ARB |
| Oildale-Manor | Middle | Source Impact | SLAMS | ARB |
| Stockton-Hazelton | Neighborhood | High Concentration | NAMS | ARB |
| Stockton-Wagner/Holt | Neighborhood | Representative Concentration | NAMS | SJVAPCD |
| Taft-College | Neighborhood | Representative Concentration | SLAMS | SJVAPCD |
| Turlock-Minaret | Neighborhood | Representative Concentration | SLAMS | SJVAPCD |
| Visalia-Church | Neighborhood | Representative Concentration | SLAMS | ARB |

## AMBIENT AIR QUALITY DATA AND ANALYSIS

The current federal standards for PM10 are 50 ug/m$^3$ for an annual arithmetic mean, and 150 ug/m$^3$ for a maximum 24-hour concentration. The monitoring network discussed earlier provides the data, and this section presents some key findings of that data.

**Recent Ambient Air Data**

Table 2-2 summarizes the 24-hour maxima of PM10 data for the years 1995-2001 by site. Table 2-3 presents the sites in exceedance of the PM10 24-hour standard and the estimated number of days in exceedance. It is important to realize that since the District monitors PM10 only once in six days, the specific number of days that exceed the 24-hour standard cannot be determined. Table 2-4 presents specific dates when exceedances were observed. Although monitoring for PM10 started in 1987, only recent data are included in these tables.

**Table 2-2**
**Trend Data: PM10 24-Hour Maximum**
**($\mu/m^3$)**

| Station Name | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|
| Bakersfield-California | 130 | 153 | 137 | 148 | 143 | 140 | 190 |
| Bakersfield-Golden State | 132 | 153 | 124 | 159 | 183 | 145 | 205 |
| Clovis-Villa | 120 | 108 | 103 | 113 | 151 | 114 | 155 |
| Corcoran-Patterson | --- | 141 | 199 | 128 | 174 | 128 | 165 |
| Fresno-Drummond | 126 | 121 | 121 | 132 | 162 | 138 | 186 |
| Fresno-First Street | 122 | 144 | 124 | 141 | 154 | 138 | 193 |
| Hanford-Irwin | 186 | 120 | 143 | 146 | 143 | 119 | 185 |
| Madera-Library | 110 | --- | --- | --- | --- | --- | --- |
| Merced-2334 M Street | --- | --- | --- | --- | 134 | 104 | 113 |
| Modesto-I Street | 115 | 133 | 119 | 61 | --- | --- | --- |
| Modesto-14th Street | --- | 74 | --- | 125 | 132 | 112 | 158 |
| Oildale-Manor | 195 | 138 | 125 | 103 | 156 | 122 | 158 |
| Stockton-Hazelton | 109 | 127 | 98 | 106 | 150 | 91 | 140 |
| Stockton-Wagner/Holt | --- | 117 | 130 | 99 | 118 | 104 | 119 |
| Taft-College | 93 | 94 | 78 | 84 | 101 | 99 | 128 |
| Turlock-Minaret | 120 | 122 | 111 | 108 | 157 | 104 | 148 |
| Visalia-Church Street | 128 | 115 | 96 | 160 | 152 | 130 | 143 |

**Table 2-3**
**SJV Monitoring Sites that Violate the**
**24-Hour PM10 NAAQS (Estimated)**

| Monitoring Station | Estimated 1999 Exceedances | Estimated 2000 Exceedances | Estimated 2001 Exceedances | Average # of Exceedances per year 1999-2001 |
|---|---|---|---|---|
| Modesto 14th St | 0.0 | 0.0 | 1.0 | 1.0 |
| Fresno Drummond | 8.4 | 0.0 | 6.0 | 4.8 |
| Fresno First St | 0.0 | 0.0 | 6.0 | 2.0 |
| Clovis | 0.0 | 0.0 | 6.0 | 2.0 |
| Bakersfield Golden State | 6.0 | 0.0 | 12.0 | 6.0 |
| Bakersfield California Ave | 0.0 | 0.0 | 9.0 | 3.0 |
| Oildale | 3.8 | 0.0 | 5.6 | 3.1 |
| Corcoran | 6.1 | 0.0 | 7.6 | 4.6 |
| Hanford | 0.0 | 0.0 | 12.6 | 4.2 |
| Turlock | 11.5 | 0.0 | 0.0 | 3.8 |

**Table 2-4**
**Site Concentrations of Days Exceeding the 24-Hour**
**PM10 NAAQS (Observed)**

<table>
<tr><th>Date</th><th>Monitoring Site</th><th>Concentration (µg/m³)</th></tr>
<tr><td>January 12, 1999</td><td>Oildale</td><td>156</td></tr>
<tr><td rowspan="3">October 21, 1999</td><td>Fresno- Drummond</td><td>162</td></tr>
<tr><td>Corcoran</td><td>174</td></tr>
<tr><td>Turlock</td><td>157</td></tr>
<tr><td>November 14, 1999</td><td>Bakersfield- Golden State</td><td>183</td></tr>
<tr><td rowspan="6">January 1, 2001</td><td>Fresno-Drummond</td><td>186</td></tr>
<tr><td>Fresno-First St</td><td>193</td></tr>
<tr><td>Clovis</td><td>155</td></tr>
<tr><td>Bakersfield- Golden State</td><td>205</td></tr>
<tr><td>Bakersfield- California Ave</td><td>186</td></tr>
<tr><td>Oildale</td><td>158</td></tr>
<tr><td>January 3, 2001</td><td>Bakersfield- California Ave</td><td>190</td></tr>
<tr><td rowspan="5">January 7, 2001</td><td>Bakersfield- Golden State</td><td>174</td></tr>
<tr><td>Bakersfield- California Ave</td><td>159</td></tr>
<tr><td>Modesto</td><td>158</td></tr>
<tr><td>Corcoran</td><td>165</td></tr>
<tr><td>Hanford</td><td>185</td></tr>
<tr><td>November 9, 2001</td><td>Hanford</td><td>155</td></tr>
</table>

**Trend and Spatial Variations**

The SJVAB has followed the national trend of declining PM10 levels since the 1980s, with relatively stable values over the last few years. The national long-term trend of declining PM10 values and the unusual nature of recent meteorological influences of El Niño and La Niña affect District PM10 trends. The SJVAB also experiences periods of long-term drought that would be expected to increase the geologic component of PM10 by decreasing soil moisture and increasing the emission factors for sources that generate fugitive PM10 emissions. Complex meteorological phenomena make it challenging, if not impossible, to differentiate between improvements made in ambient air quality due to regulatory actions and voluntary emission reduction projects, and those improvements due to unusual meteorological effects.

**Seasonal Variations**

Extensive seasonal variation has been established for sources contributing to PM10 concentrations and atmospheric processes contributing to particle formation and retention. The period of October through January generally includes the most frequent and severe exceedances of the federal 24-hour PM10 standard. Analysis of filters reveals that different meteorological conditions and sources contribute to exceedances in the fall versus the winter. However, both periods commonly experience stagnant conditions. During a stagnant period, primary geologic or secondary particulates accumulate, resulting in concentrations that eventually exceed the PM10 standard.

The first of the two periods of the year is during the months of October, November, and December. Generally, rain has not occurred and there are low wind speeds and stagnant air. The PM10 during this period is dominated by primary particulates. One species of primary particulates (primary geologic) comprises the highest portion (at least two thirds) of the samples taken during this period. Primary geologic is simply dust generated from dirt that is under ten microns in size. Sources contributing to elevated geologic dust include paved and unpaved roads, construction activities, and agricultural operations. The nitrates become more prevalent in mid-November, while geologic materials do not decline until significant rainfall occurs, usually in the mid-November to mid-December time frame.

The second elevated PM10 period of the year begins mid-November to mid-December and extends through February. The second period is characterized by extended periods of stagnant air interspersed with cold, damp, foggy conditions conducive to the formation of particulate nitrate in amounts that are frequently the dominant component of PM10. Colder, frequently stagnant conditions occurring in December and January favor the formation of ammonium nitrate. Secondary PM10 species, such as ammonium nitrate, ammonium sulfate, and organic particles are formed through chemical interactions from directly emitted SOx, NOx, VOC and ammonia. The samples during this period are dominated by secondary particulates (often 70 percent or more of the material found on a filter). Secondary particulates are particles that are the end products of many chemical reactions that occur in the atmosphere. Precursors, the chemicals that are involved in the chemical reactions, are NOx, VOC, SOx and ammonia.

**Diurnal Variations**

During the Integrated Monitoring Study of 1995 (IMS95), a special study as part of the California Regional PM10/PM2.5 Air Quality Study (CRPAQS), special monitors were run on a daily basis for approximately one month with the filters being changed every three hours. The results of that study showed that in urban areas, the greatest concentrations of PM10 during December and January are measured in the evening hours after most people arrive home from work. This data suggest that PM10 could be emitted and be forming at increased rates during the evening hours (6:00 PM through midnight). Other findings from CRPAQS have already been incorporated in these discussions regarding seasons and episodic development and patterns.

**Ongoing PM10 Data Analysis**

The EPA requires that ongoing analysis of PM10 data from throughout the network be conducted to determine if the monitoring schedule meets the minimum sampling frequency requirements of Title 40, Code of Federal Regulations, Part 58.13. All PM10 monitoring in the SJVAB is conducted on a sixth-day minimum schedule, as required by EPA and the ARB. The PM2.5 monitor scheduling varies according to season. Sampling frequency from April-September is every six days and changes to every third day for the months of October-March.

## CONCLUSION

Air pollution within the SJVAB is intensified by topographical and meteorological conditions, which hinder the movement of air, thereby reducing the dispersion and dilution of emissions. The surrounding mountain ranges block dispersion, minimizing wind flows into and out of the basin.

The SJVAB exceeds both the federal annual and 24-hour PM10 standards for ambient air quality. According to air quality monitoring data, exceedances of the 24-hour standard are generally seasonal and occur during fall and winter months.

# EMISSION INVENTORY

## INTRODUCTION

This chapter discusses the District's emission inventory (EI). It also describes the federal requirements pertaining to emissions inventories for State Implementation Plan (SIP) submittals and includes summaries of the emission inventories used in the PM10 Plan.

Emission inventories are lists of all known pollutant sources for a specific area. The District relies on emissions inventories as one of the key factors used to develop a strategy to attain air quality standards and to prioritize the adoption of controls. It is important to recognize that the emission inventory is not a direct measure of air quality. The emission inventory does not explain how long pollutants stay in the air, how they react in the atmosphere to form other substances, or how far they travel. Nevertheless, an accurate inventory is critical to the success of the air quality modeling used to demonstrate attainment of the standards.

The federal Clean Air Act (CAA) section 172(c)(3) requires all plan submittals to include a comprehensive, accurate, and current inventory of actual emissions from all sources of the relevant pollutant(s). The inventory that meets these qualifications is selected as the base year inventory. All other inventories used in the PM10 Plan rely on the base year inventory to forecast and backcast other years. The year 1999 was selected as the base year for the PM10 Plan because it has the most complete emission inventory currently available.

The base year and subsequent year emission inventories describe fall and winter seasons, and average annual emissions for directly emitted PM10 and PM10 precursors. Seasonal inventories are provided to account for the differences in emissions occurring during the times of year when the SJVAB exceeds the 24-hour PM10 standard. Pollutants that form PM10 in reactions in the atmosphere are referred to as PM10 precursors. PM10 precursors inventoried in the PM10 Plan include oxides of nitrogen (NOx), volatile organic compounds (VOC), oxides of sulfur (SOx), and ammonia.

The emission inventory for 2002 is the basis of an important PM10 planning requirement. As a consequence of failure to attain the PM10 standard by the CAA deadline, the PM10 Plan is required to demonstrate at least five percent per year reductions in PM10 or PM10 precursors based on the most recent emission inventory. The District must calculate progress toward this milestone from the date of such submission until attainment. In this case, the PM10 Plan was due

December 31, 2002. Therefore, the 2002 inventory was used as the baseline to calculate the quantitative milestones required for 2005, 2008 and the attainment year 2010.

The emission inventory is divided into source categories and subcategories. The main source categories are stationary sources (both point and aggregated), area sources, on-road mobile sources, and off-road mobile sources. These source categories are described in greater detail in the next section. Source categories provide a convenient way to organize the emission inventory and to determine the significance of particular sources.

The inventory for the PM10 Plan will be incorporated into the SIP. Any significant changes to the 1999 or the 2002 inventories will require a public participation process that includes a public hearing and District Governing Board adoption. Inventories will also be updated during reasonable further progress reports that are required every three years until attainment. The emission inventory is continuously being updated and improved. Chapter 8, 'Ongoing Activities,' identifies emission inventory improvements that the District plans to address in the near future.

## EMISSION INVENTORY

Determining emissions involves the use of emission factors. The EPA describes an emission factor as a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., grams of particulate emitted per gallon of fuel burned). Such factors facilitate estimation of emissions from various sources of air pollution. In most cases, these factors are simply the averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i.e., a population average).

The general equation for emission estimation is:

$$E = A \times EF \times (1 - ER/100)$$

where:

E = emissions,
A = activity rate,
EF = emission factor, and
ER= overall emission reduction efficiency, %.

The extent of completeness and detail of the emissions information is determined by the information available from published references. Emissions from some processes are better documented than others. For example, several emission factors may be listed for the production of one substance: one factor for each of a number of steps in the production process such as neutralization, drying, distillation, and other operations. However, because of less extensive information, only one emission factor may be given for production facility releases for another substance, though emissions are probably produced during several intermediate steps. There may be more than one emission factor for the production of a certain substance because differing production processes may exist, or because different control devices may be used[1].

It is important to realize that emissions inventories are only estimates, since it is highly impractical to directly measure and compile emissions on a continuous basis from a multitude of sources. Methods such as surveys and sampling are used to overcome this limitation. Actual emission measurements can be taken on a sample of devices to determine an average emission rate. Source tests at stationary emission sources provide a snapshot of emission rates that can then be applied over time. Field measurements of fugitive dust emissions taken at area sources such as construction sites can be used to determine an average emission rate under a variety of conditions. Generally, emission factors developed using a large number of measurements are more accurate than those relying on fewer measurements. The EPA has developed a comprehensive source for emission factors known as the "Compilation of Air Pollutant Emission Factors," or commonly referred to as "AP42." The ARB also compiles California-specific emission factors for many sources. The District is responsible for selecting emission factors for stationary sources and some area sources.

Once an emission factor is determined, the next step is to determine the population (number of sources) and extent of each source. Population data is collected directly and indirectly. For example, vehicle registration data is reported directly to the state. Stationary sources must obtain a permit from the District and so populations of permitted equipment are directly obtained and are reasonably accurate. The number of fireplaces is not reported and must be estimated indirectly using housing statistics and surveys. Each source category has its own methodology.

The next step is to determine an activity rate. Activity data is reported in hours of operation, gallons of fuel used, miles traveled, and other units. Stationary sources of emissions permitted by the District are required to report actual emissions to ensure that they remain below their emission limits. This provides detailed activity data that is used in the emission inventory. Often, a survey is carried out to determine usage rates. For example, people are asked to report how much wood they burn in their fireplaces and the type of woodburning devices they use, or vehicle miles traveled is estimated with the aid of traffic counts, travel surveys, and transportation models.

[1] http://www.epa.gov/oar/oaqps/efactors.html

A variety of measurement units are applied to emission-producing activities. For example, when estimating emission factors for engines, data such as horsepower, hours of operation, or gallons of fuel used may be used to determine emissions. Population or miles driven may be used as units for other sources to determine emission factors for water heaters or vehicles, respectively. The emission estimates for most point sources (specific facilities) are more reliable than the estimates based on studies because emission estimates from point sources are usually generated from the use of source tests, and the emission factors for that source are generated from this test. Furthermore, facility operators can inform the District of their actual production figures or fuel burned which eliminates the need for the District to estimate this type of data.

Emissions inventories are never considered to be entirely complete at one given time. These inventories can always be improved with the use of better emission factors and activity data. The District, in cooperation with the ARB, is committed to continually updating the emission inventory as research studies, emission factor updates, and other information become available. When emissions data change dramatically, the District is committed to revising the inventory and to ensuring that any impact is reflected in the control strategy and the attainment demonstration.

The 1999 EI used in this PM10 Plan uses the most recent data available; therefore, it differs from the published 1999 inventories for earlier plans. The detailed emissions inventories for 1999, 2002, 2005, 2008, and 2010 are included as reference document to this Plan. Summaries of these inventories are found at the end of this chapter.

The PM10 Plan also includes an emission inventory of PM10 precursors. Precursors are those compounds that are emitted into the atmosphere as a gas and that form PM10 through a variety of chemical processes. Since the amount of secondary material formed is dependent on atmospheric conditions and the presence of other reactive compounds, the amount of secondary particulates cannot be directly calculated for an emission inventory. However, with the use of an atmospheric model, the precursor emission inventory can be used to estimate particulate formation under the conditions experienced in the SJVAB. This is the same method used for ozone, which is a product of atmospheric processes involving VOC and NOx. Precursors examined for the PM10 Plan are VOC, NOx, ammonia ($NH_3$), and SOx. Of these precursors only NOx appears to make a significant contribution to the attainment strategy. However, because of uncertainty in the precursor modeling, the District and ARB have developed inventories for each precursor. This is the first attempt by ARB to produce an $NH_3$ inventory for the SJVAB. The inventory is prepared differently than the criteria pollutants inventory. Ammonia emission estimates have a large amount of uncertainty and the District has committed to its improvement. The $NH_3$ inventory is shown in tables at the end of this chapter.

**Stationary Sources**

Stationary source emissions are classified as an emission source that is fixed in place rather than movable (e.g., stack, engine, large water heater, etc.). Primary processes that produce air pollution are fuel combustion; industrial processes; solvent use; miscellaneous processes; petroleum processing, storage, and transfer; and waste burning. The specific sources associated with these processes are listed within the following source categories:

1. Fuel Combustion: This category contains emissions produced by stationary fossil fuel combustion equipment such as boilers and engines. Emissions in this category are produced by the following sources:
   a. Petroleum Refining: Fuel burning equipment located at refineries;
   b. Agricultural: Orchard heaters;
   c. Oil and Gas Production: Stationary internal combustion engines, boilers, heaters, turbines, and steam generators at facilities engaged in the extraction and processing of petroleum products for shipment, using fuels such as natural gas, distillate oil, and liquified petroleum gas;
   d. Electric Utilities: Diesel and natural gas turbines;
   e. Other Manufacturing/Industrial: The same type of equipment as listed under Oil and Gas Production, but used in industrial and manufacturing activities;
   f. Other Services and Commerce: Fuel combustion equipment including commercial space and water heaters; and
   g. Other: Unspecified fuel combustion processes.
2. Industrial Processes: This category produces VOC and NOx emissions from the following sources:
   a. Mineral Processes: Crushed rock and other mineral processing;
   b. Food and Agriculture: Sugar beet processing, wine fermentation, wine and brandy aging, bakeries, spice manufacturing, and commercial charbroiling;
   c. Chemical: Fiberglass operations, synthetic rubber and plastics manufacturing and miscellaneous chemical processes; and
   d. Other: Unspecified industrial processes.
3. Petroleum Processing, Storage and Transfer: This category includes emissions resulting from the handling of petroleum liquids and gases at extraction, processing, transport, and marketing facilities. Because

this category includes emissions related to the handling of petroleum products, and does not include combustion sources, it is comprised entirely of VOC emissions. Emissions in this category are produced by the following sources:

a. Oil and Gas Extraction: Valves, fittings, compressor seals, flanges, storage tanks, crude oil sumps and pits, and oil production tanks;
b. Petroleum Marketing: Petroleum storage tanks, loading of marine vessels and tank cars/trucks with crude oil, natural gas transmission losses, underground gasoline tanks, and vehicle refueling;
c. Petroleum Refining: Valves, fittings, storage tanks and loading racks at refining facilities; and
d. Other: Unspecified emissions related to the handling of petroleum liquids and gases.

Sources of air pollution in the stationary source inventory are tracked as point sources or aggregated-point sources. Point sources are those facilities that emit pollutants in quantities sufficient to require individual tracking of their emissions (generally over 10 tons per year) and include processing, manufacturing, and industrial operations.

Aggregated-point sources are point sources that emit less than 10 tons per year of any one pollutant. There are far too many of these to keep track of individually, but when added together they can represent a large quantity of air pollution. Examples of these sources include gas stations, water heaters, and space heating. Emissions from these types of sources are calculated on a broader scale of estimation, and not on an individual basis. For example, emissions from gas stations are generally calculated by the amount of gasoline sold in each county, with an emission factor based on 1000 gallons sold.

**Area Sources**

Area sources include source categories that are associated with human activity and the emissions that take place over a wide geographic area. Area sources dominate the PM10 inventory as a directly emitted source category. Fugitive dust sources of PM10 (e.g., paved roads, unpaved roads, and agricultural operations) are examples of area sources. In addition, paints, cooking, construction, and consumer products are also considered area sources. The following is a more descriptive list of the types of sources categories found under area sources:

1. <u>Miscellaneous Processes</u>: The emissions in this category are produced by the following sources:

   a. Pesticide Application: Synthetic and non-synthetic pesticides used for agricultural and non-agricultural purposes;
   b. Unplanned Fires: Timber, brush, grassland wildfire, and auto/structural fires;
   c. Residential Fuel Combustion: fuel oil, propane, natural gas, and wood, etc.
   d. Waste Disposal: Decomposition of waste material at landfill sites;
   e. Farming Operations;
   f. Construction and Demolition;
   g. Entrained Road Dust – Paved;
   h. Entrained Road Dust – Unpaved;
   i. Fugitive Windblown Dust; and
   j. Other: Other unspecified processes.
2. <u>Solvent Use</u>: This inventory category consists of evaporative emissions from surface coatings, degreasing operations, and manufacturing activities. Emissions in this category are produced by the following sources:
   a. Dry Cleaning: Petroleum and other dry cleaning solvents;
   b. Architectural Coating: Oil and water based paints and thinners used to paint commercial and residential buildings and other structures;
   c. Asphalt Paving: Cutback asphalt, emulsified asphalt, hot-mix asphalt, and road oils;
   d. Printing: Inks, solvents, and cleaning agents;
   e. Consumer Products: Antiperspirants and deodorants, air fresheners, automotive windshield wiper fluids, bathroom cleaners, consumer engine cleaners, barbecue lighter fluid, and aerosol insect repellents;
   f. Industrial Solvent Use: Organic cleaning agents and solvents used in industrial processes such as the fabrication of plastic products and surface coating operations;
   g. Degreasing: Petroleum and synthetic solvents used to clean parts and materials at industrial and commercial facilities;
   h. Other Surface Coating: Paints, thinners, and cleaning agents for auto painting, solvent vats used in manufacturing, coatings used for aircraft parts, solvent used for adhesives and sealants, industrial coatings for plastics, paper, marine vessels, and wood furniture;
   i. Other Manufacturing/Industrial: Thinning solvents; and
   j. Other: Unspecified solvent use emissions.
3. <u>Waste Burning</u>: This category includes various activities that burn waste materials. Waste Burning sources contribute emissions from the following sources:
   a. Incineration: Incinerators and flares burning process gas;

   b. Agricultural Debris: Field crop residue and pruning;
   c. Range Management: Forest vegetation and chaparral; and
   d. Other: Weed abatement and fire fighter training.

Methods used to estimate emissions for area sources are similar to aggregated-point sources, but area source emissions are more difficult to estimate. The same techniques used in estimating point source emissions are often used, but with less reliability. For example, it is difficult to determine the number of residential fireplaces as well as the amount of wood burned in fireplaces within the District. Although there are methods to estimate this, the quality of data is not as reliable or accurate as that of point sources and point source tests. The estimates are based on total activity during a season and they do not provide much information about typical use, daily activity, or exact location of the source.

**Mobile Sources**

The mobile source inventory includes emissions from vehicles and mobile equipment powered by piston and turbine engines. Mobile sources are grouped as on-road vehicles (e.g., cars and trucks), and other mobile sources (e.g., tractors, construction equipment, and lawn and garden equipment).

Mobile source emissions (VOC, NOx, SOx, CO, $NH_3$, and PM10) result from fuel combustion and fuel evaporation. For example, evaporative emissions from automobile fuel tanks are a source of VOC emissions. During the day, increasing temperatures cause gasoline in tanks and fuel systems to expand, displacing vapors (which are mostly VOC) into the atmosphere unless they are contained by an on-board vapor recovery system. Mobile source emissions categories are as follows:

1. <u>On-Road Motor Vehicles</u>: This category includes light-duty passenger vehicles (automobiles), light-duty trucks (pick-up trucks), medium-duty trucks, heavy-duty trucks (dominated by diesel trucks), motorcycles, and heavy-duty diesel buses. The on-road motor vehicle emission inventory was developed for the District by the California Air Resources Board (ARB).
2. <u>Other Mobile sources:</u> this group includes ships, boats, airplanes, trains, residential utility equipment, and construction equipment which do not produce emissions on roads and highways. It includes the following types of sources:
   a. Aircraft - Government: Military aircraft;
   b. Aircraft - Other: Commercial and general aviation;
   c. Mobile Equipment: Farm equipment and construction equipment not included in the utility equipment category;
   d. Off-Road Vehicles: Commercial boats, recreational boats, four-wheel drive passenger vehicles, and off-road motorcycles;
   e. Ships: Commercial shipping;

f. Trains: The District is traversed by a several major railway lines linking the area with the Sacramento and Bay Areas, and the Southeast Desert; and
g. Utility Equipment: Small utility engines driving chain saws, lawn mowers, leaf blowers, and portable compressors and generators.

The PM10 Plan uses ARB's mobile source emission inventory model EMFAC2002 version 2.08 to calculate on-road mobile source emissions. The ARB developed EMFAC in lieu of the EPA's motor vehicle emissions model MOBILE. The benefit of the ARB's model is that statewide motor vehicle emission control programs are included in the emission estimates. Basin-wide summaries of the District's on-road motor vehicle emission inventory for 1999, 2002, 2005, 2008, and 2010 are included in Appendix B.

The off-road emission inventory is developed with emission estimates from ARB's OFF-ROAD model. Other mobile categories, such as locomotives and aircraft, are estimated using emission factors developed by the EPA.

**Natural Sources**

In addition to man-made air pollution, there are natural sources of emissions, also known as biogenic sources (i.e., plants, molds, and animals,) and geogenic sources (such as windblown dust from undisturbed land and the earth itself). These natural sources emit significant quantities of pollutants. For example, certain types of vegetation emit large amounts of isoprene, terpenes, and other organic compounds that are VOC. Emission rates depend upon plant species, season, biomass density, time of day, local temperature, moisture, and other factors.

The biogenic inventory for the San Joaquin Valley has been the subject of recent research and refinements. The biogenic VOC emission inventory is estimated at 379.37 tons per day for the District. Seasonal or annual estimates have not been prepared using this updated methodology, but it provides a sense of the magnitude of biogenic emissions during the summer. A typical winter day emissions and a typical fall day emissions will be provided by ARB prior to the release of the final plan.

**Base Year Inventory**

A base year inventory is defined as an inventory of actual annual and typical weekday peak season emissions used in calculating projected inventories and in developing control strategies. The base year inventory is defined to include man-made sources of PM10, NOx, SOx, $NH_3$, and VOC emissions. It must include emissions from all point, area, and highway and non-highway mobile sources located within the nonattainment area. Since the EPA has not issued any guidance on the types of emissions inventories to be included in this PM10 Plan, the District followed the basic guidance that was issued for the ozone attainment SIP and made modifications as appropriate.

**Revisions to Base Year Inventory**

The emission inventory is prepared through the joint efforts of the ARB and the District. The ARB is responsible for on and off-road mobile sources. The District is responsible for point sources. Both agencies are responsible for area sources.

Prior to the current planning process, the last time the PM10 inventory was significantly updated was in 1997. The 1997 inventory was based on a 1993 inventory base year. These changes produced a dramatic decrease in the geologic dust of 20-70 percent, depending on the category. The changes in geologic dust are primarily due to introducing source specific activity and emission rates where none were available for previous inventories.

Starting in January 2002, ARB and the District took a systematic look at each of the categories in the emission inventory. Staff determined that the existing methodologies for area sources were still valid, but their inputs and emission factors needed updating. Staff also found that the stationary source inventory was recently updated for other reasons and needed no further work. On and off-road mobile source inventories are always being updated and the District determined to use the latest version of EMFAC and the Off-Road Model to develop the estimates.

The updates to the area source inventory primarily reflected an update of the underlying data to the 1999 activity levels, an update of emission factors where available, minor changes to methodologies where needed, and better spatial and temporal information. These changes should be considered refinements to the emission inventory and not a major overhaul of the inventory.

Table 3-1 below contains a list of source categories that were evaluated for this PM10 Plan. A check in the box means that the category was actually updated. A description of the changes to each of the categories that were updated can be found in Appendix C. Only emission categories that were evaluated are shown on this table.

**Table 3-1**
**Summary of Emission Source Categories Evaluated and Updated**

| Category | Updated | Category | Updated |
|---|---|---|---|
| **Stationary Source** | | **Area Source** | |
| Electric Utilities | ☒ | Paved Road Dust | ☒ |
| Cogeneration | ☒ | Unpaved Road Dust – Non-Ag | ☒ |
| Oil and Gas Production | ☒ | Unpaved Road Dust – Ag | ☒ |
| Petroleum Refining | ☒ | Agricultural Operations | ☒ |
| Manufacturing and Industrial | ☒ | Woodstoves & Fireplaces | ☒ |
| Food and Agricultural | ☒ | Agricultural Burning | ☒ |
| Service and Commercial | ☒ | Prescribed Burning | ☒ |
| Sewage Treatment | ☒ | Construction | ☒ |
| Landfills, Incinerators | ☒ | Commercial Charbroiling | ☒ |
| Degreasing and Other | ☒ | Livestock | ☒ |
| Coatings and Adhesives | ☒ | Fertilizers - Ammonia | ☒ |
| Printing | ☒ | Pesticides | ☐ |
| Oil and Gas Production | ☒ | Consumer products | ☐ |
| Petroleum Refining | ☒ | Architectural coatings | ☐ |
| Petroleum Marketing | ☒ | Refrigerants | ☐ |
| Chemical | ☒ | Solvent evaporation | ☐ |
| Food and Agriculture | ☒ | Windblown dust from ag lands | ☐ |
| Mineral Processes | ☒ | Structure and car fires | ☐ |
| Metal Processes, Wood & Paper | ☒ | Asphalt paving / roofing | ☐ |
| Glass and Related Products | ☒ | Utility equipment | ☐ |
| **On-Road Mobile**[2] | | **Off-Road Mobile**[3] | |
| Light Duty Passenger | ☒ | Aircraft | ☒ |
| Light Duty Trucks | ☒ | Trains | ☒ |
| Medium & Heavy Duty Gas Truck | ☒ | Ships and Commercial Boats | ☒ |
| Light & Med Duty Diesel Truck | ☒ | Recreational Boats | ☒ |
| Heavy Duty Diesel Truck | ☒ | Off-Road Recreational Vehicles | ☒ |
| Motorcycles | ☒ | Off-Road Equipment | ☒ |
| Heavy Duty Diesel Buses | ☒ | Farm Equipment | ☒ |
| Heavy Duty Gas Buses | ☒ | Fuel Storage and Handling | ☒ |
| School Buses | ☒ | | |
| Motor Homes | ☒ | | |
| | | | |

## Growth and Control Factors

Projecting quantities of pollution in future years is traditionally accomplished by assuming that PM10, NOx, SOx, $NH_3$, and VOC emissions are directly related to activity and control levels. If an activity level increases, it is generally assumed that emissions will similarly increase. Activity levels are represented by indicators such as population, housing, employment, oil and gas production, and vehicle miles traveled. These indicators are referred to as "surrogates". The ratio of the projected surrogate for each year to the actual 1999 level of activity is referred to as its growth factor. Growth factors are multiplied by 1999 emissions to project future year's emissions. A growth factor of less than one indicates a decline in an activity (declining emissions) over the planning period, while a

[2] EMFAC2002 version 2.08 was used in calculating the emissions in this category.
[3] For all off road categories, the most current emission estimates from the Off-Road model was used.

growth factor of more than one indicates an increase in activity (increasing emissions).

Using the best data available, the ARB and the District compiled growth factor estimates for the years 1970 through 2030 for each group of sources and in each of the eight counties within the District. Although using growth factors is a standard method for projecting emissions, their use cannot account for all activities that might occur in an area during a given time frame. However, growth factors tend to be more accurate when applied to the SJVAB as a whole. For example, one facility might gain in market share while another loses its market share even though production increases at both facilities. While the overall growth factor is correct, each facility had very different growth rates. A report showing the growth factors that were used is located in a reference document.

The ARB estimates the on-road mobile source emissions growth for each class of vehicle, based on information obtained from the Transportation Planning Agencies (TPAs) located within the District, and Caltrans. Also, enhanced inspection and maintenance programs for motor vehicles and other motor vehicle control programs are factored into the mobile source projections included in this PM10 Plan. These data collectively represent the best available estimates on a county-by-county basis of future activity levels for mobile sources within the District.

After the baseline emission inventory is multiplied by a growth factor, it is then multiplied by a control factor. A control factor is a weighted average that represents the level of controls of one or more rules, regulations, and/or programs, for a group of sources. This control factor takes into account information other than control levels as stated in a rule or program. Rule penetration, compliance rates, public awareness, participation, and other agency's rules that affect the air quality are all considered in determining a control factor. Control factors need to be updated on a continuing basis as the production levels, industry types and size, programs, public awareness, base year inventories, and other conditions change over time. Control factor estimates for the years 1970-2030 were compiled by the District and ARB and can be found in a reference document.

## FUTURE YEAR INVENTORIES

Detailed Annual, Fourth, and First quarter inventories for the 1999, 2002, 2005, 2008, and 2010 inventories are available in a reference document to this Plan. At the end of this chapter, there is a series of summary tables that show the annual emissions of a year followed by that year's seasonal emissions. The summary tables include 1999, 2002, 2005, and 2010 emissions.

## AVERAGE ANNUAL, SEASONAL, PLANNING, AND MODELING INVENTORIES

An annual average inventory represents the emissions on an average day during a year, by taking the total annual emissions in tons and dividing them by 365 days. Fall emissions are represented by the emissions that occur in October and November, and the winter emissions are represented by the emissions that occur in November, December, and January. The month of November is a transitional month between the fall (primarily geological) episodes and the winter (primarily ammonium nitrate) episodes. The reason that these four months were chosen is that these months were the only months where exceedances of the federal 24-hour PM10 standard were measured. For more details, please see the chapters that discuss modeling and air quality data. These monthly inventories are called modeling inventories and are prepared based on the ARB's published guidelines, as described below.

The point source emissions for modeling inventories are based on average daily emissions during that month. For example, some businesses have certain months that are busier than others. These busy months will have more emissions than slower months. An example of this type of operation is a tomato processing plant, which has more emissions during harvest time than any other time during the year. Data on normal operating schedules (hours per day, days per week, and weeks per year) are collected as a part of routine point source inventory procedures.

Area and aggregate-point source emissions are based on an estimated monthly throughput (e.g. gasoline usage peaks during the summer). Representative profiles showing monthly variation in emissions are prepared for each source category. These profiles are then used to obtain average operating day emissions. Once the average daily emissions by month are obtained, the monthly emissions are totaled and then divided by the total number of months. This number represents the average weekday emissions for the season. Please see Appendix D for the fall and winter inventories.

Planning inventories are used as the base for preparing plans. In this document, the inventory for 2002 is the planning inventory. The fall and winter modeling inventories were used to determine the necessary control strategy to attain the federal 24-hour PM10 standard. The 2002 annual average inventory will be used to show attainment of the federal annual PM10 standard and compliance with the five percent reduction per year requirement.

## MOTOR VEHICLE EMISSION BUDGETS FOR CONFORMITY

In accordance with the 1990 Clean Air Act Amendments, conformity requirements are intended to ensure that transportation activities do not result in air quality degradation. Section 176 of the Amendments requires that transportation plans, programs, and projects conform to applicable air quality plans before the transportation action is approved by a Metropolitan Planning Organization (MPO).

Section 176(c) provides the framework for ensuring that Federal actions conform to air quality plans under section 110. Conformity to an implementation plan means that proposed activities must not (1) cause or contribute to any new violation of any standard in any are, (2) increase the frequency or severity of any existing violation of any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. For nonattainment areas required demonstrating RFP and attainment, EPA requires that the SIP revision contain statements of the motor vehicle emissions on which the demonstrations are based. These statements become the “emission budgets” for highway and transit vehicles. The transportation plans and programs produced by the transportation planning process are required to result in emissions that are less than or equal to the budget.

EPA transportation conformity regulations issued in November 1993 establish criteria involving the comparison of projected transportation plan emissions with the motor vehicle emissions assumed in the applicable air quality plans. The regulations define the term “motor vehicle emissions budget” as meaning “the portion of the total allowable emissions defined in a revision of the applicable implementation plan (or in an implementation plan revision which was endorsed by the Governor or his or her designee) for a certain date for the purpose of meeting reasonable further progress milestones or attainment or maintenance demonstrations, for any criteria pollutant or its precursors, allocated by the applicable implementation plan to highway and transit vehicles.”

*NOTE: Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.*

Regional emissions have been estimated for 1999, 2002, 2005, 2008, and 2010. The reasonable further progress demonstration contained in Chapter 7 is based on the average annual daily emissions for milestone years 2005 and 2008. In addition, the modeling demonstrates attainment of both the annual average standard and the 24- hour standard in 2010. In accordance with the conformity rule described in more detail below, motor vehicle emissions budgets are being established for 2005, 2008, and 2010 based on the average annual daily emissions that are applicable for both the annual and 24-hour PM10 standards.

For conformity purposes, the motor vehicle emissions budget for PM10 includes regional reentrained dust from travel on paved roads, vehicular exhaust, travel on unpaved roads, and road construction. Section 93.122(d)(2) of the federal conformity rule requires that PM10 from construction-related fugitive dust be included in the regional PM10 emissions analysis, if it is identified as a contributor to the nonattainment problem in a PM10 implementation plan.

