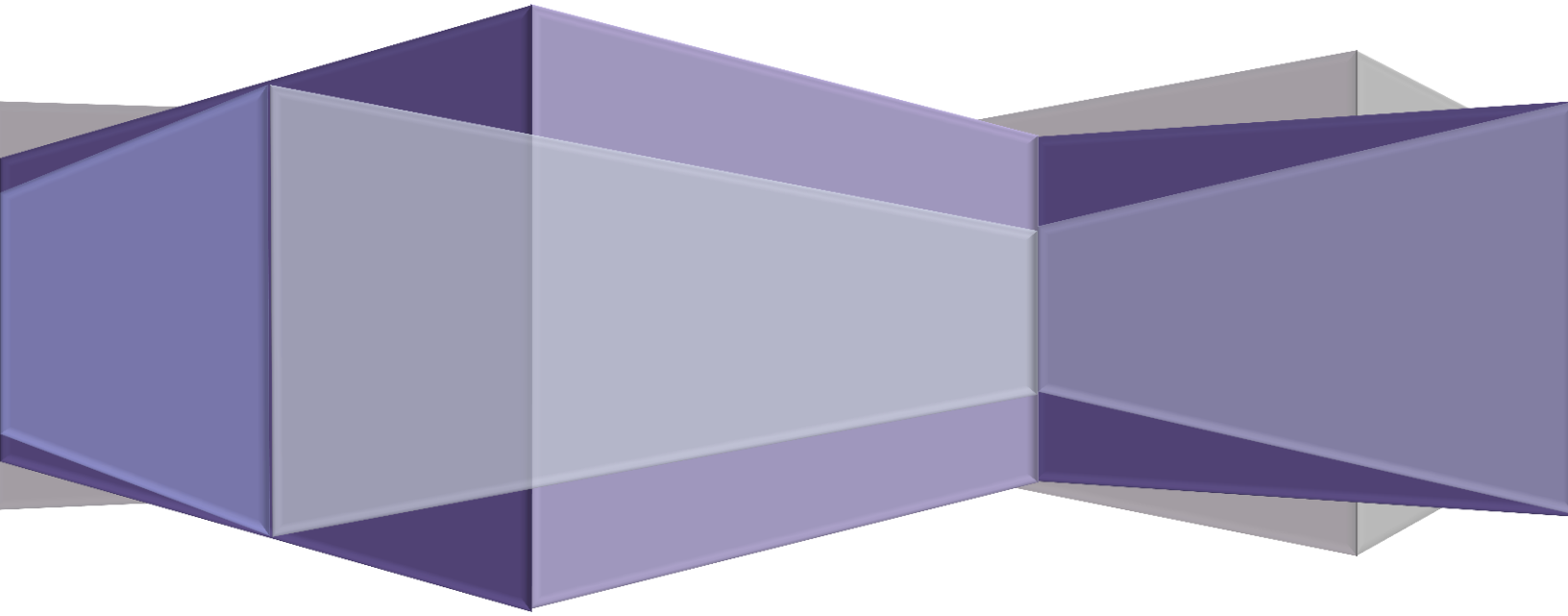
2016 Moderate Area Plan for the 2012 PM2.5 Standard

San Joaquin Valley Air Pollution Control District



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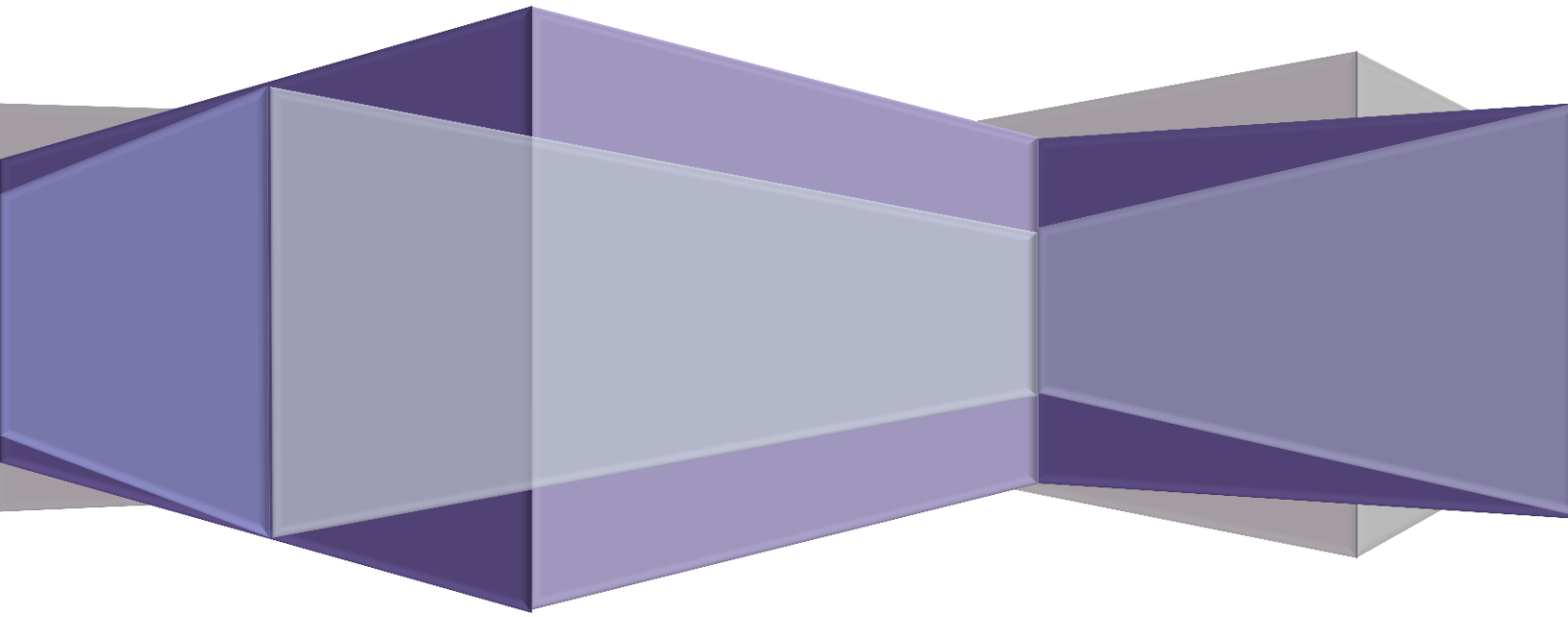
Executive Summary

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Executive Summary

This *2016 Moderate Area Plan for the 2012 PM2.5 Standard* (*2016 PM2.5 Plan)* addresses the federal mandates for areas classified as "Moderate" nonattainment for the 2012 PM2.5 federal annual air quality standard of 12 µg/m³. This is the latest PM2.5 standard for which the Valley is classified as a Moderate nonattainment. On July 29, 2016, two months before the plan for the 2012 PM2.5 standard is due and decades after promulgation of the 1997 and 2006 PM2.5 Standards, EPA released the PM2.5 Implementation Rule that outlines the applicable requirements for preparation and submittal of the required PM2.5 attainment plans.

Consistent with the Guiding Principles adopted by the District Governing Board on August 18, 2016 and the provisions of the PM2.5 Implementation Rule, the *2016 PM2.5 Plan*:

- Satisfies the mandate to submit a Moderate attainment plan due to EPA by October 2016
- Demonstrates impracticability of attaining the 2012 PM2.5 standard by the Moderate nonattainment area deadline of 2021
- Includes a request to reclassify the Valley to a Serious nonattainment area for the 2012 PM2.5 standard
- Satisfies all applicable federal Clean Air Act requirements for Moderate nonattainment areas
- Demonstrates that emissions are continuing to be reduced in the Valley

In addition to the many attainment plans that the District has already developed and implemented, the District is mandated under the Clean Air Act to develop and adopt a number of new ozone and particulate matter plans in the coming years. With respect to PM2.5, the Valley has now reached a point where it is subject to three federal PM2.5 standards with multiple attainment plans required for each standard, leading to multiple overlapping requirements and deadlines as summarized below.

<u>1997 PM2.5 Standard (24-hour 65 µg/m³ and annual 15 µg/m³)</u>

- Serious Attainment Deadline: December 31, 2015
- 5% Plan due December 31, 2016

<u>2006 24-hour PM2.5 Standard (35 µg/m³)</u>

- Serious Attainment Deadline: December 31, 2019
- Serious attainment plan due August 2017: Attainment demonstration requires a clean data finding for the consecutive three-year period of 2017 through 2019. This means that the 35 µg/m³ standard needs to be reached by 2017 or much lower concentrations must be achieved in 2018 or 2019. Given that the State's truck and bus regulation will not be fully implemented until after 2023 and that EPA imposition of a national standard for trucks and locomotives, even if contemplated by EPA, cannot be implemented in that timeframe, it is impossible to craft an approvable attainment plan. The Clean Air Act provides a mechanism

for seeking an extension of up to five years. However, EPA's recent inaction on the extension request for the 1997 PM2.5 standard sets a hurdle that is not achievable for seeking an extension. Furthermore, attaining the standard by 2024 is highly unlikely even if EPA grants a five-year extension.

2012 Annual PM2.5 Standard (12 µg/m^3)

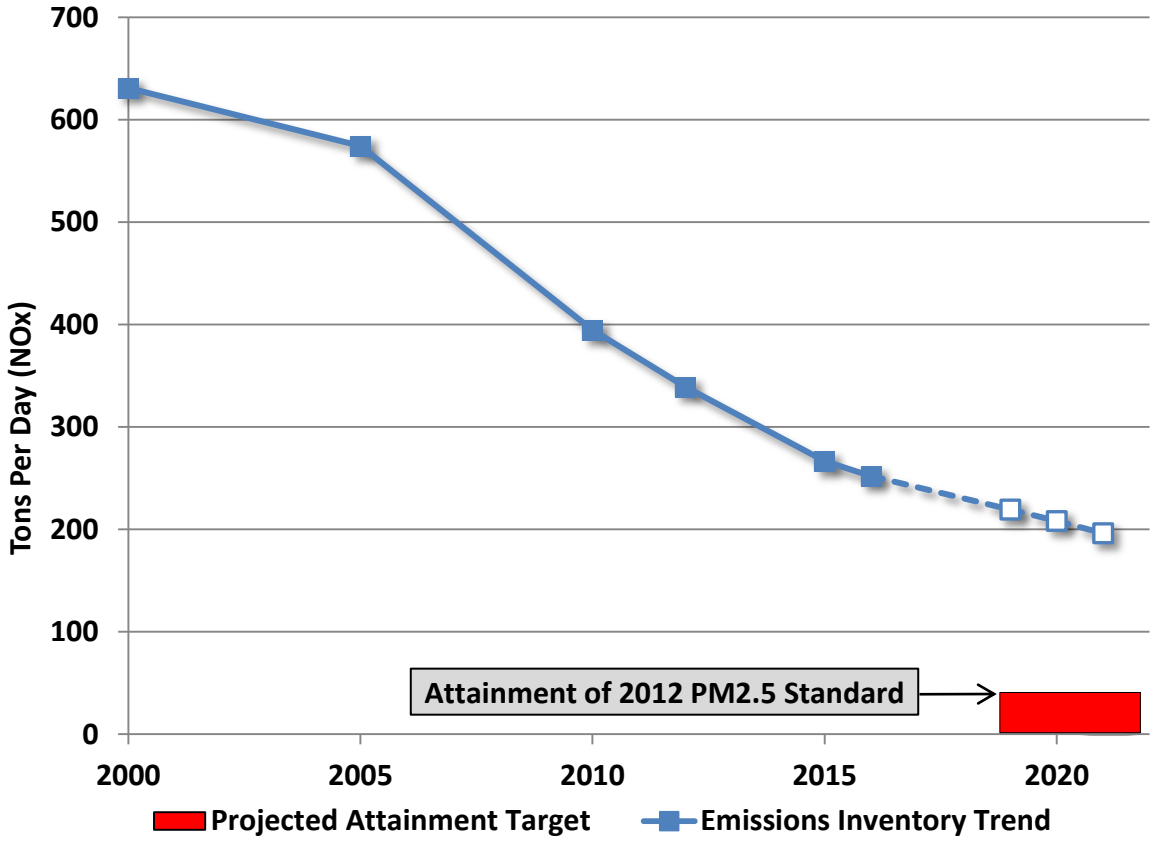
- Moderate Attainment Deadline: December 31, 2021
- Moderate attainment plan due October 2016
- The District can bump up to a Serious nonattainment classification with an attainment deadline of 2025 if a request is submitted by October 2016 and approved by EPA demonstrating that attainment by the Moderate deadline of 2021 is impracticable and that the District meets all other applicable requirements for Moderate areas. The attainment plan under a Serious classification will then be due four years after EPA approves reclassification to Serious. The Clean Air Act also provides a mechanism for seeking an extension of up to five years beyond the 2025 Serious attainment deadline. However, EPA's recent inaction on the extension request for the 1997 PM2.5 standard sets a hurdle that is not achievable for seeking an extension. Furthermore, attaining the standard by 2030 is highly unlikely even if EPA granted a five-year extension.

Under the antiquated provisions of the Clean Air Act, even though the District is already classified as Serious for the less stringent 1997 and 2006 PM2.5 standards, the District must still submit another attainment plan including a request to EPA to be classified as Serious for the more stringent 2012 PM2.5 Standard. Furthermore, even though attainment is not possible under a Moderate area classification, the Clean Air Act requires two plans to be submitted, one for a Moderate classification and another for a Serious classification for the same standard.

Attainment by Moderate Area Deadline of 2021 is Impracticable

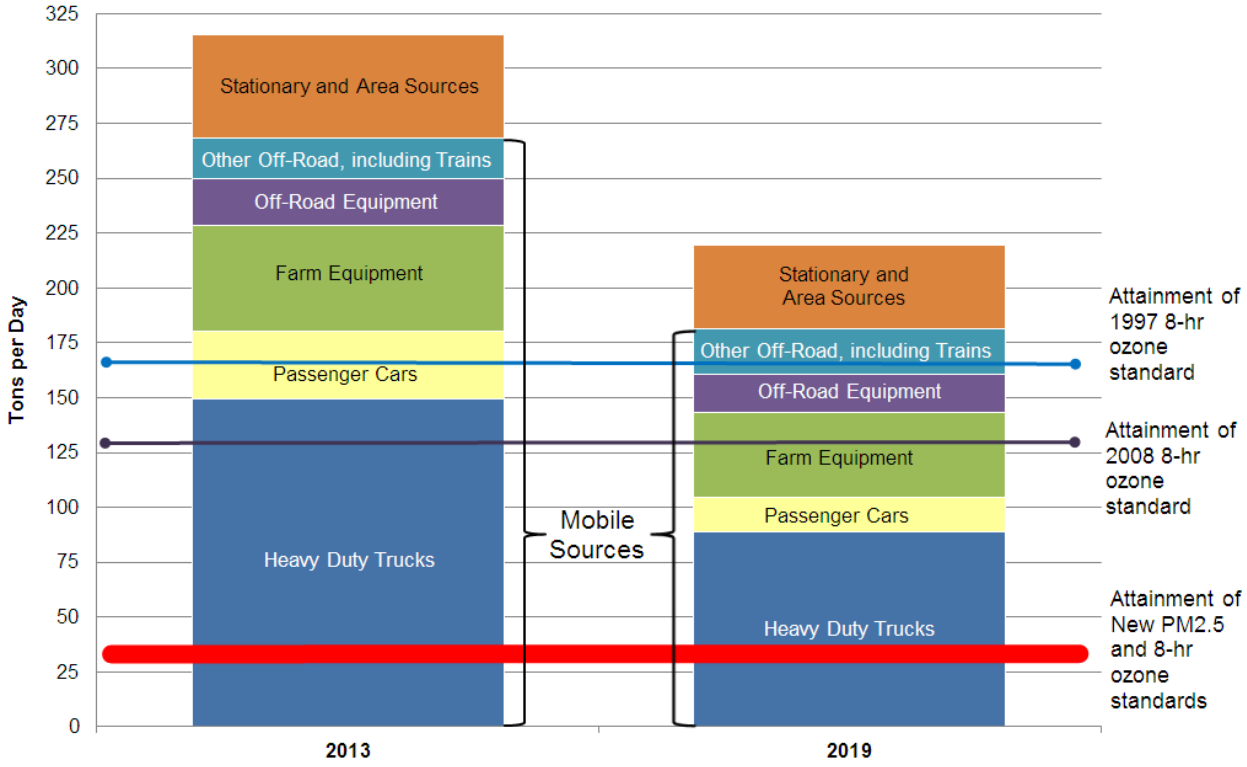
The Valley will need enormous additional emission reductions to meet the 2012 PM2.5 standard and attainment is not possible by the mandated Moderate area deadline of 2021. Under the Clean Air Act, demonstrating attainment requires a clean data finding for three consecutive years from 2019 through 2021. This means that the needed reductions must be achieved by 2019 or extra reductions must be made in 2020 or 2021 for the three-year average concentration to be below the standard. As illustrated in Figure ES-1, this is physically impossible given that critical mobile source regulations such as the ARB truck and bus regulation and off-road engine regulation will not be fully implemented until 2023. In addition, despite the significant progress and stringent regulations on stationary and mobile sources, extensive modeling performed by ARB demonstrates that attainment of the 2012 PM2.5 Standard is not possible by the mandated Moderate area deadline of 2021 (see Appendix A).

Figure ES-1 – San Joaquin Valley NOx Emissions Inventory and Target for Attainment of 2012 PM2.5 Standard



Furthermore, as illustrated by Figure 2 below, after reducing Valley air pollution by over 80%, we have reached a point where we cannot reach attainment even if we eliminated all Valley businesses, agricultural operations, or trucks traveling through the San Joaquin Valley.

Figure ES-2 – San Joaquin Valley NOx Emissions and Target for Attainment of Latest PM2.5 and Ozone Standards



Given the impracticability of meeting the Moderate attainment deadline date for the 2012 PM2.5 standard, this *2016 PM2.5 Plan* includes a request that the Valley be reclassified to Serious nonattainment with a new attainment deadline of 2025. This reclassification will provide the Valley the time needed to develop an attainment plan aimed at achieving expeditious attainment of the standard. As required by the Clean Air Act, the new attainment plan will be submitted to EPA no later than four years after EPA reclassification of the Valley to Serious nonattainment.

Plan Satisfies all Federal Clean Air Act Requirements

As a result of the District's exhaustive efforts to reduce emissions in the Valley through decades of implementing multiple plans and hundreds of regulations, the District already meets or exceeds all emissions control requirements applicable to Moderate areas as demonstrated in this plan. In addition, this plan satisfies all other applicable federal Clean Air Act requirements for areas classified as Moderate nonattainment for the 2012 PM2.5 standard as shown in Table ES-1 below.

Table ES-1 Summary of Federal Requirements for PM2.5 Moderate Nonattainment Areas

Requirement	Federal Regulation/ Guidance	Summary of *2016 PM2.5 Plan*
CAA Subpart 1 – Nonattainment Areas in General		
Reasonable Further Progress (RFP)	§172(c)(2)	Demonstrate reasonable further progress
Emissions Inventory	§172(c)(3)	Includes an accurate and current emission inventory
Contingency Measures	§172(c)(9)	Includes contingencies if area fails to meet reasonable further progress or attain by the attainment date
CAA Subpart 4 – Additional Provisions for Particulate Matter Nonattainment Areas		
Permit Program	§189(a)(1)(A)	Includes a permit program providing that permits are required for the construction and operation of new and modified major stationary sources
Attainment Demonstration	§189(a)(1)(B)	Demonstration that attainment by applicable date is not possible and a request for reclassification is included
Reasonably Available Control Measures (RACM)	§189(a)(1)(C)	Demonstrates that all control measures meet or exceed RACM
Plan Submissions	§189(a)(2)(B)	Demonstrates that plan is being submitted within the appropriate timeline
Quantitative Milestones	§189(c)(1)	Demonstrates that Plan includes quantitative milestones which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress toward attainment by the applicable date

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Acronyms

ACRONYMS, ABBREVIATIONS, AND INITIALISMS

AADT: Annual Average Daily Trips
AB: Assembly Bill
ACC: Advanced Clean Cars
ACT: Alternative Control Techniques
AEO: Annual Energy Outlook
AERO: Advanced Emission Reduction Options
AERR: Air Emissions Reporting Requirements
AFO: Animal Feeding Operation
AIP: Achieved in Practice
AIRS: Atmospheric Infrared Sounder
AMI: Acute Myocardial Infarction
AMP: Air Monitoring Program
AMR: Annual Monitoring Report
AO: Agricultural Operations
APCD: Air Pollution Control District
APCO: Air Pollution Control Officer
AQ: Air Quality
AQAST: Air Quality Applied Science Team
AQI: Air Quality Index
AQIP: Air Quality Improvement Program
AQMD: Air Quality Management District
AQMP: Air Quality Management Plan
AQS: Air Quality System
ARB: California Air Resources Board
ARRA: American Reinvestment and Recovery Act
ATC: Authority to Construct
ATCM: Airborne Toxic Control Measure
BACM: Best Available Control Measure
BACT: Best Available Control Technology
BCs: Boundary Conditions
BEARPEX: Biosphere Effects on Aerosols and Photochemistry Experiment in 2007 and 2009
BEIGIS: Biogenic Emission Inventory GIS
BHP: Brake Horsepower
BMP: Best Management Practice
BTU: British Thermal Units
BVOC: Biogenic Volatile Organic Compounds
CAA: Clean Air Act
CABERNET: California Airborne BVOC Emission Research in Natural Ecosystem Transects in 2011
CAC: Citizens Advisory Committee

CAF: Confined Animal Facilities
CALFIRE: California Department of Forestry and Fire Protection
CalNex: Research at the Nexus of Air Quality and Climate Change conducted in 2010
CalTrans: California Department of Transportation
CalVAD: California Vehicle Activity Database
CARES: Carbonaceous Aerosols and Radiative Effects Study in 2010
CCAQS: Central California Air Quality Studies
CCDAQ: Clark County Department of Air Quality
CCOS: Central California Ozone Study
CDFA: California Department of Food and Agriculture
CE: Cost Effectiveness
CEC: California Energy Commission
CE-CERT: University of California, Riverside College of Engineering - Center for Environmental Research and Technology
CEIDARS: California Emission Inventory Development and Reporting System
CEMS: Continuous Emissions Monitoring System
CEPAM: California Emissions Projection Analysis Model
CEQA: California Environmental Quality Assessment
CFR: Code of Federal Regulations
CGYM: Clean Green Yard Machine
CH&SC: California Health and Safety Code
CIT: California Institute of Technology
CIMIS: California Irrigation Management Information
CM: Control Measures
CMAQ: Community Multi-Scale Air Quality
CMAQ: Congestion Mitigation and Air Quality
CMP: Conservation Management Practice
CNG: Compressed Natural Gas
CO: Carbon Monoxide
CO2: Carbon Dioxide
CPRC: California Public Resources Code
CRF: Capital Recovery Factor
CRPAQS: California Regional Particulate Air Quality Study
CSUF: California State University, Fresno
CTG: Control Techniques Guidelines
CVP: Central Valley Project
CVRP: Clean Vehicle Rebate Project
DAC: Direct Annual costs
DC: Direct Capital (costs)
DERA: Diesel Emission Reductions Act
DF: Deposition Fraction
DI: Direct Installation (cost)
Disover – AQ: Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality

District: San Joaquin Valley Air Pollution Control District
DMV: Department of Motor Vehicles
DOF: Department of Finance
DOGGR: California Department of Conservation's Division of Oil, Gas, and Geothermal Resources
DOT: Department of Transportation
DOW: Day of Week
DPR: Department of Pesticide Regulation
DPWK: Days per Week code
DTIM4: Direct Travel Impact Model
DV: Design Value
e-AIM: Extended Aerosol Inorganics Model
EC: Elemental Carbon
ECF: Efficiency Correction Factor
EF: Emission Factor
EF & EE: Engine, Fuel and Emission Engineering
EFMP: Enhanced Fleet Modernization Program
EIC: Emission Inventory Code
EJAG: Environmental Justice Advisory Group
EMFAC: Emission Factors Model
EPA: U.S. Environmental Protection Agency
ER: Emergency Room
ERC: Emission Reduction Credits
eTrip: Employer-Based Trip Reduction
ESP: Electrostatic Precipitator
FAF: Freight Analysis Framework
FDDA: Four- Dimensional Data Assimilation
FDEP: Florida Department of Environmental Protection
FDOC: Final Determination of Compliance
FEM: Federal Equivalent Method
FG: Flare Gas
FHWA: Federal Highway Administration
FMMP: Farmland Mapping and Monitoring Program
FMP: Flare Minimization Plan
FOFEM: First Order Fire Effects
FR: Federal Register
FRAP: Fire and Resource Assessment Program
FRIS: Farm and Ranch Irrigation Survey
FRM: Federal Reference Method
FY: Fiscal Year
GDFs: Gasoline Dispensing Facilities
GEOS-5: Goddard Earth Observing System Model, Version 5
GHG: Greenhouse Gas
GIS: Geographic Information System
GMAO: Global Modeling and Assimilation Office