Section 93.102(b)(2)(iii) of the federal conformity rule identifies VOC and NOx as the two PM10 precursor pollutants that must also have a motor vehicle emissions budget if deemed significant. The air quality modeling indicates that VOC is not a significant precursor. Accordingly, a motor vehicle emissions budget for NOx is being established and includes vehicular exhaust only. It is important to note that the conformity rule does not require sulfur oxides or ammonia to be addressed.

According to EPA (November 24, 1993 Federal Register, page 62194), the emissions budget applies as a ceiling on emissions in the year for which it is defined, and for all subsequent years until another year for which a different budget is defined or until a SIP revision modifies the budget. The emissions budgets provided in Table 3-2 are applicable for both the annual and 24-hour PM10 standards.

The budgets are derived starting with projections from ARB's EMFAC2002 on-road mobile source emission factor model. These are adjusted to account for any baseline emission reductions not included in the model and any emissions that the model does not project (e.g., road dust). Finally, any new emission reduction commitments are subtracted from the adjusted baseline to arrive that the conformity budgets. It is important to note that Section 93.124(e) of the federal conformity rule indicates that nonattainment areas with more than one MPO may establish motor vehicle emission budgets for each MPO in the implementation plan. As a result, County-level emission budgets are provided in this plan. The following is the 2010 budget calculation for Fresno County. The calculation methodology for the other years and counties is identical.

| | NOx | PM10 |
|---|---|---|
| **Emissions Baseline** | | |
| Baseline EMFAC2002 | 32.9 | 1.5 |
| I/M Improvements/Expansion | 0.6 | 0.0 |
| Reentrained road dust (paved) | -- | 13.7 |
| Reentrained road dust (unpaved) | -- | 0.9 |
| Road Construction Dust | -- | 4.6 |
| Adjusted Baseline | 33.3 | 20.7 |
| **Control Measures** | | |
| New State Measures | 2.2 | 0.0 |
| **New Local Measures** | 0.4 | 4.6 |
| **Conformity Emission Budgets*** | 29.7 | 16.2 |

*Rounded up to the nearest tenth

**Table 3-2**
**Motor Vehicle Emissions Budgets**
**(tons per average annual day)**

| County | 2005 | | 2008 | | 2010 | |
|---|---|---|---|---|---|---|
| | PM10 | NOx | PM10 | NOx | PM10 | NOx |
| **Fresno** | 14.1 | 42.6 | 13.3 | 36.4 | 16.2 | 29.7 |
| **Kern** | 10.6 | 38.8 | 10.7 | 34.2 | 10.8 | 28.4 |
| **Kings** | 5.6 | 7.5 | 5.6 | 6.5 | 6.7 | 5.4 |
| **Madera** | 4.3 | 9.9 | 4.3 | 9.1 | 4.5 | 7.8 |
| **Merced** | 5.5 | 15.3 | 5.2 | 12.5 | 5.3 | 9.9 |
| **San Joaquin** | 9.0 | 28.9 | 9.0 | 23.4 | 9.2 | 18.3 |
| **Stanislaus** | 6.5 | 22.5 | 6.1 | 18.7 | 6.1 | 14.9 |
| **Tulare** | 8.7 | 23.6 | 7.9 | 20.1 | 8.9 | 16.4 |

Section 93.124 of the federal conformity rule, in particular 93.124(c), allows for the SIP to establish trading mechanisms between budgets for pollutants or precursors, or among budgets allocated to mobile and other sources. This SIP allows trading from the motor vehicle emissions budget for the PM10 precursor NOx to the motor vehicle emissions budget for primary PM10 using a 1.5 to 1 ratio. The trading mechanism will allow the agencies responsible for demonstrating transportation conformity in the San Joaquin Valley to supplement the 2010 budget for PM10 with a portion of the 2010 budget for NOx, and use these adjusted motor vehicle emissions budgets for PM10 and NOx to

demonstrate transportation conformity with the PM10 SIP for analysis years after 2010.

The trading mechanism will be used only for conformity analyses for years after 2010. To ensure that the trading mechanism does not impact the ability to meet the NOx budget, the NOx emission reductions available to supplement the PM10 budget shall only be those remaining after the NOx budget has been met. Finally, reductions from the State's motor vehicle control program shall be calculated using ARB approved factors and methodologies.

The agency responsible for demonstration transportation conformity shall clearly document the calculations used in the trading, along with any additional reductions of NOx or PM10 emissions in the conformity analysis. In addition, in light of the role that growth in travel plays in PM10 emissions in the Valley, the San Joaquin Valley COG Directors have committed to conduct feasibility analyses as part of each new Regional Transportation Plan, excluding revisions (i.e., amendments). The analysis will identify and evaluate potential control measures that could be included in the Regional Transportation Plans (see Appendix O). Any additional PM10 or NOx reductions achieved in the RTPs shall be credited in the transportation conformity demonstration. Reductions achieved after 2010 shall be credited prior to implementing the trading mechanism.

## PRE-BASELINE EMISSION REDUCTION CREDITS

The District requires all new and modified stationary sources that increase emissions in amounts in excess of emission offset thresholds to obtain emission reduction credits (ERC) to offset the growth in emissions. District Rule 2201 (New and Modified Stationary Source Review Rule) contains the offset requirement. Offsets represent either on-site reductions or the use of banked ERCs. Calendar year 2002 constitutes the baseline year for this PM10 Plan. The District expects that some pre-baseline credits will be used to allow growth from permitted stationary sources.

The General Preamble (57 FR 13498) states that the pre-baseline ERCs must be reflected as growth "*to the extent that the State expects that such credits will be used as offsets or netting prior to attainment of the ambient standards.*" The August 26, 1994 memorandum from John Seitz, EPA's Director of Office of Air Quality Planning and Standards, to David Howekamp of EPA Region IX provides two ways for inclusion of these ERCs as growth by stating that "*A state may choose to show that the magnitude of the pre-1990 ERCs (in absolute tonnage) was included in the growth factor, or the state may choose to show that it was not included in the growth factor, but in addition to anticipated general growth.*"

By including the pre-1990 ERCs in the growth factor, the District has selected the first methodology provided in Seitz's memorandum. The quantity of pre-baseline ERCs expected to be used was estimated by examining the District's historical permitting trends and considering projected growth from stationary sources during the course of this Plan. Based on this analysis, the quantity of offsets that would be required of all permitted stationary sources from 2002 through 2010 is estimated to be 9.6 tons per day for NOx, 6.4 tons per day for ROG, 1.6 tons per day for PM10, and 2.4 tons per day for SOx. It should be noted that a minimum offset ratio of 1.3:1 is required by the District. However, historically, the offset ratio for most projects has been at 1.5:1.

The above estimates represent total ERC usage, some of which may come from post-baseline reductions. Nonetheless, as a conservative measure, it is assumed that all of the above ERCs will come from pre-baseline reductions. Should in reality some of these ERCs come from post baseline reductions, the plan would have overestimated the projected growth from permitted stationary sources.

As shown in Appendix F, the expected growth from permitted stationary sources during the same period (2002-2010), including the above pre-baseline ERCs is estimated to be 11 tons per day for NOx, 7.8 tons per day ROG, 2.3 tons per day of PM10, and 2.6 tons per day of SOx.

The District will not allow the use of pre-baseline ERCs in excess of the above estimates, unless this Plan is amended and approved by EPA with revised growth and ERC usage estimates. Appendix E contains a list of all ERCs currently banked with the District which can be used to offset emissions from and new and modified sources.

As shown in Appendix F, the expected growth from permitted stationary sources during the same period (2002-2010), including the above pre-baseline ERCs is estimated to be 11 tons per day for NOx, 7.8 tons per day ROG, 2.3 tons per day of PM10, and 2.6 tons per day of SOx.

The District will not allow the use of pre-baseline ERCs in excess of the above estimates, unless this Plan is amended and approved by EPA with revised growth and ERC usage estimates. Appendix E contains a list of all ERCs currently banked with the District which can be used to offset emissions from and new and modified sources.

As currently adopted, if growth in new and modified sources occurs at the rate estimated in this Plan, the use of offsets as provided in Rule 2201 will ensure that permitted increases in major source emissions will not interfere with progress toward attainment of federal PM10 standards or the achievement of the 5 percent per year reduction in PM10 precursors emissions.

## CONCLUSION

This PM10 Plan contains the most up-to-date and accurate emission inventory possible within the time allowed to accomplish the full range of tasks required to assemble a plan meeting all CAA requirements. Many emission categories were updated to reflect current data and emission factors. Many emission improvement projects are in process and the emission inventory will be updated as the projects are completed. The District and the ARB are already planning new emission inventory improvement projects that will be accomplished in the next few years. As these projects are completed, the inventory will be updated. ERC caps have been determined and set.

Following this subsection, there are a series of summary tables that show the annual emissions of a year followed by that year's seasonal emissions. The years shown are 1999, 2002, 2005, 2008, and 2010. The detailed emission inventories for 1993, 1999, 2002, 2005, 2008, and 2010 are found in a reference document to this Plan.

**Table 3-3:**
**Annual Average Total Organic Gases (TOG)**
**Tons per day**

| STATIONARY SOURCES | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **FUEL COMBUSTION** | | | | | |
| ELECTRIC UTILITIES | 3.4 | 3.9 | 4.3 | 4.6 | 4.9 |
| COGENERATION | 8.3 | 8.8 | 9.7 | 10.1 | 10.1 |
| OIL AND GAS PRODUCTION (COMBUSTION) | 35.3 | 37.7 | 41.6 | 41.7 | 41.4 |
| PETROLEUM REFINING (COMBUSTION) | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| MANUFACTURING AND INDUSTRIAL | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 |
| FOOD AND AGRICULTURAL PROCESSING | 3.1 | 3.0 | 3.0 | 3.0 | 3.0 |
| SERVICE AND COMMERCIAL | 7.3 | 7.7 | 7.9 | 8.1 | 8.1 |
| OTHER (FUEL COMBUSTION) | 0.9 | 0.8 | 0.7 | 0.6 | 0.6 |
| *** TOTAL FUEL COMBUSTION** | 59.1 | 62.8 | 68.2 | 69.1 | 69.0 |
| **WASTE DISPOSAL** | | | | | |
| SEWAGE TREATMENT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LANDFILLS | 211.1 | 226.2 | 240.3 | 253.9 | 263.0 |
| INCINERATORS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOIL REMEDIATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (WASTE DISPOSAL) | 1.6 | 1.8 | 1.9 | 2.0 | 2.1 |
| *** TOTAL WASTE DISPOSAL** | 212.8 | 228.0 | 242.2 | 256.0 | 265.1 |
| **CLEANING AND SURFACE COATINGS** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| LAUNDERING | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 |
| DEGREASING | 14.7 | 11.2 | 2.5 | 2.6 | 2.7 |
| COATINGS AND RELATED PROCESS SOLVENTS | 14.1 | 15.1 | 15.8 | 17.1 | 18.1 |
| PRINTING | 1.4 | 1.5 | 1.6 | 1.6 | 1.7 |
| ADHESIVES AND SEALANTS | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 |
| OTHER (CLEANING AND SURFACE COATINGS) | 3.9 | 4.3 | 4.9 | 5.4 | 5.7 |
| *** TOTAL CLEANING AND SURFACE COATINGS** | 35.6 | 33.6 | 26.3 | 28.3 | 29.8 |
| **PETROLEUM PRODUCTION AND MARKETING** | | | | | |
| OIL AND GAS PRODUCTION | 54.7 | 53.4 | 55.1 | 55.2 | 54.1 |
| PETROLEUM REFINING | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| PETROLEUM MARKETING | 13.5 | 14.4 | 15.6 | 16.0 | 16.2 |
| *** TOTAL PETROLEUM PRODUCTION AND MARKETING** | 70.0 | 69.6 | 72.5 | 73.1 | 72.1 |
| **INDUSTRIAL PROCESSES** | | | | | |
| CHEMICAL | 2.5 | 2.7 | 3.0 | 3.2 | 3.4 |
| FOOD AND AGRICULTURE | 10.6 | 11.0 | 11.1 | 11.4 | 11.7 |
| MINERAL PROCESSES | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 |
| METAL PROCESSES | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| WOOD AND PAPER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GLASS AND RELATED PRODUCTS | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| ELECTRONICS | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| OTHER (INDUSTRIAL PROCESSES) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| *** TOTAL INDUSTRIAL PROCESSES** | 14.1 | 14.7 | 15.0 | 15.6 | 16.1 |
| **** TOTAL STATIONARY SOURCES** | 391.6 | 408.8 | 424.2 | 442.0 | 452.2 |
| **AREA-WIDE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **SOLVENT EVAPORATION** | | | | | |
| CONSUMER PRODUCTS | 30.8 | 30.9 | 28.8 | 30.6 | 31.8 |
| ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS | 12.1 | 12.6 | 10.9 | 11.2 | 11.4 |
| PESTICIDES/FERTILIZERS | 28.4 | 26.4 | 25.4 | 24.4 | 23.8 |
| ASPHALT PAVING / ROOFING | 2.6 | 2.7 | 2.7 | 2.8 | 2.8 |
| *** TOTAL SOLVENT EVAPORATION** | 73.9 | 72.6 | 67.8 | 69.0 | 69.8 |
| **MISCELLANEOUS PROCESSES** | | | | | |
| RESIDENTIAL FUEL COMBUSTION | 14.3 | 14.6 | 14.8 | 15.0 | 15.1 |
| FARMING OPERATIONS | 713.3 | 762.1 | 804.9 | 862.0 | 900.1 |
| CONSTRUCTION AND DEMOLITION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| UNPAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FUGITIVE WINDBLOWN DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FIRES | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| WASTE BURNING AND DISPOSAL | 47.8 | 47.3 | 46.8 | 46.4 | 46.1 |
| COOKING | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 |
| OTHER (MISCELLANEOUS PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL MISCELLANEOUS PROCESSES** | 776.1 | 824.7 | 867.3 | 924.2 | 962.2 |
| **** TOTAL AREA-WIDE SOURCES** | 850.0 | 897.3 | 935.1 | 993.2 | 1031.9 |
| **MOBILE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **ON-ROAD MOTOR VEHICLES** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| LIGHT DUTY PASSENGER (LDA) | 56.6 | 43.5 | 33.2 | 25.1 | 20.7 |
| LIGHT DUTY TRUCKS - 1 (LDT1) | 28.2 | 23.1 | 19.3 | 15.8 | 13.5 |
| LIGHT DUTY TRUCKS - 2 (LDT2) | 18.6 | 15.6 | 13.4 | 11.4 | 10.3 |
| MEDIUM DUTY TRUCKS (MDV) | 8.1 | 6.7 | 5.8 | 5.0 | 4.6 |
| LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1) | 8.2 | 3.6 | 2.3 | 1.8 | 1.6 |
| LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2) | 0.7 | 0.6 | 0.6 | 0.6 | 0.6 |
| MEDIUM HEAVY DUTY GAS TRUCKS (MHDV) | 6.1 | 5.0 | 4.1 | 3.3 | 2.8 |
| HEAVY HEAVY DUTY GAS TRUCKS (HHDV) | 4.0 | 2.8 | 2.3 | 1.9 | 1.7 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1) | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV) | 0.6 | 0.7 | 0.7 | 0.7 | 0.6 |
| HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV) | 4.7 | 4.8 | 4.6 | 4.1 | 3.8 |
| MOTORCYCLES (MCY) | 2.5 | 2.4 | 2.3 | 2.2 | 2.1 |
| HEAVY DUTY DIESEL URBAN BUSES (UB) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| HEAVY DUTY GAS URBAN BUSES (UB) | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 |
| SCHOOL BUSES (SB) | 0.5 | 0.4 | 0.3 | 0.3 | 0.3 |
| MOTOR HOMES (MH) | 1.0 | 1.0 | 1.0 | 0.8 | 0.7 |
| *** TOTAL ON-ROAD MOTOR VEHICLES** | 141.6 | 111.9 | 91.8 | 74.7 | 65.0 |
| **OTHER MOBILE SOURCES** | | | | | |
| AIRCRAFT | 12.3 | 13.3 | 14.0 | 14.4 | 14.7 |
| TRAINS | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 |
| SHIPS AND COMMERCIAL BOATS | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| RECREATIONAL BOATS | 13.1 | 11.4 | 10.0 | 8.7 | 7.2 |
| OFF-ROAD RECREATIONAL VEHICLES | 5.2 | 4.8 | 5.0 | 5.2 | 5.3 |
| OFF-ROAD EQUIPMENT | 14.8 | 12.8 | 11.2 | 10.6 | 8.9 |
| FARM EQUIPMENT | 10.2 | 9.4 | 8.6 | 7.3 | 6.8 |
| FUEL STORAGE AND HANDLING | 7.7 | 7.2 | 2.7 | 2.3 | 2.4 |
| *** TOTAL OTHER MOBILE SOURCES** | 64.4 | 59.8 | 52.4 | 49.3 | 46.2 |
| **** TOTAL MOBILE SOURCES** | 206.0 | 171.7 | 144.2 | 124.0 | 111.1 |
| | | | | | |
| **GRAND TOTAL TOG FOR SAN JOAQUIN VALLEY** | **1447.6** | **1477.8** | **1503.5** | **1559.3** | **1595.3** |

**Table 3-4:**
**Annual Average Volatile Organic Compounds (VOC)**
**Tons per day**

| **STATIONARY SOURCES** | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **FUEL COMBUSTION** | | | | | |
| ELECTRIC UTILITIES | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 |
| COGENERATION | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 |
| OIL AND GAS PRODUCTION (COMBUSTION) | 2.7 | 2.9 | 3.2 | 3.2 | 3.2 |
| PETROLEUM REFINING (COMBUSTION) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| MANUFACTURING AND INDUSTRIAL | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 |
| FOOD AND AGRICULTURAL PROCESSING | 2.5 | 2.5 | 2.4 | 2.4 | 2.4 |
| SERVICE AND COMMERCIAL | 2.4 | 2.5 | 2.6 | 2.7 | 2.7 |
| OTHER (FUEL COMBUSTION) | 0.6 | 0.6 | 0.5 | 0.4 | 0.4 |

| | | | | | |
|---|---|---|---|---|---|
| *** TOTAL FUEL COMBUSTION** | 9.6 | 10.0 | 10.4 | 10.5 | 10.5 |
| **WASTE DISPOSAL** | | | | | |
| SEWAGE TREATMENT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LANDFILLS | 2.7 | 2.9 | 3.1 | 3.3 | 3.4 |
| INCINERATORS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOIL REMEDIATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (WASTE DISPOSAL) | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 |
| *** TOTAL WASTE DISPOSAL** | 3.2 | 3.4 | 3.7 | 3.9 | 4.0 |
| **CLEANING AND SURFACE COATINGS** | | | | | |
| LAUNDERING | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| DEGREASING | 12.3 | 8.7 | 1.5 | 1.5 | 1.5 |
| COATINGS AND RELATED PROCESS SOLVENTS | 13.5 | 14.5 | 15.1 | 16.4 | 17.4 |
| PRINTING | 1.4 | 1.5 | 1.5 | 1.6 | 1.7 |
| ADHESIVES AND SEALANTS | 0.7 | 0.7 | 0.7 | 0.6 | 0.6 |
| OTHER (CLEANING AND SURFACE COATINGS) | 2.7 | 3.0 | 3.4 | 3.8 | 4.0 |
| *** TOTAL CLEANING AND SURFACE COATINGS** | 30.7 | 28.5 | 22.3 | 24.0 | 25.3 |
| **PETROLEUM PRODUCTION AND MARKETING** | | | | | |
| OIL AND GAS PRODUCTION | 32.5 | 31.5 | 32.3 | 32.2 | 31.5 |
| PETROLEUM REFINING | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| PETROLEUM MARKETING | 6.5 | 7.0 | 7.4 | 7.7 | 8.0 |
| *** TOTAL PETROLEUM PRODUCTION AND MARKETING** | 40.3 | 39.9 | 41.0 | 41.3 | 40.8 |
| **INDUSTRIAL PROCESSES** | | | | | |
| CHEMICAL | 1.8 | 2.0 | 2.2 | 2.3 | 2.4 |
| FOOD AND AGRICULTURE | 9.9 | 10.3 | 10.3 | 10.7 | 10.9 |
| MINERAL PROCESSES | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| METAL PROCESSES | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| WOOD AND PAPER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GLASS AND RELATED PRODUCTS | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| ELECTRONICS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (INDUSTRIAL PROCESSES) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| *** TOTAL INDUSTRIAL PROCESSES** | 12.4 | 13.0 | 13.2 | 13.8 | 14.2 |
| **** TOTAL STATIONARY SOURCES** | 96.3 | 94.8 | 90.6 | 93.4 | 94.8 |
| **AREA-WIDE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **SOLVENT EVAPORATION** | | | | | |
| CONSUMER PRODUCTS | 25.9 | 25.7 | 24.2 | 25.7 | 26.7 |
| ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS | 11.8 | 12.3 | 10.7 | 11.0 | 11.1 |
| PESTICIDES/FERTILIZERS | 28.4 | 26.4 | 25.4 | 24.4 | 23.8 |
| ASPHALT PAVING / ROOFING | 2.2 | 2.3 | 2.3 | 2.4 | 2.4 |
| *** TOTAL SOLVENT EVAPORATION** | 68.4 | 66.7 | 62.6 | 63.5 | 64.1 |
| **MISCELLANEOUS PROCESSES** | | | | | |
| RESIDENTIAL FUEL COMBUSTION | 6.3 | 6.4 | 6.5 | 6.6 | 6.6 |
| FARMING OPERATIONS | 57.1 | 61.0 | 64.4 | 69.0 | 72.0 |
| CONSTRUCTION AND DEMOLITION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| UNPAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| | | | | | |
|---|---|---|---|---|---|
| FUGITIVE WINDBLOWN DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FIRES | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| WASTE BURNING AND DISPOSAL | 26.7 | 26.4 | 26.1 | 25.9 | 25.7 |
| COOKING | 0.4 | 0.5 | 0.4 | 0.5 | 0.5 |
| OTHER (MISCELLANEOUS PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL MISCELLANEOUS PROCESSES** | 90.5 | 94.2 | 97.5 | 102.0 | 104.9 |
| **** TOTAL AREA-WIDE SOURCES** | 158.9 | 161.0 | 160.1 | 165.5 | 169.0 |
| **MOBILE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **ON-ROAD MOTOR VEHICLES** | | | | | |
| LIGHT DUTY PASSENGER (LDA) | 52.4 | 40.1 | 30.7 | 23.1 | 19.1 |
| LIGHT DUTY TRUCKS - 1 (LDT1) | 26.1 | 21.3 | 17.8 | 14.6 | 12.5 |
| LIGHT DUTY TRUCKS - 2 (LDT2) | 17.1 | 14.3 | 12.3 | 10.5 | 9.5 |
| MEDIUM DUTY TRUCKS (MDV) | 7.4 | 6.1 | 5.3 | 4.6 | 4.2 |
| LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1) | 7.6 | 3.4 | 2.1 | 1.6 | 1.5 |
| LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2) | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 |
| MEDIUM HEAVY DUTY GAS TRUCKS (MHDV) | 5.7 | 4.6 | 3.8 | 3.0 | 2.6 |
| HEAVY HEAVY DUTY GAS TRUCKS (HHDV) | 3.6 | 2.5 | 2.1 | 1.7 | 1.5 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1) | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2) | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV) | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 |
| HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV) | 4.1 | 4.2 | 4.0 | 3.6 | 3.3 |
| MOTORCYCLES (MCY) | 2.4 | 2.3 | 2.2 | 2.0 | 1.9 |
| HEAVY DUTY DIESEL URBAN BUSES (UB) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| HEAVY DUTY GAS URBAN BUSES (UB) | 1.1 | 1.0 | 1.0 | 1.0 | 0.9 |
| SCHOOL BUSES (SB) | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 |
| MOTOR HOMES (MH) | 0.9 | 0.9 | 0.8 | 0.7 | 0.6 |
| *** TOTAL ON-ROAD MOTOR VEHICLES** | 130.4 | 102.7 | 84.2 | 68.4 | 59.4 |
| **OTHER MOBILE SOURCES** | | | | | |
| AIRCRAFT | 11.0 | 11.8 | 12.5 | 12.9 | 13.2 |
| TRAINS | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 |
| SHIPS AND COMMERCIAL BOATS | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| RECREATIONAL BOATS | 12.2 | 10.5 | 9.3 | 8.1 | 6.7 |
| OFF-ROAD RECREATIONAL VEHICLES | 4.8 | 4.5 | 4.6 | 4.8 | 4.9 |
| OFF-ROAD EQUIPMENT | 13.3 | 11.3 | 9.9 | 9.5 | 8.0 |
| FARM EQUIPMENT | 9.1 | 8.3 | 7.6 | 6.5 | 6.0 |
| FUEL STORAGE AND HANDLING | 7.7 | 7.2 | 2.7 | 2.3 | 2.4 |
| *** TOTAL OTHER MOBILE SOURCES** | 58.8 | 54.5 | 47.4 | 44.8 | 41.9 |
| **** TOTAL MOBILE SOURCES** | 189.2 | 157.2 | 131.6 | 113.2 | 101.2 |
| | | | | | |
| | | | | | |
| **GRAND TOTAL VOC FOR SAN JOAQUIN VALLEY** | **444.4** | **413.0** | **382.4** | **372.1** | **365.0** |

## Table 3-5:
## Annual Average Oxides of Nitrogen (NOx)
## Tons per day

| STATIONARY SOURCES | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **FUEL COMBUSTION** | | | | | |
| ELECTRIC UTILITIES | 3.0 | 2.8 | 2.9 | 2.8 | 3.0 |
| COGENERATION | 11.0 | 10.4 | 9.7 | 6.2 | 6.3 |
| OIL AND GAS PRODUCTION (COMBUSTION) | 40.6 | 25.0 | 26.4 | 26.0 | 25.5 |
| PETROLEUM REFINING (COMBUSTION) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| MANUFACTURING AND INDUSTRIAL | 31.3 | 30.1 | 31.6 | 33.0 | 33.9 |
| FOOD AND AGRICULTURAL PROCESSING | 20.2 | 19.9 | 19.7 | 19.5 | 19.4 |
| SERVICE AND COMMERCIAL | 28.7 | 29.2 | 30.4 | 31.1 | 31.4 |
| OTHER (FUEL COMBUSTION) | 9.0 | 8.4 | 7.7 | 6.9 | 6.3 |
| *** TOTAL FUEL COMBUSTION** | 145.3 | 127.3 | 129.9 | 126.9 | 127.4 |
| **WASTE DISPOSAL** | | | | | |
| SEWAGE TREATMENT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LANDFILLS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| INCINERATORS | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| SOIL REMEDIATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (WASTE DISPOSAL) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL WASTE DISPOSAL** | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| **CLEANING AND SURFACE COATINGS** | | | | | |
| LAUNDERING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DEGREASING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COATINGS AND RELATED PROCESS SOLVENTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PRINTING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ADHESIVES AND SEALANTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (CLEANING AND SURFACE COATINGS) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL CLEANING AND SURFACE COATINGS** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **PETROLEUM PRODUCTION AND MARKETING** | | | | | |
| OIL AND GAS PRODUCTION | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| PETROLEUM REFINING | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| PETROLEUM MARKETING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL PETROLEUM PRODUCTION AND MARKETING** | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| **INDUSTRIAL PROCESSES** | | | | | |
| CHEMICAL | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| FOOD AND AGRICULTURE | 9.3 | 9.2 | 9.1 | 9.0 | 9.0 |
| MINERAL PROCESSES | 1.4 | 1.5 | 1.5 | 1.6 | 1.6 |
| METAL PROCESSES | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| WOOD AND PAPER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GLASS AND RELATED PRODUCTS | 12.3 | 12.3 | 11.8 | 9.9 | 10.3 |
| ELECTRONICS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (INDUSTRIAL PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL INDUSTRIAL PROCESSES** | 23.2 | 23.1 | 22.6 | 20.7 | 21.1 |
| **** TOTAL STATIONARY SOURCES** | 168.8 | 150.7 | 152.9 | 148.0 | 148.9 |

| AREA-WIDE SOURCES | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **SOLVENT EVAPORATION** | | | | | |
| CONSUMER PRODUCTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PESTICIDES/FERTILIZERS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ASPHALT PAVING / ROOFING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL SOLVENT EVAPORATION** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **MISCELLANEOUS PROCESSES** | | | | | |
| RESIDENTIAL FUEL COMBUSTION | 6.8 | 6.6 | 6.4 | 6.3 | 6.3 |
| FARMING OPERATIONS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CONSTRUCTION AND DEMOLITION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| UNPAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FUGITIVE WINDBLOWN DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FIRES | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| WASTE BURNING AND DISPOSAL | 4.6 | 4.6 | 4.5 | 4.5 | 4.5 |
| COOKING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (MISCELLANEOUS PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL MISCELLANEOUS PROCESSES** | 11.4 | 11.2 | 11.0 | 10.8 | 10.8 |
| **** TOTAL AREA-WIDE SOURCES** | 11.4 | 11.2 | 11.0 | 10.8 | 10.8 |

| MOBILE SOURCES | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **ON-ROAD MOTOR VEHICLES** | | | | | |
| LIGHT DUTY PASSENGER (LDA) | 47.2 | 37.7 | 28.2 | 21.3 | 17.5 |
| LIGHT DUTY TRUCKS - 1 (LDT1) | 28.9 | 23.8 | 18.5 | 14.4 | 12.1 |
| LIGHT DUTY TRUCKS - 2 (LDT2) | 24.7 | 20.9 | 16.9 | 13.8 | 12.0 |
| MEDIUM DUTY TRUCKS (MDV) | 11.8 | 10.2 | 8.4 | 7.0 | 6.1 |
| LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1) | 2.8 | 2.1 | 2.1 | 2.4 | 2.6 |
| LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2) | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 |
| MEDIUM HEAVY DUTY GAS TRUCKS (MHDV) | 3.0 | 2.9 | 2.6 | 2.2 | 2.0 |
| HEAVY HEAVY DUTY GAS TRUCKS (HHDV) | 5.5 | 4.7 | 3.9 | 3.0 | 2.5 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1) | 1.2 | 2.6 | 2.8 | 2.5 | 2.1 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2) | 2.2 | 2.3 | 2.1 | 1.9 | 1.6 |
| MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV) | 18.0 | 19.3 | 18.3 | 16.2 | 14.3 |
| HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV) | 86.0 | 87.9 | 81.4 | 70.9 | 61.9 |
| MOTORCYCLES (MCY) | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 |
| HEAVY DUTY DIESEL URBAN BUSES (UB) | 3.6 | 3.7 | 3.7 | 3.6 | 3.6 |
| HEAVY DUTY GAS URBAN BUSES (UB) | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 |
| SCHOOL BUSES (SB) | 2.0 | 2.2 | 2.4 | 2.4 | 2.5 |
| MOTOR HOMES (MH) | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 |
| *** TOTAL ON-ROAD MOTOR VEHICLES** | 241.1 | 224.5 | 195.6 | 165.9 | 145.1 |
| **OTHER MOBILE SOURCES** | | | | | |
| AIRCRAFT | 3.3 | 3.5 | 3.7 | 3.9 | 3.9 |
| TRAINS | 19.9 | 17.5 | 13.6 | 11.5 | 10.8 |
| SHIPS AND COMMERCIAL BOATS | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| RECREATIONAL BOATS | 2.2 | 2.5 | 3.1 | 3.3 | 3.3 |

| | | | | | |
|---|---|---|---|---|---|
| OFF-ROAD RECREATIONAL VEHICLES | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 |
| OFF-ROAD EQUIPMENT | 51.7 | 49.0 | 44.4 | 39.0 | 34.4 |
| FARM EQUIPMENT | 66.2 | 60.1 | 53.7 | 47.8 | 43.6 |
| FUEL STORAGE AND HANDLING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL OTHER MOBILE SOURCES** | 143.9 | 133.3 | 119.3 | 106.1 | 96.8 |
| **** TOTAL MOBILE SOURCES** | 385.0 | 357.9 | 314.9 | 272.1 | 242.0 |
| | | | | | |
| | | | | | |
| **GRAND TOTAL NOX FOR SAN JOAQUIN VALLEY** | **565.2** | **519.8** | **478.8** | **430.9** | **401.6** |

## Table 3-6:
## Annual Average Oxides of Sulfur (SOx)
## Tons per day

| **STATIONARY SOURCES** | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **FUEL COMBUSTION** | | | | | |
| ELECTRIC UTILITIES | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| COGENERATION | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 |
| OIL AND GAS PRODUCTION (COMBUSTION) | 7.4 | 7.9 | 8.7 | 8.7 | 8.6 |
| PETROLEUM REFINING (COMBUSTION) | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| MANUFACTURING AND INDUSTRIAL | 5.5 | 6.1 | 6.7 | 6.9 | 7.1 |
| FOOD AND AGRICULTURAL PROCESSING | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| SERVICE AND COMMERCIAL | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 |
| OTHER (FUEL COMBUSTION) | 1.2 | 1.1 | 1.1 | 1.1 | 1.2 |
| *** TOTAL FUEL COMBUSTION** | 20.3 | 21.4 | 22.8 | 23.1 | 23.3 |
| **WASTE DISPOSAL** | | | | | |
| SEWAGE TREATMENT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LANDFILLS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| INCINERATORS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOIL REMEDIATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (WASTE DISPOSAL) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL WASTE DISPOSAL** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **CLEANING AND SURFACE COATINGS** | | | | | |
| LAUNDERING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DEGREASING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COATINGS AND RELATED PROCESS SOLVENTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PRINTING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ADHESIVES AND SEALANTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (CLEANING AND SURFACE COATINGS) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL CLEANING AND SURFACE COATINGS** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **PETROLEUM PRODUCTION AND MARKETING** | | | | | |
| OIL AND GAS PRODUCTION | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| PETROLEUM REFINING | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| PETROLEUM MARKETING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL PETROLEUM PRODUCTION AND MARKETING** | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| **INDUSTRIAL PROCESSES** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| CHEMICAL | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 |
| FOOD AND AGRICULTURE | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 |
| MINERAL PROCESSES | 1.2 | 1.2 | 1.3 | 1.3 | 1.4 |
| METAL PROCESSES | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| WOOD AND PAPER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GLASS AND RELATED PRODUCTS | 4.0 | 4.1 | 4.2 | 4.4 | 4.6 |
| ELECTRONICS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (INDUSTRIAL PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL INDUSTRIAL PROCESSES** | 6.5 | 6.7 | 6.9 | 7.2 | 7.5 |
| **** TOTAL STATIONARY SOURCES** | 27.1 | 28.5 | 30.1 | 30.7 | 31.2 |
| **AREA-WIDE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **SOLVENT EVAPORATION** | | | | | |
| CONSUMER PRODUCTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PESTICIDES/FERTILIZERS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ASPHALT PAVING / ROOFING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL SOLVENT EVAPORATION** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **MISCELLANEOUS PROCESSES** | | | | | |
| RESIDENTIAL FUEL COMBUSTION | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| FARMING OPERATIONS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CONSTRUCTION AND DEMOLITION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| UNPAVED ROAD DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FUGITIVE WINDBLOWN DUST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FIRES | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| WASTE BURNING AND DISPOSAL | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| COOKING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (MISCELLANEOUS PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL MISCELLANEOUS PROCESSES** | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| **** TOTAL AREA-WIDE SOURCES** | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| **MOBILE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **ON-ROAD MOTOR VEHICLES** | | | | | |
| LIGHT DUTY PASSENGER (LDA) | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 |
| LIGHT DUTY TRUCKS - 1 (LDT1) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| LIGHT DUTY TRUCKS - 2 (LDT2) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| MEDIUM DUTY TRUCKS (MDV) | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEDIUM HEAVY DUTY GAS TRUCKS (MHDV) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HEAVY HEAVY DUTY GAS TRUCKS (HHDV) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV) | 0.2 | 0.2 | 0.2 | 0.0 | 0.0 |
| HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV) | 0.8 | 0.9 | 1.0 | 0.1 | 0.1 |
| MOTORCYCLES (MCY) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| | | | | | |
|---|---|---|---|---|---|
| HEAVY DUTY DIESEL URBAN BUSES (UB) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HEAVY DUTY GAS URBAN BUSES (UB) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SCHOOL BUSES (SB) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MOTOR HOMES (MH) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL ON-ROAD MOTOR VEHICLES** | 1.6 | 1.8 | 1.7 | 0.6 | 0.6 |
| **OTHER MOBILE SOURCES** | | | | | |
| AIRCRAFT | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 |
| TRAINS | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| SHIPS AND COMMERCIAL BOATS | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| RECREATIONAL BOATS | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 |
| OFF-ROAD RECREATIONAL VEHICLES | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OFF-ROAD EQUIPMENT | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| FARM EQUIPMENT | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| FUEL STORAGE AND HANDLING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL OTHER MOBILE SOURCES** | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 |
| **** TOTAL MOBILE SOURCES** | 2.7 | 3.0 | 2.9 | 1.8 | 1.8 |
| | | | | | |
| | | | | | |
| **GRAND TOTAL SOX FOR SAN JOAQUIN VALLEY** | **30.2** | **31.8** | **33.4** | **32.8** | **33.3** |

**Table 3-7:**
**Annual Average Particulate Matter < 10 Microns (PM10)**
**Tons per day**

| **STATIONARY SOURCES** | | | | | |
|---|---|---|---|---|---|
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **FUEL COMBUSTION** | | | | | |
| ELECTRIC UTILITIES | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 |
| COGENERATION | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 |
| OIL AND GAS PRODUCTION (COMBUSTION) | 1.8 | 1.9 | 2.1 | 2.1 | 2.0 |
| PETROLEUM REFINING (COMBUSTION) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| MANUFACTURING AND INDUSTRIAL | 0.7 | 0.8 | 0.8 | 0.8 | 0.9 |
| FOOD AND AGRICULTURAL PROCESSING | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| SERVICE AND COMMERCIAL | 1.1 | 1.2 | 1.2 | 1.3 | 1.3 |
| OTHER (FUEL COMBUSTION) | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 |
| *** TOTAL FUEL COMBUSTION** | 6.6 | 6.9 | 7.2 | 7.3 | 7.3 |
| **WASTE DISPOSAL** | | | | | |
| SEWAGE TREATMENT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LANDFILLS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| INCINERATORS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOIL REMEDIATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (WASTE DISPOSAL) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL WASTE DISPOSAL** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **CLEANING AND SURFACE COATINGS** | | | | | |
| LAUNDERING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DEGREASING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COATINGS AND RELATED PROCESS SOLVENTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| | | | | | |
|---|---|---|---|---|---|
| PRINTING | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| ADHESIVES AND SEALANTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (CLEANING AND SURFACE COATINGS) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL CLEANING AND SURFACE COATINGS** | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| **PETROLEUM PRODUCTION AND MARKETING** | | | | | |
| OIL AND GAS PRODUCTION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PETROLEUM REFINING | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| PETROLEUM MARKETING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL PETROLEUM PRODUCTION AND MARKETING** | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| **INDUSTRIAL PROCESSES** | | | | | |
| CHEMICAL | 1.7 | 2.0 | 2.2 | 2.4 | 2.6 |
| FOOD AND AGRICULTURE | 9.9 | 10.0 | 10.1 | 10.3 | 10.5 |
| MINERAL PROCESSES | 5.3 | 5.6 | 5.7 | 6.0 | 6.1 |
| METAL PROCESSES | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| WOOD AND PAPER | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| GLASS AND RELATED PRODUCTS | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 |
| ELECTRONICS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHER (INDUSTRIAL PROCESSES) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| *** TOTAL INDUSTRIAL PROCESSES** | 18.0 | 18.7 | 19.3 | 20.0 | 20.5 |
| **** TOTAL STATIONARY SOURCES** | 24.7 | 25.8 | 26.6 | 27.4 | 28.0 |
| **AREA-WIDE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **SOLVENT EVAPORATION** | | | | | |
| CONSUMER PRODUCTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PESTICIDES/FERTILIZERS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ASPHALT PAVING / ROOFING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL SOLVENT EVAPORATION** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **MISCELLANEOUS PROCESSES** | | | | | |
| RESIDENTIAL FUEL COMBUSTION | 11.8 | 12.0 | 12.3 | 12.5 | 12.6 |
| FARMING OPERATIONS | 80.2 | 79.6 | 78.9 | 78.3 | 77.8 |
| CONSTRUCTION AND DEMOLITION | 11.6 | 12.1 | 14.2 | 15.0 | 21.6 |
| PAVED ROAD DUST | 46.2 | 50.7 | 55.1 | 59.8 | 63.2 |
| UNPAVED ROAD DUST | 34.6 | 34.9 | 35.3 | 35.6 | 35.8 |
| UNPAVED TRAFFIC AREAS | 7.3 | 7.2 | 7.2 | 7.1 | 7.1 |
| FUGITIVE WINDBLOWN DUST | 51.1 | 50.7 | 50.3 | 49.8 | 49.6 |
| FIRES | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| WASTE BURNING AND DISPOSAL | 40.1 | 39.6 | 39.2 | 38.9 | 38.6 |
| COOKING | 1.9 | 2.0 | 2.1 | 2.2 | 2.2 |
| OTHER (MISCELLANEOUS PROCESSES) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL MISCELLANEOUS PROCESSES** | 285.0 | 289.1 | 294.7 | 299.3 | 308.7 |
| **** TOTAL AREA-WIDE SOURCES** | 285.0 | 289.1 | 294.7 | 299.3 | 308.7 |
| **MOBILE SOURCES** | | | | | |
| *SUMMARY CATEGORY NAME* | 1999 | 2002 | 2005 | 2008 | 2010 |
| **ON-ROAD MOTOR VEHICLES** | | | | | |
| LIGHT DUTY PASSENGER (LDA) | 1.4 | 1.5 | 1.6 | 1.8 | 1.8 |
| LIGHT DUTY TRUCKS - 1 (LDT1) | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 |

| | | | | | |
|---|---|---|---|---|---|
| LIGHT DUTY TRUCKS - 2 (LDT2) | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 |
| MEDIUM DUTY TRUCKS (MDV) | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 |
| LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEDIUM HEAVY DUTY GAS TRUCKS (MHDV) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HEAVY HEAVY DUTY GAS TRUCKS (HHDV) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV) | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 |
| HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV) | 2.3 | 2.1 | 1.9 | 1.6 | 1.5 |
| MOTORCYCLES (MCY) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HEAVY DUTY DIESEL URBAN BUSES (UB) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| HEAVY DUTY GAS URBAN BUSES (UB) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SCHOOL BUSES (SB) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| MOTOR HOMES (MH) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL ON-ROAD MOTOR VEHICLES** | 6.0 | 6.1 | 6.2 | 6.2 | 6.2 |
| **OTHER MOBILE SOURCES** | | | | | |
| AIRCRAFT | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| TRAINS | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 |
| SHIPS AND COMMERCIAL BOATS | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| RECREATIONAL BOATS | 0.6 | 0.6 | 0.8 | 0.9 | 0.9 |
| OFF-ROAD RECREATIONAL VEHICLES | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OFF-ROAD EQUIPMENT | 3.2 | 3.1 | 2.9 | 2.6 | 2.4 |
| FARM EQUIPMENT | 4.2 | 3.9 | 3.6 | 3.2 | 3.0 |
| FUEL STORAGE AND HANDLING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *** TOTAL OTHER MOBILE SOURCES** | 8.9 | 8.6 | 8.2 | 7.6 | 7.1 |
| **** TOTAL MOBILE SOURCES** | 14.9 | 14.7 | 14.5 | 13.8 | 13.4 |
| | | | | | |
| | | | | | |
| **GRAND TOTAL PM10 FOR SAN JOAQUIN VALLEY** | **324.7** | **329.5** | **335.8** | **340.5** | **350.1** |

The District performed an analysis indicating that all pre-baseline ERCs are included in growth. The analysis also showed that growth in permitted emission from power plants between 1999 and 2002 will need to be added to the baseline inventories in the following amounts: NOx - 0.6 t/d, PM10 - 0.2 t/d, VOCs - 0.1 t/d. These amounts alter the baseline inventories and then will be grown and controlled in accordance with the factors contained in the inventory for the affected source categories. Since the baseline and future years change at a parallel rate and the amounts are small, there will be no impact to the 5% calculations and to the attainment demonstration when these changes are incorporated into the inventory.

**Table 3-8**
**Summary of Annual Ammonia Emissions**
**(tons per day)**

| Source Category | 1999 | 2002 | 2005 | 2008 | 2010 |
|---|---|---|---|---|---|
| Burning – Ag & Timber | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Burning – Residential | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Composting | 14.8 | 16.0 | 17.3 | 18.6 | 19.4 |
| Domestic | 5.1 | 5.4 | 5.9 | 6.3 | 6.6 |
| Fertilizer Application | 15.3 | 15.1 | 15.0 | 14.8 | 14.8 |
| Landfill | 2.5 | 2.7 | 2.8 | 3.0 | 3.1 |
| Beef | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| Dairy | 216.4 | 240.7 | 262.3 | 285.7 | 302.6 |
| Poultry | 46.3 | 46.3 | 46.3 | 46.3 | 46.3 |
| Other Livestock | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 |
| Motor Vehicles | 5.1 | 5.7 | 6.2 | 6.8 | 7.1 |
| Native | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| POTW (Sewage Treatment) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Soil – Natural and Ag | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| **TOTAL** | **371.0** | **397.4** | **421.4** | **447.1** | **465.4** |

The ARB provided a winter biogenic inventory indicating that biogenic VOC emissions are 22 tons per day. No detailed breakdown was provided for biogenic species.

# CONTROL STRATEGY

## INTRODUCTION

The complex nature of the PM10 pollutant in the SJVAB requires a multi-faceted control strategy that encompasses a wide variety of controls on many different sources of emissions. This chapter describes the type of controls required for the SJVAB to attain the air quality standard for PM10. To facilitate a better understanding of the information found in this chapter, key air quality terms are identified as follows:

- control strategy is the combination of all actions taken by all agencies with authority to control air pollutant emissions that affect attainment of the PM10 standard.

- control measure is a general term that applies to an individual control strategy. The District implements control measures with "regulations", "rules" and "programs. In addition, control measures that rely on voluntary participation are usually implemented as programs; examples include incentive programs and education programs.

- regulations are groups of rules that have some common element, such as prohibitory rules (Regulation IV), and fugitive dust rules (Regulation VIII). The state and federal government also adopt rules, regulations, and programs within their authority.

- BACM and BACT are best available control measures and best available control technology, respectively. BACM and BACT are defined as the maximum degree of emission reduction considering technical and economic feasibility and environmental impacts of the control, and must be implemented independent of attainment requirements.

One of the most important elements of control strategies found in a serious PM10 nonattainment area is the requirement for the regulating air quality control district to demonstrate that best available control measures (BACM) and best available control technologies (BACT) have been implemented on all significant sources of PM10 and PM10 precursors. The emission inventory and the chemical speciation of PM10 samples collected at sites throughout the SJVAB provide the starting point for the BACM/BACT determination. A discussion of the significant source determination is located later in this chapter.

Appendix G contains the BACM/BACT Demonstration prepared for the PM10 Plan, which includes the following: analysis of rules that regulate significant source categories, proposed agricultural conservation management practices (CMP) program, fugitive PM10 prohibition rules under Regulation VIII, and residential wood combustion. The rules, regulations, and control measures listed below reflect the results of this demonstration. In most cases, the existing level of control meets the BACM/BACT definition, but in other cases, changes were identified that were needed to bring the control up to the BACM/BACT level. The proposed changes are listed as new commitments in this chapter.

The District, the ARB, and the EPA have adopted and implemented numerous measures to control PM10 and PM10 precursors. While these measures have reduced many sources of emissions, they were not enough to bring the region into attainment by the December 31, 2001 deadline for serious nonattainment areas. This PM10 Plan control strategy relies on continued implementation of rules and regulations now in effect, new regulations currently under development, and additional control measures needed to attain the PM10 standards at the earliest practicable date.

## DISTRICT APPROACH TO ATTAINMENT

Attainment will require substantial reductions in directly emitted PM10 pollutants and PM10 precursors. During the worst episodes that occur during the winter, secondary nitrate is the largest contributor to the problem followed by geologic material and carbon from wood combustion and motor vehicles. Modeling using UAM-Aero indicates that controls of oxides of nitrogen (NOx controls) are the most effective at reducing nitrate concentrations throughout the air basin. Fugitive dust controls on activities in the urban area are most effective at reducing geologic dust in the areas with the highest readings, although reductions in rural areas may be important to protect people living in proximity to large sources. Controls on residential wood burning will result in substantial reductions in carbon particles in urban areas with high concentrations of wood burning devices. The state and federal motor vehicle program and diesel fuel regulations will also significantly reduce NOx, volatile organic compounds (VOC), diesel particulate and oxides of sulfur (SOx) emissions. Although modeling indicates that VOC controls do not have a significant effect in reducing secondary nitrate, existing and planned regulations on VOC sources adopted for ozone will result in some air quality benefit due to reduction in condensable PM10 emissions from these organic compounds.

The District's control strategy must address the basin's 24-hour and annual PM10 problems. The annual emissions are dominated by fugitive PM10. Year round controls are needed on significant fugitive PM10 sources such as construction, paved and unpaved roads, open areas, and agricultural operations to attain the annual standard. Episodic controls on sources such as open burning, prescribed fire, and residential wood combustion are needed to avoid violations of the 24-hour standard during periods when dispersion is poor.

Many of the controls needed to attain the PM10 standard have already been adopted as rules and regulations by the District, the state, local agencies, and the federal government. Some of these regulations are fully implemented while others that rely on equipment/vehicle turnover take many years to make a large impact. The new control measure commitments contained in this plan include changes related to several different requirements. Some upgrades are the result of the District's BACM/BACT demonstration. For example, changes to Regulation VIII were identified in the BACM demonstration. Other upgrades reflect corrective actions taken to comply with prior EPA deficiencies on portions of adopted District rules. For example, Rule 4901 (Residential Wood Burning) falls under this category. The final category of changes includes controls that are proposed to achieve the PM10 standard as expeditiously as practicable. These include new control measures proposed by the state and federal government as well as District stationary source controls identified as all feasible control measures required by the California Clean Air Act.

While some strategies contained in this PM10 Plan do not claim emission reductions, they provide critical support for pursuing difficult and sometimes contentious regulations. For example, the District's public education program increases support for air quality programs and influences citizens to take personal actions to reduce emissions on a voluntary basis. A second example is the District's environmental review program that educates the public and decision makers on the effect of land use decisions on air quality and proposes ways that developers can mitigate emissions.

**Expeditious Attainment of the PM10 Standards**

The PM10 Plan provides for attainment of the PM10 standards by 2010. To show that this date represents expeditious attainment, the District must demonstrate that an earlier attainment date is not possible. The attainment strategy primarily relies upon reductions in directly emitted PM10 and NOx. The three most significant source categories of directly emitted PM10 are addressed by Regulation VIII Fugitive PM10 Prohibitions, the Agricultural Conservation Management Practices Program, and Rule 4901 – Residential Wood Combustion. These rules and regulations will be fully implemented between 2003 and 2006. Most of the reductions from these measures will be obtained in the first few years of implementation. Exceptions are actions included in these rules and regulations that accrue benefits over time like unpaved road paving programs that add new paving each year and changeout of non-EPA certified woodburning devices at the time of sale. NOx reductions are obtained during the entire 2003-2010 period, but stationary source measures under the District's authority are nearly all implemented prior to 2006. Later stationary source measures have a high degree of uncertainty in their emission reductions and typically need additional emission inventory work prior to implementation. The bulk of the emission reductions scheduled for after 2006 are from adopted and committed state and federal mobile source measures that rely on fleet turnover at purchase of the vehicle or equipment. These regulations cannot be moved forward by the District, and because mobile sources represent a large part of the NOx inventory, attainment cannot be projected until 2010.

The monitoring sites with the highest design values in Fresno and Bakersfield attain the annual and 24-hour standards in 2010, but other SJVAB nonattainment sites with lower design values are expected to attain the standard earlier. Sites currently in attainment of the standard will benefit from the attainment strategy and are expected to stay well below the annual and 24-hour PM10 standards.

## OVERVIEW OF CONTROL MEASURES IMPLEMENTED

### District PM10 and PM10 Precursor Rules

The District has adopted numerous rules that reduce emissions of PM10 and the precursors to PM10, which include NOx, SOx and VOC. Furthermore, certain precursor pollutants involved in the formation of ammonium nitrate are critical to the attainment strategy. Table 4-1 below lists the rules adopted or amended since 1990:

**Table 4-1:**
**PM10 and PM10 Precursor Rules Adopted and/or Amended between 1990-2002**

| Rule Number | Rule Title | Rule Number | Rule Title |
|---|---|---|---|
| 4101 | Visible Emissions | 4102 | Nuisance |
| 4103 | Open Burning | 4104 | Reduction of Animal Matter |
| 4105 | Commercial Offsite Multiuser Hazardous Waste and Nonhazardous Waste Disposal Facilities | 4106 | Prescribed Burning and Hazard Reduction Burning |
| 4201 | Particulate Matter Concentration | 4202 | Particulate Matter Emission Rate |
| 4203 | Particulate Matter Emissions from Incineration of Combustible Refuse | 4301 | Fuel Burning Equipment |
| 4302 | Incinerator Burning | 4303 | Orchard Heaters |
| 4304 | Equipment Tuning Procedure for Boilers, Steam Generators, and Process Heaters | 4305 | Boiler, Steam Generators, and Process Heaters |
| 4311 | Flares | 4313 | Lime Kilns |
| 4351 | Boilers, Steam Generators, and Process Heaters - RACT | 4352 | Solid Fuel Fired Boilers, Steam Generators, and Process Heaters |
| 4354 | Glass Melting Furnaces | 4401 | Steam-enhanced Crude Oil Production Well Vents |
| 4402 | Crude Oil Production Sumps | 4403 | Components Serving Light Crude Oil or Gases at Light Crude Oil and Gas Production Facilities and Components at Natural Gas Processing Facilities |

**Table 4-1:
PM10 and PM10 Precursor Rules Adopted and/or Amended between 1990-2002, Continued**

| | | | |
|---|---|---|---|
| 4404 | Heavy Oil Test Station – Kern County | 4405 | NOX Emissions from Existing Steam Generators Used in Thermally Enhanced Oil Recovery – Central and Western Kern County Fields |
| 4406 | Sulfur Compounds from Oil-Field Steam Generators – Kern County | 4407 | In-situ Combustion Well Vents |
| 4408 | Glycol Dehydration Systems | 4451 | Valves, Pressure Relief Valves, Flanges, Threaded Connections and Process Drains at Petroleum Refineries and Chemical Plants |
| 4452 | Pump and Compressor Seals at Petroleum Refineries and Chemical Plants | 4453 | Refinery Vacuum Producing Devices or Systems |
| 4454 | Refinery Process Unit Turnaround | 4601 | Architectural Coatings |
| 4602 | Motor Vehicle and Mobile Equipment Refinishing Operations | 4603 | Surface Coating of Metal Parts and Products |
| 4604 | Can and Coil Coating Operations | 4605 | Aerospace Assembly and Component Manufacturing Operations |
| 4606 | Wood Products Coating Operations | 4607 | Graphic Arts |
| 4610 | Glass Coating Operations | 4621 | Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants |
| 4622 | Transfer of Gasoline into Vehicle Fuel Tanks | 4623 | Storage of Organic Liquids |
| 4624 | Organic Liquid Loading | 4625 | Wastewater Separators |
| 4641 | Cutback, Slow Cure, and Emulsified Asphalt Paving and Maintenance Operations | 4642 | Solid Waste Disposal Sites |
| 4651 | Volatile Organic Compound Emissions from Decontamination of Soil | 4652 | Coatings and Ink Manufacturing |
| 4653 | Adhesives | 4661 | Organic Solvents |

**Table 4-1: PM10 and PM10 Precursor Rules Adopted and/or Amended between 1990-2002, Continued**

| | | | |
|---|---|---|---|
| 4662 | Organic Solvent Degreasing Operations | 4663 | Organic Solvent Cleaning, Storage and Disposal |
| 4672 | Petroleum Solvent Dry Cleaning | 4681 | Rubber Tire Manufacturing |
| 4682 | Polystyrene Foam, Polyethylene and Polypropylene Manufacturing | 4684 | Polyester Resin Operations |
| 4691 | Vegetable Oil Processing | 4692 | Commercial Charbroiling |
| 4693 | Bakery Ovens | 4701 | Stationary Internal Combustion Engines - RACT |
| 4703 | Stationary Gas Turbines | 4801 | Sulfur Compounds |
| 4802 | Sulfuric Acid Mist | 4901 | Residential Wood Burning |
| 4902 | Residential Water Heaters | | |

**District Fugitive PM10 and Burning Rules**

The District has adopted and amended rules that reduce emissions of directly emitted PM10 from all significant sources. The rules are summarized below.

Fugitive PM10 Prohibitions

Regulation VIII (Fugitive PM10 Prohibitions) is a series of rules aimed at reducing fugitive PM10 emissions. Sources regulated under these rules include: construction, demolition, extraction, excavation, earthmoving activities, bulk materials, landfill disposal sites, carryout and trackout, open areas, paved and unpaved roads, unpaved vehicle/equipment traffic areas, and agricultural sources. Regulation VIII was adopted in 1993 and was revised in 1994, 1996, and 2001. Regulation VIII will be discussed in more detail later in this chapter.

Residential Wood Combustion

Rule 4901 (Residential Wood Combustion), seeks to reduce emissions from fireplaces, wood and pellet stoves, and other sources of wood combustion from residential sources. This rule was adopted in 1993 and is currently being revised to implement BACM, and will be discussed later in this chapter.

Burn Rules and Allocation System

Rule 4103 (Open Burning) and Rule 4106 (Prescribed Burning and Hazard Reduction Burning), regulate and coordinate the use of burning while trying to minimize smoke impacts on the public. Rule 4103 was adopted in 1992 and was amended in 1992, 1993, and 2001, while Rule 4106 was adopted in 2001. The 2001 action for both rules included the use of a burn allocation system that is based on predicted meteorological conditions, the total number of burns conducted, and the potential impacts to the population and monitors. The EPA has approved these two rules as BACM.

### State Control Measures

The ARB has adopted numerous regulations affecting sources under their regulatory authority. The Bureau of Automotive Repair (BAR) has responsibility for vehicle inspection and maintenance programs.

**Table 4-2**
**Control Measures Already Adopted by ARB and BAR**

| Control Measure Adopted by ARB and BAR | Adoption Date |
|---|---|
| M1: Light-duty vehicle scrappage | 1998 |
| M2: Low Emission Vehicle II program | 1998 |
| M3: Medium-duty vehicles | 1995 |
| M4: Incentives for clean engines (Moyer Program) | 1999 |
| M5: California heavy-duty diesel vehicle standards | 1998 |
| M8: Heavy-duty gasoline vehicle standards | 1995 |
| M9: CA heavy-duty off-road diesel engine standards | 2000 |
| M11: CA large off-road gas/LPG engine standards | 1998 |
| CP2: Consumer products mid-term measures | 1997/1999 |
| CP3: Aerosol paint standards | 1995/1998 |
| Enhanced I/M (Smog Check II) BAR administered program | 1982/1994 |
| Clean fuels measures | Multiple |
| Marine pleasurecraft (reductions beyond M16) | 1998/2001 |
| Motorcycle Standards | 1998 |
| Urban transit buses | 2000 |
| Enhanced vapor recovery program | 2000 |
| Medium/heavy-duty gasoline standards (beyond M8) | 2000 |
| 2007 Heavy-duty diesel truck standards (beyond M5 and M6) | 2001 |
| Small off-road engine standard revisions | 1998 |

### Federal Control Measures

The EPA has adopted numerous regulations affecting sources regulated under their jurisdiction. Table 4-3 lists those control measures adopted by the EPA.

**Table 4-3**
**Control Measures Adopted by the EPA**

| Control Measure | Adoption Date |
|---|---|
| M6: National heavy-duty diesel vehicle standards | 1998 |
| M10: National heavy-duty off-road diesel engine standards | 1998 |
| M12: National large off-road gas/LPG engine standards | 2002 |
| M13: Marine vessel standards | 1999 |
| M14: Locomotive engine standards | 1997 |
| M16: Marine pleasurecraft standards | 1996 |
| 2007 Heavy-duty diesel truck standards (beyond M5 and M6) | 2001 |

## EMISSIONS REDUCTIONS FROM ALL ADOPTED CONTROL MEASURES

The rules and regulations adopted by the District, ARB, BAR, and EPA, have provided substantial emissions reductions in the past twelve years. Table 4-4 shows the absolute and percentage change in the emission inventory from 1990 to 2001.

**Table 4-4**
**Historical Emissions Inventory Reductions in the SJVAB, 1990-2001**

| Pollutant | Annual Emissions by Pollutant (tpd)* | | Tons Reduced | % Decrease |
|---|---|---|---|---|
| | 1990 | 2001 | | |
| NOx | 796 | 547 | 249 | 31 |
| VOC | 625 | 472 | 153 | 24 |
| PM10 | 450 | 465 | -15 | -3 |
| SOx | 86 | 46 | 40 | 47 |

*Emission figures were obtained from ARB's website - www.arb.ca.gov.

As shown in the table above, emissions in the SJVAB have seen substantial decreases during the last decade. The PM10 inventory shown in the table has not been updated with changes that will be implemented with this PM10 Plan. The changes will impact both recent and past inventories due to changes in emission factors and activity data. The 2002 PM10 inventory used for this Plan totals 329.5 tons per day. An updated 1990 PM10 inventory is not available at the time of this writing to provide a valid comparison. One reason for the apparent increase in growth in PM10 in the mid-1990s is that a significant new emissions inventory category, prescribed burning, totaling approximately 23 tons per day, was added to the emissions inventory in the late 1990s and was not back cast into prior year inventories. With that correction, the PM10 inventory will show a small decline during that period. Regardless, PM10 reductions have been difficult to achieve and maintain. A large fraction of PM10 sources are area-wide sources whose emissions are directly related to growth in population and vehicle miles traveled. The two sources, with the highest growth within the time period of 1990-2001, are residential wood combustion and paved road dust. The current residential wood combustion rule contains a voluntary curtailment program that achieves limited reductions and no measures to reduce the number of old high emitting wood stoves and new woodburning devices in the Valley. The paved road dust emission category has been impacted by rapid increases in VMT in the Valley. These factors have been taken into account when developing the control strategy for this Plan.

## CURRENT RULEMAKING CALENDAR

The District has several rules currently under development. These rules were originally included as part of the District's ozone strategy, but also reduce PM10 and will aid the District in attaining the NAAQS for PM10. Table 4-5 lists the rules that are currently under development.

**Table 4-5**
**District Rules Currently Under Development**

| Rule | Pollutant | Category | Adoption Date (Quarter/Yr) | Compliance Date(s) (Quarter/Yr) |
|---|---|---|---|---|
| 4306 | NOX | Boilers, Steam Generators, and Process Heaters | 3Q/03 | 2Q/07 |
| 4403 & 4455 | VOC | Fugitives from Oil and Gas Facilities, and Refinery & Chemical Plants | 1Q/04 | 1Q/05 |
| 4604 | VOC | Can and Coil Coatings | 4Q/03 | 4Q/04 |
| 4702 | NOX | Stationary Spark Ignited IC Engines | 3Q/03 | 2Q/07 |
| 9200-9260 (New) | NOX | Amendments to Regulation IX (Mobile Sources) | 2Q/04 | 4Q/04 |

Rule 4306 – Boilers, Steam Generators and Process Heaters

*REASON FOR CONTROL MEASURE:* Rule 4306 is a commitment in the Ozone ROP. This commitment intended to reduce NOx emissions and to prevent any increase in carbon monoxide (CO) emissions from boilers, process heaters, and steam generators.

*AFFECTED SOURCES:* The measure would affect any new or existing boiler, steam generator, and/or process heater with a rated heat input capacity greater than 5 million Btu per hour. Facilities with units that are subject to this control measure represent a wide range of industries, including but not limited to medical facilities, educational institutions, office buildings, prisons, military facilities, hotels, and industrial facilities (including agricultural processing facilities). All units that are subject to this control measure are already required by the District to have permits to operate. Due to the diversity of industries, units in this source category may be located throughout the eight (8) county area of the SJVAB. Based on population and job-base, there may be more units located in urban and suburban settings.

*DESCRIPTION:* Combustion modifications appropriate for small boilers, steam generators, and process heaters include low excess air, low or ultra-low NOx burners, water/steam injection, and flue gas recirculation (FGR). Post-combustion controls can include the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) treatment of the exhaust stream.

*IMPLEMENTATION SCHEDULE:* Adoption of Rule 4306 is scheduled for the third quarter of 2003, and full implementation is scheduled for the second quarter in 2007.

*EMISSIONS AND EMISSIONS REDUCTIONS:* Total NOX emissions from sources subject to Rule 4306 are estimated to be 14.2 tons per day in 2007. Upon full implementation of Rule 4306, 7.9 tons per day of NOX reductions is anticipated.

Rule 4403 – Oil and Gas Fugitives

*REASON FOR CONTROL MEASURE:* Rule 4403 is a commitment in the Ozone ROP, and would reduce fugitive VOC emissions from crude oil and gas production operations and natural gas processing plants.

*AFFECTED SOURCES:* Rule 4403 applies to business establishments with Standard Industry Code (SIC) 1311 (crude Oil and Natural gas) and SIC 1321 (Natural Gas Liquids). There are approximately 200 businesses in the San Joaquin Valley that are potentially subject to Rule 4403. The California Department of Oil, Gas, and Geothermal Resources Report shows approximately 105 oil and/or gas production fields in the San Joaquin Valley. The District's permit database indicates eight permitted natural gas processing plants.

*DESCRIPTION:* Crude oil and gas production facilities and natural gas processing facilities contain a large number and different types of components such as flanges, valves, fittings, threaded connections, hatch, packing, sealing mechanism, seal fluid system, sight glass, meter, pressure relief valves, pumps, and compressors. Leakage of fluids or gases from these components can be expected to occur during process and transfer operations, causing fugitive VOC emissions. The actual percentage of leaking components for most of these facilities may be ~~is~~ small, but due to the large number of components the fugitive VOC emissions from leaking components, in aggregate, could be significant.

Possible controls include lowering the gaseous leak threshold of 10,000 ppmv, eliminating some existing exemptions, improving the existing inspection and repair programs by increasing the frequency of inspection, and shortening the repair period for leaking components and replacing frequently leaking components with Best Available Control Technology.

*IMPLEMENTATION SCHEDULE:* Rule adoption is scheduled for the first quarter of 2004. Full implementation is scheduled for the first quarter of 2005.

*EMISSIONS AND EMISSIONS REDUCTIONS:* Total VOC emissions from sources subject to Rule 4403 are estimated to be 10.6 tons per day in 2005. Upon full implementation of Rule 4403 in 2005, 4.8 tons per day of VOC reductions is anticipated.

Rule 4455 – Oil and Gas Fugitives from Petroleum Refineries and Chemical

*REASON FOR CONTROL MEASURE:* Rule 4455 is a commitment in the Ozone ROP. Rule 4455 would replace Rules 4451 and 4452, and it would reduce fugitive VOC emissions from leaking components in petroleum refining and chemical manufacturing plants by strengthening and expanding the requirements in existing Rules 4451 and 4452.

*AFFECTED SOURCES:* Rule 4455 would apply to businesses with Standard Industry Code (SIC) 2911 (Petroleum Refining) and SIC 286 (Industrial Organics).

There are four petroleum refineries and one gas liquids processing facility that would be subject to Rule 4455. No chemical plant currently operates in the San Joaquin Valley.

*DESCRIPTION:* Petroleum facilities, gas liquids processing facilities, and chemical plants contain a large number and different types of components such as flanges, valves, threaded connections, pressure relief valves, process drains, pump seals, compressor seals, and seal fluid systems. Leakage of fluids or gases from these components can be expected to occur during process and transfer operations, causing fugitive VOC emissions. The actual percentage of leaking components for most of these facilities may be small, but due to the large number of components the fugitive VOC emissions from leaking components, in aggregate, could be significant.

In general, the state RACT/BARCT and other air districts' rules establish lower leak thresholds, require operators to conduct more frequent inspections of components, and provide shorter periods to repair leaking components than currently allowed in Rules 4451 and 4452. Rules 4451 and 4452 could be made more effective by implementing a rigorous leak detection and repair program and by requiring BACT equipment to replace or retrofit frequently leaking devices.

*IMPLEMENTATION SCHEDULE:* Rule adoption is scheduled for the first quarter of 2004. Full implementation is scheduled for the first quarter of 2005.

*EMISSIONS AND EMISSIONS REDUCTIONS:* Total VOC emissions from sources subject to Rule 4455 are estimated to be 0.5 tons per day in 2005. Upon full implementation of Rule 4455, 0.2 tons per day of VOC reductions is anticipated.

<u>Rule 4604 – Can and Coil Coatings</u>

*REASON FOR CONTROL MEASURE:* Amendments to Rule 4604 is a commitment in the Ozone ROP that would reduce VOC emissions from can and coil coating operations.

*AFFECTED SOURCES:* Eight of the affected sources are located in the northern part of the District, one is located in the central part and none in the southern part. There is one additional source in the north that has active permits although the facility is closed. All except one of the active facilities manufacture food cans. The remaining facility produces 55-gallon steel drums, most of which are used in the food industry. There are no coil coating operations in the District at this time.

*DESCRIPTION:* This control measure is intended to reduce VOC emissions from can and coil coating operations. These units are currently subject to District permitting requirements and Rule 4604 (Can and Coil Coating Operations) for VOC control. Effective means of controlling VOC emissions are the use of compliant coatings and the use of a VOC emission control system.

The choice of coating used by a can/drum manufacturer is driven by the buyer of the can or drum. For some customers, only solvent-based coatings meet their performance needs. Even if a customer could be persuaded to consider a different coating, the testing necessary to approve the change takes 18-24 months to complete. Accordingly, most sources subject to this rule use emission control devices to meet VOC emission limits, rather than using rule-compliant coatings.

*IMPLEMENTATION SCHEDULE:* The amendments to Rule 4604 is expected to be approved in the fourth quarter of 2003, with full implementation scheduled for the fourth quarter of 2004.

*EMISSIONS AND EMISSIONS REDUCTIONS:* Total VOC emissions from sources subject to Rule 4604 are estimated to be 4.6 tons per day in 2005. Upon full implementation, 0.3 tons per day of VOC reductions is anticipated.

<u>Rule 4702 – Stationary Internal Combustion (IC) Engines</u>

*REASON FOR CONTROL MEASURE:* Rule 4702 is a commitment in the Ozone ROP and is intended to reduce NOx emissions from stationary, spark-ignited IC engines.

*AFFECTED SOURCES:* The number of permitted IC engines in the SJVAB is estimated to be approximately 1,700 (excluding portable engines). Due to their utility, these engines are used throughout the San Joaquin Valley in almost every industry regulated by the District. IC engines are used to power machinery for electricity generation, oil production, manufacturing, food and fiber processing, and for commercial/institutional applications. In 1996, the last year for which data are available, approximately 62 percent of permitted engines were located in Kern and Tulare Counties, 19 percent in Fresno, Kings, and Madera Counties, and 19 percent in Merced, San Joaquin, and Stanislaus Counties.

*DESCRIPTION:* The District's existing Rule 4701 reduces emissions from stationary IC engines by placing NOx emissions limits on their operation. Further reductions can be achieved by increasing the stringency of NOx emission limits to meet recently adopted Best Available Retrofit Control Technology (BARCT) standards and by making the standards applicable to certain engines now exempted from the rule.

*IMPLEMENTATION SCHEDULE:* Rule adoption is scheduled for the third quarter of 2003, with full implementation in the second quarter of 2007.

*EMISSIONS AND EMISSIONS REDUCTIONS:* Total NOX emissions from sources subject to Rule 4702 are estimated to be 25.6 tons per day in 2007. Upon full implementation, 1.8 tons per day of NOX reductions is anticipated.

<u>Regulation IX – Mobile Sources</u>

*REASON FOR CONTROL MEASURE:* The California Clean Air Act requires Districts to develop ambient air quality standard attainment plans that consider "the full spectrum of emission sources and focus particular attention on reducing emissions from transportation and area-wide emission sources." (Health and Safety

Code, Section 40910). In particular, Districts responsible for air basins designated as having "serious," "severe," or "extreme" air pollution, "shall, to the extent necessary to meet the requirements of the plan,…" include in their attainment plans "[m]easures to achieve the use of a significant number of low-emission motor vehicles by operators of motor vehicle fleets." [Health and Safety Code section 40919(a)(4)]. Thus although the CARB is responsible for setting vehicle emission standards, Districts such as the SJVUAPCD have the authority to ensure that those standards are met. Regulation IX (Mobile Sources), which is currently under development, represents the District's emerging program for controlling mobile source emissions.

*AFFECTED SOURCES:* The rules would apply to publicly-owned fleets, and could also apply to privately owned fleets providing contracted services to government (e.g., waste haulers). Fleet exemptions that could be implemented as part of the rule include military, public safety, and law enforcement vehicles, vehicles operated at locations where clean fuels are not readily available, and small fleets whose size falls below a threshold (e.g., fleets with 15 vehicles or less might be exempt). The District estimates that public agencies in the SJVAB operate a substantial number of light-, medium-, and heavy-duty vehicles to provide public services of all types. Based on the numbers of vehicles subject to South Coast Air Quality Management District (SCAQMD) fleet rules that were adopted in years 2000 and 2001, and assuming the same ratio of vehicles per person in the SJVAB, approximately 2,600 heavy-duty vehicles (e.g., transit and school buses, dump trucks, street sweepers, road maintenance trucks and refuse haulers) could be subject to the rules. In addition, pick-up trucks and passenger vehicles supplement this estimated total.

*DESCRIPTION:* Amendments to Regulation IX will focus on rules designed to reduce NOx and PM emissions from light-, medium-, and heavy-duty vehicles in fleets used in providing public services. This rule is intended to achieve greater and earlier NOx and PM emission reductions than would occur through the normal vehicle replacement process for fleets in public service. Emissions could be reduced in a number of ways, including (1) replacing mobile sources before scheduled retirement; (2) replacing engines/power trains of existing sources with cleaner technology; (3) retrofitting emission control technology to existing sources; or (4) switching to cleaner fuels.

As mentioned above, the rules are in the initial stages of development, and as a result details are not available. However, some general concepts that could appear in the rules are as follows:

- Require fleet operators to purchase heavy-duty vehicles equipped with engines that are certified to ARB's optional low-NOx standard and that achieve substantial reductions in diesel particulate emissions.

- Require fleet operators to retrofit vehicles with exhaust after-treatment devices or to re-power existing vehicles with cleaner engines on a phased schedule. Examples of exhaust after-treatment include a NOx adsorber and a catalytic diesel particulate filter (CDPF). Re-powering could be done by installing newer engines (e.g., an October 2002 or later 2.5 g/bhp-hr NOx + NMHC engine) into existing vehicles. The District could require retrofit and re-power in addition to (rather than as a substitute for) the new vehicle purchase requirements described above.
- Require the use of clean fuels for heavy-duty vehicles. These fuels could include ultra-low sulfur (15 ppm) diesel fuel or natural gas.
- Require operators of certain light- and medium-duty fleets to purchase vehicles certified to lower emission levels when adding or replacing vehicles in their fleets (e.g., replace low emission vehicles with ultra-low emission vehicles or super ultra-low emission vehicles).

*IMPLEMENTATION SCHEDULE:* Rule adoption is scheduled for the second quarter of 2004, with implementation starting in the fourth quarter of 2004.

*EMISSIONS AND EMISSIONS REDUCTIONS:* The emissions and emissions reductions from sources affected by the control measure are not known at this time. A survey of possible affected sources is under way. The results of the survey will assist in determining both emissions and emissions reductions.

## NEW COMMITMENTS

### Background

The CAA requires all serious nonattainment areas to implement BACM no later than four years after reclassification of an air district from moderate to serious. The EPA guidance[1] adds that BACM includes BACT on all significant sources of PM10 or PM10 precursors. The EPA will generally presume the contribution to nonattainment of any source category to be de minimis if the source category causes an impact in the area of less than 1 $\mu g/m^3$ for the annual mean concentration and 5 $\mu g/m^3$ for a 24-hour average. Source categories are defined as categories of area-wide sources or large individual sources of PM10 or PM10 precursor emissions that may be regulated under a specific rule, generic emission limit, or standard of performance, or a specific control program in a SIP.