GVWR: Gross Vehicle Weight Rating
HAL: Healthy Air Living
HC: Hydrocarbon
HD: Heavy Duty
HEPA: High-Efficiency Particulate Arresting (filtration systems)
HHDV: Heavy Heavy-Duty Vehicles
HMA: Hot-Mix Asphalt
HO: Hydroxyl Radical
HOTS: Heavy Oil Test Stations
HPDY: Hours per Day code
HRRS: Heath Risk Reduction Strategy
HVIP: Hybrid Truck and Bus Voucher Incentive Program
IAC: Indirect Annual Costs
IC: Internal Combustion
ICs: Initial Conditions
IEPR: Integrated Energy Policy Report
IOUs: Investor Owned Utilities
IMPROVE: Interagency Monitoring of Protected Visual Environments
IRP: International Registration Plan
ISD: In-station Diagnostic
ISR: Indirect Source Review
kW: Kilowatt
kWH: Kilowatt-hour
LAER: Lowest Achievable Emission Rate
lb/MMBtu: Pounds per Million British thermal units of heat output
LAI: Leaf Area Index
LDT: Light-Duty Trucks
LHDV: Light Heavy-Duty Vehicles
LMA: Land Management Agency
LPG: Liquefied Petroleum Gas
LTO: Low Temperature Oxidation
LSI: Large Spark Ignited
MACT: Maximum Achievable Control Technology
MCF: Thousand Cubic Feet
MCSF: Thousand Cubic Standard Feet
MCY: Motorcycles
MDA8: Maximum Daily Average 8-Hr. Ozone
MEGAN: Model of Emission of Gases and Aerosols from Nature
MH: Motor Homes
MHDV: Medium Heavy-Duty Vehicles
MMBtu/hr: Million British Thermal units per hour
MOU: Statement of Principles
MOZART: Model for Ozone and Related Chemical Tracers
MPO: Metropolitan Planning Organization
MSA: Metropolitan statistical area

MSM: Most Stringent Measure
MSW: Municipal Solid Waste
MW: Megawatt
NAAQS: National Ambient Air Quality Standards
NARR: North American Regional Reanalysis
NASA: National Aeronautics and Space Administration
NASS: National Agriculture Statistics Service
NCAR: National Center for Atmospheric Research
NESHAP: National Emission Standards for Hazardous Air Pollutants
NG: Natural Gas
ng/J: Nanograms per Joule of heat output
NO: Nitrogen Oxide
NOAA: National Oceanic and Atmospheric Administration
NOx: Oxides of Nitrogen
NPS: Nation Park Service
NRCS: Natural Resources Conservation Service
NSCR: Non-Selective Catalytic Reduction
NSPS: New Source Performance Standard
NSR: New Source Review
NTE: Not-to-Exceed
OAQPS: Office of Air Quality Planning and Standards (EPA)
OB: Other Buses
OBD: On-Board Diagnostics
OC: Organic Carbon
OFP: Ozone Forming Potential
OGV: Ocean-Going Vessels
OH: Hydroxyl Radicals
O & M: Operating and Maintenance
OMB: Office of Management and Budget
OMP: Operator Management Plan
ORVR: Onboard Refueling Vapor Recovery
PAH: Polycyclic Aromatic Hydrocarbons
PAN: Peroxy Acetyl Nitrate
PASS: Polluting Automobile Scrap and Salvage
PAW: Public Advisory Workgroup
PBW: Particle Bound Water
PCAPCD: Placer County Air Pollution Control District
PEC: Purchased Equipment Costs
PEER: Permit-Exempt Equipment Registration
PERP: Portable Equipment Registration Program
PFTs: Plant Functional Types
PG& E: Pacific Gas and Electric
PM: Particulate Matter
PM0.1: Ultrafine Particles

PM10: Particulate Matter that is 10 microns or less in diameter
PM2.5: Particulate Matter that is 2.5 microns or less in diameter
POA: Primary Organic Aerosols
PPB: Parts per billion
PPM: Parts per million
PPMV: Parts per million by volume
PPN: Particulate Protein Nitrogen
PSD: Particle Size Distribution
PST: Pacific Standard Time
PTFE: Poly Tetra Fluoro Ethylene
PUC: Public Utilities Commission
QA: Quality Assurance
QC: Quality Control
RAAN: Real-Time Air Quality Advisory Network
RACM: Reasonably Available Control Measures
RACT: Reasonably Available Control Technology
RAP: Reclaimed Asphalt Pavement
RARE: Regional Applied Research Effort
RAWS: Remote Automated Weather Stations
RBS: Risk-Based Strategy
REES: Regional Energy Efficiency Strategy
REHEX: Regional Human Exposure Model
REMI: Regional Economic Models, Inc.
REMOVE: REduce MOtor Vehicle Emissions
RFP: Reasonable Further Progress
RFP: Request for Proposals
RFQ: Request for Qualifications
RH: Relative Humidity
ROAR: Real-time Outdoor Activity Risk
ROP: Rate-of-Progress
ROS: Reactive Oxygen Species
RPS: Renewable Portfolio Standard
RRD: Respirable Road Dust
RRF: Relative Response Factors
RTO: Regenerative Thermal Oxidizer
RV: Recreational Vehicles
SA: Stationary Aggregated
SANDWICH: Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous material balance approach
SAPRC: Statewide Air Pollution Research Center
SB: School Buses
SB: Senate Bill
SBA: Small Business Assistance
SBCAPCD: Santa Barbara County Air Pollution Control District

SBS: Sodium Bisulfate
SC: Source Category
SCAQMD: South Coast Air Quality Management District
SCC: Source Classification Code
SCF: Standard Cubic Feet
SCM: Suggested Control Measure
SCR: Selective Catalytic Reduction
SIP: State Implementation Plan
SLAMSs: State and Local Air Monitoring Stations
SJV: San Joaquin Valley
SJVAPCD: San Joaquin Valley Air Pollution Control District
SJVUAPCD: San Joaquin Valley Unified Air Pollution Control District
SMAQMD: Sacramento Metropolitan Air Quality Management District
SMAT: Speciated Modeled Attainment Test
SMOKE: Sparse Matrix Operator Kernel Emissions
SMS: Smoke Management System
SNCR: Selective Non-Catalytic Reduction
SOA: Secondary Organic Aerosol
SORE: Small Off-Road Engines
SOx: Oxides of Sulfur
STN: Speciated Trend Network
TAC: Toxic Air Contaminant
TAP: Technology Advancement Program
TAZ: Traffic Analysis Zone
TCI: Total Capital Investments
TITU: Tune in Tune Up
TMR: Total Mixed Ration
TOC: Total Organic Compounds
TOG: Total Organic Gases
TPA: Transportation Planning Agencies
Tpd: Tons per day
Tpy: Tons per year
TRU: Transport Refrigeration Unit
TSD: Technical Support Document
TSM: Total Selective Metals
TVP: True Vapor Pressure
TVP: Truck Voucher Program
UB: Urban Buses
UCSF: University of California, San Francisco
UFP: Ultrafine Particles
US: United States
USB: United States Background
USDA: United States Department of Agriculture
USDA-ARS: United States Department of Agriculture-Agricultural Research Service
USG: Unhealthy for Sensitive Groups

Valley: San Joaquin Valley
VCAPCD: Ventura County Air Pollution Control District
VDE: Visible Dust Emissions
VIP: Voucher Incentive Program
VMT: Vehicle Miles Traveled
VOC: Volatile Organic Compounds
WAAQS: Web-based Archived Air Quality System
WOE: Weight of Evidence
WMA: Warm-Mix Asphalt
WRAP: Western Regional Air Partnership
WRF: Weather and Research Forecast Model
WWTP: Wastewater Treatment Plan
XRF: X-ray Fluorescence
ZEV: Zero-Emission Vehicle
$\mu g/m^3$: Micrograms per Cubic Meter

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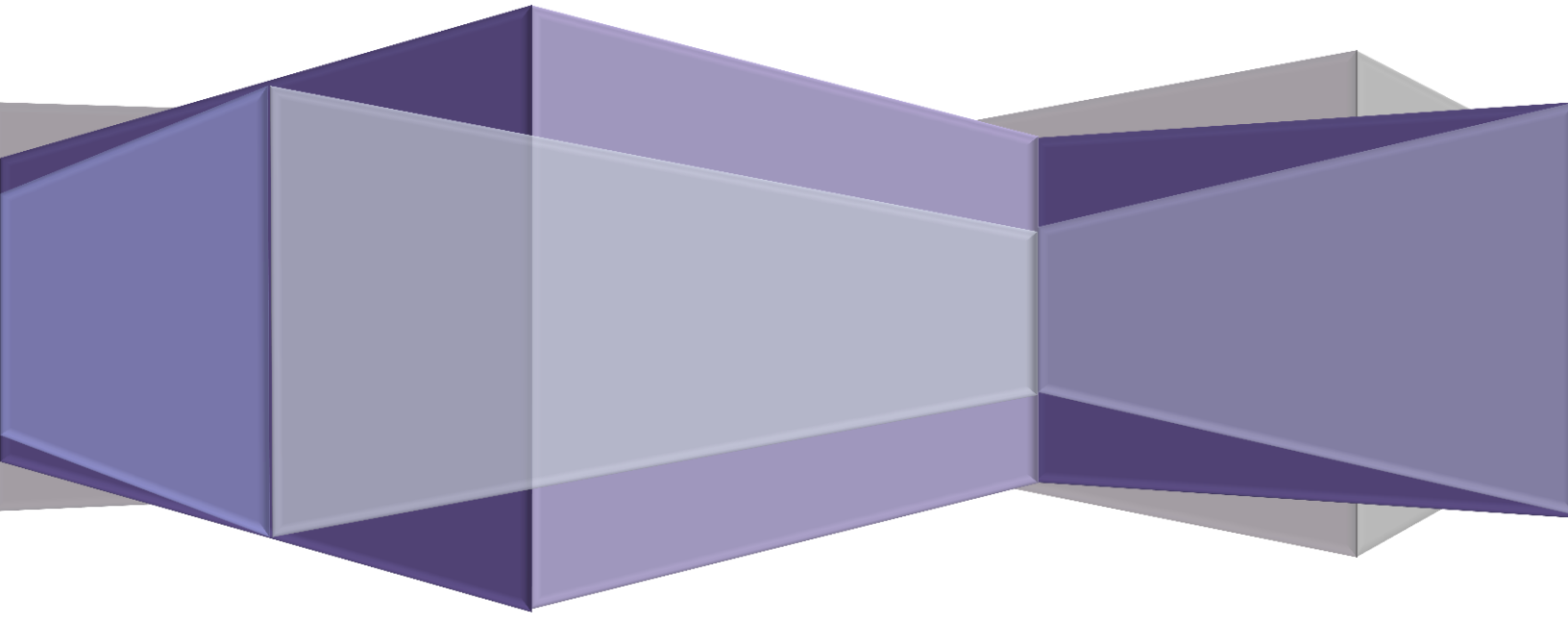
CHAPTER 1

Introduction

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Chapter 1: Introduction

The U.S. Environmental Protection Agency (EPA) periodically reviews and establishes health-based air quality standards (often referred to as National Ambient Air Quality Standards, or NAAQS) for ozone, particulates, and other pollutants. Although the San Joaquin Valley's (Valley) air quality is steadily improving, the Valley experiences unique and significant difficulties in achieving these increasingly stringent standards. Over the past couple of decades, the San Joaquin Valley Air Pollution Control District (District) has implemented several generations of emissions control measures for those stationary and area sources under its jurisdiction. Similarly, the California Air Resources Board (ARB) has adopted regulations for mobile sources. Together, these efforts represent the nation's toughest air pollution emissions controls and have greatly contributed to reduced ozone and particulate matter concentrations in the Valley. Despite the significant progress under these regulations, greatly aided by the efforts of Valley businesses and residents, many air quality challenges remain, including attainment of the 2012 PM2.5 standard, EPA's most recent standard for particulate matter that is 2.5 microns or less in diameter. Significant additional emissions reductions will be needed, particularly with respect to mobile sources under ARB and EPA jurisdiction that make up over 85% of remaining Valley emissions.

The District is developing this *2016 Moderate Area Plan for the 2012 PM2.5 Standard (2016 PM2.5 Plan)* to satisfy federal Clean Air Act (CAA) requirements under EPA's 2012 PM2.5 standard. This *2016 PM2.5 Plan* demonstrates the impracticability of the Valley to attain the federal 2012 PM2.5 standard by the Moderate nonattainment area deadline of 2021, and includes a request for reclassification from Moderate to Serious as provided for under CAA §188(b).

1.1 NATIONAL AMBIENT AIR QUALITY STANDARDS

1.1.1 EPA's Standard Setting Process

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

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

Once a standard is set, EPA designates an area as attainment or nonattainment based on the most recent three years of air quality data available. For particulate matter standards, EPA automatically classifies nonattainment areas as Moderate by order of law pursuant to CAA Subpart 4 requirements.

EPA also adopts implementation rules to guide states and local air districts as they prepare state implementation plans[1] (SIPs) to bring areas into attainment with the standard. While EPA cannot consider costs or difficulty in setting the standards, costs and difficulty are inescapable for local air districts as they determine the best way to bring areas into attainment. That being said, local air districts must meet planning and attainment requirements to avoid federal sanctions and to improve public health.

There are a number of serious penalties and risks associated with any failure to submit approvable attainment strategies for meeting federal standards. Upon development of an attainment strategy, an area submits the plan to EPA for approval. If EPA finds that an area fails to submit an approvable plan on time or fails to implement plan commitments after the plan has been approved, then the following sanctions may be applied:

- Two-to-one offset requirement for major sources, leading to a de facto ban on new and expanding business
- Loss of federal highway funds
- A federal implementation plan (FIP), which would result in a loss of local control

Once EPA approves a SIP, that plan becomes federally enforceable.

[1] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule. 81 Fed. Reg. 164, pp. 58010-58162. (2016, August 24). (to be codified at 40 CFR Parts 50, 51, and 93). https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

1.1.2 Federal PM2.5 Standards and Implementation

Table 1-1 summarizes EPA's 2012 PM2.5 national ambient air quality standard and the timing of District actions under the standard consistent with CAA requirements.

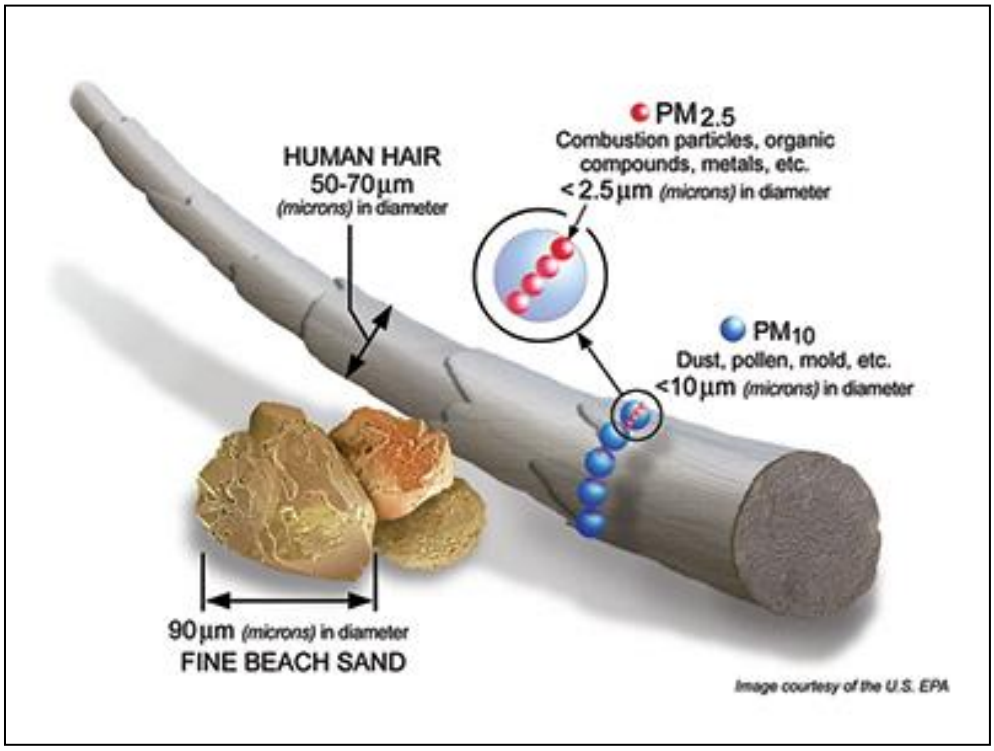
Table 1-1 2012 PM2.5 National Ambient Air Quality Standard

Year	Milestone
2012	EPA sets NAAQS: Annual: 12 µg/m³
2013	D.C. Circuit Court makes Subpart 4 finding
2014	-
2015	EPA designates Valley as a Moderate nonattainment area (effective 4/15/2015) EPA proposes an implementation rule for Subpart 4
2016	EPA finalizes implementation rule for Subpart 4 (August 2016) Attainment plan due to EPA October 15, 2016
2017-2025	(2021) Attainment deadline for Moderate nonattainment areas (not later than 6 years after designation) (2025) Attainment deadline for Serious nonattainment areas (not later than 10 years after designation)

1.2 PM2.5 POLLUTION DEFINED

Particulate matter (PM) is a mixture of solid particles and liquid droplets in the air. PM can be emitted directly into the atmosphere (primary PM), or can form as secondary particulates in the atmosphere through the photochemical reactions of precursors (when precursors are energized by sunlight). Thus, PM is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals and soil or dust particles. PM10 is PM that is 10 microns or less in diameter, and the PM2.5 subset includes smaller particles that are 2.5 microns or less in diameter (see Figure 1-1).

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



1.2.1 Nature and Formation of PM2.5

The nature of PM2.5 formation in the Valley is highly complex, and attainment of the 2012 PM2.5 standard is not a one-size-fits-all effort. Significant differences in regional natural environments and the relative contribution of precursor emissions requires regionally specific modeling and regionally specific control strategies. Also, differences within PM2.5 itself, directly-emitted PM2.5 versus secondary PM2.5 forming in the atmosphere through series of chemical reactions, adds to the complexity inherent in modeling and planning efforts.

This complexity is accounted for in the modeling and other scientific analyses conducted for this plan. The District, ARB, and researchers have developed and refined these analytical tools, including regional modeling, over many years. The District's regional modeling protocol notes that the Valley is one of the most studied airsheds in the world in terms of the number of publications in peer-reviewed scientific journals and other major reports. Such scientific analyses, and the field studies providing data for these analyses, are the foundation of the modeling efforts for this plan. Public and private sector partnership through the San Joaquin Valleywide Air Pollution Study Agency (Study Agency) provided funding and coordination for many of these studies.

Unlike ozone, which is a fairly simple molecule of three oxygen atoms, PM2.5 can be composed of any material that has a diameter of 2.5 microns or less. Among the chemical precursors that can form secondary PM2.5 are nitrogen oxides (NOx), volatile organic compounds (VOCs), sulfur dioxide (SO_2), and ammonia (NH_3). In addition,

naturally occurring emissions from biogenic sources, such as plants, can also add to the formation of PM2.5.

The resulting ambient PM2.5 mixture can include aerosols (fine airborne solid particles and liquid droplets) consisting of components of nitrates, sulfates, elemental carbon, organic carbon compounds, acid aerosols, trace metals, geological materials, and more.

The complex formation and composition of PM2.5 requires a robust planning effort, where various components of the mass can be targeted for reduction. A control strategy that targets reductions among the precursors of PM2.5 has been shown to have a positive impact in reducing the total formed mass. Both direct PM2.5 and its precursors are tracked and projected within the emissions inventory.

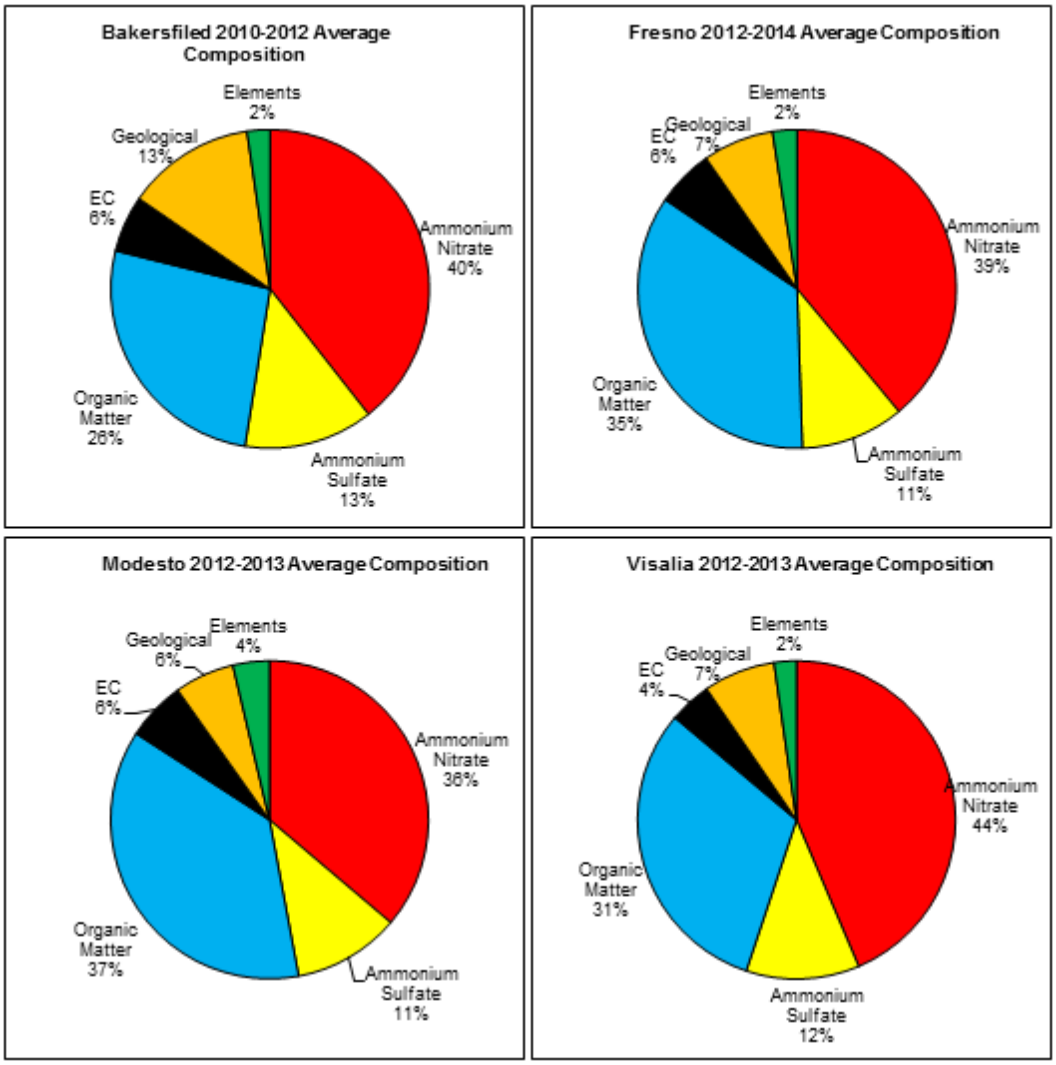
1.2.2 PM2.5 Species in the Valley

PM2.5 in the Valley is comprised of many species that contribute to the total PM2.5 mass, as summarized in Table 1-2 and Figure 1-2 below. This complex mixture is attributable to stationary, mobile, and area-wide sources, as well as naturally occurring emissions. Although the list of species contributing to PM2.5 in the Valley is lengthy, it can be grouped into larger representative categories. The following is a brief description of how each of these larger species categories are formed and emitted into the atmosphere.

Table 1-2 Summaries of PM2.5 Species

PM2.5 Species	Description
Organic carbon	Directly emitted, primarily from combustion sources (e.g. residential wood combustion). Also, smaller amounts attached to geologic material and road dusts. May also be emitted directly by natural/biogenic sources.
Elemental carbon	Also called soot or black carbon; formed during incomplete combustion of fuels (e.g. diesel engines).
Geologic material	Road dust and soil dust that are entrained in the air from activity, such as soil disturbance or airflow from traffic.
Trace metals	Identified as components from soil emissions or found in other particulates having been emitted in connection with combustion from engine wear, brake wear, and similar processes. Can also be emitted from fireworks.
Sea salt	Sodium chloride in sea spray where sea air is transported into the Valley.
Secondary organic aerosol	Secondary particulates formed from photochemical reactions of organic carbon.
Ammonium nitrate	Reaction of ammonia and nitric acid, where the nitric acid is formed from nitrogen oxide emissions, creating nitric acid in photochemical processes or nighttime reactions with ozone.
Ammonium sulfate	Reaction of ammonia and sulfuric acid, where the sulfuric acid is formed primarily from sulfur oxide emissions in photochemical processes, with smaller amounts forming from direct emissions of sulfur.
Combined water	A water molecule attached to one of the above molecules.