The District took a conservative approach for determining de minimis levels. The analysis matched annual average daily emissions with the maximum annual average PM10 measurement for each county, and matched the worst-case 24-hour ambient measurement with seasonal quarter emissions for each corresponding pollutant.

[1] State Implementation Plans for Serious PM-10 Non-Attainment Areas, and Attainment Date Waivers for PM-10 Non-Attainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, Federal Register, Vol. 59, No. 157, August 16, 1994

The worst-case condition for each component of PM10 was examined separately. This approach determines a de minimis level for each contributing component of PM10 based on the *potential* for a worst-case PM10 day, which is greater than the actually measured highest 24-hour PM10 concentration. The de minimis levels, in terms of tons of emissions per day, for the SJVAB are provided in Table 4-6, as follows:

**Table 4-6**
**SJVAB De Minimis Levels**
(tons per day)

| NOX | SOx | VOC | PM10 |
|---|---|---|---|
| 1.3 | 2.5 | 2.8 | 0.9 |

Should any source category in the SJVAB contribute more than these levels, those categories are considered significant and BACM (including BACT) is required to be implemented.* The District analyzed the emissions inventory to identify significant source categories, the results of which can be found in Tables 4-7 and 4-8. For a detailed analysis of the de minimis calculations, please see Appendix G.

**Table 4-7**

**Significant Source Categories Not in the District's Regulatory Authority**

| Source Category | 1999 Emissions of Qualifying Pollutant(s) (tpd) | | | | Regulatory Entity |
|---|---|---|---|---|---|
| | VOC | NOX | SOX | PM10 | |
| Agricultural Equipment | 16.8 | 66.2 | | 4.2 | EPA/ARB |
| Agricultural Pesticides | 28.1 | | | | DPR |
| Aircraft | 11.0 | 3.3 | | | EPA |
| Construction & Mining Equipment | 3.7 | 32.7 | | 2.0 | EPA/ARB |
| Consumer Products | 24.0 | | | | ARB |
| Heavy Duty Diesel Urban Buses | | 3.6 | | | EPA/ARB |
| Heavy Duty Diesel Trucks | 4.1 | 86.0 | | 2.3 | EPA |
| Heavy Duty Gas Trucks | 3.6 | 5.5 | | | EPA/ARB |
| Industrial Equipment | | 3.6 | | | ARB |
| Lawn & Garden Equipment | 5.5 | | | | EPA/ARB |

* Ibid.

| Source Category | 1999 Emissions of Qualifying Pollutant(s) (tpd) | | | | Regulatory Entity |
|---|---|---|---|---|---|
| | VOC | NOX | SOX | PM10 | |
| Light Commercial Equipment | | 3.2 | | | ARB |
| Light Duty Passenger | 52.4 | 47.2 | | 1.4 | ARB |
| Light Duty Trucks | 43.1 | 53.6 | | 1.2 | ARB |
| Light Heavy Duty Diesel Trucks | | 3.4 | | | EPA/ARB |
| Light Heavy Duty Gas Trucks | 8.3 | 3.7 | | | EPA/ARB |
| Medium Duty Trucks | 7.4 | 11.8 | | | EPA/ARB |
| Medium Heavy Duty Diesel Trucks | | 18.0 | | | EPA/ARB |
| Medium Heavy Duty Gas Trucks | 5.7 | 3.0 | | | EPA/ARB |
| Motorhomes | | 2.1 | | | EPA/ARB |
| Off-road Recreational Vehicles | 4.8 | | | | EPA/ARB |
| Recreational Boats | 12.2 | 2.2 | | | EPA/ARB |
| School Buses | | 2.0 | | | EPA/ARB |
| Trains | | 19.9 | | | EPA |
| Transportation Refrigeration Units | | 3.2 | | | EPA |

Source categories within the District's regulatory authority are listed in Table 4-8. Since BACM (including BACT) implementation is required, a discussion of the implementation status is included. While each source category may or may not have emissions for all of the pollutants, only the emissions that are above the de minimis levels are listed. The "status" column in Table 4-8 summarizes the BACM findings.

**Table 4-8:**
**Significant Source Categories Within the District's Regulatory Authority**

| **Source Category** | **Rule Number (if any)** | **Commitment ID** (if any) | **1999 Emissions of Qualifying Pollutant(s)** (tpd) | | | | **Status** |
|---|---|---|---|---|---|---|---|
| | | | **VOC** | **NOX** | **SOX** | **PM10** | |
| Agricultural Crop Processing Losses Unspecified | | | | 3.1 | | 4.4 | The emissions from this source category could not be further broken down to represent source categories that would be regulated under a similar rule or emissions limit and be a significant source category. Therefore, BACM has not been identified at this time. It is expected that this category represents drying and fugitive emissions from processing corn, various grains, rice, various seeds/nuts, soybeans, sugar, wheat, and other misc. crops. Please see the emissions inventory improvement section of chapter 8, Ongoing Activities. |
| Agricultural Irrigation IC Engines | | Incentive Program | | 17.4 | | 1.2 | The District's Heavy-Duty Engine Program is rapidly replacing uncertified diesel engines with new engines certified to the EPA off-road NOX engine standard or better. Expect sufficient funding will be available to replace all uncertified engines in the SJVAB by 2010. |
| Agricultural Products Processing Losses Unspecified | | | | 6.2 | | | The emissions from this source category could not be further broken down to represent source categories that would be regulated under a similar rule or emissions limit and be a significant source category. Therefore, BACM has not been identified at this time. It is expected that this category represents drying emissions from processing almonds, candy, corn, cotton, flour, grain feed, milk/dairy, peanuts, potato chips, and other misc. products. Please see the emissions inventory improvement section of Chapter 8, On-Going Activities. |
| Agricultural Unpaved Roads | 8081 | A, F | | | | 11.0 | 1. See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.**<br>2. See Appendix G for BACM analysis on Regulation VIII. **Rule revision is necessary.** |
| Agricultural Windblown Dust | | A | | | | 41.4 | See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.** |

| Source Category | Rule Number (if any) | Commitment ID (if any) | 1999 Emissions of Qualifying Pollutant(s) (tpd) | | | | Status |
|---|---|---|---|---|---|---|---|
| | | | VOC | NOX | SOX | PM10 | |
| Architectural Coatings | 4601 | | 11.8 | | | | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Can & Coil Coatings | 4604 | L | 4.6 | | | | This rule is currently being amended. |
| Cattle Feedlot Dust | | A | | | | 7.0 | See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.** |
| Charbroiling | 4692 | | | | | 1.3 | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Components at Oil and Gas Facilities | 4403 | | 10.4 | | | | This rule is currently being amended. |
| Cotton Gins | | B | | | | 2.7 | **Rule adoption is necessary.** |
| Degreasing | 4662 | | 11.3 | | | | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| IC Engines, stationary | 4701 | | | 47.0 | | | This rule is currently under development. |
| Earthmoving | 8021 | F | | | | 12.9 | See Appendix G for BACM analysis on Regulation VIII. **Rule revision is necessary.** |
| Glass Manufacturing | 4354 | D | | 12.3 | 4.0 | | The current rule is BACM for NOx. Please see BACM Analyses for existing rules in Appendix G. **Rule revision is necessary for SOx.** |
| Harvest Operations | | A | | | | 36.8 | See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.** |
| Livestock Wastes | | A | 57.1 | | | | See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.** |
| Manufacturing and Industrial Fuel Combustion | | C, I, J | | 24.3 | 5.2 | | **Rule adoption is necessary.** |
| Natural Gas Boilers | 4305 | | | 3.7 | | | Rule 4305 is currently being amended for NOx. |

| Source Category | Rule Number (if any) | Commitment ID (if any) | 1999 Emissions of Qualifying Pollutant(s) (tpd) | | | | Status |
|---|---|---|---|---|---|---|---|
| | | | VOC | NOX | SOX | PM10 | |
| Natural Gas Fired Oilfield Steam Generators | 4305, 4406 | E | | 6.4 | 6.9 | 1.4 | Rule 4305 is currently being amended for NOx. **Rule revision is necessary for SOx.** A BACT investigation revealed that there are no available controls for PM10. |
| Oil Drilling and Workover | 2280 | | | 10.8 | | | Please see BACM Analyses for existing rules in Appendix G. |
| Open Areas | 8051 | F | | | | 3.1 | See Appendix G for BACM analysis on Regulation VIII. **Rule revision is necessary.** |
| Open Burning | 4103 | | 10.3 | 4.6 | | 11.4 | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Organic Solvents | 4661 | | 7.6 | | | | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Paved & Unpaved Roads | 8061 | F | | | | 66.8 | See Appendix G for BACM analysis on Regulation VIII. **Rule revision is necessary.** |
| Plastic and Plastic Products Manufacturing | | | | | | 1.5 | Emissions for 1999 totaled 1.5 tpd. However, adopted controls reduce emissions for 2000 to 0.1 tpd Therefore, this category is now considered de minimis. |
| Prescribed Burning | 4106 | | 16.5 | | | 28.9 | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Residential Space Heating | | M | | 2.7 | | | **Rule adoption is necessary.** |
| Residential Water Heaters | 4902 | | | 1.6 | | | Please see BACM Analyses for existing rules in Appendix G. |
| Residential Wood Combustion | 4901 | H | 6.0 | | | 11.3 | See Appendix G for BACM analysis on Residential Wood Combustion. |
| Service and Commercial-Other Fuel Combustion | | C, I, J | | 25.7 | | 1.0 | **Rule adoption is necessary.** |

| Source Category | Rule Number (if any) | Commitment ID (if any) | 1999 Emissions of Qualifying Pollutant(s) (tpd) | | | | Status |
|---|---|---|---|---|---|---|---|
| | | | VOC | NOX | SOX | PM10 | |
| Solid-Fueled Boilers, Steam Generators and Process Heaters | 4352 | | | 3.5 | | | **Rule revision may be necessary.** Please see page 4-56. |
| Stationary Gas Turbines | 4703 | | | 10.2 | | | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Steam Enhanced Crude Oil Production Well Vents | 4401 | | 14.0 | | | | **Rule revision is necessary**. |
| Storage of Organic Liquids | 4623 | | 6.9 | | | | The current rule is BACM. Please see BACM Analyses for existing rules in Appendix G. |
| Tilling Dust | | A | | | | 36.4 | See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.** |
| Windblown Dust from Pasture Lands | | A | | | | 6.6 | See Appendix G for BACM analysis of the Proposed Ag CMP Program. **Rule adoption is necessary.** |
| Wineries | | K | 7.0 | | | | **Rule adoption is necessary.** |

**RACM Demonstration**

Moderate PM10 nonattainment areas are required to implement reasonably available control measures (RACM) and reasonably available control technology (RACT). In this discussion, the term RACM will include both RACM and RACT. Although the District is now subject to the more stringent BACM requirement, EPA has not approved several of the District's rules as RACM. Further discussion of this situation is provided below.

The District's 1991 Moderate Area PM10 Attainment Plan contained commitments to implement RACM. The EPA never acted to approve or disapprove the 1991 Plan, but it has acted on the rules and regulations submitted by the District to implement the 1991 Plan, the 1994 Serious Area Plan, and the 1997 PM10 Attainment Demonstration Plan. When the District was reclassified to serious nonattainment in 1993, it was required to implement the more stringent BACM within four years. After submittal of the 1994 Serious Area Plan, the District began amending the RACM rules and added several new rules to meet BACM. In 2001 and 2002, EPA completed its review of District PM10 rules that were submitted as early as 1993 and the new and amended rules.

The EPA took action to approve some of the rules, and to partially approve or partially disapprove several other rules. In the EPA's judgment, some of the rules had not met the stringency needed to demonstrate BACM, but were likely to have met the RACM level of stringency. The EPA requested that the District provide a detailed analysis demonstrating whether the rules are RACM or BACM. The District embarked on a BACM analysis designed to meet the current requirement and also to satisfy the RACM requirement. If the BACM analysis identified sources that were not controlled to the BACM level, the District was committed to upgrading the rules that applied to those sources in its new PM10 Plan.

In August of 2002, Earthjustice, on behalf of Medical Advocates for Healthy Air, Latino Issues Forum, and the Sierra Club, notified the EPA of their intent to file a lawsuit against the EPA insisting that a Moderate Area Federal Implementation Plan (FIP) containing RACM go forward in the San Joaquin Valley to be followed by a BACM FIP. Since the District was in the midst of preparing a BACM analysis for the 2003 PM10 Plan, it was the District's belief that the results of the more stringent BACM analysis would satisfy any RACM requirements for sources, hence, rendering an actual RACM analysis unnecessary. However, rule development to upgrade rules that are found to need increased stringency would take nine to twelve months to complete even with expedited timelines. Therefore, as an interim measure to eliminate the EPA's need to implement a RACM FIP, the District is including a RACM demonstration with this PM10 Plan.

The District's RACM Analysis used several different approaches to meet its objectives. The District contracted with Sierra Research to prepare a Technical and Economic Feasibility Study for fugitive dust measures as part of the BACM analysis.

This information also provides a basis to demonstrate RACM. The District also contracted with a consultant to help coordinate the BACM and RACM demonstrations. For a substantial number of rules, EPA had already approved the District's existing rules as BACM or RACM. In those cases, no further analysis was required. District staff prepared the analysis of stationary sources, agricultural sources, and residential wood combustion.

The results of the RACM analysis are presented in Appendix G. In summary, the analysis determined that all significant sources of PM10 and PM10 precursors are regulated to the RACM level or that no RACM was available for that source. The analysis provides a comparison with RACM suggested in the EPA guidance documents, and RACM and BACM adopted in other areas (South Coast Air Quality Management District, Maricopa County, Arizona, and Clark County, Nevada) as a test of feasibility. When a measure is identified to be more stringent than the current District measure, the analysis provides a reasoned justification for not pursuing that measure. For example, the source category controlled may be very small in the SJVAB or local factors may greatly increase implementation costs. Since the comparison was done with areas that had met the BACM requirement, in some cases, federal administrative actions required the EPA to approve the rules found in these other areas as RACM and BACM. If a measure was approved as BACM in another area, the District used that measure as a standard of comparison for its BACM analysis. When the District's existing rule was reasonably close to measures suggested in the EPA Guidance or to those adopted in other areas, the District concluded that the rule is, at a minimum, RACM.

**District Commitments**

For the purposes of implementing the PM10 Plan, the District is committed to adopt and implement control measures that will achieve, in aggregate, emission reductions specified in the following section. Emission reductions achieved in excess of the amount committed to in a given year can be applied to the emission reduction commitments of subsequent years. The District is committed to adopt the control measures listed below unless these measures or a portion thereof are found infeasible and other substitute measures that can achieve equivalent reductions in the same adoption/implementation timeframes are adopted. Findings of infeasibility will be made at a regularly scheduled meeting of the District Governing Board with proper public notification. For purposes of State Implementation Plan (SIP) commitment, infeasibility means that the proposed control technology is not reasonably likely to be available by the implementation date in question, or achievement of the emission reductions by that date is not cost-effective. The District acknowledges that this commitment is enforceable under Section 304(f) of the CAA.

The District has identified the following source categories that will require a rule adoption or amendment to assist in attaining the NAAQS at the earliest practicable date. Some of these commitments were not necessary to satisfy the BACM requirement, but were necessary to demonstrate attainment, such as the Indirect Source Mitigation Fee. All measures will go through additional analysis and public review during rule development that will determine their technical and economic feasibility and the specific rule provisions that are ultimately adopted. The District commitments are as follows:

**Table 4-9**
**List of New District Commitments**

| Commitment ID | Source Category | Pollutant |
|---|---|---|
| A | Agriculture (Conservation Management Practice Program) | PM10, VOC |
| B | Cotton Gins | PM10 |
| C | Dryers | NOX |
| D | Glass-Melting Furnaces | SOX |
| E | Gas-Fired Oilfield Steam Generators | SOX |
| F | Fugitive PM10 (Regulation VIII) | PM10 |
| G | Indirect Source Mitigation Fee | NOX, PM10 |
| H | Residential Wood Combustion (Rule 4901) | PM10, VOC |
| I | Small Boilers, Steam Generators, and Process Heaters | NOX, SOX |
| J | Water Heaters (Industrial, Commercial, and Institutional) | NOX |
| K | Wineries | VOC |
| L | Steam Enhanced Crude Oil Production Well Vents | VOC |
| M | Residential Space Heating | NOX |
| N | Agricultural Irrigation Engines | PM10 |

The following section provides control measure summaries for each plan commitment. The summaries include the reason for adopting the control measure, affected sources, a description of the potential control technology, the expected emission reductions, and the implementation schedule. All of the control measures will require rule development. The District is committing to proceed with rule development as rapidly as possible. Rule development is scheduled to begin immediately upon adoption of the PM10 Plan for the most critical control measures. The remaining measures will begin rule development in accordance with an ambitious schedule and no measures will be delayed unnecessarily. Upon adoption of each rule, the rule will immediately be forwarded to ARB for SIP Submittal.

A. Agricultural Conservation Management Practice Program

*REASON FOR CONTROL MEASURE*: Areas designated as serious nonattainment for PM10 are required to implement BACM and BACT on all significant sources of emissions. Review of regulations in other serious nonattainment areas revealed that two other air basins (South Coast Air Quality Management District, and Maricopa County, Arizona) have implemented agricultural best management practices (BMP) to fulfill their BACM requirement. The District's proposed program, Agricultural Conservation Management Practices (CMP) Program, relies on similar practices and is at least as stringent as the two existing programs.

Samples collected from monitoring sites in the SJVAB over the last three years indicate that geologic material comprises as much as 95 $\mu g/m^3$ on the worst days. Data from the California Regional PM10/PM2.5 Air Quality Study (CRPAQS) indicates that geologic material comprises about 46 percent of the mass on an annual basis. Although agriculture is only responsible for a portion of these geologic emissions, several agricultural source categories are likely to exceed significant source thresholds.

The PM10 Plan CMP Program commits to reduce only fugitive PM10 emissions; however, the program is being structured to allow additional pollutants to be added in the future. For example, VOC emissions from concentrated animal feeding operations (CAFO) or from reduced pesticide application may be added as commitments in the upcoming ozone plan. In addition, the District commits to implement ammonia controls if the results from CRPAQS indicate that ammonia reductions would expedite attainment of the PM10 standard. For any new source category added to the CMP Program, the District must demonstrate that there are no other feasible BACM rules that could be applied to that source category.

*AFFECTED SOURCES*: The affected sources for this category include on-field agricultural operations, such as land preparation and harvesting; off-field activities, such as unpaved access roads; equipment parking and storage areas; and inactive open area windblown emissions. Other affected agricultural sources include concentrated animal feeding operations (CAFO). Growers preparing fugitive dust management plans to comply with Regulation VIII, Rule 8081 (Agricultural Sources) will be considered to meet the requirements of the CMP Program for off-field activities. Regulation VIII currently contains a daily trip exemption threshold of 75 for unpaved agricultural roads and for unpaved vehicle and equipment parking and traffic areas. The CMP Program will require management practices for unpaved roads and vehicle and equipment parking and traffic areas exempt from Regulation VIII where feasible. At a minimum, practices such as limiting access and speed restrictions should be feasible on most roads and parking areas. Many growers raising dust sensitive crops are expected to choose to apply dust suppressants and water as their CMP for unpaved roads and parking areas. Small farms will be exempt from the program reporting requirements, but will be given program information to promote the implementation of the practices. Certain crop categories that prevent PM10 emissions or produce only small amounts of PM10 during some or all of the growing cycle will be considered to meet one or more of the CMP requirements.

*DESCRIPTION*: The CMP Program is not a traditional air pollution control measure. The District considers command and control regulations to be inappropriate for most activities related to the growing of crops. Emissions from agricultural sources vary by many factors that are beyond the control of the grower. For example, drought conditions and related cuts in water deliveries can lead to increased fallow lands and more wind blown dust emissions. Market conditions can change quickly and can turn a profitable crop into a losing proposition. This limits the ability of growers to absorb the costs of controls in many cases. Limited research on the effectiveness of agricultural practices on emissions has been completed to date. The EPA has recognized these problems and has allowed programs where growers can select practices that are feasible for their operation as BACM.

Participation in the CMP Program will be mandatory, but the growers will, by their own choosing, select measures most appropriate for their operation. The source categories include (1) unpaved roads, (2) unpaved vehicle/equipment traffic areas, (3) land preparation, (4) harvest, and (5) other - including windblown PM10 from open areas, and agricultural burning. Practices that reduce pesticide application may be added at a later date. Growers must select at least one management practice from each of the five categories, but have no specific emission reduction target. One option being considered is for growers to be able to select two measures from one category that would result in emission reductions greater than or equal to that obtained from one practice from each category. This allows growers the flexibility they need, but ensures that emission reductions from agricultural sources will be achieved. Growers that cannot identify a feasible practice for a category can propose new practices or justify not providing a practice due to technical or economic feasibility considerations. No calculations will be required of the grower. The District will calculate emission benefits.

The District expects that growers operating CAFOs will also participate in the program. They will be required to select practices from three source categories: (1) entrained PM10 from animal activity, (2) unpaved roads, and (3) unpaved equipment parking and storage areas. CMPs related to manure and waste disposal are not in the current proposal, but are expected to be added as a potential measure for the District's next ozone plan expected later this year. The District is working closely with agencies and organizations with experience in raising livestock to develop CMPs specific to CAFOs. Some CAFO operators also grow field crops. Those growers must select CMPs for both their field crops and for their CAFO.

In order to meet the federal BACM requirements, the CMP Program must include an enforcement mechanism to ensure participation. The mandatory provisions of the program will be contained in a District rule to be developed and adopted prior to program implementation in January 2004. The District has authority to adopt regulations for these sources under California Health and Safety (H&S) Code 40716(a)(1). Growers that fail to comply with the rule will be subject to District enforcement action. The rule will also contain a provision to require direct reporting to the District if insufficient participation is achieved. In the event that District management of the program is required, the District may adopt a schedule of fees to cover the estimated reasonable costs of evaluating plans and monitoring and enforcing activities in accordance with H&S 41512.5. The CMP rule must contain a mechanism to ensure that the District and EPA will be able to verify that all growers subject to the rule are participating and that CMP plans are being implemented. The rule will go through an extensive public participation process prior to adoption.

One of the objectives of the program is to promote the widespread adoption of practices that growers have found beneficial in some way to their operation and that also help reduce emissions. For some CMPs, incentive funds will be available to offset increased costs. Education and outreach to growers regarding the most effective measures are critical to program success.

The Natural Resources Conservation Service (NRCS) and Resource Conservation Districts (RCD) will be the primary points of contact for the growers and will collect all program data. The NRCS/RCD will provide growers with a CMP Handbook describing the CMPs available for the various crop categories. The growers would select practices at the beginning of the year and implement those measures during that year. The growers would fill out a simple form listing the CMPs selected that would constitute their CMP Plan. The goal is to keep the CMP Plan to one page. The growers would submit a copy of the CMP Plan to the NRCS or Resource Conservation District (RCD) and maintain a copy on site. This process would be repeated annually. If the same CMPs are selected in subsequent years, the grower could submit a signed copy of previous year's plan to the NRCS/RCD indicating that they intend to continue using the practices. The program will be judged on its effectiveness as a whole and not on a farm by farm basis.

The NRCS and/or RCD's will accept the CMP Plans and will provide assistance to growers in selecting CMPs and filling out forms. The District will be responsible for tracking emission reductions achieved by the program and for taking any enforcement action regarding the mandatory portions of the program. The District will not maintain any record of individual grower participation. Additional assistance to growers may be available from the Agricultural Research Service (ARS), California Department of Food and Agriculture (CDFA) and agricultural groups, such as farm organizations, agriculture trade associations, and grower groups. The District has a Memorandum of Understanding (MOU) with the NRCS and the CDFA in place that commits the agencies to work together on the development and implementation of measures dealing with agricultural operations. Please see Appendix H for a more detailed discussion on the proposed Agricultural CMP Program.

*TYPES OF CONTROL REQUIRED*: Through the work of stakeholders, the District, ARB, NRCS, and farm organizations, a preliminary list of CMPs has been developed. The list is quite extensive, and is expected to increase in control options prior to publication of the CMP Handbook. Practices reducing emissions fall into several broad categories:

- Practices that reduce or eliminate the need to disturb the soil;
- Practices that protect the soil from wind erosion;
- Equipment modifications to physically produce less PM10;
- Applying water or dust suppressants in off-field high traffic areas;
- Reducing speeds or access on unpaved roads and parking areas;
- Alternative practices to waste burning; and
- Actions that reduce pesticide application.

Some examples of the suggested CMPs are combined operations, conservation tillage, cover crops/native vegetation, equipment changes, overhead systems, orchard floor management, and dust suppressants. For example, the combined operations CMP would specify combining pieces of equipment to perform several operations in one pass, which would reduce soil disturbance and PM emissions. The details of each CMP will be included in the CMP Handbook.

The District is also proposing to include PM10 emissions from CAFO, such as dairies, beef feedlots and poultry operations in the CMP Program. There are a number of practices listed in the literature for these facilities that are expected to reduce PM10 emissions. However, most research literature on the subject that describes possible control methods contains little or no performance data. VOC emissions and potential reductions are not well characterized. The District will be working with stakeholders and researchers to identify VOC measures in the coming months. The District will estimate emission reductions based on available information prior to program implementation. The PM10 Plan will not claim any VOC reductions from the CMP Program; however the next ozone plan will likely contain CMP VOC measures.

The NRCS and the District will approve all proposed CMPs after review by the Agricultural Technical Advisory Committee. Resource Conservation Districts (RCD) are encouraged to work with grower members on identifying and developing CMPs representing the conditions unique to their district, and to the extent possible, develop RCD specific handbooks. The primary criteria for including a conservation practice in the program is that there must be a reasonable certainty that it will result in emission reductions.

*EMISSIONS AND EMISSION REDUCTIONS*: The 2002 inventory indicates that PM10 emissions from agriculture-related sources total 197 tons per day, or more than half of all directly emitted PM10 emissions.

The effectiveness of a CMP can be influenced by various factors such as weather conditions, soil types, cropping systems, moisture conditions, water availability, and relation to urban centers. Each CMP must be specifically selected for an agricultural source based on the factors encountered by the agricultural source. A single CMP may not work equally well for all growers. Although there is a limited amount of scientific information concerning the effectiveness of some CMPs in reducing PM10 emissions, it is reasonable to balance this limitation with the common sense recognition that minimizing agricultural activities that disturb the soil would reduce the entrainment of dust, thereby reducing PM10 emissions.

Table 4-10 summarizes the emissions and estimated emission reductions for each identified source category. For practices where no emission reduction data was available the District used a conservative estimate of the expected benefit.

**Table 4-10**
**Emissions and Potential Emissions Reductions**
**San Joaquin Valley Agricultural CMP Program**

| CMP Category | 2010 Emissions (tpd) | 2010 Emissions Reductions (tpd) | % |
|---|---|---|---|
| **PM10** | | | |
| Unpaved Roads (Ag)* | 10.6 | 2.3 | 21.7 |
| Unpaved Traffic Areas (Ag)* | 6.3 | 0.6 | 9.5 |
| Harvest | 35.6 | 13.2 | 37.1 |
| Land Prep | 35.2 | 9.2 | 26.1 |
| Windblown Dust | 40.1 | 7.9 | 19.7 |
| Ag Burning | 9.5 | 0.5 | 5.3 |
| CAFO PM10** | 7.0 | 0.1 | **1.4** |
| **TOTAL PM10** | **144.3** | **33.8** | **23.4%** |

*The emissions attributed to Ag Unpaved Roads and Ag Unpaved Traffic Areas will be controlled by Regulation VIII, and the Proposed Indirect Source Mitigation Fee, in addition to the Proposed Ag CMP Program. The % reduction listed is only for the Proposed Ag CMP Program compared to the entire category
**CAFO PM10 only includes PM10 from feedlots and dairies.

*IMPLEMENTATION SCHEDULE*: The District anticipates that the first CMP plans will be required beginning July 2004. The District will begin the background work required for the rule development process prior to approval of the PM10 Plan by the District Governing Board. After rule adoption, agencies supporting the program such as the NRCS and the RCDs will set up the support structure and begin providing outreach to the growers. The District anticipates the need for numerous grower workshops during 2004 to help assist the growers in understanding the requirements and with completing the CMP Plans. The following implementation schedule is proposed:

- Commence rule development background work — April 2003
- CMP Program concept approved by Board — June 2003
- Complete CMP Handbook — December 2003
- Adopt District CMP Rule — January 2004
- Outreach Program and Agency Coordination — February 2004
- Provide CMP Handbook and forms to growers — March 2004
- Begin collecting CMP Plans — July 2004

B. Cotton Gins

*REASON FOR CONTROL MEASURE*: PM10 emissions from cotton gins exceed the "de minimis threshold" level, therefore, are subject to federal BACM requirements.

*AFFECTED SOURCES*: There are 72 cotton gin facilities in the SJVAB, approximately 85% of which use state-of-the-art 1D-3D cyclones as part of their PM10 control strategies.

*DESCRIPTION*: Cotton gins are currently subject to District permitting requirements, and Rule 2201 (New and Modified Stationary Source Review Rule) is the rule under which permit conditions apply. No District prohibitory rule sets specific emission limits for cotton gins. Many cotton gins have recently retrofitted with cyclones in order to reduce emissions and create emission reduction credits.

According to District estimates, the overall control efficiency of PM10 controls on District cotton gins is currently around 78%. A new rule specifically for cotton gins, which is similar to the Maricopa County, Arizona rule, could increase PM10 control efficiency to over 90%. Under this control measure, cotton gins could be retrofitted with 1D-3D cyclones or equivalent devices with at least 95% efficiency, which is considered as BACT for seed-cotton loading, first seed-cotton cleaning, master trash system and other high-pressure exhaust emission units. The 2D-2D cyclones or equivalent devices with at least 90% efficiency could be installed for low-pressure exhaust units. A trash hopper with a properly positioned auger and a two-sided enclosure could be employed to minimize fugitive emissions. This measure could also require operation of cyclones at their designed gas flow rates, which could be assured by conducting flow maintenance evaluations. This requirement would ensure maximum particulate matter collection efficiency for the cyclones.

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the fourth quarter of 2004. Full BACM implementation for PM10 is projected for the year 2005 (A phase-in schedule may be appropriate for some sources).

*EMISSIONS AND EMISSIONS REDUCTION:* Total PM10 emissions from sources subject to the proposed Cotton Gin Rule are estimated to be 2.9 tons per day in 2005. Upon final implementation of the Cotton Gin control measure, 1.5 tons per day of PM10 reductions is anticipated.

C. Dryers

*REASON FOR CONTROL MEASURE*: NOx and SOx emissions from industrial and commercial dryers exceed the "de minimis threshold" levels, therefore, are subject to federal BACM requirements.

*AFFECTED SOURCES:* Dryers are used to remove water from process material by heating, causing evaporation of the water. Most dryers in the SJVAB are used to remove moisture from fruits, nuts, vegetables, cotton, and also from clothing at dry cleaning plants. Facilities with units that are subject to this control measure represent a wide range of industries, including but not limited to cotton ginning, nut, fruits and vegetable processing, dairy products, laundry cleaning services, and concrete manufacturing. Units in this source category are located throughout the eight county area of the SJVAB. The emissions inventory categories affected include Manufacturing and Industrial Fuel Combustion, and Service and Commercial-Other Fuel Combustion.

*DESCRIPTION*: These units are currently subject to District permitting requirements, but not a specific prohibitory rule. The BACM would establish BACT NOx and SOx emission standards for dryers subject to permitting requirements. Differing emission standards may be established based on the heat input capacity of the dryer, and whether the unit is new or existing. Emission controls appropriate for dryers include combustion of PUC quality natural gas, low excess air, low NOx burners, and flue gas recirculation (FGR).

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the second quarter of 2005. Full BACM implementation for NOX and SOx is projected for the year 2006.

*EMISSIONS AND EMISSIONS REDUCTION:* Total NOX emissions from sources subject to the Dryer control measure are estimated to be 8.6 tons per day in 2006. Upon final implementation of the Dryer control measure, 1.0 tons per day of NOX reductions is anticipated. Total SOX emissions from sources subject to the Dryer control measure are estimated to be 1.1 tons per day in 2006. Upon final implementation of the Dryer control measure, 0.1 tons per day of SOX reductions is anticipated.

D. Fugitive PM10 Prohibitions and Commitments from Local Agencies to Reduce Fugitive PM10 Emissions (Amendments to Regulation VIII)

*REASON FOR CONTROL MEASURE*: As required by the CAA, a serious nonattainment area must provide BACM for fugitive dust sources. Regulation VIII (Fugitive PM10 Prohibitions) is the District's regulatory instrument used to control fugitive dust emissions. The eight rules comprising Regulation VIII (Rules 8011, 8021, 8031,8041, 8051, 8061, 8071, 8081) are *prohibitory* rules, that is, they are rules that do not require the issuance of a District permit.

In March 2003, the EPA finalized a conditional approval of Regulation VIII with respect to CAA requirements for RACM and a limited approval/limited disapproval of Regulation VIII with respect to the CAA for BACM. Failure by the District to provide a RACM Demonstration within a 12-month timeframe (March 2004) will result in automatic imposition of two sanctions, (1) an increase in emission reduction offsets, and (2) a withholding of transportation-related funding. In addition to the two sanctions, the CAA also requires the imposition of a federal implementation plan (FIP). Failure to provide a BACM Demonstration and receive EPA approval of BACM amendments to Regulation VIII within an 18-month timeframe (September 2004) will also result in immediate imposition of both emission reduction offsets and highway funding sanctions, and a FIP.

As part of the District's efforts to comply with the CAA, the District is committed to amending Regulation VIII to meet BACM requirements. Also, the 58 cities, 8 counties, and the California Department of Transportation ("Caltrans" Districts 6 & 10) within the District's jurisdictional area have committed to undertaking a comprehensive effort in reducing sources of fugitive PM10 emissions within their purview (e.g., budget considerations, codes and regulations, land use decisions, etc.). The local jurisdictions have completed their public process of identifying and adopting BACM commitments and will provide copies of the documentation supporting this effort to the District prior to the Plan Workshops. An overview of the Regional Transportation Planning Agency process to identify and implement BACM is support the PM10 Plan is provided as Appendix I.

*AFFECTED SOURCES*: Anthropogenic (human-caused) activities result in the majority of fugitive dust emissions in the SJVAB. Regulation VIII applies only to anthropogenic fugitive dust sources; it does not apply to PM10 precursor sources or sources of smoke. Mechanical disturbance (for example, vehicles traveling over an unpaved surface, or earthmoving operations associated with construction activities, or sand and gravel or other mining activities) is a significant source of fugitive dust emissions. Wind events, although infrequent within the SJVAB, also contribute to fugitive dust emissions especially as wind travels over a previously disturbed, unstabilized surface. Regulation VIII applies to activities that have the potential to emit or result in primary PM10 fugitive dust emissions such as construction, demolition, excavation, extraction or other earthmoving activities; handling, transport, and storage of bulk materials; landfill operations; unpaved roads; unpaved vehicle/equipment traffic areas; disturbed open areas; and off-field agricultural sources.

*DESCRIPTION*: Amendments to Regulation VIII would apply to various fugitive dust generating sources. Proposed amendments include changes in administrative requirements (e.g., reporting requirements and dust control plans), applicability (i.e.; what sources the rules apply to), thresholds (e.g., amount of activity, such as vehicular passes per day, or size of an area where an activity occurs, or amount of material moved during an activity, etc.), and additional control options. Controlling fugitive dust sources often requires compliance with more than one Regulation VIII rule. For example, during construction activities, it is possible that earthmoving activities, handling and storage of bulk materials, use of unpaved roads, use of unpaved vehicle/equipment traffic areas, and carryout/trackout will occur.

In order to reduce, minimize, or eliminate fugitive dust emissions, guidance developed by the EPA places an emphasis on preventive techniques rather than mitigation techniques when developing BACM level controls (i.e., prevent soil trackout vs. clean up trackout). Therefore, the District is pursuing BACM that will prioritize techniques that prevent fugitive dust as opposed to techniques than require a reactive or mitigation response.

As noted earlier, Regulation VIII is a prohibitory rule that does not require the issuance of District permits. Prohibitory rules rely on both field enforcement and citizen complaints to ensure compliance. The District proposes to enhance the effectiveness of enforcement through several actions that include an increased presence of Compliance Division staff in the field, increased use of Dust Control Plans, increased compliance assistance, and greater public outreach. By making Regulation VIII enforcement a greater priority, the District expects to significantly improve compliance rates.

The "BACM Technological and Economic and Feasibility Analysis," a report prepared by Sierra Research for the District was used as a resource to identify potential BACM-level amendments to Regulation VIII and is included as Appendix G of this Plan. Appendix G contains a table entitled "Identification and Justification of BACM Selected," that provides a comprehensive listing of control measures, what the control measure does, technological feasibility, cost effectiveness, and discussion/justification of control measures. The BACM Analysis provides a preliminary indication that additional controls may be feasible. Feasibility or infeasibility will be confirmed during rule development. Below is a rule-by-rule description of the potential amendments to the seven rules under Regulation VIII that the District will consider during the rule development process. Measures listed as contingency measures are those that were not selected as BACM, but could be implemented if emission milestones are not achieved.

The District commits to strengthening Regulation VIII to the extent necessary to achieve the BACM level of control for the San Joaquin Valley and to obtain the emission reductions necessary to attain the PM10 standards as expeditiously as practicable. Rule development is the time when individual measures will ultimately be judged on technical and economic feasibility based on input from the public and stakeholders and the detailed socioeconomic study that is required under California law. Therefore, the measures listed below are subject to change, but will meet the test of economic and technical feasibility when adopted in rule form.

1. **Rule 8021** (Construction, Demolition, Excavation, Extraction and Other Earthmoving Activities) affects construction or demolition related disturbances of soil, including land clearing, grubbing, scraping, excavation, extraction, land leveling, grading, cut and fill operations, travel on a site, travel on access roads to and from a site, and demolition of structures. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8021:

For Demolition Activities:

- Add a visible plume distance limit of 100 feet;
- Require application of dust suppressants to erodible surfaces within 100 feet of a structure where debris may fall;
- Require application of water within 1-hour of demolition to erodible surfaces within 100 feet of structure;
- Require application of water or dust suppressants to areas where equipment will operate; and

- Require application of water or dust suppressants to disturbed soils and debris within one hour after demolition is complete or at the end of each workday.