Figure 1-2 Annual PM2.5 Chemical Composition in the San Joaquin Valley[2]



1.2.3 PM2.5 and Associated Health Impacts

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

The potential health impacts of particle pollution are linked to the size of the particles, with the smaller particles having larger impacts. Numerous studies link PM2.5 to a variety of health problems, including aggravated asthma, increased respiratory symptoms (irritation of the airways, coughing, difficulty breathing), decreased lung function in children, development of chronic bronchitis, irregular heartbeat, non-fatal

[2] Source: California Air Resources Board

heart attacks, increased respiratory and cardiovascular hospitalizations, lung cancer, and premature death. Children, older adults, and individuals with heart or lung diseases are the most likely to be affected by PM2.5. Many studies have quantified and documented the health benefits of attaining the air quality standards for PM.

Understanding various PM2.5 species, including how each species is formed, how much each contributes to the Valley's total PM2.5 concentrations, and how each is linked to different public health impacts, is of the utmost importance for the development of an effective, health-protecting control strategy. For example, ammonium nitrate is estimated to comprise about 40% of the Valley's annual average PM2.5 concentrations, but it is generally regarded as having relatively low toxicity compared to other PM2.5 species, such as organic or elemental carbon.

In addition to affecting human health, air pollution also affects the health of the natural environment. PM2.5 can be transported from sources hundreds of miles away to contribute to visibility problems at remote locations, such as the Sierra Nevada mountain range and associated national parks. As PM settles out of the air, it can make lakes and streams acidic, change an ecosystem's nutrient balance, and affect ecosystem diversity. PM can affect vegetation by damaging foliage, disrupting the chemical processes within plants, reducing light adsorption, and disrupting photosynthesis. As the Valley progresses toward attainment of EPA's human-health-based PM2.5 standards, there will also be less harmful impacts to the surrounding natural environment.

1.2.4 Health Risk Reduction Strategy

EPA NAAQS are the primary driving force for new emissions controls that result in air quality improvements and health benefits to Valley residents. In the conventional planning process for attaining these standards, success in protecting public health is defined by whether the standards are met at all air monitors. In effect, the reduction in PM2.5 mass, which shows progress toward attainment of the standard, serves as the surrogate for population exposure and risk.

NAAQS, as currently established, are essentially *mass-based* standards. In the case of PM2.5, the current standards do not account for particle size distribution, chemical species composition, surface area, and other factors of health risk. In contrast, recent health-science research has substantially deepened our knowledge of air pollutant health risk beyond the CAA framework and EPA standards. There is a growing recognition within the scientific community that the NAAQS alone can be incomplete measures of public exposure to air pollution. Thus, while the CAA NAAQS and SIP process is motivated by public health, the process alone does not fully address public health impacts of ambient air pollution. To fully address potential public health benefits, the District's attainment strategy uses a more comprehensive, multidimensional

population exposure assessment approach that goes beyond ambient mass measurements.[3]

The District Governing Board adopted a research-driven Risk-based Strategy (RBS) designed to maximize public health improvements resulting from the District's attainment strategies and related initiatives. The overall goal of the RBS was to minimize cumulative population exposure to air pollution and corresponding health risks in the region. In May 2013, the District Governing Board rebranded this strategy as the Health Risk Reduction Strategy (HRRS) in response to criticisms and skepticism by a number of air quality advocates. The District has integrated the HRRS into the development of air quality attainment plans.

A number of the District programs have been influenced by the underlying principles and goals of the HRRS and provide a model of the success and added potential benefits possible under this strategy. The following are a few examples.

- **District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) and the District's corresponding Check-Before-You-Burn program** have both been reducing harmful species of PM2.5 where and when those reductions are most needed—in impacted urbanized areas when the local weather is forecast to hamper PM dispersion. In 2008, the Central Valley Health Policy Institute found that District wood burning curtailments on days with high PM concentrations reduced annual PM exposure by about 13% in Bakersfield and Fresno, resulting in an estimated 59 to 121 avoided cases of annual premature mortality.[4]

  The District's *2012 PM2.5 Plan* committed to amend the Rule 4901 in 2016 with compliance beginning the winter season of 2016-2017. When the District Board adopted the *2012 PM2.5 Plan,* guided by the HRRS, they directed the District to amend Rule 4901 in 2014. As a result, the rule was amended and implemented two years ahead of the SIP commitment. The significant increase in curtailment days resulting from the lowered threshold has resulted in a reduction in nighttime neighborhood exposure to PM 0.1. The District's prioritization of Rule 4901 is one of the best examples of a District policy aimed at maximizing public health benefits based on a rigorous assessment of population exposure and risk.

- **District grant programs** reach beyond the current CAA NAAQS-SIP process to reduce emissions in advance of or beyond regulations.

[3] Lippman, M. (2012, April 16). Presentation: Results from National Particle Component Toxicity (NPACT) Program and NYU: Toxicology Findings, Integration, and implications. Presented at the Annual Meeting of the Health Effects Institute (HEI) in Chicago, IL, April 15–17, 2012. Presentation retrieved from http://www.healtheffects.org/Slides/AnnConf2012/Lippmann-MonPM.pdf

[4] Lighthall, D., Nunes, D., & Tyner, T.R. (2009). Environmental Health Evaluation of Rule 4901: Domestic Wood Burning. Fresno, CA: Central Valley Health Policy Institute for the San Joaquin Valley Air Pollution Control District. Retrieved from http://www.fresnostate.edu/chhs/cvhpi/documents/wood-burning-report.pdf

- **The District's information and educational programs, such as the Real-Time Air Quality Advisory Network (RAAN),** also contribute to the HRRS. RAAN uses real-time data from air monitoring stations throughout the Valley to provide hour-by-hour air quality updates to schools and other subscribers. Subscribers can use this information to make informed decisions and plan outdoor activities for times with the best air quality, reducing potential air quality health risks.

- **District-supported health research.** As part of the District's HRRS, the District is playing an active role in funding leading edge health research focusing on the Valley population. The District will continue to seek out and fund research opportunities that further the understanding of PM-related impacts on public health.

1.3 CHALLENGES TO ATTAINMENT

1.3.1 Challenges of the Natural Environment

The Valley's natural environment supports one of the most productive agricultural regions in the country. However, these same natural factors present significant challenges for air quality, the surrounding mountains trap pollution and block air flow, and the mild climate keeps pollutant-scouring winds at bay most of the year.

The Valley, as seen in Figure 1-3, is an inter-mountain valley encompassing nearly 25,000 square miles. Surrounded by mountain ranges to the west, east, and south, the air flow through the Valley can be blocked, leading to severely constrained dispersion. During the winter, high-pressure systems can cause the atmosphere to become stagnant for longer periods of time, where wind flow is calm and air movement is minimal. These stagnant weather systems can also cause severe nighttime temperature inversions, which exacerbate the build-up of PM2.5 and related precursors both beneath and above the evening inversion layer.

Figure 1-3 San Joaquin Valley Air Basin

Under normal conditions, temperature decreases with increasing altitude, but during temperature inversions the temperature gradient is reversed, with temperatures *increasing* with altitude, causing warmer air to be above cooler air. Temperature inversions are common in the Valley throughout the year. Since the inversion is often lower than the height of the surrounding mountain ranges, the Valley effectively becomes a bowl capped with a lid that traps emissions near the surface. When horizontal dispersion (transport flow) and vertical dispersion (rising air) are minimized, PM2.5 concentrations can build quickly, especially in the winter. These naturally occurring meteorological conditions have the net effect of spatially concentrating direct PM2.5 concentrations near their sources; promoting the formation and regional buildup of secondary species; and chemically aged organic carbon species, resulting in an increase in their relative toxicity.

Given these challenges, the Valley needs even more effective emissions reductions to attain the federal PM2.5 standard; and the District continues to pursue these reductions through its numerous air quality attainment plans, prohibitory regulatory control strategy

and innovative non-regulatory emission reduction strategy. However, given the enormity of the reductions needed for attainment, mobile sources, particularly in the goods movement sector, must transition to near-zero emission levels through the implementation of transformative measures. The District does not have the authority to implement regulations requiring tailpipe emissions standards on mobile sources. New state and federal regulations coupled with a robust incentive-based emission reduction strategy are necessary to have any chance to achieve the enormous reductions that are necessary to attain the federal standards. EPA must take responsibility for implementing regulatory and incentive-based measures for sources under their jurisdiction.

1.3.2 Population Growth in the San Joaquin Valley

To further exacerbate current air quality challenges, the Valley is one of the fastest growing regions in the state. The Population Research Unit of the California Department of Finance (DOF) released revised population growth projections in December 2014 that demonstrate how significantly the Valley's population is expected to grow in the coming years.

Based on the revised 2015 to 2030 DOF data, the Valley's population is expected to increase by 25.3% (Table 1-3). In contrast, the total population for the State of California is projected to increase by only 13.3% over the same time period. Increasing population generally means increases in air pollutant emissions as a result of increased consumer product use and more automobile and truck vehicle miles traveled (VMT). In addition to increased VMT resulting from increased Valley population, the Valley will also see increased vehicular traffic along the State's major goods and people movement arteries, both of which run the length of the Valley.

Table 1-3 Estimated Valley Population by County, 2015-2030[5]

County	Projected 2015	Projected 2020	Projected 2025	Projected 2030
Fresno	981,681	1,055,106	1,130,406	1,200,666
Kern*	894,492	989,815	1,088,711	1,189,004
Kings	155,122	167,465	180,355	192,562
Madera	157,722	173,146	189,267	204,993
Merced	269,572	288,991	313,082	337,798
San Joaquin	723,506	766,644	822,755	893,354
Stanislaus	538,689	573,794	611,376	648,076
Tulare	467,170	498,559	537,015	578,858
Total	***4,187,954***	***4,513,520***	***4,872,967***	***5,245,311***

** Includes entire Kern County population*

[5] California Department of Finance. Retrieved on June 29, 2015 from: http://www.dof.ca.gov/research/demographic/reports/projections/view.php

While the bulk of the Valley's remaining emissions come from mobile sources outside of the District's regulatory authority, under the federal Clean Air Act, the responsibility to bring the region into attainment with the federal standards rests with the local air district. Additionally, the region will be subject to sanctions that would be devastating to the Valley's economy if mobile sources under federal regulatory authority are not adequately controlled. As such, given the enormity of the reductions needed for attainment, mobile sources, particularly in the goods movement sector, must transition to near-zero emission levels through the implementation of transformative measures. The District does not have the authority to implement regulations requiring ultra-low tailpipe emissions standards on mobile sources. New state and federal regulations coupled with a robust incentive-based emission reduction strategy are necessary to have any chance to achieve the enormous reductions that are necessary to attain the federal standards. EPA must take responsibility for implementing regulatory and incentive-based measures for sources under their jurisdiction.

1.4 PUBLIC PROCESS

To ensure that the public has the opportunity for meaningful participation in the development of this *2016 PM2.5 Plan* the District has provided multiple opportunities for the public to learn more about this plan and to provide the District with comments or to request more information. The District has presented regular updates on the *2016 PM2.5 Plan* at public meetings, such as meetings of District Governing Board, Citizens Advisory Committee (CAC), and Environmental Justice Advisory Group (EJAG).

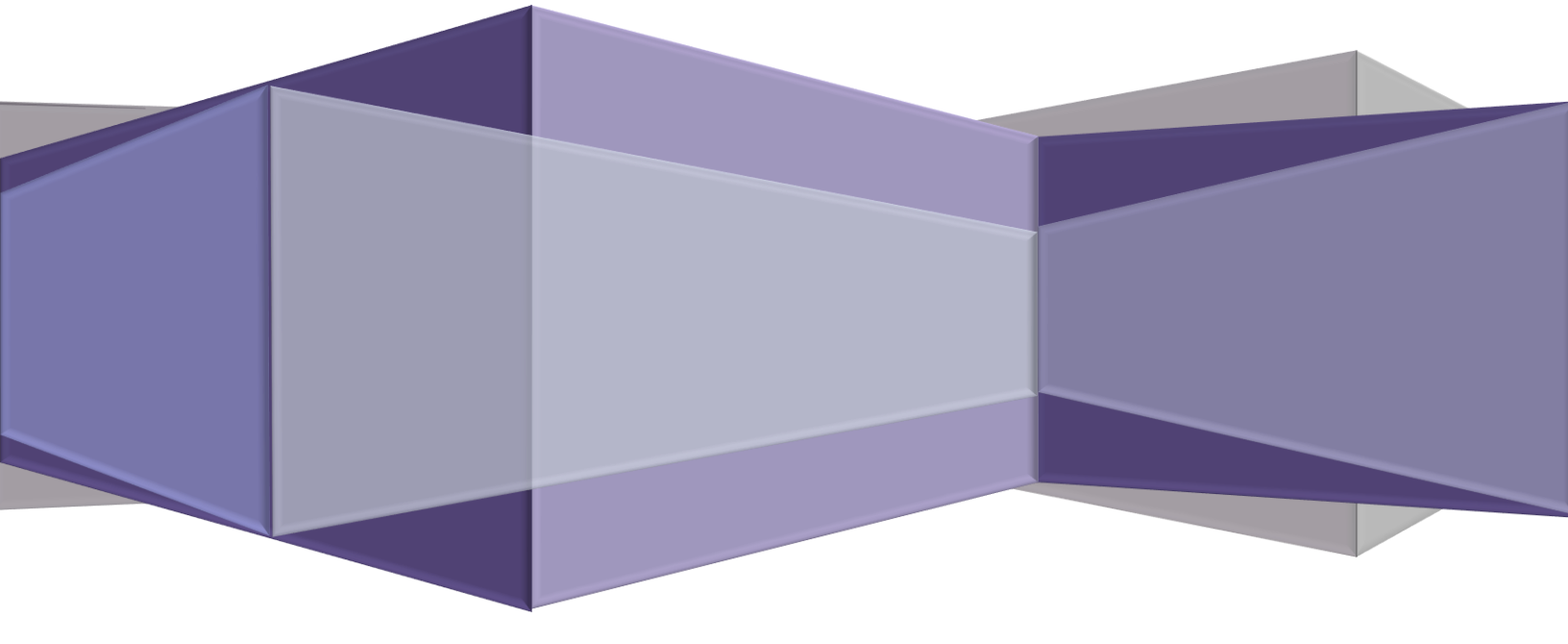
Table 1-4 *2016 PM2.5 Plan* Development Timeline

Date	Meeting Summary
Ongoing	Continuous updates on plan development process at public meetings of the Governing Board, Citizen's Advisory Committee, and Environmental Justice Advisory Group. Each update is followed by an opportunity for the public to provide comments and ask questions.
August 2016	Proposed plan published for public review and comment
September 2016	Present proposed plan to the District Governing Board for consideration at a public hearing
October 2016	ARB hearing to adopt the District Governing Board approved plan

CHAPTER 2

Impracticability Demonstration and Request for Reclassification

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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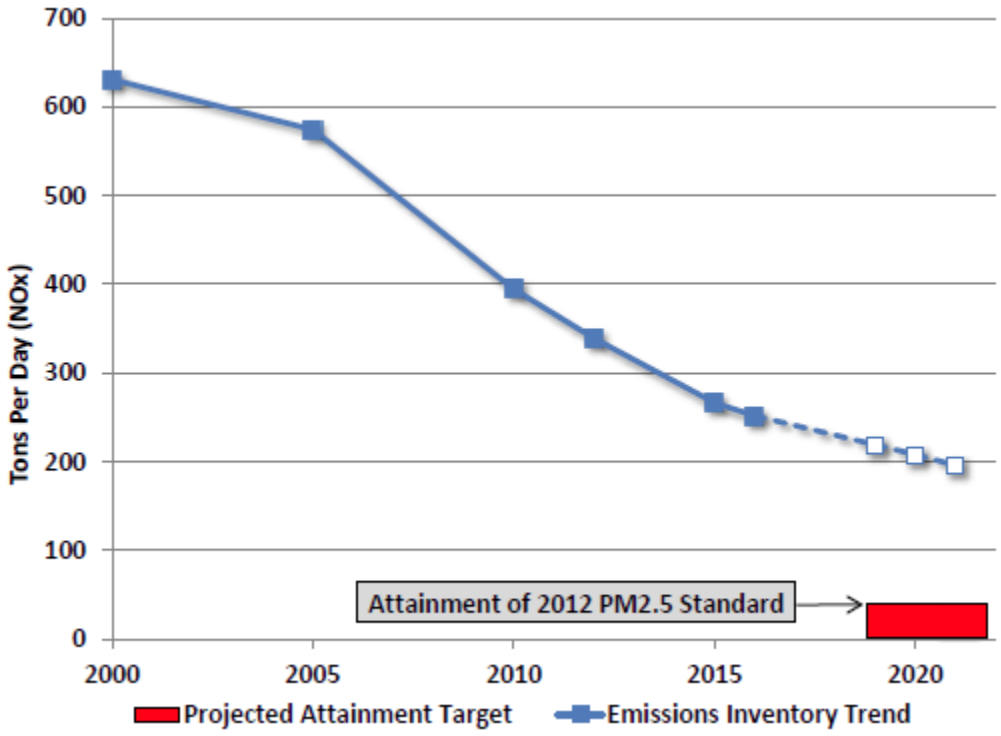
Chapter 2: Impracticability Demonstration and Request for Reclassification

This chapter demonstrates that attainment by the Moderate area deadline date of December 31, 2021 for the 2012 PM2.5 standard is not practicable and as such provides the supporting documentation necessary for the U.S. Environmental Protection Agency (EPA) to reclassify the San Joaquin Valley air basin (Valley) as a Serious nonattainment area.

2.1 VALLEY ATTAINMENT OF THE 2012 STANDARD BY MODERATE AREA ATTAINMENT DEADLINE OF 2021 IS NOT PRACTICABLE

Although the Valley has some of the most stringent regulations in the nation (see Chapter 3) that will continue to bring about significant reductions into the future, the Valley will need enormous additional emission reductions, specifically from sources that are under the state and federal jurisdiction, in order to meet this standard. As shown below, attainment is not possible by the mandated Moderate area deadline of 2021.

Figure 2-1 San Joaquin Valley NOx Emissions Inventory and Target for Attainment of 2012 PM2.5 Standard



Under the Clean Air Act, demonstrating attainment requires a clean data finding for three consecutive years from 2019 through 2021. This means that the needed reductions must be achieved by 2019 or extra reductions must be made in 2020 or 2021 for the three-year average concentration to be below the standard. As illustrated in Figure 2-1, this is physically impossible given that the ARB truck and bus regulation and off-road engine regulation will not be fully implemented until 2023.

Furthermore, modeling for this plan, as summarized in Section 2.3 – Summary of Modeling Results, confirms that attainment of the 2012 PM2.5 standard by 2021 is not practicable.

2.2 REQUEST FOR RECLASSIFICATION FROM MODERATE AREA TO SERIOUS AREA

Pursuant to CAA subpart 4 §188(b) a Moderate area may be reclassified for one of the following two circumstances:

1. Before the Attainment Date: Any Moderate area that EPA determines cannot practicably attain the NAAQS by the attainment date.

2. Upon Failure to Attain: Any Moderate area that EPA finds is not in attainment after the applicable attainment date shall be reclassified by operation of law as a Serious area.

Given the impracticability of meeting the Moderate attainment deadline date for this standard, the Valley should be reclassified as a Serious nonattainment area. This reclassification will provide the Valley the time needed to develop an attainment plan aimed at achieving expeditious attainment of the standard.

For a Serious area, the attainment date will be as expeditiously as practicable no later than 2025. The District will demonstrate an appropriate attainment year in a new attainment plan satisfying Serious nonattainment area federal mandates. As required by the Clean Air Act, the new attainment plan will be submitted to EPA no later than four years after EPA reclassification of the Valley to Serious nonattainment.

2.3 SUMMARY OF MODELING RESULTS

[*This section provided by the California Air Resources Board*]

Photochemical modeling plays a crucial rule in demonstrating attainment of the national ambient air quality standards based on projected future year emissions. Currently, San Joaquin Valley (SJV or Valley) is designated as a Moderate nonattainment area for the 2012 U.S. EPA annual $PM_{2.5}$ standard (i.e., 12 µg/m^3) with an attainment date of 2021. However, recent $PM_{2.5}$ trends in the Valley brought on by a sustained drought, and supported by the modeling assessment described below, illustrate the impracticability of attaining the standard by 2021. This would lead to a reclassification of the Valley from a Moderate to Serious nonattainment area, as well as a new State Implementation Plan[1] (SIP) timeline and attainment date of 2025.

The findings from the modeling assessment are summarized below. Additional descriptions of the model inputs, modeling procedures, and results can be found in Appendix A.

The current modeling approach draws on the products of large-scale, scientific studies as well as past $PM_{2.5}$ SIPs in the region, collaboration among technical staff of state and local regulatory agencies, and from participation in technical and policy groups in the region. In this work, the Weather Research and Forecasting (WRF) model version 3.6 was utilized to generate the annual meteorological fields. The Community Multiscale Air Quality (CMAQ) Model version 5.0.2 with state-of-the-science aerosol treatment was used for modeling annual $PM_{2.5}$ in the Valley. Other model inputs and configuration, including the modeling domain definition, chemical mechanisms, initial and boundary conditions, and emission processing can be found in the Modeling Protocol and Modeling Emissions Inventory Appendices.

The U.S. EPA modeling guidance[2] recommends using modeling in a “relative” rather than “absolute” sense. Based on analysis of recent years’ ambient $PM_{2.5}$ levels and meteorological conditions leading to elevated $PM_{2.5}$ concentrations, the year 2013 was selected for baseline modeling calculations.

Specifying the baseline design value (DV) is a key consideration in the model attainment test, because this value is projected forward to the future and used to test for future attainment of the standard at each monitor. To minimize the influence of year-to- year variability in demonstrating attainment, the U.S. EPA optionally allows the averaging of three DVs, where one of the DV years is the same as the baseline emissions inventory and modeling year. This average DV is referred to as the baseline (or reference) DV. For a baseline modeling year of 2013, this would typically mean that the average of the

[1] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule. 81 Fed. Reg. 164, pp. 58010-58162. (2016, August 24). (to be codified at 40 CFR Parts 50, 51, and 93). https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

[2] U.S. EPA, 2014, Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM and Regional Haze, available at https://www.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM- RH_Modeling_Guidance-2014.pdf

2013, 2014, and 2015 DVs would be used. However, at the time of this work the 2015 DVs were still preliminary (i.e., 2015 measurements had not been finalized), so the average DV instead includes 2012, 2013, and 2014 (see the Table 2-2 for the baseline DV utilized in the modeling assessment).

In order to use the modeling in a relative sense, three simulations were conducted: 1) base year simulation for 2013, which demonstrated that the model reasonably reproduced the observed $PM_{2.5}$ concentrations in the Valley; 2) reference (or baseline) year simulation for 2013, which was the same as the base year simulation, but excluded exceptional event emissions such as wildfires; 3) future year simulation for 2021, which was the same as the reference year simulation, except projected emissions for 2021 were used in lieu of the 2013 emissions.

Table 2-1 shows the 2013 and 2021 SJV annual anthropogenic emissions for the five $PM_{2.5}$ precursors. From 2013 to 2021, anthropogenic emissions in the SJV are estimated to drop approximately 38%, 8%, 7%, 2%, and 1% for nitrogen oxides (NO_x), reactive organic gases (ROG), primary $PM_{2.5}$, sulfur oxides (SO_x), and ammonia (NH_3), respectively. Among these five precursors, anthropogenic NO_x emissions show the largest relative reduction, dropping from 318.2 tons/day in 2013 to 196.1 tons/day in 2021. Anthropogenic ROG emissions will drop from 319.2 tons/day to 292.8 tons/day, reflecting an 8% reduction from 2013 to 2021.

Table 2-1 SJV Annual Planning Emissions for 2013 and 2021

Category	NO_x	ROG	$PM_{2.5}$	SO_x	NH_3
			2013 (tons/day)		
Stationary	38.6	85.1	8.9	7.2	13.8
Area	8.1	150.3	42.3	0.3	310.7
On-road Mobile	183.2	49.9	6.4	0.6	4.5
Other Mobile	88.3	33.9	5.8	0.2	0.0
Total	318.2	319.2	63.5	8.4	329.1
			2021 (tons/day)		
Stationary	29.8	90.5	9.1	6.9	15.3
Area	8.1	152.4	41.9	0.3	306.4
On-road Mobile	88.0	23.3	3.3	0.6	4.2
Other Mobile	70.2	26.7	5.0	0.3	0.0
Total	196.1	292.8	59.3	8.2	325.9
Change in total emissions in 2021 compared to 2013	-38%	-8%	-7%	-2%	-1%

In this relative approach, the fractional change (or ratio) in $PM_{2.5}$ concentration between the model future year (2021) and model baseline year (or reference year, 2013) are calculated. These ratios are called RRFs. Since $PM_{2.5}$ is comprised of different chemical species, which respond differently to changes in emissions of various pollutants, separate RRFs were calculated for individual $PM_{2.5}$ specie. In addition,

because of potential seasonality in $PM_{2.5}$ formation mechanisms, RRFs for each specie were also calculated separately for each quarter.