For Construction Activities

- Add a visible plume distance limit of 100 feet;
- Require Dust Control Training Class;
- Limit on-site vehicle speeds to 15 mph;
- Require speed limit signage at sites greater than 10 acres;
- Require Dust Control Plans for residential projects larger than 10 acres and for commercial projects larger than 5 acres;
- Require notification to the District of any earthmoving operations between 1 and 10 acres for residential construction projects, and 1 and 5 acres for commercial construction projects;
- Cease construction activities when a wind event is declared. (A wind event is defined as any day in which 1-minute wind gust exceeds 25 mph as determined by the District.);
- Cease construction activities when 20% opacity is exceeded and plume distance exceeds 100 feet due to wind; and
- Require continued operation of water trucks when construction ceases due to wind, unless unsafe to do so.

2. **Rule 8031** (Bulk Materials) affects the outside storage and handling of any unpackaged material that emits dust when stored or handled. Rule 8031 requires bulk handling and storage facilities to limit dust from material transfer and from storage piles that emit dust within a facility's location. This rule also requires measures to reduce emissions caused by transport of material off-site. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8031:

- Add a visible plume distance limit of 100 feet;
- Limit an exemption to the storage of materials where the total amount of material stored is 100 cubic yards or less (specifically, section 4.4);
- Require that visible dust emissions (VDE) not travel beyond the property line;
- Require wind barriers to have less than 50% porosity;
- Require control during the handling of bulk material piles regardless of size and retain an exemption for stored bulk material piles where no material is being added or removed; and
- Add an additional option to Table 8031 to allow 3-sided enclosures that are at least as high as the storage pile and with less than 50% porosity.

3. **Rule 8041** (Carryout and Trackout) requires prevention or expeditious cleanup of mud and dirt deposited on adjacent paved public roads. A key phrase in understanding impacts caused by carryout and trackout is "deposition." Amendments to carryout and trackout are intended to prevent or expedite removal of material, mostly in the form of dirt (soil), that are deposited on paved public road surfaces. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8041:

- Add requirements applicable to vehicles with three or more axles;
- Require trackout control devices to be a minimum of 25 feet in length and full width of the unpaved road;
- Require paved interior roads to be 100 feet in length and full width of the unpaved road (including the turning radius where an interior road meets a paved public road);
- Require gravel pads to be 3 inches deep, 50 feet long, and cover the full width of the unpaved road (including the turning radius where an unpaved road meets a paved public road);
- Remove trackout onto public paved roads within one hour of such occurrence.

4. **Rule 8051** (Open Areas) addresses open areas by requiring measures to prevent or minimize fugitive emissions from activities that have disturbed surface areas that will not be used in the immediate or short-term. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8031:

- Change applicability to 0.5 acres in urban areas, or 3 acres in non-urban areas, which contain disturbed surface areas of at least 1,000 square feet;
- Require control measures immediately after cessation of disturbance;
- Require more than one control method for disturbed open areas if VDE exceeds 20% opacity due to windblown dust;
- Add an exemption for mowing and/or cutting weeds that maintain at least 3 inches of stubble.

5. **Rule 8061** (Paved and Unpaved Roads) affects any paved, unpaved, or modified public or private road, street highway, freeway, alley, way, access drive, access easement, or driveway constructed or modified within the District. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8031:

<u>For Paved Roads</u>:

- Caltrans and local governments within the District have committed to controlling fugitive dust emissions through a variety of means. The

Transportation Planning Agencies (TPA) are compiling the commitments from the local agencies for inclusion in the Plan.

- Obtain commitments from municipalities to construct 4-foot paved shoulders on 50% of existing paved roads with the highest ADT in urban areas and on 25% of existing paved roads with the highest ADT in rural areas (measure subject to state and local funding constraints);
- Require 4-foot paved shoulders on new or modified paved roads where right of way is available;
- Require municipalities, or their contractors, to purchase PM10-efficient street sweepers when new street sweepers are purchased;
- Require municipalities to purchase at least one PM10-efficient street sweeper within three years;
- Require priority sweeping on dirt-laden roads;
- Require street sweeping frequency of at least once per month on roads where PM10-efficient street sweepers are used;
- Require removal of dirt/debris from roadways within 24 hours of identification of such conditions after a wind or rain runoff event;
- Require that PM10-efficient street sweepers are operated according to manufacturer's specifications; and
- Require that proper procedures be followed to minimize entrainment of material during removal of wind/rain related dirt deposits from roads.

For Unpaved Roads:

- Limit vehicle speeds to 25 mph;
- Require all new non-temporary roads in urban areas to be paved; and
- Require existing unpaved roads in urban areas to be paved.

6. **Rule 8071** (Unpaved Vehicle/Equipment Traffic Areas) requires operations to control fugitive dust emissions from unpaved vehicle/equipment areas, parking, fueling and service areas, and shipping, receiving, and transfer areas. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8031:

- Eliminate the existing one-acre applicability provision (i.e.; the provisions of this rule will apply to all sites regardless of size);
- Require watering and speed controls on unpaved areas receiving up to 25 VT/day;
- Establish a vehicle threshold limit of 26-75 vehicle trips/day before specified controls must be used to prevent VDE;

- Establish a vehicle threshold limit of 75 or more vehicle trips/day before specified controls must be used to prevent VDE and to provide a stabilized surface;
- Establish a threshold limit of 25 or more vehicle trips/day for vehicles with three or more axels; and
- Require 48-hr notification to the District of special events whenever 1,000 or more vehicles will use unpaved surfaces for parking.

7. **Rule 8081** (Agricultural Sources) only applies to off-field agricultural source activities. Rule 8081 provides control requirements for bulk material storage and handling, unpaved roads, unpaved traffic areas, and unpaved staging/storage areas on farms. On-field agricultural sources (on cultivated land) are exempt from Rule 8081, but are subject to the control techniques specified in an agricultural Conservation Management Practice Program. The District's BACM analysis identified the following measures that will be considered during the amendment process for Rule 8031:

- Add a visible plume distance limit of 100 feet;
- Require that visible dust emissions not travel beyond the property line;
- Limit vehicle speeds to 15 mph on agricultural unpaved roads;
- Require watering and speed controls on unpaved areas receiving up to 25 VT/day;
- Establish a vehicle threshold limit of 26-75 vehicle trips/day before specified controls must be used to prevent VDE;
- Establish a vehicle threshold limit of 75-100 vehicle trips/day before specified controls must be used to prevent VDE and to provide a stabilized surface;
- Establish a threshold limit of 25 or more vehicle trips/day for vehicles with three or more axles;
- Limit an exemption to the storage of materials where the total amount of material stored is 100 cubic yards or less (specifically, section 4.6);
- Eliminate the existing one-acre exemption for unpaved vehicle and equipment parking and traffic areas (i.e.; the provisions of this rule will apply to all sites regardless of size) in section 4.7;
- Carryout and trackout from off-field agricultural sources are proposed to be part of the CMP Program, therefore, section 4.9 will need to be modified to reflect this situation. Any measure/practice for this source category must consider the benefits of existing Department of Motor Vehicles (DMV) regulations requiring trackout cleanup;
- Require wind barriers to have less than 50% porosity;

- Add an additional option to Table 8081-1 to allow 3-sided enclosures that are at least as high as the storage pile and with less than 50% porosity.

Regulation VIII does not address on-field agricultural activities. On-field agricultural sources (e.g., tilling, land preparation, and harvesting) will be regulated under the Conservation Management Practices (CMP) Program described earlier in this chapter. In addition, the CMP Program proposes to require growers to implement CMPs on their unpaved roads and unpaved staging/storage areas even if area (site size) or vehicle thresholds would normally preclude compliance with Rule 8081 provisions. The combination of the CMP Program and Rule 8081 are expected to make the District's agricultural fugitive dust program the most stringent in the nation for this source category.

*EMISSIONS AND EMISSIONS REDUCTION:*

**Table 4-11**
**PM10 Emissions Reductions from Regulation VIII in 2010**

| Rule | 2010 PM10 Emissions (tpd) | 2010 PM10 Emissions Reductions (tpd) | % Reduced |
|---|---|---|---|
| 8021 | 30.5 | 6.1 | 20.0 |
| 8031 | 0.2 | 0.0 | 0.3 |
| 8051 | 3.0 | 0.5 | 16.7 |
| 8061 | 85.3 | 10.4 | 12.2 |
| 8071 | 1.0 | 0.3 | 30.0 |
| 8081* | 16.9 | 1.5 | 8.9 |
| **Total** | **136.9** | **18.8** | **13.7** |

*Quantifies agricultural Unpaved Roads and Unpaved Traffic Areas only.

The reductions listed in Table 4-11 Include local commitments that overlap with Regulation VIII controls. Specific local commitment reductions that cover the same Regulation VIII source categories will be developed during the rule amendment process.

*IMPLEMENTATION SCHEDULE*: Implementation of amended rules to Regulation VIII would be effective immediately upon Governing Board adoption. Amendments to Regulation VIII must be completed by September 2004 in order to satisfy EPA approvability requirements.

E. Glass Melting Furnaces (Rule 4354)

*REASON FOR CONTROL MEASURE*: SOx emissions from glass melting furnaces exceed the "de minimis threshold" level, therefore, are subject to federal BACM requirements.

*AFFECTED SOURCES*: This control measure is intended to reduce SOx emissions from glass melting furnaces used in the production of container glass, flat glass, and fiberglass. These units are currently subject to District permitting requirements and Rule 4354 (Glass Melting Furnaces) for NOX, carbon monoxide (CO), and VOC control only. These facilities are located in all three regions of the District. For most of these facilities, the most effective control of SOx would be achieved through a fuel change or caustic scrubbing of the exhaust gas.

*DESCRIPTION*: The glass manufacturing industries are comprised of companies engaged in the manufacture of float glass for windows, mirrors, automobile windshields and the manufacture of glass packaging for beverages, food, chemicals and fiberglass products. There are three flat glass, three container glass, and two fiberglass companies in the SJVAB.

For this source category the furnaces are typically fired on a petroleum-based fuel to produce heat in a furnace that melts glass stock to form molten glass which is then formed into either flat or bottle glass. The SOx is a by-product of combustion of the petroleum-based fuel. This measure would affect any new and existing glass furnaces fired on petroleum-based fuel, and would establish specific SOx limits.

EMISSIONS AND EMISSIONS REDUCTIONS: Total SOX emissions from sources subject to Rule 4354 are estimated to be 4.2 tons per day in 2006. Upon final implementation of Rule 4354, 1.1 tons per day of SOX reductions is anticipated.

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the second quarter of 2005. Full BACM implementation (including BACT) for SOx is projected for the year 2006.

F. <u>Gas Fired Oilfield Steam Generators</u>

*REASON FOR CONTROL MEASURE*: SOx emissions from gas-fired oil production steam generators exceed the “de minimis threshold” level, and therefore are subject to federal BACM requirements.

*AFFECTED SOURCES*: Steam generators are similar to boilers found at industrial sources in that they produce steam for a process. In this source category, the steam generator is fired on oilfield gas to produce steam that is injected into oil reservoirs to decrease the viscosity of the oil being extracted. The majority of these units are located in the Kern County and Fresno County oilfields.

*DESCRIPTION*: These units are currently subject to District permitting requirements and Rule 4406 (Sulfur Compounds from Oilfield Steam Generators – Kern County). This control measure is intended to assure appropriate BACT control of SOx emissions from steam generators used in petroleum production. Compliance could be achieved through fuel conditioning (“sweetening”). Caustic scrubbing of the exhaust gas has also been an effective method of SOx control.

EMISSIONS AND EMISSIONS REDUCTIONS: Total SOX emissions from sources subject to the Gas Fired Oilfield Steam Generators control measure are estimated to be 8.5 tons per day in 2006. Upon final implementation of the Gas Fired Oilfield Steam Generators control measure, 5.0 tons per day of SOX reductions is anticipated.

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the fourth quarter of 2004. Full BACM implementation (including BACT) for SOX is projected for the year 2006.

G. Indirect Source Mitigation Fee

*REASON FOR CONTROL MEASURE:* Growth in indirect source emissions offsets a substantial portion of the benefit of controls on motor vehicles and directly emitted PM10 from entrained road dust and construction. Indirect source mitigation fees provide an option to reduce emissions off-site when additional on-site emission reductions are not feasible. This control measure is needed for attainment.

*AFFECTED SOURCES:* The program will be applicable to all development projects that generate motor vehicle trips.

*DESCRIPTION:* Indirect sources are land uses that attract or generate motor vehicle trips. Indirect source emissions are not emitted directly from activities at the location, as is the case for stationary sources such as boilers, and fuel storage tanks, but are the result of vehicles traveling to and from the site. They include residential, commercial, industrial, and institutional development.

The SJVAB population is expected to continue to grow rapidly. As more people settle in this region and use motor vehicles as their primary means of transportation, vehicle miles traveled also increase. This greater motor vehicle use offsets a significant amount of the progress achieved by tailpipe and fuel controls and by regulations to reduce construction and vehicle related fugitive PM10. Under the Indirect Source Mitigation Fee Program, new development projects would be required to mitigate a portion of their emissions by contributing to a mitigation fund that would be used to pay for the most cost-effective projects to reduce emissions. The amount of the fee can be revised depending on the emission reductions required to meet RFP and the emission reducing projects available to fund. The program could be managed by the District or delegated to cities and counties.

The District is also proposing a focused mitigation program for the Bakersfield Metropolitan Area. This area has experienced relatively high levels of geologic PM10 on mid-winter days compared to other parts of the Valley. This condition occurs on days with very low wind speed. This indicates that local sources such as construction, paved and unpaved road dust, and unpaved parking areas are a significant problem in the Bakersfield Metropolitan Area. Modeling conducted for the PM10 Plan confirms that additional reductions of approximately 1 ton per day of PM10 emissions are needed to bring the Bakersfield, Golden State Boulevard monitoring site into attainment by 2010. This 1 ton per day commitment is beyond the reductions expected for the Valley-wide Indirect Source Mitigation Fee Program. These additional reductions may be funded through fees or through grants such as the federal Congestion Mitigation Air Quality (CMAQ) or state sources. CMAQ is due to be reauthorized by Congress this year, but funding is not certain. During the previous six-year cycle, the San Joaquin Valley received about $160 million in CMAQ funding. To allow time for funding sources to be determined, this commitment is proposed for the 2006 to 2010 period.

Available information indicates that no comprehensive indirect source fee-based programs exist in the country. Some local jurisdictions in the SJVAB have adopted small indirect source fees. Several California air districts negotiate mitigation fees on a project-by-project basis through the California Environmental Quality Act (CEQA) review process.

*EMISSIONS AND EMISSIONS REDUCTIONS:*

**Table 4-12**
**Estimated Emissions Reductions**
**from Indirect Source Mitigation Fee**

| Category | 2010 PM10 Emissions (tpd) | 2010 PM10 Emissions Reductions (tpd) | % Reduction |
|---|---|---|---|
| Paved Road Dust | 43.3 | 4.2 | 9.7 |
| Unpaved Road Dust | 6.6 | 1.2 | 18.2 |
| Windblown Dust | 3.1 | 0.6 | 19.4 |
| Unpaved Traffic Areas | 1.0 | 0.2 | 20.0 |
| Total | 54.0 | 6.2 | 11.5 |

It is also anticipated that 4.1 tons per day of NOX will be reduced from this control measure in 2010. The NOX reductions are projected to come from mobile sources fueled by diesel, such as agricultural equipment or irrigation pumps, heavy duty trucks, heavy duty buses, off-road equipment, and development measures that reduce vehicle trips or miles traveled and area source emissions from buildings and landscape maintenance. The program will not be limited to these sources. All cost-effective projects that reduce emissions will be considered.

*IMPLEMENTATION SCHEDULE:* Rule development is scheduled to begin in the second quarter of 2003 with adoption in 2004, and implementation will begin in 2005.

H. Residential Wood Combustion

*REASON FOR CONTROL MEASURE*: PM10 and VOC emissions from residential wood combustion exceed the “de minimis threshold” level, and therefore are subject to federal BACM requirements. Rule amendments are also needed to address deficiencies identified by EPA in their February 7, 2002 limited approval and limited disapproval of Rule 4901, Residential Wood Burning.

*AFFECTED SOURCES*: Rule 4901 addresses wood-burning devices (e.g., fireplaces, pellet stoves and wood stoves) that burn solid fuels such as cordwood, pellet fuel, manufactured logs, or any other non-gaseous or non-liquid fuels.

*DESCRIPTION*: The amendments to the existing Rule 4901 would implement BACM and address deficiencies identified by EPA. Those deficiencies are:

- The lack of mandatory curtailment on high pollution days,
- The lack of a requirement to limit the number of fireplaces and wood burning devices per acre in new residential developments, and
- The lack of a requirement for fireplaces or woodstoves to have EPA-certified Phase II standards upon property sale or transfer.

The District conducted a BACM analysis to demonstrate that the existing measures included in Rule 4901, when combined with the proposed amendments listed above, meet BACM requirements. The results of the analysis indicated that the rule with proposed amendments will meet BACM requirements. Please see Appendix G for the Rule 4901 BACM analysis.

EMISSIONS AND EMISSIONS REDUCTIONS: Total emissions and emissions reductions from the proposed amendments to Rule 4901 are as follows:

**Table 4-13**
**Emissions and Emissions Reductions from Rule 4901 in 2004**

| | Annual Average | | 24-Hour Average (Seasonal) | | 24-Hour Average (Episodic) | |
|---|---|---|---|---|---|---|
| | Emissions (tpd) | Emissions Reduction (tpd) | Emissions (tpd) | Emissions Reduction (tpd) | Emissions (tpd) | Emissions Reduction (tpd) |
| NOX | 1.2 | 0.2 | 2.3 | 0.4 | 2.3 | 1.8 |
| VOC | 6.2 | 1.1 | 12.0 | 2.3 | 12.0 | 9.6 |
| PM10 | 11.7 | 2.3 | 22.9 | 4.7 | 22.9 | 18.3 |

*IMPLEMENTATION SCHEDULE*: The District expects to adopt amendments to Rule 4901 by the third quarter of 2003.

I. Small Boilers, Steam Generators and Process Heaters, from 2 MMBtu/hr to 5 MMBtu/hr

*REASON FOR CONTROL MEASURE*: NOx and SOx emissions from smaller boilers, steam generators, and process heaters, exceed the “de minimis threshold” levels, and therefore are subject to federal BACM requirements.

*AFFECTED SOURCES*: Facilities with units that are subject to this control measure represent a wide range of industries, including but not limited to medical facilities, educational institutions, office buildings, prisons, military facilities, hotels, and industrial facilities (including agricultural processing facilities). Due to the diversity of affected industries, units in this source category are located throughout the SJVAB. Based on population and job base, there are likely to be more units located in urban and suburban settings. The emissions inventory categories affected include Manufacturing and Industrial Fuel Combustion, and Service and Commercial-Other Fuel Combustion.

*DESCRIPTION*: These units are not currently regulated by the District permitting process or a prohibitory rule. The District does not currently issue permits to operate for gas-fired equipment in this source category, but may do so in the future. Combustion modifications appropriate for small boilers, steam generators, and process heaters include low excess air, low NOx burners, and flue gas recirculation (FGR).

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the fourth quarter of 2004. Full BACM implementation for NOX and SOx is projected for the year 2006.

EMISSIONS AND EMISSIONS REDUCTIONS: Total SOX emissions from sources subject to the Small Boilers, Steam Generators and Process Heaters control measure are estimated to be 1.1 tons per day in 2006. Upon final implementation of the proposed Small Boilers, Steam Generators and Process Heaters control measure, 0.1 tons per day of SOX reductions is anticipated in 2006. Total NOX emissions from sources subject to the Small Boilers, Steam Generators and Process Heaters control measure is estimated to be 8.6 tons per day in 2006. Upon final implementation of the Small Boilers, Steam Generators and Process Heaters control measure, 1.0 tons per day of NOX reductions is anticipated.

J. <u>Water Heaters 75,000 Btu/hr to 2 MMBtu/hr</u>

*REASON FOR CONTROL MEASURE*: NOx and SOx emissions from industrial, commercial and institutional water heaters exceed the “de minimis threshold” levels, and are therefore subject to federal BACM requirements.

*AFFECTED SOURCES*: Facilities with units that are subject to this control measure represent a wide range of industries, including but not limited to medical facilities, educational institutions, office buildings, prisons, military facilities, hotels, and industrial facilities (including agricultural processing facilities). Due to the diversity of industries, units in this source category are located throughout the eight (8) county area of the SJVAB. Based on population and job base, more units may be located in urban and suburban settings. Affected emissions inventory categories include Manufacturing and Industrial Fuel Combustion, and Service and Commercial-Other Fuel Combustion.

*DESCRIPTION*: These units are not currently regulated by the District permitting process or by a prohibitory rule. The BACM would likely affect new and existing commercial, industrial, or institutional water heaters with a rated heat input capacity between 75,000 Btu/hr and 2 MMBtu/hr. NOx and SOx prohibitory rules may be coupled with a financial incentive program to accelerate the replacement or retrofit of higher-polluting units. The District does not anticipate issuing permits for these units in the future.

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the fourth quarter of 2004. Full BACM implementation of controls for new units for NOx and SOx is projected for the year 2004.

EMISSIONS AND EMISSIONS REDUCTIONS: Total SOX emissions from sources subject to the Water Heaters control measure are estimated to be 5.1 tons per day in 2004. Upon final implementation of the Water Heaters control measure, 0.0 tons per day of SOX reductions is anticipated. Total NOX emissions from sources subject to the Water Heaters control measure is estimated to be 39.8 tons per day in 2004. Upon final implementation of the Water Heaters control measure, 0.2 tons per day of NOX reductions is anticipated.

K. Wineries

*REASON FOR CONTROL MEASURE*: VOC emissions from wineries exceed the "de minimis threshold" level, and therefore are subject to federal BACM requirements.

*AFFECTED SOURCES:* Two winery processes that produce significant VOC emissions are wine fermentation and wine aging. Fermentation is the process in which sugars (glucose and fructose) in grape juice undergo a reaction with yeast to produce ethyl alcohol (ethanol) and carbon dioxide. Temperature is very important in the fermentation of wine, and there are specific temperature tolerance ranges for red, white, sparkling and dessert wines. It is becoming common practice for wineries to have temperature-controlled fermentation tanks. The EPA AP 42 document lists a range from 53°F to 83°F for fermentation temperatures inside winery tanks. Refrigeration of fermentation tanks can also serve to inhibit the evaporation of ethanol.

The production of wine is seasonal, coinciding with the growth cycle of grapes. The first processing of harvested grapes, called the crush, occurs as early as mid-July with its peak occurring in mid-September to late October. Peak VOC emissions from wineries typically occur between mid-July and late November.

*DESCRIPTION*: Wine fermentation and wine aging are not currently regulated by the District permitting process or a prohibitory rule. Emission controls (other than process refrigeration) are not currently being used during the production of wines. Reductions of VOC could be achieved through the use of tanks with vapor collection and control systems, carbon adsorption, water scrubbers, catalytic incineration, condensation, and additional temperature control as appropriate.

*IMPLEMENTATION SCHEDULE*: Rule adoption is scheduled for the fourth quarter of 2004. Full BACM implementation for VOCs is projected for the year 2007.

EMISSIONS AND EMISSIONS REDUCTIONS: Total VOC emissions from sources subject to the Wineries control measure are estimated to be 7.9 tons per day in 2007. Upon final implementation of the Wineries control measure, 2.5 tons per day of VOC reductions is anticipated.

L. Steam-Enhanced Crude Oil Production Well Vents

REASON FOR CONTROL MEASURE: VOC emissions from steam enhanced crude oil production well vents exceeds the “de minimis threshold” level, therefore, are subject to federal BACM requirements.

AFFECTED SOURCES: This control measure would reduce VOC emissions from steam-enhanced crude oil production wells and any associated vapor collection and control systems. 1998, there were approximately 23,000 active steam enhanced crude oil production wells in the SJVAB. Most of the steam enhanced crude oil production wells are located in Kern County. As the wells operate throughout the year, emissions occur uniformly during the year. Rule 4401 prohibits the operation of steam enhanced crude oil production wells unless the VOC emissions from oil production well vents are reduced by at least 99 percent by weight. This level of control can be achieved through the operation of a vapor collection and control system. The rule also requires that well vent vapor collection and control systems be maintained in good repair, with standards for specified allowable number of leaks depending upon the number of wells connected to the systems. Limited numbers of cyclic wells that meet specified conditions are currently exempted from the rule. Sources are also subject to Rule 4002 (National Emissions Standards for Hazardous Air Pollutants) and Rule 4102 (Nuisance).

DESCRIPTION: Further emission reductions can be achieved by lowering the exemption thresholds to make more sources subject to the rule. The rule is enforced through District permit and enforcement programs and would include inspections, annual on site emission source testing and keeping of records.

IMPLEMENTATION SCHEDULE: Adoption for this control measure is anticipated by the first quarter of 2005 and full BACM implementation for VOC control is projected for the year 2006.

EMISSIONS AND EMISSIONS REDUCTIONS: Total VOC emissions from sources subject to the Steam-Enhanced Crude Oil Production Well Vents control measure are estimated to be 14.7 tons per day in 2006. Upon final implementation of the proposed Steam-Enhanced Crude Oil Production Well Vents control measure, 1.5 tons per day of VOC reductions is anticipated.

M. Residential Space Heating

REASON FOR CONTROL MEASURE: NOx emissions from residential space heating exceed the “de minimis threshold” level and, therefore, are subject to federal BACM requirements.

AFFECTED SOURCES: Residential fan-type central furnaces fueled on natural gas emit NOx emissions from the combustion of fuel and contribute to the PM10 problem as a PM10 precursor. These units are located throughout the District in urban, suburban, and rural settings. The emissions inventory for this source category shows that grow that has occurred in the San Joaquin Valley Air Basin but also shows a decline in emissions over time. Staff believes that the area source emissions inventory is accounting for the sale of units already in compliance with the proposed control. Several other air district's in the state have rules in place that prohibit the sale of units that do not meet the limits specified in their rules and it is conceivable that rather than manufacturing a non-compliant furnace specifically for the SJVAB, that manufacturers supply the same compliant furnaces for sale in the District. This issue is not fully understood at this time but will be investigated further during the rule development process.

DESCRIPTION: These units are not currently regulated by the District. The control measure would likely affect new furnaces installed in new residences and units replaced in existing homes. The control measure would address central furnaces with a rated heat input capacity of less than 175,000 BTU per hour. Installation of natural gas fired fan type central furnaces will be limited to units certified to have NOx emissions less than 40 nanograms per joule (0.093 lbs NOx per million BTU) of heat output. Existing units installed prior to the adoption of this control measure would not be impacted until the replacement of those units. Bay Area Air Quality Management District's assumed a 20 year full implementation process for this source category and District staff assumes the same implementation schedule for this control measure.

IMPLEMENTATION SCHEDULE: Adoption for this control measure is anticipated by the third quarter of 2004 and full BACM implementation for NOx control is projected for the year 2020.

EMISSIONS AND EMISSIONS REDUCTIONS: Total NOX emissions from sources subject to the Residential Space Heating control measure are estimated to be 2.4 tons per day in 2010. The NOX reduction from the Residential Space Heating control measure is anticipated to be 0.01 tons per day in 2010.

N. Agricultural Irrigation Engines

*REASON FOR CONTROL MEASURE:* EPA has indicated that this source category should be evaluated for BACM control, specifically a limitation on visible emissions, as in Rule 4101 (Visible Emissions). Rule 4101 (Visible Emissions) contains an exemption for equipment in agricultural operations necessary for the growing of crop or raising of fowl or animals. The District will review this measure for technical and economic feasibility prior to proceeding with rule development.

*AFFECTED SOURCES:* The District currently estimates that there are approximately 4,500 internal combustion engines operated by the agriculture industry for irrigation in the San Joaquin Valley.

*DESCRIPTION:* The operation of internal combustion engines involves the combustion of fossil fuels, which generate PM10 emissions. If not properly tuned, diesel engines can emit visible emissions (PM). Rule 4101 establishes the 20% opacity standard for all sources with the exception of certain activities including equipment used in agricultural operations such as irrigation engines. Possible control techniques include periodic engine tune-ups to achieve the visible emission standard of 20% opacity. The District will review the feasibility of this measure.

*IMPLEMENTATION SCHEDULE:* Rule adoption in the fourth quarter 2004, full compliance by third quarter 2005.

*EMISSIONS AND EMISSIONS REDUCTIONS:* Emissions reductions are not quantifiable at this time.

## State Commitments

**This section was prepared by California Air Resources Board staff. No changes to the text were made by the District.**

This section describes the proposed State commitments to achieve further emission reductions in PM10 and its precursors to help attain the federal PM10 standards in the San Joaquin Valley by 2010. The motor vehicles and equipment under State and federal jurisdiction are responsible for the majority of Valley air pollution, and are contributing the majority of the emission reductions needed for attainment. Adopted State and federal regulations for cleaner engines and fuels are driving Valley NOx emissions down by over 140 tons per day (tpd) or nearly 40 percent between 1999 and 2010. Emissions of direct particulate matter from these sources will drop by over ten percent and ROG by well over 40 percent in the same timeframe.

To supplement the existing program, the Air Resources Board (ARB) staff has identified a series of new measures that would be developed over the next several years to provide additional NOx and PM10 reductions, consistent with the attainment demonstration needs established in this SIP. These measures are a subset of a larger strategy ARB staff has proposed to cut emissions of ROG, NOx, and particulate matter statewide. The draft strategy was released in January; the *Proposed 2003 State and Federal Strategy for the California State Implementation Plan* will be available on ARB's website on May 12. This document contains a description of each proposed measure. ARB began developing the strategy in 2001 with workshops around the State, including the Valley, to solicit ideas from the public and to share initial concepts for emission reduction measures.

The proposed State commitment for this plan has two parts – achieving specific emission reductions and developing the defined measures for Air Resources Board consideration.

### State Commitment for Further Emission Reductions

Table 4-11 shows the proposed State commitment to adopt new measures between 2002-2008 that reduce emissions by an additional 10 tpd NOx and 0.5 tpd direct PM10 in the San Joaquin Valley in 2010. ARB may meet this commitment by adopting one or more of the control measures in Table 4-12, by adopting one or more alternative measures, or by implementing incentive program(s), as long as the total new emission reductions are achieved.  While the legal commitment is to adopt and implement strategies that achieve the emission reductions by the attainment date, ARB staff is already working on several of the measures for near-term consideration.

The new reductions also include the benefits of planned improvements to the enhanced vehicle inspection and maintenance program, or Smog Check.  This implementation may require additional regulatory action by the Bureau of Automotive Repair (BAR).

Table 4-14
**Proposed State Commitment for New Emission Reductions**
**San Joaquin Valley, 2010**

| | **TOTAL STATE** |
|---|---|
| **NOx** | 10 |
| **Direct PM10** | 0.5 |

State Commitment to Propose Defined Control Measures

In addition to the enforceable commitment to reduce emissions, the ARB staff also commits to submit to the Board and propose for adoption the ARB control measures set forth in Table 4-12.  For LT/MED-DUTY-1, ARB commits to complete the pilot program and propose a control measure if the approach described proves to be feasible and effective.

The specific regulatory proposal for each potential measure will be developed in an extensive public process that considers the technical feasibility, cost-effectiveness, and other impacts of the strategy.  The Board shall take action on or before the dates set forth in Table 4-12.  Such action by the Board may include any action within its discretion.  For informational purposes, Table 4-12 shows the benefits that would be expected from implementation of each defined measure, although the enforceable commitment is for the total new reductions.

The defined State measures are described in detail in ARB's document *Proposed 2003 State and Federal Strategy for the California State Implementation Plan,* which will be publicly available on May 12.  This document also includes evidence of BAR's commitment to finish implementing the Enhanced Smog Check improvements described in LT/MED-DUTY-2.

**Table 4-15**
**Proposed New State Measures**
**San Joaquin Valley, 2010**

| Strategy (Agency) | Name | Expected Reductions*, tpd | | | Action Dates |
|---|---|---|---|---|---|
| | | ROG | PM10 | NOx | |
| LT/MED-DUTY-1 (ARB) | Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles – Pilot Program | 0-2.4 | -- | 0-2.7 | 2005 |
| LT/MED-DUTY-2 (BAR) | Smog Check Improvements | 1.5 | -- | *3* | 2002-2005 |
| ON-RD HVY-DUTY-3 (ARB) | Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet – PM In-Use Emission Control, Engine Software Upagrade, On-Board Diagnostics, Manufacturers' In-Use Compliance, Reduced Idling | 1.5 | 0.1 | 4 | 2003-2006 |
| OFF-RD CI-1 (ARB) | Pursue Approaches to Clean Up the Existing Heavy-Duty Off-Road Equipment Fleet (Compression Ignition Engines) – Retrofit Controls | 1.0 | 0.4 | 0 | 2004-2008 |
| OFF-RD LSI-2 (ARB | Clean Up Existing Off-Road Gas Equipment Through Retrofit Controls (Spark-Ignition Engines 25 hp and Greater) | 0.1 | -- | 0.1 | 2004 |
| OFF-RD LSI-3 (ARB) | Require Zero Emission Forklifts (Rental and New Purchases) Where Feasible – Lift Capacity ≤8,000 Pounds | 0.1 | -- | 0.2 | 2004 |
| **Total Emission Reduction Commitment from New State Measures** | | 0 | 0.5 | 10 | 2002-2008 |

* Expected reductions from individual defined measures are shown for information only. The State is proposing commitments for total new reductions in NOx and PM10 emissions only, consistent with the PM10 attainment demonstration. Commitments for further ROG reductions will be considered in the context of the upcoming Valley Ozone SIP.

## Process for State Action

ARB staff has provided this section to the District staff for publication in this document to facilitate public review of the plan by consolidating the local and State control strategy. The State's proposal is not subject to action by the District's Governing Board. The Air Resources Board will hold its own public hearing on June 26-27, 2003 in Fresno to consider adoption of ARB staff's proposal for new State commitments, as well as the local elements of the San Joaquin Valley PM10 SIP if approved by the District's Governing Board.

The State proposal is summarized here and in Section I, Chapter D of the comprehensive strategy document. Only the emission reduction commitment for the San Joaquin Valley PM10 SIP and the associated measures identified in this portion of the document will be considered by ARB at its June meeting. If the SIP is adopted by the District and the SIP and the State commitment are approved by ARB, ARB will submit both of these elements to the U.S. EPA for approval as a revision to the California SIP.

**State Contacts and Documents**

ARB's *Proposed 2003 State and Federal Strategy for the California State Implementation Plan* will be available at http://arb.ca.gov/planning/sip/sip.htm on May 12. For more information on the ARB hearing, please check the "Board Meetings" section of the ARB website at http://arb.ca.gov. Written copies of the Strategy or hearing notice may also be obtained from ARB's Public Information Office at 1001 I Street, 1st Floor, Environmental Services Center, Sacramento, California 95814, or by calling (916) 322-2990.

**Transportation Planning Agency Commitments**

The Regional Transportation Planning Agencies (RTPA)s conducted an extensive process to identify and implement BACM in support of the PM10 Plan for the SJVAB. The documentation for that process can be found in Appendix I. The resolutions adopted by the RTPAs and their member jurisdictions to commit to implement local government control measures for PM10 precursors are included in the corresponding Regional Transportation Planning Agency Commitments for Implementation Document (RTPACID) and can be viewed at the District's Fresno Office. Each jurisdiction determined which measures are feasible for implementation by that jurisdiction. The commitment documents also contain the measures that these jurisdictions found not to be feasible and the corresponding justification for their assessment.

## EMISSIONS REDUCTIONS FROM ALL COMMITTED MEASURES

Reductions in PM10 and PM10 precursor emissions will be achieved from several different sources. New commitments listed in this PM10 Plan will be quantified in the following tables, as well as commitments listed in the Ozone Rate of Progress (ROP) Plan that have not already been incorporated into the emissions inventory. Several federal, State and District measures have been adopted, but not fully implemented. The emissions reductions attributed to these measures have already been incorporated into the emissions inventory and they will assist the District with attainment of the NAAQS and the 5 percent demonstration. However, they will not be quantified in Tables 4-16 through 4-23.

## Table 4-16
## Estimated Annual Emission Reductions of PM10

| CM Name | Rule # | PM10 Emission Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Agriculture Conservation Management Practices | To be Determined (TBD) | 34.4 | 34.0 | 33.8 | 3Q/04 |
| Cotton Gins | TBD | 1.5 | 1.6 | 1.7 | 2Q/05 |
| Fugitive PM10 Prohibitions (excluding unpaved vehicle areas) | Regulation VIII | 10.3 | 16.4 | 18.8 | 4Q/05** |
| Indirect Source Mitigation Fee | TBD | 1.3 | 4.0 | 6.2 | 1Q/05 |
| Residential Wood Combustion | 4901 | 2.9 | 4.4 | 5.4 | 1Q/04 |
| State and Federal Measures* | Various | N/A | N/A | 0.5 | Varies |
| **Total PM10 Emissions Reductions** | | **50.3** | **60.4** | **66.4** | |

*Reductions listed are in winter tpd.
**All of Regulation VIII will be implemented by 4Q of 2005, with the exception of an unpaved road measure which will be phased and fully implemented by 4Q of 2008.

## Table 4-17
## Estimated Seasonal Emission Reductions of PM10

| CM Name | Rule # | PM10 Emission Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Agriculture Conservation Management Practices | To be Determined (TBD) | 27.2 | 26.9 | 26.7 | 3Q/04 |
| Cotton Gins | TBD | 2.3 | 2.4 | 2.5 | 2Q/05 |
| Fugitive PM10 Prohibitions (excluding unpaved vehicle areas) | Regulation VIII | 9.9 | 15.7 | 17.9 | 4Q/05** |
| Indirect Source Mitigation Fee | TBD | 1.2 | 3.7 | 5.7 | Unknown |
| Residential Wood Combustion | 4901 | 18.7 | 19.7 | 20.4 | 1Q/04 |
| State and Federal Measures* | Various | N/A | N/A | 0.5 | Varies |
| **Total PM10 Emissions Reductions** | | **59.2** | **68.3** | **73.7** | |

*Reductions listed are in winter tpd.
**All of Regulation VIII will be implemented by 4Q of 2005, with the exception of an unpaved road measure which will be phased and fully implemented by 4Q of 2008.

**Table 4-18**
**Estimated Annual Emission Reductions of NOx**

| CM Name | Rule # | NOX Emissions Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Boilers, Steam Generators & Process Heaters | 4306 | 2.0 | 7.7 | 7.7 | 2Q/07 |
| Dryers | TBD | 0.2 | 0.4 | 0.4 | 4Q/06 |
| Incentive Programs | None | 6.3 | 6.8 | 6.5 | N/A |
| Indirect Source Mitigation Fee | TBD | 0.7 | 2.7 | 4.1 | 4Q/04 |
| Residential Wood Combustion | 4901 | 0.2 | 0.2 | 0.2 | 1Q/04 |
| Residential Space Heating | TBD | 0.0 | 0.0 | 0.0 | 4Q/20 |
| Small Boilers | TBD | 0.2 | 0.4 | 0.4 | 4Q/06 |
| Smog Check II* | N/A | 6.1 | 5.7 | 4.9 | 1Q/03 |
| State and Federal Measures | TBD | N/A | N/A | 10.0 | Varies |
| Stationary Internal Combustion Engines | 4702 | 0.4 | 1.7 | 1.7 | 2Q/07 |
| Water Heaters | TBD | 1.0 | 1.7 | 1.8 | 4Q/04 |
| **Total NOX Emissions Reductions**** | | **16.7** | **26.1** | **36.1** | |

*Smog Check II is not accounted for in the emissions inventory, so reductions are accounted for in this table.
**Totals may differ slightly due to rounding.

**Table 4-19**
**Estimated Seasonal Emission Reductions of NOx**

| CM Name | Rule # | NOX Emissions Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Boilers, Steam Generators & Process Heaters | 4306 | 1.9 | 7.3 | 7.3 | 2Q/07 |
| Dryers | TBD | 1.1 | 1.2 | 1.2 | 4Q/06 |
| Incentive Programs | None | 4.8 | 5.2 | 5.0 | N/A |
| Indirect Source Mitigation Fee | TBD | 0.5 | 2.0 | 3.1 | 4Q/04 |
| Residential Wood Combustion | 4901 | 1.8 | 1.9 | 1.9 | 1Q/04 |
| Residential Space Heating | TBD | 0.0 | 0.0 | 0.0 | 4Q/20 |
| Small Boilers | TBD | 0.2 | 1.2 | 1.2 | 4Q/06 |
| Smog Check II | | 6.4 | 6.0 | 5.2 | |
| State and Federal Measures | TBD | N/A | N/A | 10.0 | Varies |
| Stationary Internal Combustion Engines | 4702 | 0.4 | 1.7 | 1.7 | 2Q/07 |
| Water Heaters | TBD | 0.2 | 0.5 | 0.7 | 4Q/04 |
| **Total NOX Emissions Reductions** | | **17.3** | **27.0** | **37.3** | |

**Table 4-20**
**Estimated Annual Emission Reductions of VOC**

| CM Name | Rule # | VOC Emissions Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Can & Coil Coatings | 4604 | 0.3 | 0.4 | 0.4 | 4Q/04 |
| Glass Coating Operations | 4610 | 0.2 | 0.2 | 0.2 | 1Q/04 |
| Glycol Dehydration Systems | 4408 | 1.6 | 1.7 | 1.8 | 4Q/03 |
| Fugitives from Oil and Gas Facilities | 4403 | 4.8 | 4.8 | 4.7 | 1Q/05 |
| Fugitives from Chemical and Refinery Plants | 4455 | 0.2 | 0.2 | 0.2 | 1Q/05 |
| Residential Wood Combustion | 4901 | 1.3 | 1.9 | 2.3 | 1Q/04 |
| Steam Enhanced Crude Oil Production Well Vents | 4401 | 0.0 | 1.5 | 1.4 | 1Q/06 |
| Wineries | TBD | 0.7 | 2.5 | 2.6 | 4Q/06 |
| State and Federal Measures | TBD | N/A | N/A | 7.2* | Varies |
| **Total VOC Emissions Reductions** | | **9.1** | **13.2** | **20.8** | |

*The State SIP commitment is for total reductions. Expected reductions from state and federal measures are shown for information only. Specific reductions are to be identified later.

**Table 4-21**
**Estimated Seasonal Emission Reductions of VOC**

| CM Name | Rule # | VOC Emissions Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Can & Coil Coatings | 4604 | 0.3 | 0.4 | 0.4 | 4Q/04 |
| Glass Coating Operations | 4610 | 0.1 | 0.2 | 0.2 | 1Q/04 |
| Glycol Dehydration Systems | 4408 | 1.6 | 1.7 | 1.8 | 4Q/03 |
| Fugitives from Oil and Gas Facilities | 4403 | 4.8 | 4.8 | 4.7 | 1Q/05 |
| Fugitives from Chemical and Refinery Plants | 4455 | 0.2 | 0.2 | 0.2 | 1Q/05 |
| Residential Wood Combustion | 4901 | 9.7 | 10.1 | 10.4 | 1Q/04 |
| Steam Enhanced Crude Oil Production Well Vents | 4401 | 0.0 | 1.5 | 1.4 | 1Q/06 |
| Wineries | TBD | 0.7 | 2.3 | 2.3 | 4Q/06 |
| State and Federal Measures | TBD | N/A | N/A | 7.2* | Varies |
| **Total VOC Emissions Reductions** | | **17.4** | **21.1** | **28.6** | |

*The State SIP commitment is for total reductions. Expected reductions from state and federal measures are shown for information only. Specific reductions are to be identified later.

**Table 4-22**
**Estimated Annual Emission Reductions of SOx**

| CM Name | Rule # | SOX Emissions Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Natural Gas-Fired Oilfield Steam Generators | TBD | 2.4 | 4.8 | 4.8 | 2Q/06 |
| Glass Melting Furnaces | 4354 | 0.2 | 1.1 | 1.2 | 4Q/06 |
| Small Boilers | TBD | 0.1 | 0.1 | 0.15 | 4Q/06 |
| Dryers | TBD | 0.1 | 0.1 | 0.15 | 4Q/06 |
| **Total SOX Emissions Reductions** | | **2.7** | **6.2** | **6.3** | |

Totals may differ slightly due to rounding.

**Table 4-23**
**Estimated Seasonal Emission Reductions of SOx**

| CM Name | Rule # | SOX Emissions Reduction (tpd) | | | Final Implementation Date |
|---|---|---|---|---|---|
| | | 2005 | 2008 | 2010 | |
| Natural Gas-Fired Oilfield Steam Generators | TBD | 2.4 | 4.8 | 4.8 | 2Q/06 |
| Glass Melting Furnaces | 4354 | 0.2 | 1.2 | 1.2 | 4Q/06 |
| Small Boilers | TBD | 0.0 | 0.1 | 0.2 | 4Q/06 |
| Dryers | TBD | 0.0 | 0.1 | 0.2 | 4Q/06 |
| **Total SOX Emissions Reductions** | | **2.7** | **6.2** | **6.3** | |

Totals may differ slightly due to rounding.

There are some rules that will reduce emissions of PM10 and PM10 precursors, but these rules are not currently quantifiable and/or were not incorporated into the emissions inventory. These rules are: Soil Decontamination, Regulation VIII – Windblown Dust from Open Areas (other than unpaved roads), and the Fleet Rule.

The emissions reductions identified in Tables 4-16 through 4-23 will be incorporated with the emissions inventory to project future year emissions inventories with controls. These projected year emissions inventories are referred to as attainment inventories and can be found in Appendix J.

## CONTINGENCY CONTROL MEASURES

The CAA section 172(c)(9) requires attainment plans to provide for the implementation of specific measures to be undertaken if an area fails to make reasonable further progress (RFP). Contingency measures must take effect without any further action by the State or the EPA. The Addendum to the General Preamble Section VII(B)(4) states that EPA will require the submittal of a plan revision within nine months after failure to achieve a milestone that assures that the area will achieve the next milestone. That action would also necessitate the implementation of contingency measures.

The District has included all measures currently known to be feasible in the PM10 Plan to obtain the reductions needed to attain the NAAQS at the earliest practicable date. Some of the proposed contingency measures have substantial uncertainties in their emission inventory and control technology and were not suitable for inclusion as a regular control measure, but staff continues the process of researching additional information to establish a viable control measure. These measures are on the District's rule development schedule as firm commitments. In some cases, the contingency measures have not undergone the review afforded to the primary control measures. Accordingly, their description and estimated reductions are subject to revision.

The contingency measures proposed for potential implementation by the District are identified below. The District continually tracks new technologies and control strategies to identify potential measures suitable for this region. The measures may be modified at a later date to account for cost effectiveness and technical feasibility considerations prior to rule adoption. The listed measures may be replaced with new, more effective contingency measures as needed.

Regulation VIII Amendments

Appendix G, the BACM analysis for Regulation VIII, contains a table entitled "Identification and Justification of BACM Selected," that provides a comprehensive listing of control measures, what the control measure proposes, technological feasibility, cost effectiveness, and discussion/justification of control measures. Of the measures that were not selected for BACM, several measures were identified as contingency measures for varying reasons. The final contingency measures are subject to change based on input received from stakeholders and the public and from the socioeconomic impact analysis. Below is a description of the potential amendments to the rules under Regulation VIII that the District would implement if emission milestones are not achieved.

**Rule 8021**

- Prohibit demolition activities when wind speeds exceed 25 mph.
- Require a designated person to monitor and if necessary to manage/optimize dust control activities on-site for constructions projects with 50 or more acres of disturbed surface; and
- Require minimum soil moisture content of 12% for earthmoving.

**Rule 8031**

- Cease material handling activities when a dust plume crosses property line(s) during a wind event; and
- Require application of water to storage piles at least once per hour or cover piles with tarps or similar coverings during a wind event.

**Rule 8071**

- Eliminate the use of water as a control option for unpaved parking areas with activity levels of 75 or more vehicle trips/day to prevent VDE more than 25 days per year. The use of water shall remain an optional control technique for vehicles that operate exclusively within the site; and
- Eliminate the use of water as a control option for unpaved parking areas with 25 or more vehicle trips/day for more than 25 days per year with three or more axles to prevent VDE and to provide a stabilized surface.

**Rule 8081**

- Eliminate the use of water as a control option for unpaved parking areas with activity levels of 75 or more vehicle trips/day to prevent VDE as specified in Rule 8071. The use of water shall remain an optional control technique for vehicles that operate exclusively within the site;
- Eliminate the use of water as a control option for unpaved parking areas with 25 or more vehicle trips/day more than 25 days per year with three or more axles to prevent VDE and to provide a stabilized surface as specified in Rule 8071;
- Cease material handling activities when a dust plume crosses property line(s) during a wind event; and
- Require application of water to storage piles at least once per hour or cover piles with tarps or similar coverings during a wind event.

<u>Agricultural Conservation Management Practices (CMP) Program</u>

The Agricultural Conservation Management Practices (CMP) Program contains a backstop provision that would require the District to increase the number of measures required if the CMP fails to achieve its emission reduction goals. The program currently is envisioned to require one measure from each of five source categories – unpaved roads, unpaved parking and equipment storage areas, land preparation, harvest, and other. Depending on the reductions needed, the requirement could be increased by one or more measures. The grower would choose the source category to which the additional measure would apply. The District would implement the change in the year following the shortfall identification.

<u>Additional Local Commitments</u>

If the cause of the failure to achieve RFP is related to failure to meet local commitments, the local agencies will be required to identify and fund projects under their jurisdiction and budget authority that will reduce emissions prior to the next RFP milestone date. This contingency measure is subject to financial constraints at the local jurisdiction. Since future budgets cannot be accurately predicted and are subject to forces beyond the control of the local jurisdiction, it will be necessary to evaluate the feasibility of pursuing additional local projects at the time the need to make up reductions arises. The District will work closely with the local agencies to track progress on commitments and to identify additional or alternative funding sources for projects.

## FURTHER STUDY CONTROL MEASURES

The District identified several emission source categories that appear to have the potential for emission reductions, but they have highly uncertain emission inventories or control measure effectiveness estimates. For those sources, the District proposes further study to enable an informed decision on whether to pursue a control measure and to determine a realistic emission reduction estimate. The following measures are the District's "Further Study Measures."

Solid-Fueled Boilers, Steam Generators and Process Heaters (Rule 4352)

NOx and SOx emissions from solid fuel fired boilers, steam generators, and process heaters, exceed the "de minimis threshold" levels, and therefore are subject to federal BACM requirements. The SJVAB has 14 permitted units in this category within the SJVAB, with half of the units located in the District's Southern Region, and the remaining units split between the Central and Northern Regions. Facilities in this category generate utility and industrial power (electricity and heat) by burning petroleum coke, municipal solid waste, or biomass wastes (including wood, vine clippings, leaves, grass, and other by products of the farming and food processing industries).

The District's permitting process establishes limits for both NOx and SOx emissions, and Rule 4352 (Solid Fuel-Fired Boilers, Steam Generators, and Process Heaters) regulates the NOx emissions from these units. Emission controls appropriate for solid fuel fired units include low excess air, low NOx burners, selection non-catalytic ammonia injection, thermal de-NOx, and limestone injection for SOx control. District staff will investigate whether these units' current emission limits are consistent with current BACT determinations. If all current NOx and SOx limits are considered BACT, District staff may choose to demonstrate that federally enforceable BACT is currently in place, without the need for additional rulemaking.

In the event that the current emissions limits are not consistent with current BACT determinations, rulemaking will be pursued with an adoption date during the second quarter of 2005 and an implementation date during the fourth quarter of 2006.

Soil Decontamination (Rule 4651)

District staff is currently improving the VOC emission inventory for soil decontamination. This source category is currently covered under prohibitory Rule 4651 and permits are issued for in-situ soil decontamination.

The District is aware of some facilities within the SJVAB that receive contaminated soils from locations outside of our District boundaries as well as from within the District. The soils are processed by open aeration volatizing the VOCs in the contaminated soil directly to the atmosphere. District staff will investigate whether this practice is occurring at other locations within the District and establish an emissions inventory for this source category.

The District's permitting process establishes limits for in-situ soil decontamination and Rule 4651 places limitations on open aeration. The emission controls appropriate for this source category includes the improvement of work practices by eliminating open aeration, requiring in-situ aeration and preventing the importation of contaminated soil into the District.

Leaf Blowers

The emissions inventory does not adequately reflect all emissions from the operation of leaf blowers. The current inventory only accounts for NOx and VOC emission related to fuel losses and engine operation. Fugitive PM10 entrained from leaf blowing and general landscape maintenance activities is not accounted for in the inventory. The responsible agency for the emissions inventory for the lawn and garden equipment source category is ARB. ARB has done some work in this area, but has not yet determined SJVAB emissions. District staff conducted research to identify other areas that have adopted leaf blower regulations. No air district regulations were identified that were aimed at PM10 reductions; however, several cities have adopted bans on leaf blowers and time of day restrictions based primarily on noise concerns.

If the emissions inventory identifies this source as significant, the District will conduct an analysis to identify available control measures. In addition, the various control options would need to be analyzed for technical and economic feasibility. For example, a leaf vacuum could be a control option. The bag that collects the debris may not completely capture PM10 that is collected or the cost of purchasing and operating such a system may be excessive compared to the expected emission reduction benefit.

Concentrated Animal Feeding Operations (CAFOs)

The San Joaquin Valley is the home of a large and growing CAFO industry. Dairies are the most important CAFO in the region with a current population of over one million cows, but also important are cattle feedlots, poultry operations, and to a lesser extent hogs. Air emissions from livestock are produced directly from the animals and their digestive processes, as well as from the decomposition and treatment of their wastes. CAFOs produce primary and secondary PM10 emissions. Directly emitted primary PM10 comes from livestock movement and equipment such as tractors and vehicles used at the facility. Secondary PM10 emissions are created from ammonia in reaction with nitric acid formed from NOx. The decomposition of livestock waste also produces VOCs that are responsible for ozone formation and for condensable PM10 under some conditions. Livestock VOC controls will be considered in the upcoming ozone planning process. The District proposes to include CAFO PM10 management practices in the CMP Program. The District could find no evidence that controls for CAFO related ammonia have been achieved in practice. Potential controls for ammonia found in the District's literature search can best be termed experimental.

One area is proposing controls to reduce ammonia from CAFOs. In the 2003 South Coast Ozone SIP, SCAQMD proposes to reduce dairy emissions by out of basin relocation of dairies, impact of water quality regulations, and other control measures as needed. The proposed controls include out of basin manure removal, anaerobic digesters, low-nitrogen feeds, promotion of aerobic conditions, and improved housekeeping. The District is concerned that the primary strategy of the SCAQMD is not to reduce the emissions, but to relocate them to another area. Water regulations related to preventing excess nitrogen contamination of surface and ground water could have the effect of increasing ammonia emissions if nitrogen is removed from the water by ammonia volatilization to the air. The effect of low-nitrogen feeds on the health and productivity of the animals is not certain. Although these measures are promising, more research is needed to ensure they have the intended effect. In addition, dairies operating in South Coast Air Basin are substantially different from San Joaquin Valley dairies. Practices designed for the SCAQMD may be inappropriate for this area.

The emissions from CAFOs are highly uncertain. The National Academy of Sciences in its recent report[2] recommends that the per head emission factors now widely used in air pollution regulatory programs such as this Plan be replaced with process based factors. Specifically, the report recommends that the EPA and the United States Department of Agriculture should use process-based mathematical models with mass balance constraints for nitrogen-containing compounds, methane, and hydrogen sulfide. Model results will be used to identify, estimate, and guide management changes that decrease emissions for regulatory and management programs. They also found that there is a general paucity of credible scientific information on the effects of mitigation technology on concentrations, rates, and fates of air emissions from animal feeding operations. To overcome these problems continued research is needed.

The District is actively engaged in efforts to provide the information needed to develop better emission estimates and potential controls for CAFOs. The District, through its Agriculture Technical Advisory Committee, is developing a Dairy Research Action Plan that contains short, medium, and long-term research objectives. The District has begun working with other CAFO industries to identify research needed to quantify emissions and to develop effective and feasible controls. Also, the District participates in several state and national working groups that are tracking and fostering CAFO research and control measure development. These include the USDA Agriculture Air Quality Task Force, the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO) Agriculture Committee. In addition, the District will continue to closely follow the rule development process now underway in the South Coast Air Quality Management District (SCAQMD) for dairy ammonia and VOCs through participation on the SCAQMD Livestock Waste Management Control Working Group.

[2] Final Report, Air Emissions from Animal Feeding Operations: Current Knowledge, Future Needs, National Research Council of the Academies, February 2003

The District commits to adopting ammonia controls once they have been proven to expedite attainment of the PM10 standards and have been demonstrated as technologically and economically feasible for San Joaquin Valley CAFOs. CAFO VOC measures will be considered during the development of the next ozone plan.

## COMPLIANCE/ENFORCEMENT

### District Compliance Program

The District operates a highly efficient and effective compliance program. The Compliance Division's staff of 75 personnel maintains a strong presence in each of the District's three regional service areas. The Compliance Division has a critical role in ensuring that rules and regulations relied upon to attain the PM10 NAAQS are fully enforced.

The District uses several methods to increase compliance while maintaining a streamlined process. The first method is education and outreach. Educational approaches include an extensive array of compliance assistance bulletins, and a compliance school for those who have received a notice of violation. A second method is increased use of information technology. The District's website along with printed information helps to ensure that the regulated community has full access to the applicable regulations and instructions. The District is automating its permitting system to enable applicants to take advantage of streamlined applications for permits such as those required for agricultural burns. By making the process easier, compliance rates will be higher. The third method is the traditional field enforcement activities that include rigorous source tests, inspections, and response to complaints. The District has toll free complaint hot lines that enable the public to contact an on-call inspector at any time. The final approach falls into the District's legal and Mutual Settlement area. District legal staff has the authority to issue large penalties as one of the strongest compliance incentives.

Until recently, the District's Regulation VIII fugitive dust rules were enforced almost entirely on a complaint basis. The District recognized that compliance rates for activities subject to Regulation VIII could be improved. The District is committed to increasing its reliance on field inspections through increases in total compliance staff and by redirecting resources to Regulation VIII compliance. In addition, one of the proposed upgrades to Regulation VIII is to increase the number of construction sites that will be required to file a dust control plan. This will enable Compliance staff to quickly identify active construction sites and to better focus their efforts on dust control. The District's proposed budget includes additional staff assigned to compliance activities.

<u>Compliance School</u>

"Compliance School" is offered as a voluntary educational training session to individuals and companies who have received a "Notice of Violation Settlement Letter" from the District. A person having the authority and responsibility to control the event that led to the violation of a District rule may qualify for a one-time penalty reduction by attending this two-hour training session. The first hour presents an overview of the air quality problems within the SJVAB. The second hour discusses rule requirements and provides recommendations regarding rule compliance.

Compliance Assistance Bulletins and Publications

The following Compliance Assistance Bulletins are now available on the District's website:

- Equipment Tuning Procedures for Boilers, Steam Generators and Process Heaters
- Portable Equipment Recordkeeping
- Rescue Requirements for Floating Roof Tank Inspections
- Source Testing Requirements for Alternative Monitoring Schemes for Boilers, Steam Generators, and Process Heaters
- Title V Reporting Requirements
- Rule 4692 – Chain-driven Charbroiling Equipment
- Vineyard Removal Update
- Regulation VIII – Fugitive Dust Control at Construction Sites
- Regulation VIII – Control for Public Agencies

Other informational documents or web pages include the following:

- Fugitive Dust Control at Agricultural Sources
- Asbestos Requirements for Demolitions and Renovations
- Abrasive Blasting Operations
- Degreasing Operations
- Industry Self Inspection Program

## INCENTIVE PROGRAMS

The District has operated incentive programs since 1992. The programs have expanded in funding and increased in sophistication over the years. The District is currently operating two incentive programs aimed at reducing ozone precursor emissions: the Heavy-Duty Engine Emission Reduction Incentive Program (Heavy-Duty Program) and the Reduce Motor Vehicle Emissions (REMOVE) Program. In addition, the District recently concluded a highly successful Light and Medium-Duty Vehicle Incentive Program that substantially reduced air pollutant emissions in the SJVAB. As opportunities to achieve cost-effective emission reductions present themselves and funding becomes available, the District has been willing to develop new programs. The District's Clean Green Yard Machine Program that helped consumers purchase electric lawnmowers is an example of a new program that will likely be continued in coming years if funding is available.

Incentive program funding is derived from several sources. Current programs use a combination of state, local, and federal funds including ARB's Moyer Program, state transportation funds, state peaker power plant offset funds, District Department of Motor Vehicles Surcharge Fees (DMV Fees), and federal Congestion Mitigation and Air Quality (CMAQ). Of these funding sources, only DMV fees are under the direct control of the District. The District will seek funding for cost-effective programs from all potential sources. Emission reductions claimed for this plan are based on funding already committed and estimates of funding for future years. The mix of locally generated funding, state funding, and federal funding will vary.

**Heavy-Duty Engine Emission Reduction Incentive Program**

The Heavy-Duty Engine Emission Reduction Incentive Program (Heavy-Duty Program) is by far the District's largest and most successful incentive program. The Heavy-Duty Program accepts applications for a wide variety of engines that power vehicles or equipment. It provides funding for new purchases, engine repowers, or retrofits. Emission reductions are obtained when the project applicant purchases vehicles and engines that are cleaner than required by current emission standards or installs an emission certified retrofit kit on an existing engine. The District pays the differential cost of purchasing the lower emitting technology compared to conventional technology up to a cost-effectiveness cap of $13,000 per ton for NOx. The program is primarily aimed at NOx reductions, but many projects also achieve particulate reductions.

SIP submittals for the SJVAB have not included emission reductions from the Heavy-Duty Program. The first projects that were funded began operating in 1998. Since then, each year additional funds have been allocated to the program and additional projects have become operational. Project life varies from 7 to 20 years depending on the application. The average project life is 7.7 years based on the mix of projects received to date. Therefore, most emission reductions will be in effect prior to 2005, and some projects will continue to provide reductions past 2010. Note that emission reductions are cumulative since additional projects are completed each year. Emission reductions projected to be achieved by completed projects and with currently committed funding amount to 6.1 tons per day of NOx by 2005. The District expects additional funding will be obtained to allow continued emission reductions in later years.

The most successful component of the program is the replacement of agricultural internal combustion (IC) engines used for water pumping. Approximately 65% of all engines retrofitted have been agricultural IC engines that have been replaced with new engines meeting current off-road engine standards.

**REMOVE Program**

The Reduce Motor Vehicle Emissions (REMOVE) Program is the District's first incentive program. It began its first phase in 1992. The program is funded by the District's DMV Fees. The REMOVE Program is limited to projects that reduce motor vehicle emissions. No stationary or area source emission projects are eligible due to restrictions placed on these funds by the enabling legislation. Projects are solicited from public and private entities with a request for proposals, and are reviewed by a evaluation committee appointed by the District's Governing Board. The program has been a proving ground for a wide variety of emission reduction projects. The most successful programs, such as the old vehicle retirement program, the Heavy-Duty Engine Program, and the Light and Medium-Duty Vehicle Program, were spun off to become stand-alone programs.

Recent REMOVE Program phases have concentrated on transportation control measures, such as video-teleconferencing, vanpool subsidies, bicycle facilities, transit enhancements, and distance learning. The program emphasizes emission reductions as the primary criterion for project selection.

**Light and Medium-Duty Vehicle Incentive Program**

The District recently completed a highly successful Light and Medium-Duty Vehicle Incentive Program. The program provided incentives for the purchase of low-emission passenger vehicles, light trucks, small buses, and trucks under 14,000 pounds gross vehicle weight. The purpose of the program was to encourage the early introduction of low-emission vehicles in the SJVAB. The program paid between $1,000 and $3,000 per vehicle depending on the emission certification level and size of the vehicle. Vehicles must be powered by alternative fuel, electric, or hybrid electric engines/motors. Emission reductions from vehicles purchased under this program were claimed under ARB's Low Emission Vehicle program. Since the District is currently out of funds for this incentive program, the program has been discontinued. In the event that additional funds become available in the future, this program may be revisited.

**Electric Lawnmower Incentives**

The District operated an electric lawnmower incentive program in recent years. The District worked with electric lawnmower manufacturers and local equipment dealers to provide large discounts to people who turned in their gasoline powered mowers. The program scrapped 2,310 gasoline mowers over a period of two years. If funding becomes available, this popular program is likely to be reintroduced.

## EDUCATION/PUBLIC AWARENESS

Engaging the public in efforts to reduce emissions is a key element of the PM10 attainment strategy. Education increases public support for new and controversial regulations. Helping people understand the complex issues underlying the PM10 problem further improves this support. There are many actions that individuals can undertake to reduce PM10 emissions. When members of the public are aware that they can make a difference and are convinced that the problem is real, many people will change their behavior in a positive way.

The District's educational program has expanded and evolved over the years. It uses a variety of media and techniques to ensure the widest possible dissemination of air quality information. It uses direct marketing approaches with traditional media including television, radio, and print. It networks with other agencies, educational institutions, organizations, industry groups, and the news media in educational efforts. It produces educational materials, such as videos, brochures, and fact sheets that provide focused information to targeted audiences.

**Public Education Program**

The District's public education program contains traditional approaches and approaches that are unique to the SJVAB. An overview of the District's program is provided below.

Agricultural Outreach - The agriculture outreach component reflects the importance of this economic sector to the SJVAB's economy and to the PM10 attainment strategy. The District works closely with the Valley's agricultural industry leaders. This cooperative effort has lead to perhaps the most intensive research into agriculture related emissions and conservation practices anywhere in the country. The $27 million California Regional Particulate Air Quality Study (CRPAQS), now nearing completion, was a direct result of this cooperation. A landmark Memorandum of Understanding (MOU) is in place with the Natural Resources Conservation Service (NRCS), the California Department of Food and Agriculture (CDFA) and the District. The MOU solidifies the agencies' commitment to work together to assist the agricultural community in the development and implementation of methods of reducing PM10 from agricultural practices.

Outreach is a critical component of the Agricultural Conservation Management Practice (CMP) Program proposed in this Plan. The contacts developed with agriculture industry leaders and agencies that assist growers such as the NRCS and the Farm Bureaus will help get the word out to the thousands of growers expected to participate in the program.

Spare the Air - The District's Spare the Air Program is a voluntary program that encourages businesses and residents to avoid pollution-producing activities on days when high pollution levels are expected. Although primarily aimed at reducing ozone precursor emissions during the summer ozone season, these same precursor emissions also contribute to secondary PM10 formation and affect the SJVAB's compliance with the annual PM10 standard. In addition to extensive multi-media English and Spanish language campaigns, information regarding the program is communicated to employers through comprehensive employer packets (bilingual), and Spare the Air fairs throughout the Valley. The District notifies participating employers and the public, via faxes, news broadcasts, and radio announcements, when it is predicted that the ozone standard will be exceeded the following day. The public is asked to postpone or avoid such activities as using oil-based paints, solvents, aerosol spray cans, and gasoline-powered lawn equipment, and avoid making unnecessary vehicle trips.

Educational Videos - One video, currently under development, will focus on the SJVAB itself. Topics to be covered include why we have air quality problems in the SJVAB, where the pollution comes from, the impact of air pollution on public health, agricultural crops and natural vegetation, and District Rules and Regulations. This video will be supplemented by a brochure, which covers the same areas of interest. The production of a second video is planned in order to describe issues related to the PM10 problem in the SJVAB. The District has produced three other educational videos; two of these videos describe commute alternatives, and the third explains the District's Spare the Air program.

Valleywide Public Service Announcements and Paid Advertising - Public Service Announcements (PSAs) have been created for use on television and radio stations throughout the SJVAB. These short PSAs (30-60 second) remind the public to use public transportation, share rides to work (rideshare), walk to lunch, buy nonvolatile consumer products, etc., as their contribution in improving air quality. PSAs for Rules 4901 (Residential Wood Burning) have been airing on local newscasts since 1994. Also, through enhanced public outreach, the District has strengthened its Smoking Vehicle Program, which encourages the public to report vehicles with excessive visible emissions. An extensive public outreach campaign also informs SJVAB residents about the Spare the Air program.

Pollutant Standard Index (PSI) Predictions - Daily PSI predictions are faxed directly to local television, radio, and newspaper media to educate the public about air quality and advise them of days with poor air quality so that activities can be modified. Rule 4901 is in the process of being amended to require mandatory curtailment during days expected to have high PSI readings. The widest possible distribution of no burn day information is critical to obtaining a high level of compliance. The District has a staff meteorologist to provide more accurate air quality predictions for the SJVAB. Forecasts now use more detailed information specific to the local daily conditions in the SJVAB.

Air Quality Symposium - The District holds the Air Quality Symposium about every other year. A wide variety of organizations, businesses and individuals participate. Past versions of the symposium, have drawn over 200 attendees. The events include keynote speakers, general sessions, breakout sessions on topics of special interest, and air quality exhibits.

**District Publications**

Information Pamphlets – The District continues to develop new and updated brochures to address air quality issues in the SJVAB. Current brochures include the following:

- Guide to the District's Regulation VIII Fugitive Dust Prohibitions
- Residential Woodburning
- Automotive Checkbook (vehicle maintenance record book)
- The Smoking Vehicle Program
- Air Pollution Health Effects

Newsletter – The Valley Air News is a monthly publication of the District widely distributed throughout the SJVAB. The newsletter highlights current activities of the District, summarizes Governing Board actions, highlights commendable efforts by

Valley businesses in reducing air pollution beyond what is required, and discusses other relevant air quality issues.

**Youth Education**

As part of the youth education program, schools are able to contact the District office to request classroom presentations on a variety of topics.

Furthermore, beginning in 1995, children of the SJVAB now have the opportunity to become a member of the Clean Air Kids Club and have information sent directly to their homes regarding air pollution and what they can do to help prevent it. Clean Air Kids Club newsletters will be sent on a quarterly basis.

In the future, the Clean Air Kids Club members will serve as ambassadors to bridge the District's youth outreach program into schools. Environmental curriculum and special activities have been provided to primary schools since the fall of 2000. The Clean Air Kids Club members will also act as special home ambassadors to reinforce the Spare the Air and wood burning outreach efforts.

**Events/Activities**

The District works with local groups such as the American Lung Association and rideshare agencies to promote annual events that reinforce clean air activities. The following are local and nationally established, annual events held throughout the year in which the District participates:

| Event | Lead Organization | Time of Year |
|---|---|---|
| Earth Day | Local Earth Day Sponsors | April |
| Clean Air Month | American Lung Association | May |
| Rideshare Week | Local Rideshare Committee | October |
| Car Care Month | Calif. State Automobile Assn. and American Lung Association | October |

A wide variety of local activities are conducted by organizations and agencies throughout the Valley. Such activities include the annual Clean Air Rally sponsored by Project Clean Air and the annual Conservation Fair by the County of San Joaquin. The District participates in many of these events and encourages activities that increase public awareness of air pollution and public participation in programs or activities to reduce air pollution. In addition, many of the District activities can be found on its web site at www.valleyair.org.

**Agriculture Improving Resources (A.I.R.)**

Agriculture Improving Resources (A.I.R.) is a partnership formed to aid agriculture in promoting voluntary improvement of air quality through scientifically proven and cost effective measures. Partners in A.I.R. include the California Cotton Ginners and Growers Associations, Nisei Farmers League, California Citrus Mutual, California Grape and Tree Fruit League, Raisin Bargaining Association, California Apple

Commission, California Plant Health Association, Kern County Farm Bureau, Kings County Farm Bureau, Fresno County Farm Bureau, Tulare County Farm Bureau, Madera County Farm Bureau, Merced County Farm Bureau, Stanislaus County Farm Bureau, USDA Natural Resources Conservation Service, The San Joaquin Valley Air Pollution Control District, and the California Air Resources Board.

Recent A.I.R. outreach efforts include outreach to promote alternatives to open field burning, PM10 dust control practices in orchard management, and EQIP cost sharing for fugitive PM10 control through the use of dust suppressants. This partnership will play an increasingly important role in providing information to growers on a wide variety of air quality programs.

## CONCLUSION

The control measures described in the preceding sections are the most ambitious ever included in a San Joaquin Valley PM10 Plan. The control strategy touches all significant sources of PM10 and PM10 precursors. The measures will require large new investment in control technology by previously regulated sources, as well as by sources that have never been regulated. The public will also be called upon to do their part. New wood burning regulations, indirect source mitigation, and changes in personal behavior that generate pollution will impact the public. Improved compliance and enforcement activities, increased public education and awareness, and further implementation of existing incentive programs will assist the District in reaching attainment of the NAAQS at the earliest practicable date.

# MODELING ANALYSIS

## INTRODUCTION

The modeling analysis evaluates the air quality measurements that violate the federal air quality standards. The evaluations use statistical methods and computer modeling to understand the meteorology and emission sources that are associated with each of the observed events. The measurements that violate the standard must also be evaluated to determine their relationship to the average of all measurements collected during a year (annual average) at each site. Based on the results of this analysis, a baseline connection between emissions and air quality is established for each site that violates one of the air quality standards. Using this relationship, and projection of what the emissions are expected to be in future years, the modeling analysis predicts how much additional emission reduction is needed to comply with the air quality standards. The proposed control measures can then be evaluated to determine if they are sufficient to provide enough additional emission reduction to achieve compliance in future years.

The modeling analysis is developed from the results of a series of analyses conducted pursuant to the modeling plan or protocol (Protocol). Air quality modeling analyses described in the Protocol are performed to support development of control plans and to demonstrate that the proposed control strategy is sufficient to achieve compliance of the federal annual and 24-hour PM10 National Ambient Air Quality Standards (NAAQS) in accordance with EPA guidance for the State Implementation Plans (SIP). Procedures for analysis have been selected to use the best available data to establish objective and reliable conclusions with the highest confidence. The modeling analysis establishes an attainment demonstration by successfully addressing all identifiable exceedances in the nonattainment area.

## FEDERAL MODELING REQUIREMENTS

As required by federal guidance, air quality modeling analyses are performed to demonstrate that a proposed control strategy provides for attainment and maintenance of the PM10 NAAQS. The SIP submittals must include a description of how the modeling analysis was conducted by providing information on what models are used and why they were selected; model version and configuration information; assumptions involved in model application; discussion of model input data including meteorological data and ambient monitoring data; and description of model output data. The Protocol contains the required elements and can be found in Appendix K, identified as the "San Joaquin Valley Air Pollution Control District State Implementation Plan PM10 Modeling Protocol." In accordance with federal guidance the Protocol was submitted to the EPA for review during development of the modeling analysis.

## CHARACTERIZATION OF PM10 FOR MODELING

Characterizing PM10 for modeling requires scientific understanding of the physical and chemical properties, and sources and behavior of PM10. PM10 particle size, formation, composition, and chemistry provide a basis for addressing issues such as local contribution, regional contribution, and background pollutant levels. Developing an understanding of the principal factors and influences of PM10 concentrations provides a greater degree of certainty that the proposed control strategy reductions will have the desired and expected results, and that a projection of attainment has the highest degree of reliability achievable with current information.

### Origins, Sources, and Properties of Particles

Airborne PM10 is not a single pollutant, but a mixture of many pollutants containing many different materials. Atmospheric PM10 occurs as fine and coarse particles that differ in size ranges, formation mechanisms, physical and chemical composition, and sources. Fine (PM1.0-PM2.5) and coarse (PM2.5-PM10) particles typically exhibit different behavior in the atmosphere and generally have distinct sources. The particle's formation mechanism affects the final size of the particle.

PM10 may be emitted from the same types of devices that contribute to other pollutants, such as, motor vehicle exhaust, fuel combustion, and industrial processes, where emissions are controlled through stacks or ducts. PM10 is also emitted from natural sources and formed in the atmosphere by a variety of physical and chemical processes that are not necessarily controlled by stacks or ducts. Fugitive dust is the term used for PM10 that comes from anthropogenic or natural activities emitted into the air without passing through a stack or duct that is designed to control flow, including emissions caused by movement of soil, vehicles, equipment and windblown dust.