The RRF for a specific $PM_{2.5}$ component *j* for each quarter is calculated using the following expression:

$$RRF_j = \frac{[C]_{j,\,future}}{[C]_{j,\,reference}} \qquad (1)$$

Where $[C]_{j,\,future}$ is the modeled quarterly mean concentration for component *j* predicted for the future year averaged over the 3x3 array of grid cells surrounding the monitor, and $[C]_{j,reference}$ is the same, but for the reference year simulation.

The measured FRM/FEM (i.e., Federal Reference Method/Federal Equivalent Method) $PM_{2.5}$ must be separated into its various chemical components. Species concentrations were obtained from the four $PM_{2.5}$ chemical speciation sites in the Valley. These four speciation sites are located at: Bakersfield – California Avenue, Fresno – Garland, Visalia – North Church, and Modesto – 14th Street. Since not all of the 16 FRM/FEM $PM_{2.5}$ sites in the Valley have collocated speciation monitors, the speciated $PM_{2.5}$ measurements at one of the four speciation sites were utilized to represent the speciation profile at each of the FRM/FEM sites based on geographic proximity, analysis of local emission sources, and measurements from previous field studies.

Since the FRM $PM_{2.5}$ monitors do not retain all of the $PM_{2.5}$ mass that is measured by the speciation samplers, the U.S. EPA modeling guidance recommends using the SANDWICH approach (Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid material balance)" described by Frank[3] to apportion the FRM $PM_{2.5}$ mass to individual $PM_{2.5}$ species based on nearby chemical speciation measurements. Based on completeness of the data, $PM_{2.5}$ speciation data from 2010 – 2013 were utilized. For each quarter, percent contributions from individual chemical species to FRM/FEM $PM_{2.5}$ mass were calculated as the average of the corresponding quarter from 2010-2013.

Future DVs for each site are given in Table 2-2. Corresponding RRFs, as well as base and projected future year annual $PM_{2.5}$ composition at each monitor are given in Tables 2-3, 2-4, and 2-5 (Note that the annual RRFs and composition are for reference only and that in the actual future year DV calculation, separate calculations were performed for each quarter and not on the annual average). The Bakersfield-Planz site has the highest projected future year DV at 14.8 µg/m^3, which is well above the 2012 annual $PM_{2.5}$ standard of 12 µg/m^3, but below the 2006 annual $PM_{2.5}$ standard of 15 µg/m^3. From the base to future year, there are significant reductions projected for ammonium nitrate and elemental carbon (EC), modest reduction in organic matter (OM), almost no change in sulfate, and a slight increase in crustal material (i.e., other primary $PM_{2.5}$ such as fugitive dust emissions).

[3] Frank, N.H., 2006, Retained nitrate, hydrated sulfates, and carbonaceous mass in federal reference method fine particulate matter for six eastern U.S. cities, Journal of Air & Waste Management Association, 56, 500-511

To further evaluate the impact of reducing emissions of different $PM_{2.5}$ precursors (i.e., primary $PM_{2.5}$, NO_x, SO_x, ammonia, and volatile organic compounds (VOC)) on the projected future $PM_{2.5}$ DVs, a series of model sensitivity simulations were conducted, where emissions of the precursor species were scaled by ±15% from the future year baseline emissions (in this case, emissions representing year 2025 were used as opposed to year 2021 emissions). Comparing the difference in $PM_{2.5}$ DVs from the ±15% perturbations essentially produces the sensitivity of the future year $PM_{2.5}$DVs to a 30% change in future year baseline precursor emissions. For each precursor, only anthropogenic emissions in California were perturbed. Natural emissions and emissions outside of California (e.g., Mexico) were not perturbed.

A threshold of 0.2 µg/m3 for the annual $PM_{2.5}$ DV as well as the DV portion of a precursor-specific component (see Appendix A for detail about the precursor- specific component) was used to determine the significance of a precursor to $PM_{2.5}$ formation (e.g., if a 30% change in precursor emissions leads to a change in component DV less than or equal to 0.2 µg/m^3 then the precursor is deemed not significant). Based on the sensitivity analysis, in the SJV, primary $PM_{2.5}$ and NO_x were determined to be significant precursors, while ammonia, VOC, and SO_x all are shown to be not significant.

Table 2-2 Base and projected future year $PM_{2.5}$ DVs at each monitor

Site AQS ID	Site Name	Base DV (µg/m^3)	Future 2021 DV (µg/m^3)
60290016	Bakersfield - Planz	17.3	14.8
60392010	Madera	16.9	14.4
60311004	Hanford	16.5	13.4
60310004	Corcoran	16.3	14.4
61072002	Visalia	16.2	13.7
60195001	Clovis	16.1	14.1
60290014	Bakersfield - California	16.0	13.6
60190011	Fresno-Garland	15.0	12.9
60990006	Turlock	14.9	12.8
60195025	Fresno - Hamilton & Winery (H&W)	14.2	12.2
60771002	Stockton	13.1	11.7
60470003	Merced - S Coffee	13.1	11.2
60990005	Modesto	13.0	11.2
60472510	Merced - Main Street	11.0	9.7
60772010	Manteca	10.1	8.8
60192009	Tranquility	7.7	6.5

Table 2-3 Annual RRFs for $PM_{2.5}$ components

Site Name	RRF for $PM_{2.5}$	RRF for NH_4	RRF for NO_3	RRF for SO_4	RRF for OM	RRF for EC	RRF for Crustal
Bakersfield - Planz	0.85	0.68	0.69	0.97	0.90	0.51	1.02
Madera	0.85	0.74	0.70	1.00	0.93	0.69	1.01
Hanford	0.81	0.71	0.67	1.02	0.94	0.70	0.92
Corcoran	0.88	0.70	0.68	1.04	0.97	0.76	0.95
Visalia	0.85	0.69	0.70	1.01	0.89	0.63	1.02
Clovis	0.87	0.70	0.70	1.00	0.91	0.66	1.07
Bakersfield - California	0.85	0.67	0.67	0.97	0.90	0.52	1.03
Fresno-Garland	0.86	0.72	0.72	0.99	0.89	0.59	1.05
Turlock	0.86	0.77	0.75	1.00	0.92	0.67	1.05
Fresno - H&W	0.86	0.74	0.74	0.99	0.89	0.58	1.05
Stockton	0.89	0.80	0.76	1.02	0.95	0.70	1.05
Merced - S Coffee	0.85	0.73	0.71	1.01	0.93	0.68	1.04
Modesto	0.86	0.77	0.74	1.01	0.92	0.67	1.05
Merced - Main Street	0.88	0.72	0.71	1.01	0.93	0.69	1.04
Manteca	0.87	0.81	0.77	1.02	0.92	0.68	1.04
Tranquility	0.84	0.69	0.63	1.00	0.96	0.73	1.02

Table 2-4 Base year $PM_{2.5}$ compositions*

Site	Base $PM_{2.5}$ ($\mu g/m^3$)	Base NH_4 ($\mu g/m^3$)	Base NO_3 ($\mu g/m^3$)	Base SO_4 ($\mu g/m^3$)	Base OM ($\mu g/m^3$)	Base EC ($\mu g/m^3$)	Base Crustal ($\mu g/m^3$)
Bakersfield - Planz	17.3	1.1	2.6	1.7	7.0	1.0	2.5
Madera	16.9	1.4	4.1	1.5	6.4	0.9	1.2
Hanford	16.5	1.9	5.5	1.5	4.1	0.7	1.2
Corcoran	16.3	1.2	2.9	1.5	7.4	0.7	1.2
Visalia	16.2	1.2	3.0	1.4	7.3	0.7	1.2
Clovis	16.1	0.9	2.1	1.3	8.7	0.9	1.1
Bakersfield – California	16.0	1.1	2.6	1.5	6.4	0.9	2.2
Fresno - Garland	15.0	0.9	2.2	1.1	8.0	0.8	0.9
Turlock	14.9	1.4	3.9	1.2	5.4	0.8	0.9
Fresno - H&W	14.2	0.8	2.1	1.0	7.6	0.8	0.8
Stockton	13.1	1.1	3.3	1.1	4.9	0.7	0.8
Merced - S Coffee	13.1	1.1	3.3	1.1	4.8	0.7	0.8
Modesto	13.0	1.2	3.4	1.1	4.7	0.7	0.8
Merced – Main Street	11.0	0.7	1.7	0.9	5.6	0.6	0.6
Manteca	10.1	0.9	2.6	0.8	3.6	0.5	0.6
Tranquility	7.7	0.6	1.9	0.6	2.8	0.4	0.5

* Base year $PM_{2.5}$ compositions were based on $PM_{2.5}$ chemical speciation measurement adjusted by the U.S. EPA SANDWICH method. Base year water and blank are not shown since they are not projected in the calculation.

Table 2-5 Projected future year $PM_{2.5}$ compositions

Site	Future $PM_{2.5}$ ($\mu g/m^3$)	Future NH_4 ($\mu g/m^3$)	Future NO_3 ($\mu g/m^3$)	Future SO_4 ($\mu g/m^3$)	Future OM ($\mu g/m^3$)	Future EC ($\mu g/m^3$)	Future Crustal ($\mu g/m^3$)	Future Water ($\mu g/m^3$)	Blank ($\mu g/m^3$)
Bakersfield - Planz	14.8	0.8	1.8	1.6	6.2	0.5	2.6	0.7	0.5
Madera	14.4	1.1	2.8	1.5	5.9	0.6	1.2	0.8	0.5
Hanford	13.4	1.4	3.6	1.5	3.8	0.5	1.1	0.9	0.5
Corcoran	14.4	0.8	2.0	1.5	7.1	0.5	1.1	0.7	0.5
Visalia	13.7	0.8	2.1	1.5	6.5	0.4	1.2	0.7	0.5
Clovis	14.1	0.6	1.5	1.3	7.9	0.6	1.1	0.6	0.5
Bakersfield - California	13.6	0.7	1.7	1.4	5.8	0.5	2.3	0.6	0.5
Fresno - Garland	12.9	0.6	1.6	1.1	7.1	0.5	0.9	0.5	0.5
Turlock	12.8	1.0	3.0	1.2	4.9	0.5	0.9	0.7	0.5
Fresno - H&W	12.2	0.6	1.5	1.0	6.7	0.4	0.9	0.5	0.5
Stockton	11.7	0.9	2.5	1.2	4.6	0.5	0.9	0.6	0.5
Merced - S Coffee	11.2	0.8	2.3	1.1	4.5	0.5	0.8	0.6	0.5
Modesto	11.2	0.9	2.5	1.1	4.3	0.4	0.8	0.6	0.5
Merced – Main Street	9.7	0.5	1.2	0.9	5.2	0.4	0.6	0.4	0.5
Manteca	8.8	0.7	2.0	0.8	3.3	0.3	0.6	0.5	0.5
Tranquility	6.5	0.4	1.2	0.6	2.7	0.3	0.5	0.3	0.5

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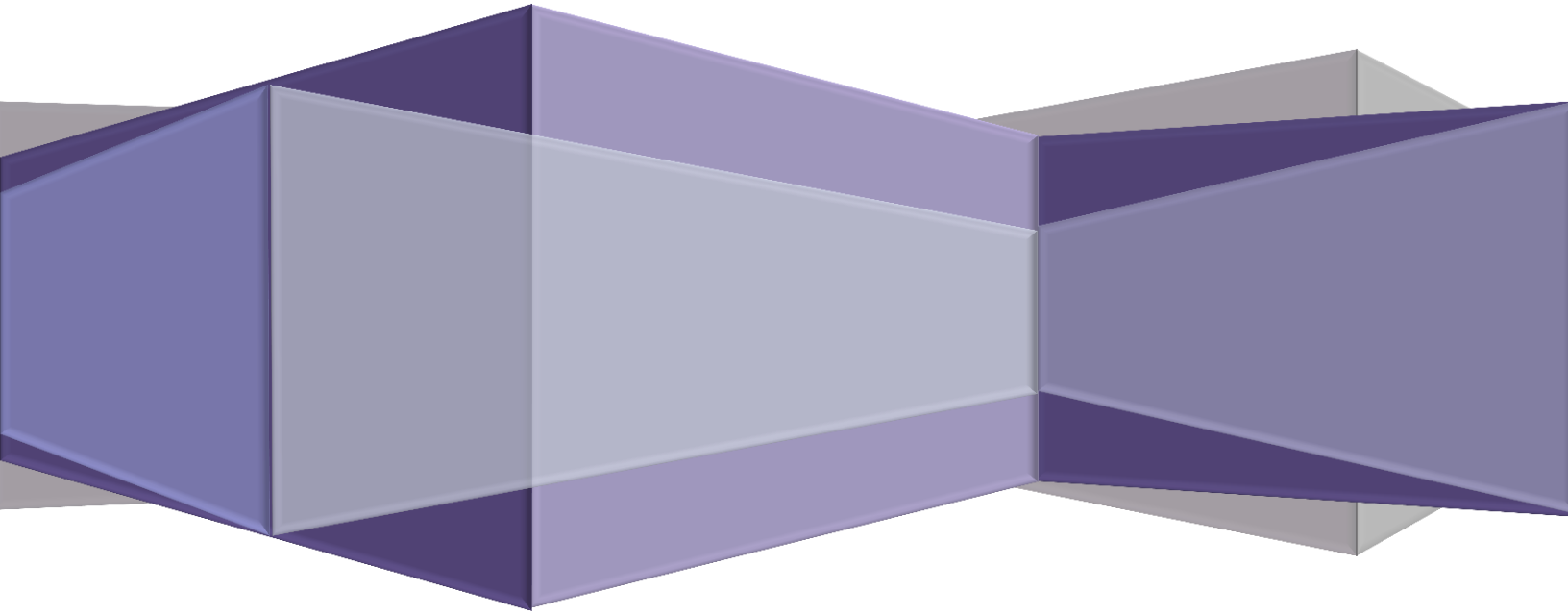
CHAPTER 3