A variety of diverse activities contribute to particulate matter concentrations: fugitive dust, such as road dust, motor vehicles, and wood smoke are the major contributors to ambient PM10 samples; and nitrates and organic carbon are the major secondary components. Other sources include fuel combustion from vehicles, power generation, and industrial facilities, residential fireplaces, agricultural burning, atmospheric formation from gaseous precursors largely produced from fuel combustion, wind blown dust, and construction and demolition activities. These diverse sources provide the mixture of substances that comprise PM10.

Most of the coarse fraction particles are emitted directly as particles and result from mechanical disruption and abrasion of surfaces, such as crushing, grinding, tire friction and evaporation of sprays, suspensions of dust from construction, agricultural operations, mining and wind erosion. In urban areas, much of the crustal material arises from soil that is tracked onto roads during wet periods, and is later pulverized and tossed into the air by vehicular traffic when it is in a dry state. A variety of industrial operations, such as construction and demolition, freight hauling, rail traffic, and grain handling generate coarse particles. In rural areas, tilling, wind blowing over disturbed soil, or vehicles traveling on unpaved roads can generate coarse particles.

Fine particulate matter is formed by the condensation of gases emitted from combustion chambers; the condensation of atmospheric precursor gases, some of which may undergo further reactions in particles; and the condensation of low vapor pressure photochemical reaction products. Fine particles are usually formed from gases in three ways: (1) nucleation (the coming together of gas molecules to form a new particle), (2) condensation of gases onto existing particles, and (3) by liquid phase reactions. Gases may dissolve in a liquid or react with another dissolved gas. When fog and cloud droplets evaporate, particulate matter usually remains in the fine particle mode. Particles formed from nucleation also coagulate to form relatively larger particles, although such particles normally do not grow into the coarse size range. Major sources of these fine mode substances are fossil fuel combustion by electric utilities, industry, motor vehicles and vegetation burning. Major components of fine particles are: sulfate, strong acid, ammonium, nitrate, organic compounds, trace elements (including metals), and elemental carbon.

**Chemistry and Physics of Atmospheric Particles**

The major chemical constituents of PM10 are sulfates, nitrates, carbonaceous compounds (both elemental and organic carbon compounds), acids, ammonium ions, metal compounds, water, and crustal geologic materials. The amounts of these components vary from place to place, and over time. Fine and coarse particles generally have distinct chemical composition, solubility, and acidity.

Coarse particulate matter sources are primarily crustal, biological, or industrial in nature. Crustal material, from soil or rock, primarily consists of compounds that contain silicon, iron, potassium, aluminum and magnesium. This material is commonly present as aluminosilicates and other oxides of crustal elements in soil dust. It is also derived from fugitive dust from roads, industry, agriculture, construction and demolition. Additional contributions are from plant and animal material. Biological material, including fungal spores, pollen, and plant and insect fragments, are examples of natural bioaerosols, which are also suspended as coarse particles.

Fine particulate matter in the atmosphere is mainly composed of varying proportions of six major components: sulfates, acids, nitrates, elemental carbon, organic carbon, and trace elements, such as metals. Fine particulate matter is derived from combustion material that has volatilized and then condensed to form primary particulate matter or from precursor gases reacting in the atmosphere to form secondary particulate matter. Sulfur oxides (SOx), nitrogen oxides (NOx), and certain volatile organic compounds (VOC) are major precursors of fine secondary particulate matter. Fine particles or vapors that rapidly form fine particles are emitted during the combustion of fossil fuels, and incineration of wastes. Fine particles are formed by the nucleation of gas phase species, and grow by coagulation (existing particles combining) or condensation (gases condensing on existing particles). Fine particles can be thought of in terms of two modes or stages of formation: a nuclei or ultrafine mode of freshly generated particles, and an accumulation mode where particles grow into particles from precursor gases and remain stable in the accumulated larger size. Chain agglomerates of very small elemental carbon particles are formed during combustion, such as in open-hearth fireplaces, wood stoves and diesel engines. Incomplete combustion forms hundreds of organic compounds with low enough vapor pressure to be present in the atmosphere as organic carbon particles. Small amounts of iron and potassium are also found among fine-mode particles, but they come from different sources, such as brake wear (iron) and wood combustion (soluble potassium).

Sampling and analysis are used to establish the typical components found in the emissions of a source. This source signature or fingerprint is referred to as a speciation profile. Many sources have components in common. For example, the PM10 emitted by the tires of a vehicle on a road is almost identical to windblown emissions from the adjacent land. To the extent which these signatures can support reliable identification, the various signatures are used in modeling to identify the contributing sources to observed events.

Analysis of filters reveals that different meteorological conditions and sources affect particle formation. Colder, frequently stagnant conditions occurring in December and January favor formation of ammonium nitrate. Secondary PM10 species, such as ammonium nitrate, ammonium sulfate, and organic particles are formed through chemical interactions from directly emitted SOx, NOx, VOC and ammonia. Particulate sulfate and nitrate can form via both gas and aqueous phase pathways. In the aqueous phase, which is the main pathway during winter fog and cloud conditions, secondary ammonium nitrate and ammonium sulfate form when nitric acid and sulfur dioxide ($SO_2$) dissolve in water droplets and then react with dissolved ammonia. Since the sulfate and nitrate ions compete with each other for the available ammonia, pollutants such as, SOx, NOx, and ammonia must be treated as a coupled system in order to adequately understand the interactions and subsequent formation of nitrate and sulfate particles.

**Atmospheric Behavior, Transport and Fate of Airborne Particles**

Coarse particles are large enough so that the force of gravity exceeds the buoyancy forces of the air. Coarse particles remain in the atmosphere for a few minutes or up to several hours, rapidly falling out of the air unless kept aloft by vigorous mixing and convection that occurs during dust storms and high winds. Coarse particles tend to be less evenly dispersed around urban areas than smaller particles, exhibiting more localized elevated concentrations downwind of their emission point and traveling as little as a kilometer to as much as twenty or thirty kilometers.

Fine particles may be directly emitted (primary PM10) or formed by atmospheric transformation of gases to particles (secondary PM10). Atmospheric transformation can take place locally during stagnations or during transport over long distances. Since fine particles may remain suspended for much longer periods of time and travel much farther than coarse fraction particles, these particles tend to be more uniformly dispersed than coarse fraction particles across urban or large geographic areas. Fine particles are small enough to be kept aloft by the buoyancy forces of the air and as a result are not easily traced back to their source of origin. Ultrafine or nuclei-mode particles tend to exist as individual particles for very short periods of time (less than minutes) in the ambient atmosphere, and they tend to age rapidly into larger accumulation particles that may be dispersed more widely over long distances. Fine particles formed from accumulation processes have very long half-lives in the atmosphere, may travel long distances, and tend to be more uniformly distributed over large geographic areas than coarse particles. Fine accumulation particles have the potential to remain in the atmosphere for days or weeks traveling as much as hundreds to thousands of kilometers. However, removal occurs when the particles absorb water, grow into cloud droplets, grow further to raindrops, and fall out as precipitation. This process reduces the typical atmospheric half-life to a few days.

The transport of PM10 has not been definitively quantified. The transport of a pollutant is when it originates from a source in one area of an air basin or from another air basin, and it becomes transported to another area or air basin where it contributes to the condition of the air quality. Currently available monitoring and speciation techniques are not able to identify the origin of PM10 sources with sufficient detail to indicate if the SJVAB is experiencing transport from outside the air basin or contributing transport of PM10 to other air basins. PM10 readings in the SJVAB are most severe during the fall and winter periods when wind speed and direction are not conducive to interregional transport. Transport of some PM10 precursors has been studied as part of ozone transport evaluation, which consisted of identifying transport of ozone and ozone precursors from and to other air basins surrounding the SJVAB. The transport of ozone was documented during the summer when the highest ozone readings are more likely to occur. This transport includes precursors of ozone and PM10; however, the amount of PM10 that could be generated in the SJVAB or other air basins from such transport has not been quantified. Pollution from areas outside of the SJVAB may or may not contribute to high PM10 levels within the SJVAB.

## UNDERSTANDING LOCAL EPISODES AND ANNUAL CONCENTRATIONS

Types of particulates include directly emitted (primary) particulates, and indirectly emitted (secondary) particulates, which are emitted as gases, but become particles in the atmosphere due to a variety of processes. The secondary particulates include increases in elemental and organic carbon, and nitrate and sulfate particulates. The carbon of secondary particulates is associated with motor vehicles, residential and agricultural wood combustion, industrial emissions, and charbroiling. Sulfates are associated with diesel emissions, and nitrates are associated with motor vehicle and industrial emission of nitrogen oxides.

Prior source apportionment receptor modeling has identified the major contributors at all sites as primary geological material during the summer and fall, and secondary ammonium nitrate during the winter. Other contributions that were considered significant at one or more sites on one or more occasions included motor vehicle exhaust, field and fireplace vegetative burning, construction, secondary formation of ammonium sulfate, secondary formation of organic particulates from anthropogenic and biogenic VOC emissions, oil combustion, and marine aerosols in some portions of the SJVAB.

**Ambient Air Quality Data**

The EPA requires that the state and the District measure the ambient levels of air pollution to determine compliance with the NAAQS. The District and the state operate the ambient monitoring network to gain a better understanding of actual conditions and to comply with this mandate. The required network has also been supplemented by conducting major field studies to collect additional information to improve understanding of the observed episodes, and their causes and contributing sources. Ambient monitoring samples were analyzed to determine the chemical make-up of the PM10 collected on the filter. Ambient air quality samples indicate that different causes are related to elevated PM10 levels occurring in different seasons.

Extensive seasonal variation has been established for sources contributing to PM10 concentrations and the atmospheric processes that contribute to particle formation and retention. The period of October through January generally includes the most frequent and severe exceedances of the federal 24-hour PM10 standard. During the October to January period, the PM10 concentrations undergo a shift from dominance by primary particles to dominance by secondary particles. Secondary particles are a major fraction in colder, wetter periods, but are present in smaller amounts before mid-November. The October through January period is discernable as dividing into two overlapping periods that develop different event types. The first of the two periods of the year is during the months of October and November, occasionally extending into December. The seasonal transition date ranges from mid-November to mid-December. Nitrates start increasing in mid-November, and geologic materials do not decline until there is significant rainfall, which can occur anytime from mid-November to mid-December. The second type of episode distribution is linked to a regional change in meteorology. Air monitoring data indicates that when meteorological conditions produce little or no air movement with cold air temperature, secondary particulate levels (largely ammonium nitrate) are elevated in the entire SJVAB and reach levels above the air quality standard in several urban areas.

The October and November episodes that have occurred in the last several years were low wind speed events. High wind PM10 events are not typical within the SJVAB, but they have occurred and have contributed to high PM10 concentrations in the past. The October-November low wind speed events tend to be localized stagnation events with wind speeds that are insufficient to disperse high PM10 concentrations. These episodes affect only a few urban areas in the SJVAB. Air quality field programs identified the highest concentrations of PM10 in urban areas. In these episodes, anthropogenic (human) activities entrain PM10 in fugitive geological dust, adding to emissions dispersing from surrounding agricultural operations. The emissions inventory for the SJVAB indicates that most of the directly emitted PM10 is due to open area fugitive geological dust sources. Anthropogenic sources (paved and unpaved road dust, farming operations, and construction/demolition) account for most of the fugitive geological PM10 emissions, and wind erosion of exposed surfaces of geological material accounts for the balance as represented in the emissions inventory. However, downwind ambient PM10 concentrations are not proportional to the emission estimates of fugitive geological PM10 emissions. Most of the large geologic particles settle to the ground within a few kilometers of their source when wind velocities are low; therefore, significant contribution to the urban area exceedances involve only the emissions of large PM10 particles that occur in the urban area and within a few kilometers of the urban area. Implementing control measures for fugitive emissions of geological origin is especially valuable during these months when the contributions from geological sources are highest.

The second elevated PM10 period of the year begins mid-November to mid-December, and it extends through February. This season is characterized by extended periods of stagnant air interspersed with cold, damp, foggy conditions conducive to the formation of particulate nitrate in amounts that are frequently the dominant component of PM10 (often 70 percent or more of the material found on a filter). During the last several years episodes dominated by increased levels of nitrate particulates and primary and secondary carbon occurred in December and January. These episodes occurred during long stagnation periods in cold weather and affected one or more urban areas. The District prohibited agricultural burning (no-burn status) during these events based on meteorology with poor dispersion to limit emissions. Residential wood combustion, particles formed from exhaust gases and poor dispersion of emissions contribute to PM10 buildup in these events.

Both seasonal periods with PM10 exceedances commonly experience stagnant conditions. During a stagnant period, primary geologic or secondary particulates accumulate, resulting in concentrations that eventually exceed the PM10 standard.

**Design Values**

A design value is the representative value for an air quality standard at an ambient air monitoring site. Design values are established by EPA rules for evaluating monitoring measurements for each monitoring site and for each air quality standard. When the design value is not in compliance with the NAAQS for a pollutant, the design value is used to establish the amount of air quality improvement that is needed to achieve compliance with the standard.

Data recorded at each monitoring site is used to determine the design value for each of the two PM10 standards, (a) the annual average PM10, and (b) the 24-hour PM10. The annual design value is intended to represent the average value of the last three years of complete, quality assured data. Each quarter of a year is averaged as a group so that extra or missing measurements do not unduly influence the design value average. All of the valid 24-hour samples collected at each site over the same period are used to establish the 24-hour PM10 design value. This value represents the peak, valid value observed at each site.

The design value is used as the baseline ambient concentration in modeling efforts to determine whether projected emissions reductions will be sufficient to reduce PM10 concentrations to levels that meet the federal standards.

PM10 concentrations in the SJVAB vary between sites and seasons with regard to sample speciation and contributions from specific source types. For this reason, use of a single design value for the entire SJVAB is not appropriate, and a design value was calculated for each site. The PM10 annual and 24-hour NAAQS require two separate design concentrations, one for each standard per site. The annual design concentration is the expected annual arithmetic mean. The uncertainty in the design concentration estimate is reduced to the extent that sufficient, representative meteorological and monitoring data are available. At least three years of representative air quality measurements are considered in determining 24-hour design concentrations. For a thorough discussion of how design values were determined, please see Appendix K, Modeling Protocol.

Only eight of the 15 sites had complete data sets for establishing the annual design value. These sites are: Bakersfield-California Ave., Clovis, Corcoran, Fresno-First, Modesto-14th Street, Oildale, Stockton-Hazelton, and Visalia. Special calculation procedures directed by federal guidance are used to establish design values for the sites with incomplete data.

**Table 5-1**
**Federal 24-Hour PM10 Design Values**

| Site Name | Design Value | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| Bakersfield - California Ave. | **190** | 143 | 140 | **190** |
| Bakersfield - Golden #2 | **205** | 183 | 145 | **205** |
| Clovis | **155** | 151 | 114 | **155** |
| Corcoran - Patterson Ave. | **174** | **174** | 128 | 165 |
| Fresno - Drummond | **186** | 162 | 130 | **186** |
| Fresno - First | **193** | 154 | 138 | **193** |
| Hanford - Irwin St | **185** | 143 | 119 | **185** |
| Merced - M Street | 134 | **134** | 104 | 113 |
| Modesto - 14th Street | **158** | 132 | 112 | **158** |
| Oildale - 3311 Manor St | **158** | 156 | 122 | **158** |
| Stockton - Hazelton-Hd | 150 | **150** | 91 | 140 |
| Stockton - Wagner-Holt | 119 | 118 | 104 | **119** |
| Taft - College | 128 | 101 | 99 | **128** |
| Turlock - 900 Minaret Street | **157** | **157** | 104 | 148 |
| Visalia - Church Street | 152 | **152** | 130 | 143 |

Design Value Column – bold indicates value exceeds standard
Year Columns - bold indicates observed value that set the Design Value

**Table 5-2**
**Federal Annual Average PM10 Design Values**

| Site Name | Calculated by SJVAPCD | Reported in EPA Notice |
|---|---|---|
| Bakersfield - California Ave. | 48 | |
| Bakersfield - Golden #2 | **57** | **55** |
| Clovis | 43 | |
| Corcoran - Patterson Ave. | 49 | |
| Fresno - Drummond | 50 | 47-**53** |
| Fresno - First | 42 | |
| Hanford - Irwin St | **53** | **51** |
| Merced - M Street | 40 | |
| Modesto - 14th Street | 37 | |
| Oildale - 3311 Manor St | 46 | |
| Stockton - Hazelton-HD | 35 | |
| Stockton - Wagner-Holt | 30 | |
| Taft - College | 36 | |
| Turlock - 900 Minaret Street | 39 | |
| Visalia - Church Street | **54** | **54** |

## MODELING METHODOLOGY

Analysis of PM10 concentrations, chemical composition, and meteorology has provided information of the temporal and spatial behavior of PM10 in the SJVAB. The results reveal three different situations that must be addressed:

- Sites with annual average concentrations above the 50 µg/m³ standard;
- Sites with 24-hour levels above 150 µg/m³ in the fall (October to mid-December, sometimes transitioning as early as mid-November), with largest contribution from geologic sources; and
- Sites with 24-hour levels above 150 µg/m³ in the winter (mid-November to mid-December through February), with largest contribution from secondary formation and fine particulate matter sources.

Annual average concentrations above the 50 µg/m³ level, and both types of events with levels above 150 µg/m³, were examined for attainment.

Evaluation is not required at sites with annual design values at or below 50 µg/m³ (rounded to the nearest microgram) and sites with 24-hour design values at or below 150 µg/m³ (rounded to the nearest ten microgram level). However, areas with design values in compliance with the standards do have emissions that contribute to the concentrations observed in locations that do not comply with the standards. Therefore, the contribution to regional levels from sites in compliance were considered for current and projected future years when evaluating the sites with concentrations above the standards.

### Emissions Inventory Preparation for Modeling

The District and ARB maintain annual emission inventories of permitted emissions and of estimates of mobile source, area source, and naturally occurring emissions. Emissions inventories were examined and structurally modified for correlation and analysis of observed exceedances. Similar adjustments were made to prepare modeling inventories representative of different seasons. The emissions were grouped as required for CMB analysis and rollback projection. The emission inventories for modeling were also prepared to address the appropriate spatial scale, with an understanding of the appropriate area identified as influencing the ambient concentration at the monitor.

The emissions inventories prepared to correlate with observed design values are called modeling base year inventories. Since these are intended to reflect emissions connected to the design value concentrations, the inventories are not the same as baseline inventories used to establish current District emissions. Projections of future year seasonal emissions without additional controls establish future year projected modeling projections. Projections of future year seasonal emissions inventories with controls to achieve attainment are referred to as attainment inventories and can be found in Appendix J.

**Modeling Protocol**

The Protocol outlines the procedures and technical considerations involved in the modeling analysis for the PM10 Plan for submission to the EPA for review and comment. The ARB, District, and Regional Transportation Planning Agencies (TPAs) have jointly prepared data analyses, emissions inventories and modeling analyses to address modeling requirements for the PM10 Plan. Modeling has been conducted with jointly developed input files and mutually accepted modeling assumptions.

**Purpose of the Protocol**

The goal of the Protocol is to determine an effective program of emission control, establishing the necessary amount and types of emission reduction that must be implemented to achieve compliance with the federal annual and 24-hour PM10 NAAQS.

The Protocol contains a series of evaluation elements including meteorological evaluation of the factors affecting PM10 concentrations and evaluation using a variety of accepted statistical methods to evaluate the factors related to known and observed episodes and to identify other combinations, patterns and factors not captured by monitoring that are potentially capable of causing PM10 episodes. The analysis also establishes the representativeness of transport and formation of PM10 observed in historical episodes. Modeling of the observed episodes and predicted changes are conducted using receptor modeling with the chemical mass balance model (version CMB 8) for annual and episode conditions at sites that currently do not comply with the federal PM10 NAAQS; regional modeling of secondary particulates by ARB using two regional scale models; and a photochemical box model evaluation to address aerosol chemistry. Episodes evaluated include time periods related to observations that are required to be analyzed for the SIP and episodes observed by additional monitoring during the December 1999 to January 2001 field study monitoring period for the California Regional PM10/PM2.5 Air Quality Study (CRPAQS).

**Assumptions**

Establishing modeling assumptions and background values requires understanding baseline and projected inventories; air monitoring data; and the properties, sources and behavior of PM10. In addition, the spatial influence of emissions sources and an estimation of background levels must be considered. When assessing secondary PM10, atmospheric reaction processes and rates must also be considered.

Factors essential for modeling analysis include:

- Origin and properties of particles;
- Chemistry and physics of atmospheric particles;
- Atmospheric behavior, transport and fate of airborne particles; and
- Background concentrations to support modeling.

**Background Concentrations to Support Modeling**

Background concentrations are an input for the specified rollback modeling to identify particulate matter that is not part of the emissions inventory and would not be reduced by local control measures. For modeling purposes, background particulate matter includes particulate matter from natural sources (local, regional, offshore emissions), and the transport of anthropogenic emissions, both particulate matter and precursor emissions of VOCs, NOx, and SOx, into the SJVAB from adjacent air basins and the surrounding region. To prevent overestimation of control effects, emissions from outside of the SJVAB must be treated as background in the modeling process to discriminate the portion of the measured PM10 affected by control strategies. The modeling definition of background is different than would be used for health assessment studies, where background is limited to natural sources and all anthropogenic emissions are evaluated for their cumulative health impact. Background levels of particulate matter vary by geographic location and season and can be higher on an episodic basis. Specific natural events such as wildfires, volcanic eruptions, and dust storms can lead to very high levels of particulate matter. Disregarding such large and unique events, an estimate of background on a daily and episodic basis can be obtained from reviewing multi-year and special field study data.

The natural component of the background contributes to both fine and coarse particles in the atmosphere, and arises from physical processes of the atmosphere that entrain particles of crustal material (PM10 contained in soil, classified as geologic material) as well as from emissions of organic particles and gases from vegetation and natural combustion sources such as wildfires that form secondary particulates. Background natural particulates and particulate precursor emission sources include: wind blown dust from erosion; sea salt; particles formed from the sulfur compounds emitted from oceans and wetlands; NOx from natural forest fires and lightning, and hydrocarbons emitted by vegetation. Living organic matter, including fungal spores, pollen, bacteria, viruses, endotoxins, and non-living organic matter, such as animal and plant debris, also contribute to the PM10 mass. Bacteria and viruses are mainly found attached to aerosol particles and their mass will be attributed to those aerosols. Fungal spores, pollen, and animal and plant debris are found as separate particles. Fungal spores occur mostly in the 2 to 4 mm size range and form the largest and most consistently present component of biological aerosols in ambient air. Levels of fungi and bacteria, which vary seasonally, are generally higher in urban than in rural areas. They are highest near compost and agriculture activities.

The exact magnitude of the natural portion of particulate matter for a given geographic location cannot be precisely determined because the natural emissions are indistinguishable from the long range transport of anthropogenic particles or precursors. Regional annual average natural background levels are estimated as 4 - 8 $\mu g/m^3$ PM10 and 1-4 $\mu g/m^3$ PM2.5 for the western US. Annual average PM10 concentrations in national parks, wilderness areas, and national monuments in the western US range from 5 to 10 $\mu g/m^3$ based on data from Interagency Monitoring of Protected Visual Environments (IMPROVE).

### Utilization of Application Assumptions

Particle dynamics, physics, and atmospheric behavior and fate establish background and regional contribution estimates. These estimates are assumptions considered in rollback calculations. If such assumptions were not utilized, the analysis would link all of the observed particulate to local quantified sources. This would overstate the predicted effectiveness of controls. The assumptions for background and regional components are included to ensure that control effectiveness is not overstated (occurring if background levels are set too low), which could potentially lead to a failure to attain, or understated (if background levels are set too high), which would underestimate control effectiveness and require implementation of excessive control measures. For modeling purposes, background particulate matter includes the distribution of particulate matter from natural sources as well as anthropogenic emissions of particulate matter and precursor emissions of VOCs, NOx, and SOx from areas outside of the SJVAB.

### Determination of Appropriate Modeling Approach

While several techniques are available to model the direct emission, secondary formation, and dispersion of particulate matter, selecting a methodology that is appropriate for the SJVAB is important. The methodology needs to consider and compensate for the strengths and weaknesses of available approaches. Based upon availability of emission estimates, meteorology, and air quality data in the SJVAB, the use of receptor CMB modeling is proposed, with the support and enhancement of regional aerosol modeling to evaluate secondary formation ratios, and with profile selection for CMB modeling enhanced by assessment of local temporal and spatial emission distribution.

## MODELING ANALYSIS COMPONENTS

### Meteorological Evaluation

Meteorological data are used to assess the potential for air pollution to accumulate in certain locations. Weather factors that may restrict horizontal and vertical air movement of air masses are important factors in air quality. Vertical movement of air disperses pollutants vertically, while horizontal movement spreads the pollutants over a wider geographic area. The greater the velocity of wind in the mixing layer, the greater the amount of mixing (dispersion) and transport of pollutants.

**Statistical Analysis of Meteorology and Air Quality**

Meteorological and statistical analysis was conducted by the District and ARB in order to examine the representativeness of episodes, both historical and present, and to categorize the meteorological regimes and pollution episodes that are being analyzed by CMB analysis as well as to determine seasonal differences in the influence of meteorological variables. Local, regional and mesoscale weather patterns were analyzed by the District to determine key weather features that produced poor dispersion and transport during PM episodes.

Each episode was characterized by a prolonged period (two to three weeks) of limited mixing and light wind flow. During each episode, cold air at the surface and warm air above the mixing layer trap pollutants. Horizontal movement of air was minimal and disorganized reducing dispersion and transport of pollutants. These conditions cause particulates to accumulate throughout the Valley. Under these poor mixing conditions, coarse and fine particulates accumulated and led to high particulate concentrations. Winter exceedances (December and January) were characterized by an increase in fine particles to a level that dominated filter samples. Fall exceedances (October and November) were dominated by coarse particles. To a lesser extent in the fall and a greater extent in the winter, cool damp mornings and restricted vertical air movement contributed to the formation of nitrates and sulfates. Total carbon concentrations from combustion sources remained proportionally the same during the fall and winter exceedances. Due to stagnant weather conditions, the elevated PM10 measurement that resulted in an exceedance of the Federal Standards were caused primarily by local emission sources, rather than background or long-range transport material.

The October 1999 particulate episode was unique and did not follow the general meteorological and chemical pattern observed in other episodes. Concentrations during this event were dominated by geological particles ($PM_{10}$), with significant contributions from fine particulates of ammonium nitrate and sulfate and total carbon. The abundance of fine particulates in the samples may have been due to abnormalities in atmospheric chemistry reactions. Due to several wildfires to the north and a major tire fire at Westley earlier in October, particulate loading aloft may have decreased solar radiation intensity measurements across the Valley Floor. With reduced solar radiation, the atmospheric chemistry reactions may have changed from the ozone forming regime of mid-October to the secondary particulate regime of late November. As a result, the geological particulates dominated the samples, but the fines exerted a large influence. Due to limited afternoon heating and stagnant weather conditions, local sources contributed to the elevated readings, causing $PM_{10}$ concentrations to exceed the Federal Standards. Please see a separate reference document to this Plan for meteorological analysis details.

Various statistical models were applied, including CART 3.6 analysis by the ARB to determine key predictive and common factors. Both qualitative meteorological analyses and statistical analysis determine whether episodes occur from common or unique factors. The analysis of different meteorological regimes identifies the frequency and extent to which pollutant concentrations are influenced by the local, regional and mesoscale meteorology. This is important to establish representative criteria for SIP development. Also, classification and identification of critical factors with CART analysis assists in the representativeness evaluation and improves parameter identification and weighting for forecasting. Please see Appendix L for a CART Summary Report.

**Chemical Mass Balance (CMB) Receptor Modeling**

Receptor modeling using the chemical mass balance model (version CMB 8) was conducted for annual and episode conditions at sites that currently do not comply with the federal PM10 air quality standards. This method uses chemical analysis of collected air monitoring samples and information about the chemical composition of contributing sources to evaluate the link between observed conditions and emission sources. The District used the results of the CMB analysis with a modified rollback approach to calculate the effect on design values of predicted aggregate adopted and proposed control measure reductions and other predicted emission trends to establish attainment at sites noncompliant with the NAAQS. This method works well for analysis of directly emitted particles, but it is less certain in predicting the effect of reductions of secondary precursors. The Protocol proposes supplementing the receptor modeling with findings from regional modeling of secondary particulate formation to factor in potential nonlinear secondary particle formation.

**CMB Analysis with Linear Rollback**

CMB analysis with linear rollback can be applied to short and long term data. However, the lack of treatment of meteorology in the model affects seasonal and annual average modeling less than it affects modeling of a 24-hour episode. In the rollback projection, ambient pollutant concentrations are linked to CMB receptor analysis of source contributions. The output of the CMB receptor model was used with linear rollback to combine the most accurate source identification available with a reliable technique for assessing control programs.

**Urban Airshed Modeling (UAM)**

Regional modeling of secondary particulates was conducted by ARB with a version of the Urban Airshed Model modified to address aerosol chemistry (UAM-Aero). This model was used to learn as much as possible from the IMS-95 dataset (an early component of CRPAQS) by evaluating a monitored event of nitrate particulate formation. Additional analysis of the dataset with modeling techniques under development for CRPAQS was used for comparison to the UAM-Aero results. Results improve understanding and provide useful secondary particle formation rates and precursor ratios, particularly for nitrate particulates, and can be viewed in

Appendix M. Results are used in conjunction with receptor modeling to enhance the accuracy and reliability of predicted effects of emission trends and adopted and proposed control measure reductions of secondary precursors.

## MODELING RESULTS

Combining the results of the meteorological and statistical analysis allows evaluation of whether the monitoring data and design value represent the likely worst case value, which would be a more stringent design value than is required, or whether the monitoring data may represent something less than the fourth highest likely value, which may not be sufficiently protective. Receptor and regional modeling allow evaluation of future NAAQS compliance by rollback analysis.

### Simulation of Observed Particulate Concentrations

CMB receptor modeling is an analysis method used to link observed levels of particulates to the sources of emissions grouped into source categories. The CMB model links the speciated chemical composition of the filter sample at the site to emissions inventories that represent the emissions at the time of the 24-hour observation, or represent seasonal or annual average values as appropriate. Where emission information is lacking for a particular component (e.g., seasonally resolved mineral dust emissions), rollback can still be applied to other components.

**Annual:** Evaluation of annual concentrations by receptor modeling to determine probable source contributions must include appropriate consideration of, and adjustments for, seasonal differences in sources and seasonal differences in atmospheric conditions that affect particle origin, formation and atmospheric residence time. In addition to CMB modeling of episode days, monthly averages for required sites have been modeled to develop annual average contribution estimates.

**Table 5-3**
**Federal Annual PM10 Design Values For Analysis**

| Site Name | Calculated by SJVAPCD | Reported in EPA Notice |
|---|---|---|
| Bakersfield-Golden #2 | **57** | **55** |
| Fresno-Drummond | 50 | 47-**53** |
| Hanford, Irwin St | **53** | **51** |
| Visalia, Church Street | **54** | **54** |

**24-Hour Episodes:** Exceedances were characterized and grouped by chemical speciation and source attribution based on conceptual models, data evaluation and modeling analyses. This information has been used to help identify the contributing sources. For 24-hour exceedances where ammonium and nitrate ions are a significant fraction of the total particulate mass, particle speciation, gaseous concentration, meteorological, and emissions data have been analyzed to attempt to determine the limiting precursor.

**Table 5-4**
**Federal 24-Hour PM10 Design Values For Analysis**

| Site Name | Design Value | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| Bakersfield, California Ave. | **190** | 143 | 140 | **190** |
| Bakersfield-Golden #2 | **205** | 183 | 145 | **205** |
| Clovis | **155** | 151 | 114 | **155** |
| Corcoran, Patterson Ave. | **174** | **174** | 128 | 165 |
| Fresno-Drummond | **186** | 162 | 130 | **186** |
| Fresno-First | **193** | 154 | 138 | **193** |
| Hanford, Irwin St | **185** | 143 | 119 | **185** |
| Modesto, $14^{th}$ Street | **158** | 132 | 112 | **158** |
| Oildale, 3311 Manor St | **158** | 156 | 122 | **158** |
| Turlock, 900 Minaret Street | **157** | **157** | 104 | 148 |

Design Value Column – bold indicates value exceeds standard
Year Columns - bold indicates observed value that set the Design Value

**Conclusions**

The modeling conducted for the 2003 PM10 Plan meets EPA criteria for areas designated as serious nonattainment for PM10. As was indicated throughout this plan, the San Joaquin Valley's PM10 problem is complex. The District and ARB used the best modeling tools available to address this complexity and to provide reasonable assurance that the control strategy will attain the NAAQS.

# ATTAINMENT PROJECTIONS

Modeling is required to assess monitored exceedances of the PM10 NAAQS at all sites that cause the District to be classified as nonattainment for the 24-hour standard. Modeling is also required to evaluate contributions to the calculated annual average values at sites determined to be nonattainment of the annual standard. Modeling for each required site must determine whether emissions that contribute to PM10 at the site will be diminished sufficiently by existing and proposed emission reductions to achieve attainment of the federal PM10 standards at the earliest practical date.

## ATTAINMENT DEMONSTRATION METHODOLOGY AND PROCEDURE

Analysis of PM10 concentrations uses emissions inventories, ambient data, meteorological analysis and mass balance and aerosol modeling.

The 1999 emissions inventory is used to represent the emissions associated with 1999 to 2001 annual average and 24-hour episode design value concentrations. The projected future year concentration is predicted based on annual and seasonal emissions inventories for the years 1999 and 2010. Each year is projected by source category, modified to address the disproportionate formation of nitrate particulates from reaction of nitrogen oxide emissions with ammonia in the atmosphere. The source contributions are projected for future years by increasing or decreasing the PM10 contribution assigned by modeling in proportion to changes in the emissions inventory that are projected to occur by the future year. The emissions projection considers regulatory action, population growth, predicted industry activity growth or decline and other related factors. Attainment is demonstrated if the predicted concentration is reduced sufficiently to achieve attainment of both the 24-hour and annual average PM10 standards.

Some of the observed PM10 sample is caused by emissions that are not included in the District's emission inventories, but are caused by natural sources or by emissions transported from areas outside the SJVAB. These emissions are indistinguishable from local emissions and must be estimated by evaluation of current technical literature. Because local control programs do not reduce natural emissions and emissions from outside the local region, these emissions are excluded from emission reduction calculations and added back to the resulting future year projection unchanged. The future year predicted concentration is the sum of the projected reduced local contribution plus the estimate of unaffected emissions.

### Methodology for Simulation of Attainment Particulate Concentration

The Chemical Mass Balance Model (CMB version 8) was used to estimate source contributions for each site's design value.

For the annual analysis, monthly CMB source contributions were evaluated for February to December of the year 2000 and averaged with CMB episode analysis from January 2001 to determine the annual average composition comparable to the annual average design value. January 2001 episode data was used because the year 2000 reflected a lower PM10 level than the calculated design value. The January episode reflects the seasonal dominance of winter emissions and is therefore an appropriate adjustment to reflect the annual chemical composition. Other methods could have been used to adjust the 2000 annual monthly CMB contributions to match the required design value; however, scalar adjustments would have required recalculation of all monthly results and would have biased the annual value a few micrograms towards elevated geologic contributions that are not as reflective of actual seasonally elevated contributions. CMB modeling for the annual analysis was carried out for Bakersfield, Fresno, Hanford, and Visalia.

The 24-hour design values represent a specific day of monitoring at the site. CMB modeling requires day specific chemical composition data to determine how much each the various source types contributed to the observed PM10 concentration. In some cases the monitoring device or processing method for the filter sample used to obtain the concentration did not provide data on chemical species. Special procedures, in accordance with the modeling protocol, were used to provide chemical species data to perform modeling for design values that did not have full chemical data. Where a full compliment of speciated data was not available to support CMB modeling for a design day, either data from a nearby site on the same day were used, or data was used from the same site on an alternate day of the same time of the year that was similar in concentration. This is the best evaluation that can be made with existing data.

Supporting analyses included the examination of historical monitoring data, evaluation of source zones of influence, assessment of spatial representativeness of monitored episodes and meteorological and statistical analysis. Examining historical data provides the context for design value observations and an assessment of whether the design values are consistent with previous experience. Evaluation of source zone of influence is necessary for prediction of effects of control strategies with receptor and rollback techniques. Analyses of the spatial representativeness of monitored episodes is important to determine which episodes are dominated by local sources and which have significant contributions from larger portions of the region.

Inherent uncertainties in any modeling approach affect the accuracy of predictions. The rollback procedure is considered to be a conservative estimate, which means that attainment is likely to be achieved even if the actual future emissions are slightly more than the calculated future rollback inventory. However, other uncertainties in the modeling and projection process suggest caution in considering the outcome as conservative. The distance and position of sources relative to the monitoring site is not considered by CMB modeling; therefore, the effect of emissions changes for a source or source category may be greater or less than projected by the linear rollback method. The accuracy of the projection is dependent on the selection of speciation profiles that are appropriate to identify emissions sources in the area being modeled, the accuracy of CMB modeling, and the completeness, precision and representativeness of monitoring data and emissions inventories for the locations modeled. Accuracy will be affected if the monitoring data or emissions inventories are not typical and representative of the community.

**Sites to be Analyzed for Attainment Demonstration**

The modeling evaluations include monitored exceedances of winter episodes dominated by secondary particulate formation in urban areas and fall episodes dominated by emissions composed of geologic material found in San Joaquin Valley (SJV) soil.

Fall events are usually dominated by material found in SJV soil that becomes entrained in the atmosphere due to a variety of urban and rural activities. Most of the observed exceedances dominated by material found in SJV soil have been observed in the fall, but it is also possible to have similar events related to high winds or unusual activities.

Winter 24-hour exceedances are identified as being dominated by urban combustion and evaporative emissions. Nitrate particulates are formed from reaction of combustion related nitrogen oxides with ammonia in the atmosphere. Carbon compounds are directly emitted or formed from combustion and evaporative gases. The largest urban communities experience the highest winter PM10 levels.

The cities expected to experience the highest fall and winter PM10 levels are monitored in accordance with federal requirements. Sites identified in the following tables have a design value that does not meet the applicable federal 24-hour or annual average NAAQS and are required to be analyzed for their future compliance.

**Table 6-1**
**Federal 24-Hour PM10 Design Values**

| Site Name | Design Value | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| Bakersfield - California Ave. | **190** | 143 | 140 | **190** |
| Bakersfield – Golden #2 | **205** | 183 | 145 | **205** |
| Clovis | **155** | 151 | 114 | **155** |
| Corcoran – Patterson Ave.<br>(two events with the same 174 value) | **174** | **174** | 128 | 165 |
| Fresno – Drummond | **186** | 162 | 130 | **186** |
| Fresno – First | **193** | 154 | 138 | **193** |
| Hanford - Irwin St | **185** | 143 | 119 | **185** |
| Modesto – 14th Street | **158** | 132 | 112 | **158** |
| Oildale - 3311 Manor St | **158** | 156 | 122 | **158** |
| Turlock – 900 Minaret Street | **157** | **157** | 104 | 148 |

Design Value Column – bold indicates value exceeds standard
Year Columns - bold indicates observed value that set the Design Value

**Table 6-2**
**Federal Annual Average PM10 Design Values**

| Site Name | Calculated by SJVAPCD | Reported in EPA Notice |
|---|---|---|
| Bakersfield - Golden #2 | **57** | **55** |
| Fresno - Drummond | 50 | 47-**53** |
| Hanford - Irwin St | **53** | **51** |
| Visalia - Church Street | **54** | **54** |
| Bold indicates value exceeds standard | | |

**CMB Source Profiles**

The CMB model analyzes ambient particulate samples to estimate the relative contributions of different source categories to the measured particulate concentration by using the known chemical composition (profile) of likely contributing sources. CMB source profiles were derived from the EPA source profile library, local geological and burning profiles and chemical profiles representing California motor vehicle fuel, type, age, and emission factor data (EMFAC).

Specific source profiles representative of the sources in the area during the season in which the design day occurred were identified for the 24-hour design day at each site. Performance evaluation of each analysis estimates the quality of the statistical fit of the source profiles to the observed event. Profiles were selected based on review of sources appropriate for the time of year, related emissions activities, and meteorological analysis to determine the probable area of contributing sources influencing the observation. CMB modeling has difficulty assessing source contributions from sources with very similar chemical composition. Contributions from paved and unpaved roads, agricultural harvesting, off-road activities and other source signatures described as fugitive dust emissions are essentially indistinguishable to the model. To address this limitation of CMB modeling without excluding important contributing sources, composite profiles were developed by combining the signatures of the various sources so that the affect of the group of emissions could be assessed by CMB modeling.

**CMB Contributions**

The results of CMB modeling can be used directly to project future concentrations from forecast future inventories that include estimated emissions reductions. The CMB method identifies the contributing sources and the proportional rollback method is used to predict future concentrations based on forecast emissions reductions.

CMB modeling assumes a direct relationship (linear) that predicts that emissions changes will be directly proportional to emission reductions. CMB modeling therefore has inherent difficulties predicting changes in particulates affected by non-linear factors. Non-linear relationships between emissions and particle formation occur due to complex chemical reactions in the processes of atmospheric chemistry.

PM10 episodes that are heavily dominated by primary emitted particles from sources that emit carbon and soil based emissions from roads, agriculture, construction and related activities are suitable for direct CMB analysis and rollback. However, SJVAB episodes and annual concentrations include contributions from nitrate and sulfate particulates produced from complex non-linear atmospheric chemistry reactions. Evaluating the complexity of the relationships involved in particle formation provides information to determine how to adjust the CMB assumption of linear response to modify modeling methods for improved prediction of secondary particle formation.

**UAM Analysis**

Episodes involving large quantities of secondary particulates formed from gaseous precursors (such as NOx, VOC, and NH3) need to be evaluated with an understanding of the atmospheric processes and the best information available about atmospheric chemistry and formation rates. Particle formation rates may vary due to influences of meteorology and precursor ratios. Temperature, relative humidity, photochemical energy flux, wind speed and atmospheric mixing affect the formation rates of secondary particulates. The balance of precursors and concentrations of ozone and carbon dioxide also influence particle formation.

Regional modeling, using a version of the Urban Airshed Model modified to assess nitrate particle formation (UAM 8-Aero), was used to determine the precursor and formed particle relationships specific to the SJVAB. Evaluation and modeling of extensive data collected for a typical winter episode from the IMS 95 project, an early element of the CRPAQS research program, was used to establish formation rates and ratios for secondary particulates. This modeling analysis determined that the formation of nitrates associated with NOx emissions does appear to have a nonlinear response in the SJVAB. While more recent projects of the CRPAQS research program have collected additional information, modeling of this information is not yet available. Modeling with newer information would enhance the precision for determining formation ratios but would not alter the finding that the relationship of emissions to reductions is nonlinear due to atmospheric chemistry.

The results of the regional modeling were used for modification of rollback projection by estimating the degree of variation from linear assumptions for formation rates of secondary particulates. The District does not have sufficient information to model the chemistry of each event with a regional photochemical model with aerosol chemistry. The regional modeling evaluates the relationship of gaseous precursors to fine particle formation to address the inherent limitation of CMB modeling to consider atmospheric chemistry. Based on the preliminary findings of the assessment of the IMS95 atmospheric chemistry, conversion factors were used for precursor formation of secondary particulate matter in conjunction with results of the CMB modeling to modify the rollback projection of secondary particulates. The approach is used in making reasonable assessments of future annual average and 24 hour episode response to emission precursor reductions.

The regional modeling provides technically improved understanding of secondary particulate formation, but is not being used to model primary particulates. Technical difficulties preclude an attainment demonstration for PM10 based entirely on grid-based photochemical modeling. In addition to the lack of sufficient information to model the chemistry of each event with a regional photochemical model including aerosol chemistry, the regional model would be burdened by limitations and uncertainties in available information for area source particulate emission rates and distributions and deposition rates for directly emitted large particles. Regional modeling requires estimation of these influences in its effort to predict what will occur in the atmosphere. Regional modeling also has difficulty representing the dispersion of coarse particle falloff distances that are less than the grid spacing, the minimum area for which the model provides a prediction. Using smaller grid spacing and/or using a coupled grid and dispersion approach would improve regional modeling of primary particulates, but available data sets lack sufficient data density to provide suitable input information for fine scale regional modeling.

As a receptor technique analyzing observed filter samples, CMB modeling avoids the limitations in input data that affect predictive regional modeling by relying on analysis of the contents of observed samples that inherently reflect the end result of all processes. CMB modeling does not need to know the distances that particles travel to produce an analysis of contributing sources but accordingly is limited in the information it provides concerning the area that influenced the observation. The District and ARB addressed this limitation through thorough analysis of meteorology associated with each event to determine the probable area of influence represented by the observed episode.

**NOx Ratio Methodology**

UAM-Aero modeling of an IMS95 January episode was used to establish a ratio relating NOx emission changes to changes in ambient ammonium nitrate concentrations. The ratio was then used in the rollback projection. The first-day (January 4, 1996) measurement was assumed to represent regional background nitrate levels. We then examined the response of ammonium nitrate concentrations on the third day of the episode (January 6, 1996) to a 50 percent reduction in NOx emissions. The response was calculated as the percent change in ammonium nitrate concentration in excess of background.

Table 6-3 shows the percent reduction in ammonium nitrate concentrations above background due to a 50 percent NOx reduction at the four IMS95 monitoring sites: Fresno-Einstein Park, Bakersfield-Van Horn School, Kern Wildlife Refuge, and South West of Chowchilla. The average response to a 50 percent NOx control was 35 percent reduction in ammonium nitrate. This corresponds to a 1.4 to 1 NOx to ammonium nitrate reduction ratio, i.e., for each 1.4 tons of NOx emission reductions, ambient ammonium nitrate mass drops 1 ton.

**Table 6-3**
**Reduction in Ammonium Nitrate Concentrations**
**due to 50% NOx Reductions**
**January 4, 1996 to January 6, 1996 Episode**

| Monitoring Site | Percent Change* |
|---|---|
| Average | 35% |
| Bakersfield Van-Horn | 53.3% |
| Kern Wildlife Refuge | 58.8% |
| Fresno Einstein Park | 8.6% |
| South West of Chowchilla | 19.9% |

** Represents percent change of ammonium nitrate in excess of background concentrations.*

To be reasonably conservative, given the limits of the IMS95 modeling, the NOx ratio was rounded up to 1.5 to 1. The nominal assumption without regional secondary particulate modeling is a NOx to ammonium nitrate ratio of 1 to 1. The 1 to 1 ratio was used in the San Joaquin Valley's 1997 PM10 plan. The more health–protective 1.5 to 1 ratio provides increased confidence that the NOx reductions will yield the ammonium nitrate reduction relied on in the attainment demonstration. The NOx ratio will be updated if the CRPAQS modeling shows that the 1.5 to 1 ratio does not provide for attainment. If the ratio proves to be closer to 1 to 1, it could result in earlier attainment of the PM10 standard.

**CMB Rollback Calculations**

Combining CMB modeling results with grid-based photochemical aerosol chemistry modeling analysis (UAM 8 Aero) provides the best available methodology to establish a reliable rollback analysis. In this approach, CMB modeling provides source apportionment for primary particles and the grid-based photochemical model provides conversion factors of precursors into secondary particles that were used to correct the proportional rollback analysis of secondary particulates. The area of influence affecting the episode was determined by separate meteorological analysis of the days before and during the observed episode.

The CMB modeling analysis used chemical profiles to divide the observed episode concentration into contributions associated with a limited number of categories. The CMB categories are very broad, including contributions from many different types of sources. Emissions inventories prepared by the District and ARB contain a much finer division of sources in smaller categories. To predict the effect on future PM10 concentrations from control programs, the CMB categories were linked proportionally to the sum of comparable emissions inventory categories. The 24-hour and annual connections between CMB and emissions inventories are different due to seasonal differences and other factors. Fugitive windblown dust contributes to the annual average values and was used in the connection to CMB; however, the 24-hour episodes occurred primarily during stagnation events so fugitive windblown dust emissions were excluded from the 24-hour analyses.

Utilizing the methodology described in this chapter, projections of the effect of control programs and emissions trends have been prepared for the annual and 24-hour design values at all required sites.

**Simulation of Future Year Particulate Concentrations**

From the CMB receptor modeling identification of emissions source contributions by chemical species, future source contributions have been estimated from baseline and projected inventories with rollback techniques to evaluate the effects of trends and proposed emissions reductions in future years. The design value concentrations were modeled at each site where concentrations were measured that exceeded the federal PM10 NAAQS and where adequate data was available to support a valid analysis.

Rollback calculations for each monitoring site determine future compliance with federal NAAQS for PM10 by calculating the effect of emission reductions predicted for the major source categories as defined in the CMB receptor modeling. The predicted PM10 concentration may also be achieved by different reductions of precursor and PM10 emissions as long as the total particulate reduction is equivalent. Attainment is demonstrated for each site that is projected to have future concentrations at or below the federal NAAQS.

**Table 6-4**
**Simulated Future Year 24-Hour PM10 Values**

| Site Name | Design Value | 2010 without additional reductions | 2010 with additional reductions |
|---|---|---|---|
| Bakersfield, California Ave. | **190** | **186** | 137 |
| Bakersfield-Golden #2 | **205** | **203** | 151 |
| Clovis | **155** | 145 | 120 |
| Corcoran, Patterson Ave. | **174**<br>**174** | **185**<br>**197** | 143<br>138 |
| Fresno-Drummond | **186** | **181** | 140 |
| Fresno-First | **193** | **182** | 144 |
| Hanford, Irwin St | **185** | **189** | 143 |
| Modesto, 14th Street | **158** | 144 | 121 |
| Oildale, 3311 Manor St | **158** | 151 | 120 |
| Turlock, 900 Minaret Street | **157** | 162 | 116 |

Analysis indicates that the following sites will comply with the 24-hour PM10 NAAQS without additional action: Clovis, Modesto, Oildale, and Turlock. The following sites require the commitments in Chapter 4 to achieve compliance by 2010: Bakersfield-California Ave., Bakersfield-Golden, Corcoran, Fresno-Drummond, Fresno-First, and Hanford.

Bakersfield Golden State was the highest design value and the most resistant to emissions change. Final analysis of this site included rechecking of baseline emission growth projections and incorporated final elements of reductions from State and District emission reduction commitments that were the last items to be quantified.

**Table 6-5**
**Simulated Future Year Annual PM10 Values**

| Site Name | Design Value | 2010 without additional reductions | 2010 with additional reductions |
|---|---|---|---|
| Bakersfield-Golden #2 | **57** | **58** | 49 |
| Fresno-Drummond | **50** | 50 | 45 |
| Hanford-Irwin St | **53** | 52 | 47 |
| Visalia-Church Street | **54** | 52 | 46 |

Analysis indicates that Fresno, Hanford, and Visalia will comply with the annual PM10 NAAQS by the year 2010 without additional action. Bakersfield requires the proposed commitments in Chapter 4 to achieve compliance in 2010.

## ATTAINMENT PROJECTION RESULTS

Projection of the future PM10 concentrations after all reductions are applied and the attainment projection for each site including additional supporting information and evaluations are contained in Appendix N. All sites are projected to attain the annual and 24-hour PM10 NAAQS by December 31, 2010.

**Table 6-6**
**Projected 24-Hour PM10 Values**

| Site Name | Design Value | 2010 |
|---|---|---|
| Bakersfield - California Ave. | **190** | 137 |
| Bakersfield - Golden #2 | **205** | 151 |
| Clovis | **155** | 120 |
| Corcoran - Patterson Ave. (two different events with the same 174 value) | **174** | 143<br>138 |
| Fresno - Drummond | **186** | 140 |
| Fresno – First | **193** | 144 |
| Hanford – Irwin St | **185** | 143 |
| Modesto – $14^{th}$ Street | **158** | 121 |
| Oildale - 3311 Manor St | **158** | 120 |
| Turlock – 900 Minaret Street | **157** | 116 |

**Table 6-7**
**Projected Annual PM10 Values**

| Site Name | Design Value | 2010 Projected Value |
|---|---|---|
| Bakersfield - Golden #2 | **57** | 49 |
| Fresno - Drummond | 50 | 45 |
| Hanford - Irwin St | **53** | 47 |
| Visalia - Church Street | **54** | 46 |

## CONCLUSION

Procedures for analysis have been selected to provide objective and reliable conclusions that have the highest confidence that can be established to determine that the SIP is comprehensive and sufficient for the entire District to achieve attainment of the federal PM10 NAAQS. Reductions of emissions included in the SIP establish an attainment demonstration of the federal PM10 annual and 24-hour standards by successfully addressing all identifiable exceedances that classify the District as nonattainment. Measures implemented throughout the District provide compliance with the NAAQS in communities that are monitored based on their selection as areas expected to experience peak PM10 concentrations. This provides assurance of compliance throughout the District in the communities and areas not directly monitored. If there are exceptions caused by currently unknown special circumstances or sources, the District will assess the special conditions or areas by appropriate action when they are detected.

This PM10 plan has been prepared consistent with the requirements of the Federal Clean Air Act Amendments and applicable federal guidance documents, providing an overview of existing conditions, previous plan commitments, proposed control strategies, required emission inventories, and a modeling discussion. The fall and winter 24-hour PM10 episodes in the SJVAB occur under calm conditions that make identification of contributing sources and development of effective controls difficult. Control strategies have been identified and extensive efforts are underway to gain a better understanding of the components that contribute to episodes in the SJVAB, in order to develop and quantify effective control options.

Modeling has indicated that all monitoring sites within the district will attain the federal average annual PM10 NAAQS by December 31, 2010. Modeling further indicates the current state and District actions and commitments will not achieve attainment of the federal 24-hour standard before 2010, and additional measures as contained in this plan are required to ensure that the District will reach attainment of the federal 24-hour PM10 NAAQS. These cumulative strategies and actions will result in attainment of the federal PM10 NAAQS by December 31, 2010.

# REASONABLE FURTHER PROGRESS

## REASONABLE FURTHER PROGRESS DEMONSTRATION REQUIREMENT

The federal Clean Air Act (CAA), Section 189(c), requires PM10 nonattainment areas to include quantitative milestones, which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress (RFP) toward attainment by the applicable date. The District's applicable date is the new attainment date of 2010. Since the District did not attain the standard by December 31, 2001, it is required to achieve reductions of five (5) percent per year of PM10 or PM10 precursors until attainment is reached. The emission inventories for the milestone years of 2005 and 2008 that reflect achievement of the 5 percent requirement will constitute the quantitative milestones for the SJVAB. The SJVAB is the first PM10 nonattainment area nationwide to be subject to the 5 percent requirement. No precedent has been set for interpreting this requirement. The District's interpretation and an alternative interpretation are provided below.

### Five Percent Annual Emissions Reduction

The District was required to submit a new SIP by December 31, 2002; therefore, the annual 5 percent emission reduction requirement becomes effective in calendar year 2003. The basis for the 5 percent annual reduction is the emission inventory for 2002 that is included in this PM10 Plan. The District's interpretation of the 5 percent requirement is summarized as follows:

a. The annual 5 percent per year emission reduction requirement represents the aggregate of directly emitted PM10 emissions and appropriate precursor emissions.

b. EPA guidance regarding the 5 percent requirement makes no mention of the relative effectiveness of the reductions, but it would be logical to assume that the reduction must have some effect on the attainment problem, and in fact should be related to efficient progress in the most expeditious manner.

c. Although no precedent is available for PM10, the CAA includes a 3 percent milestone requirement for ozone that allows NOx substitution and is additive for VOC and NOx reductions. In keeping with the NOx substitution guidance, a PM10 nonattainment area should be able to meet the milestone by reducing either PM10 or the PM10 precursor or both as long as both have an effect on ambient PM10 concentrations.

d. An area with directly emitted PM10 and precursor problems should be able to reduce zero percent of one pollutant and 5 percent of the other to meet the requirement or some combination in between as long as this is consistent with the attainment demonstration.

e. The 5 percent reduction should be demonstrated with a running average for every year until attainment to ensure that every year achieves at least 5 percent.

An even 5 percent per year reduction for each year is not possible nor in the public interest. The District only has the regulatory authority to control a fraction of the total emission inventory. For example, the federal government and the State of California regulate mobile source emissions. Mobile source reductions are predetermined by vehicle fleet turnover and the schedule for adopting new controls. This makes mobile source emissions decline gradually over time and provides little opportunity for additional early reductions due to lengthy regulation development schedules. Stationary source controls implemented by the District often get immediate reductions and then start to lose the benefits due to growth in that source category. In this case, one or two years when the rule is first implemented will show substantial percentage reductions and later years may show growth from the new lower baselines. When regulations impacting large sources are implemented prior to the baseline year, in this case 2002, there is little additional opportunity for reductions when they are needed to demonstrate 5 percent. Artificially delaying rule implementation to a later date to meet the 5 percent in a year short on reductions would be contrary to CAA provisions requiring expeditious implementation.

Table 7-1 displays the percent reduction estimated for directly emitted PM10 and PM10 precursor emissions for each milestone year and the attainment year.

**Table 7-1**
**Five Percent per Year Milestone Demonstration**
**Annual Inventory with New Controls**

| Year | NOx Emissions Tons/day | Percent NOx Reduced % | PM10 Emissions Tons/day | Percent PM10 Reduced % | Percent reduction NOx + PM10 (running average) |
|---|---|---|---|---|---|
| **2002** | **519.8** | | **329.4** | | |
| **2003** | 493.5 | 5.1 | 329.4 | 0.0 | 5.1 |
| **2004** | 479.5 | 2.7 | 312.1 | 5.3 | 6.5 |
| **2005** | 461.8 | 3.4 | 285.5 | 8.0 | 8.1 |
| **2006** | 441.0 | 4.0 | 285.8 | -0.1 | 7.1 |
| **2007** | 420.1 | 4.0 | 285.4 | 0.1 | 6.5 |
| **2008** | 403.6 | 3.3 | 280.1 | 1.6 | 6.2 |
| **2009** | 389.1 | 2.8 | 284.5 | -1.3 | 5.5 |
| **2010** | 363.7 | 4.9 | 283.7 | 0.2 | 5.5 |

Another way to interpret the requirement for 5 percent of PM10 or PM10 precursors is to conclude that it means that in each year you must meet at least 5 percent of one or the other. If a District achieves a 5 percent PM10 reduction in one year, no reduction in precursors is required that year. In a later year, one would claim a 5 percent reduction in precursors and zero percent reduction in PM10. Table 7-2 provides a demonstration using this alternative methodology.

**Table 7-2**
**Five Percent per Year Milestone Demonstration – Alternative Method**
**Annual Inventory**

| Year | NOx Emissions Tons/day | Percent NOx Reduced % | Percent NOx Carried Forward % | PM10 Emissions Tons/day | Percent PM10 Reduced % | Percent PM10 Carried Forward | Percent reduction NOx + PM10 (running average) |
|---|---|---|---|---|---|---|---|
| **2002** | **519.8** | | | **329.4** | | | |
| **2003** | 493.5 | **5.0** | **0.1** | 329.4 | 0.0 | 0.0 | 5.1 |
| **2004** | 479.5 | 0.0 | 2.8 | 312.1 | **5.0** | 0.3 | 6.5 |
| **2005** | 461.8 | 0.0 | 6.2 | 285.5 | **5.0** | 3.3 | 8.1 |
| **2006** | 441.0 | **5.0** | 5.2 | 285.8 | 0.0 | 3.2 | 7.1 |
| **2007** | 420.1 | **5.0** | 4.2 | 285.4 | 0.0 | 3.3 | 6.5 |
| **2008** | 403.6 | **5.0** | 2.4 | 280.1 | 0.0 | 4.9 | 6.2 |
| **2009** | 389.1 | **5.0** | 0.2 | 284.5 | 0.0 | 3.6 | 5.5 |
| **2010** | 363.7 | **5.0** | 0.1 | 283.7 | 0.0 | 3.8 | 5.5 |

Bold percentages indicate the year and the pollutant used to meet the annual 5 percent requirement.

Bold percentages indicate the year and the pollutant used to meet the annual 5 percent requirement.

The five percent calculation is based on directly emitted PM10 and PM10 precursors that contribute significantly toward attainment. SOx, VOCs and ammonia controls make insignificant contributions toward attainment. The entire SOx inventory is very small (32 tons/day) and all SOx reductions after implementing BACM contribute about 1.5 µg/m$^3$ of reduction for a 24-hour episode. UAM-Aero modeling indicates that a 50 percent reduction of VOCs involved in secondary formation of PM10 are ineffective at changing ambient concentrations of nitrate. Fifty percent ammonia reductions were also modeled with UAM-Aero. The results were inconclusive. Although some areas with relatively low nitrate concentrations modeled reduced ambient concentrations, most of the Valley and areas with the highest concentrations showed little reductions. See Chapter 5 for a discussion of the modeling conducted for the PM10 Plan. The District is committing to revisit potential ammonia control controls pending the results of CRPAQS data analysis that will be accomplished over the next one to two years. The District is pursuing VOC controls as part of its ozone control strategy and the District has concluded that the adopted and proposed measures would comply with the PM10 BACM/BACT requirement, if needed.

## MILESTONES/UPDATES

The CAA (Section 171) defines RFP as the “annual incremental reductions in emissions of the relevant air pollutant as required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date.” In addition, Section 182(g) discusses milestones as reductions in emissions six (6) years “after the date of the enactment of the Clean Air Amendments of 1990 and at intervals of every 3 years thereafter, the State shall determine whether each nonattainment area (other than an area classified as Marginal or Moderate) has achieved a reduction in emissions during the preceding intervals equivalent to the total emission reductions required to be achieved by the end of such interval.”

For the District’s PM10 Plan, the first milestone will be for the period 2003 to 2005. Reductions of PM10 or PM10 precursors must be implemented to achieve the quantities reflected in the inventory for the year 2005. The RFP/Milestone Report is due within 90 days after each milestone date. The first District PM10 RFP Milestone Report is due to EPA on March 31, 2006.

## CONCLUSION

The District’s PM10 Plan contains measures sufficient to meet mandated emission reduction requirements. The District commits to expeditiously implement all measures needed to demonstrate RFP.

# ON-GOING ACTIVITIES

## DISTRICT IMPROVEMENTS

There are a variety of District on-going activities that will assist in bettering the understanding of the Valley's PM10 problem and in meeting the federal PM10 standards. These on-going activities comprise improvements to selected areas in the emission inventory, monitoring network, modeling, agricultural research, other special research projects and a variety of work with organizations participating in voluntary efforts to improve air quality.

### Emissions Inventory

Improving the emissions inventory (EI) is an on-going process. During the development of this PM10 Plan and the Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone, several areas of the emission inventory have been identified for improvement (see Appendix C for more details). Improvements to the EI involve the following source categories:

1. Portable Engines;
2. Wineries (fermentation);
3. Water Heaters and Boilers 75,000 BTU/hr to 2 Million BTU/hr;
4. Boilers, Steam Generators, and Process Heaters 2 to 5 Million BTU/hr;
5. Biosolids Management;
6. Imported Livestock Waste;
7. Soil Remediation;
8. Foam Product Manufacturing;
9. Civilian Aircraft;
10. Aircraft Refueling;
11. Oil and Gas Production Sumps.

In addition to the sources listed above, the District has identified other emissions inventory categories that require improvement. While these categories are important, the District will not commit to improving each item, but will update item(s) as time, resources, and priorities allow. The following is a list of emissions inventory categories that can be improved, refined, or further evaluated:

1. Size and chemical speciation profiles for ships, trains, planes, and other sources;
2. Measurement of VOC and ammonia emissions from livestock sources, with an emphasis on cattle and poultry;
3. Paved Road Dust:
   - Evaluate AP-42 emission estimation approaches against real-time based approaches developed by Desert Research Institute and the University of California, Riverside;
   - Develop spatially allocated emissions that include road volumes; and
   - Develop a more refined approach for growth of paved road dust emissions.

4. Unpaved Roads:
   - Collect vehicle miles traveled (VMT) Data from Cities and Counties;
   - Collect VMT Data from State Agencies, such as, the Bureau of Land Management, the United States Forest Service, the Bureau of Indian Affairs, and the National Park Service;
   - Collect mileage and VMT data from private entities regarding irrigation and oil fields;
   - Refine VMT data from agricultural sources; and
   - Refine unpaved road spatial allocation methods.
6. Agricultural Operations:
   - Continue improvements on harvest emission factors, particularly almonds;
   - Associate land preparation emissions with environmental factors (humidity, soil moisture, soil type).
   - Refine methodologies for NOx and PM10 emissions from unspecified crop processing losses and unspecified product processing losses.
7. Woodstoves and Fireplaces
   - Collect better information about when, where, and how much wood is burned;
   - Collect information about the types of stoves and fireplaces used;
8. Livestock
   - Collect California PM data for dairies;
   - Evaluate PM from non-cattle livestock sources;
   - Collect speciated VOC data for dairies and other cattle;
   - Evaluate VOC from non-cattle livestock; and
   - Collect additional ammonia measurements for cattle and other livestock.
9. Construction
   - Estimates are currently based on housing units or economic indicators, need to collect actual permit data to better evaluate activity levels for construction dust emissions.
10. Ammonia
    - Provide graphic displays of ammonia emission estimates using CRPAQS data.
11. Internal Combustion (IC) Engines
    - Estimate emissions from area source IC Engines
12. Windblown Dust
    - Estimate windblown dust emissions from open areas.
    - Improve windblown dust emissions factors and emissions estimates. The current inventory for windblown dust is high considering the meteorology of the SJVAB.
13. Unpaved Traffic Areas
    - Improve activity and emission factor data.
    - Add data on industries currently not included.

**Monitoring Network**

In an effort to gather real-time hourly data, the ARB is currently operating continuous PM10 monitors at Fresno-First and Stockton-Hazelton. The ARB also collects daily PM2.5 data at Fresno-First and Bakersfield-California. Beta Attenuation Monitors

(BAM) for PM2.5 are located at Bakersfield-California, Fresno-first, Modesto-14th Street, and Visalia-Church. The District has Tapered Element Oscillating Microbalance (TEOM) PM10 monitors at Clovis-Villa and Corcoran-Patterson.

Since April 2002 the Corcoran-Patterson site is gathering real-time PM10 and PM2.5 data from Beta Attenuation Monitors (BAM). The data gathered by these units are being used to document diurnal variations in particulate matter concentrations and document PM10 concentrations for Air Quality Index (AQI) reporting and forecasting. The BAM and TEOM data are not used to determine attainment of the particulate matter standards.

**Modeling Improvements**

Modeling efforts will be improved by application of CRPAQS modeling and modeling tool development. CRPAQS results will continue to improve our understanding of the factors and relationships affecting particulate chemistry, formation and deposition. Particle size related deposition rates are poorly quantified at this time and are not considered in current modeling techniques. CRPAQS did not include deposition rate measurements to address this modeling limitation. Federally funded research in the SJVAB or elsewhere may provide technical data to address this issue in the future.

Chemical Mass Balance modeling will improve as additional speciation profiles are developed or updated for different sources; however, no national coordination or planning is evident to update and improve these signature libraries. The conduct of various state and regional studies provide occasional updates that are incorporated by ARB subsequent to technical review and consideration. Continued refinement and evaluation of the connection between emission inventories and observed particulate concentrations will be on ongoing challenge for the District and ARB. Continued review is required to ensure that the relationships suggested by CMB are tested for validity and comprehensiveness. The process of CMB modeling is limited by the proper identification, availability, selection and accuracy of appropriate contributing source profiles.

Continued analysis is required to improve the understanding of nitrate formation chemistry parameters and variation. Efforts for this Plan focused on early CRPAQS data (IMS95), which will be supplemented by evaluation and modeling of the 1999-2001 field program data.

Assessments of biogenic emissions, particulate formation mechanisms from biogenic aerosols and rates for surface deposition removal of particulates by vegetation are poorly quantified at this time. These factors are generally considered to be more important for Eastern states, but evaluation of local contributions and removal rates must be better quantified to improve model performance for CMB and regional modeling.

## ON-GOING AGRICULTURAL RESEARCH

The Agricultural Technical Advisory Committee, created in 1999, continues to provide a forum for the review of on-going and planned agricultural research at a local level. The committee is working on securing funds for the development of the Agricultural CMP program and its components. In addition, the committee plans to identify and prioritize research projects.

This committee is also known as the AgTech group. The group is comprised of representatives from the District, California Air Resources Board (ARB), California Cotton Ginners and California Cotton Growers Associations, Nisei Farmers League, Almond Hullers and Processors Association, Natural Resources Conservation Services (NRCS), Environmental Protection Agency (EPA), and local farm bureaus. Since its inception, the group has grown to include participants from the California Department of Food and Agriculture (CDFA), Western United Dairymen (WUD), JG Boswell, university researchers, and many more.

In 2002, the AgTech group created three subcommittees to better address specific issues of the agriculture industry. Members of the AgTech group as well as stakeholders comprised these subcommittees.

One subcommittee is the Growers Subcommittee, which is chaired by representatives of the agricultural industry. The primary function of this subcommittee is to assist in the identification of conservation management practices (CMP) for the nut trees, fruit trees, and row and field crops industries. The subcommittee has compiled a preliminary list of CMPs, which will be further reviewed and refined. The list was used by the District to develop the Agricultural CMP Program.

Another subcommittee is the Almond Technical Subcommittee chaired by the Air Quality Group (UC Davis and the Center of Irrigation Technology, CSU Fresno). The Air Quality Group is cooperatively conducting a research study to monitor PM emissions from almond harvesting. The objectives include the development and improvement of PM10 emission factors, and observation of PM10 emission changes due to changes in cultural practices. This group conducted initial on-field tests in an almond orchard in Manteca and is now proposing to conduct on-field measurements of PM10 emission factors from nut pick-up operations in commercial almond orchards during the 2003 season.

The last subcommittee is the Dairy Subcommittee chaired by CDFA. This subcommittee focuses on air quality research needed by the dairy industry. It has developed a draft Dairy Action Plan entitled, “Air Emissions Action Plan for San Joaquin Valley Dairies” which serves as a research plan to study air emissions and their mitigation. This plan contains proposed research objectives with short-, mid- and long-term goals, which will be refined over time. All objectives will address ammonia, particulate matter, and reactive organic gas emissions from dairy farms and their processes. The funding needs for five years of research are estimated at $2.4 million, with nearly $675,000 already secured.

The subcommittee is in the process of modifying the Dairy Action Plan into a plan that would address all California dairies rather than just the dairies in San Joaquin Valley. The subcommittee will also assist the District in developing the CMPs for the CAFO component of the Agricultural CMP program.

Currently, there are two research projects funded to measure VOC from dairies in the San Joaquin Valley Air Basin (SJVAB). One is the USDA funded project to U.C. Davis titled "Agricultural sources of PM10 and ozone precursors", and the other is an amendment to an ARB funded project to CSU Fresno titled "Ammonia emissions from soils and vegetation". Both projects began in summer of 2002. The researchers on these projects are working together to design effective experimental methods and procedures. The ultimate goal of the two research projects is to improve the emissions estimates available to the District for VOC from dairies.

## SPECIAL STUDY STRATEGY

During California Regional PM10/PM2.5 Air Quality Study (CRPAQS) field studies, selected sites had additional collocated monitoring to establish a one-in-three day sampling schedule. CRPAQS also provides a period with additional PM2.5 monitoring. During intensive episodes forecasted during CRPAQS, additional continuous and filter based measurements were also collected. The study is intended to provide products to support the development of effective PM10 and PM2.5 attainment plans for Central California. It is uniquely positioned to produce needed data within the implementation schedule specified for the new PM standards. The information developed will improve apportionment of high PM10 and PM2.5 concentrations to contributing sources.

CRPAQS has already provided evaluation and refinements for the daily forecasting of pollution episodes. The accuracy of forecasting is essential for proper management of agricultural and prescribed fires to minimize the occurrence and severity of PM10 24-hour episodes.

Future results of CRPAQS data analysis and modeling will contribute to improved understanding of atmospheric processes. The relationship and chemistry of contributing sources will be evaluated through data analysis and modeling. Development of improved modeling assumptions, tools and methods is expected to provide improved analysis for SIP planning and control measure analysis. Table 8-1 lists the schedule for completing CRPAQS modeling.

| Table 8-1<br>CRPAQS Modeling Schedule | |
|---|---|
| Spring 2003 | Initiate in-house modeling efforts for CRPAQS episodes |
| Spring 2003 | Release RFP for external modeling support |
| Summer 2003 | Initiate UCD modeling for CRPAQS episodes |
| Fall 2003 | Begin contracts for external modeling support |
| Winter 2004 | Preliminary findings from in house modeling |
| Summer 2004 | Preliminary findings from UCD modeling |
| Fall 2005 | Modeling contracts complete |

The District with assistance from ARB will analyze the CRPAQS modeling results for their impact on the attainment strategy as the researchers release the data. If the data indicates that the PM10 precursors ammonia and VOC should be part of an effective attainment strategy, the District commits to revising the PM10 Plan as needed to be consistent with the findings. With preliminary findings available in late 2004 and final reports expected in 2005, the potential plan revision will coincide with the Reasonable Further Progress (RFP) Report that will be under development at that time. That plan development process will provide an opportunity to adopt additional controls if needed for expeditious attainment.

## OPERATION CLEAN AIR

A number of political and business leaders from around the SJVAB have come together to form “Operation Clean Air”. The purpose of the group is “to create a 5-year action plan that will clean our air and promote prosperity in the San Joaquin Valley”. The centerpiece of the effort is the development of a Clean Air Action Plan (CAAP) for the SJVAB. The CAAP will include voluntary emission reduction strategies that can be implemented by governmental agencies, private businesses, and individuals. The emission reduction measures included in the CAAP will be in addition to the traditional regulatory programs included in the District’s air quality plans. The CAAP will also include a component outlining resources that will be needed to achieve the reductions outlined within it.

## ENVIRONMENTAL QUALITY INCENTIVES PROGRAM

The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. Incentives for measures that benefit air quality play an increased role in this year’s program. To date, over 600 miles of unpaved roads have been controlled with the application of oil, providing over 500 tons per year of PM10 reductions. In addition, several thousand acres have chipped agricultural prunings instead of burning them. This has resulted in over 240 tons of PM10 reductions and over 382 tons of NOx and VOC reductions.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.[1]

## SUSTAINABLE INCENTIVES

In an effort to bring about early air quality improvements for all pollutants of concern in the Valley, the District is considering a variety of new concepts. One program concept that would promote the implementation of air pollution reducing practices is to enable sources, including exempt sources, to use *sustainable incentives*. *Sustainable incentives* are financial measures, programs, and/or prohibitory rule alternative compliance plans which provide an economic mechanism to fund pollution reduction measures. *Sustainable incentives* may be in the form of private industry and/or foundation programs, federal and/or state government grants, tax credits, prohibitory rule incentives, and other programs.

*Sustainable incentives* are based in part upon the highly successful initiatives implemented by the United States Department of Agriculture, Natural Resource Service, through the federal farm bill's "Environmental Quality Incentives Program (EQIP), the State's highly successful Carl Moyer Program, and the District's "REMOVE Program" and other economic incentive and alternative compliance plan programs that offset the implementation cost for pollution reduction measures. This is accomplished within the framework of a private industry/public/agency partnership. Sustainable incentives revolves around a market based approach to

[1] http://www.nrcs.usda.gov/programs/eqip/

pollution reduction utilizing measures that are economically sound and backed up by scientific research.

*Sustainable incentives* are market based concepts that require (1) local Districts, the Air Resource Board and EPA to assist local municipalities and public agencies in acquiring federal funding for the implementation of emission reduction measures (as opposed to only mandating requirements); (2) the acceptance of proposals from private industry that generate equivalent emissions reductions identified in prohibitory rules, but are less costly, and (3) promote the acquisition of federal, State, and/or other funding to continue and expand incentive programs such as EQIP, Carl Moyer, and acquire additional funds for the local transportation agencies and local communities, to offset mitigation cost needs. *Sustainable incentives* could obtain or reductions either through contributing to programs such as the federal farm bill's Environmental Quality Incentives Program, on-site reductions or reductions generated within the geographic region of the local District.