Demonstration of Federal Clean Air Act Requirements

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Chapter 3: Demonstration of Federal Clean Air Act Requirements

The federal Clean Air Act (CAA), Title 1, Part D Subpart 1 (Subpart 1) and CAA, Title 1, Part D Subpart 4 (Subpart 4) require California to submit documentation to the U.S. Environmental Protection Agency (EPA) that is specific to the San Joaquin Valley (Valley) to address the 2012 National Ambient Air Quality Standards (NAAQS, or standard) for PM2.5. This *2016 Moderate Area Plan for the 2012 PM2.5 Standard* (*2016 PM2.5 Plan)* satisfies federal Clean Air Act requirements for the Valley as an area classified as a Moderate nonattainment area for the 2012 PM2.5 standard.

The CAA requirements summarized and demonstrated in this chapter are based on CAA language and on EPA's only guidance for PM2.5 Moderate nonattainment area under Subpart 4 – the Implementation Rule.[1] Unfortunately for the Valley, and all other areas classified Moderate for the 2012 PM2.5 NAAQS, EPA did not finalize the implementation rule until August 2016. Any Moderate area nonattainment plan for the 2006 PM2.5 national ambient air quality standards would be due to EPA no later than October 2016. For states to follow federal Clean Air Act public noticing requirements, the states must publish proposed plans and/or other demonstrations 30 days before the state can hold a public hearing and adopt said plan. In short, EPA actions only allowed the District less than one month to draft this plan pursuant to new guidance.

3.1 FEDERAL REQUIREMENTS FOR PM2.5 MODERATE NONATTAINMENT AREAS

3.1.1 Federal Air Quality Standards for PM2.5

EPA has promulgated three standards for PM2.5. The first PM2.5 standard was promulgated in July 1997,[2] with an annual PM2.5 standard of 15 micrograms per cubic meter (µg/m^3) and a 24-hour PM2.5 standard of 65 µg/m^3. In October 2006, EPA revised the 24-hour average PM2.5 standard to 35 µg/m^3.[3] In 2012, EPA revised the annual PM2.5 standard to 12 µg/m^3.[4]

The Valley was initially designated as a nonattainment area for the 1997 and 2006 standards under Subpart 1. A classification was not issued at that time because EPA was only requiring states to satisfy Clean Air Act requirements for PM2.5 under the

[1] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements Proposed Rule. 80 Fed. Reg. 55, (pp. 15340-15474) (2015, March 23) (to be codified as 40 CFR Parts 50, 51, and 93) http://www.epa.gov/airquality/particlepollution/pdfs/20150311proposal.pdf

[2] National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 138, pp. 38651-38701. (1997, July 18). (to be codified at 40 CFR Part 50) https://www.gpo.gov/fdsys/pkg/FR-1997-07-18/pdf/97-18577.pdf

[3] National Ambient Air Quality Standards for Particulate Matter; Final Rule. 71 Fed. Reg. 200, pp. 6114-61233. (2006, October 17). (to be codified at 40 CFR Part 50) http://www.gpo.gov/fdsys/pkg/FR-2006-10-17/html/06-8477.htm

[4] National Ambient Air Quality Standards for Particulate Matter; Final Rule. 78 Fed. Reg. 10, pp. 3086-3287. (2013, January 15). (to be codified at 40 CFR Parts 50, 51, 52, 53 and 58) http://www.gpo.gov/fdsys/pkg/FR-2013-01-15/pdf/2012-30946.pdf

general requirements of Subpart 1. The District subsequently adopted the *2008 PM2.5 Plan* and the *2012 PM2.5 Plan* to address Subpart 1 requirements for the standards following EPA's guidance.

In January 2013, the D.C. Circuit Court found that EPA erred in implementing the federal PM2.5 standard pursuant solely to the general implementation provisions of Subpart 1 without also considering the particulate matter-specific provisions of Subpart 4. As the result, EPA began requiring states and air districts to satisfy Subpart 1 and Subpart 4 requirements for PM2.5 standards. In addition to the PM-specific requirements, Subpart 4 also requires a nonattainment area classification system (i.e., Moderate and Serious classifications). Consequently, on June 2, 2014, EPA classified the Valley as Moderate nonattainment under Subpart 4 for the 1997 and 2006 PM2.5 standards, and required the District to submit additional documentation to fulfill all Subpart 4 requirements.[5]

Pursuant to Subpart 4, the Valley was classified as a Moderate nonattainment area for the 2012 PM2.5 standard effective April 15, 2015.[6] This *2016 PM2.5 Plan* addresses this newest PM2.5 standard and satisfies Subpart 1 and Subpart 4 requirements for a Moderate nonattainment area; provides a demonstration of impracticability of attainment by the Moderate area attainment date of 2021; and includes a request for reclassification to Serious nonattainment.

3.1.2 EPA Implementation Rule

When EPA revises an air quality standard, it considers the extent to which existing EPA regulations and guidance are sufficient to implement the standard and whether any revisions or updates to those regulations and guidance would be helpful or appropriate in facilitating the implementation of the revised standards. Where the nature of revisions to a standard indicates that additional regulations or guidance may be helpful, EPA provides those regulations and guidance to facilitate preparation of air quality plans (also called state implementation plans[7], or SIPs).

On March 23, 2015, EPA issued a proposed Implementation Rule in the Federal Register for implementing the PM2.5 NAAQS pursuant to both Subpart 1 and Subpart 4 requirements.[8] However, EPA did not promulgate a final implementation rule until August 2016 giving the District less than one month to draft this plan pursuant to new guidance.

[5] All areas designated nonattainment for PM2.5 are classified as Moderate by order of law (CAA §188(a))
[6] Air Quality Designations for the 2012 Primary Annual Fine Particle (PM2.5) NAAQS; Final Rule 80 RF. Vol.80 No10. pp. 2206-2284 (2015, January 15) (to be codified at 40 CFR part 81) http://www.gpo.gov/fdsys/pkg/FR-2015-01-15/pdf/2015-00021.pdf
[7] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule. 81 Fed. Reg. 164, pp. 58010-58162. (2016, August 24). (to be codified at 40 CFR Parts 50, 51, and 93). https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf
[8] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements Proposed Rule. 80 Fed. Reg. 55, (pp. 15340-15474) (2015, March 23) (to be codified as 40 CFR Parts 50, 51, and 93) http://www.epa.gov/airquality/particlepollution/pdfs/20150311proposal.pdf

3.1.3 Federal Requirements for PM2.5 Moderate Nonattainment Areas

Table 3-1 below provides a summary of the federal Clean Air Act requirements applicable to this *2016 PM2.5 Plan*.

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

Requirement	Federal Regulation/ Guidance	Summary
CAA Subpart 1 – Nonattainment Areas in General		
Reasonable Further Progress (RFP)	§172(c)(2)	Demonstrate reasonable further progress
Emissions Inventory	§172(c)(3)	An accurate and current emission inventory
Contingency Measures	§172(c)(9)	Contingencies if area fails to meet reasonable further progress or attain by the attainment date
CAA Subpart 4 – Additional Provisions for Particulate Matter Nonattainment Areas		
Attainment Date	§188(c)(1)	As expeditiously as practicable, but no later than end of 6th calendar year after designation as nonattainment
Permit Program	§189(a)(1)(A)	A permit program providing that permits are required for the construction and operation of new and modified major stationary sources
Attainment Demonstration	§189(a)(1)(B)	Demonstration of attainment by the applicable attainment date **or a demonstration that attainment by such date is impracticable**
Reasonably Available Control Measures (RACM)	§189(a)(1)(C)	Implement Reasonably Available Control Measures no later than four years after designation
Plan Submissions	§189(a)(2)(B)	No later than 18 months after designation as nonattainment
Extension of Attainment Date	§188(d)	No more than two one-year extensions may be issued
Request Reclassification to Serious	§188(b)	EPA may reclassify areas to Serious nonattainment
Quantitative Milestones	§189(c)(1)	Plan revisions demonstrating attainment submitted to EPA shall contain quantitative milestones which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress toward attainment by the applicable date
Precursors	§189(e)	The control requirements in effect under Subpart 4 for major stationary sources of PM10 shall also apply to major stationary sources of PM10 precursors, except where EPA determines that such sources do not contribute significantly to PM10 levels that exceed the standard.

3.2 CALIFORNIA STATE AMBIENT AIR QUALTY STANDARDS

California also sets ambient air quality standards for several pollutants, including PM2.5. California's annual average PM2.5 standard is currently 12 µg/m^3. There is no California standard for 24-hour average PM2.5. California has no specific attainment date for state air quality standards, nor does it require attainment plans. In fact, California Health and Safety Code §39602 states, "Notwithstanding any other provision of this division, the state implementation plan[9] shall only include those provisions necessary to meet the requirements of the [federal] Clean Air Act." Federal standards thus provide the framework for SIPs, and progress toward attainment of the federal standards also brings the Valley closer to the more stringent California standards.

3.3 PRECURSOR DEMONSTRATION

In its implementation rule, EPA provides three approaches for demonstrating that a particular precursor is not a significant contributor to ambient PM2.5 levels that exceed the standard:

- **Comprehensive Precursor Demonstration**. A particular precursor would not need to be addressed in control measures, RFP, quantitative milestones, or contingency measures for this plan if it is demonstrated that emissions of that precursor from all existing stationary, area, and mobile sources do not contribute significantly to PM2.5 levels.

- **Major Stationary Source Precursor Demonstration**. A particular precursor would not need to be addressed in control measures, RFP, quantitative milestones, or contingency measures for this plan for existing major stationary sources if it is demonstrated that emissions of that precursor from all existing major stationary sources do not contribute significantly to PM2.5 levels.

- **Nonattainment New Source Review (NNSR) Demonstration**. All new and modified Major stationary sources of a particular precursor would be exempt from regulation under the NNSR program if it is demonstrated that emissions of that precursor from new and modified Major stationary sources would not contribute significantly to PM2.5 levels.

This *2016 PM2.5 Plan* demonstrates that volatile organic compounds (VOC), oxides of sulfur (SOx), and ammonia are not significant precursors to exceedances of the PM2.5 standard through the *Comprehensive Precursor Demonstration* approach. As such, per EPA guidance, the District is not required to adopt control measures nor address RFP, quantitative milestones, or contingency measures for VOC, SOx, and ammonia.

[9] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule. 81 Fed. Reg. 164, pp. 58010-58162. (2016, August 24). (to be codified at 40 CFR Parts 50, 51, and 93). https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

The first type of analysis required for the *Comprehensive Precursor Demonstration* is an existing source contribution analysis that would demonstrate whether emissions of a precursor from all existing sources in the nonattainment area significantly contribute to PM2.5 concentrations that exceed the standard in the area. However, EPA failed to provide the necessary guidance to perform this analysis, committing to forthcoming technical guidance.

As a result, the California Air Resources Board (ARB) performed a precursor sensitivity analysis in accordance with EPA's implementation rule. A sensitivity analysis demonstrates the degree to which concentrations in a nonattainment area are impacted by reductions in a particular precursor. The sensitivity analysis for this *2016 PM2.5 Plan* demonstrates that in the Valley, ammonia, VOC, and SOx are not significant precursors (Appendix A).

3.4 REASONABLY AVAILABLE CONTROL MEASURES (RACM)

The Clean Air Act requires attainment plan provisions to assure that reasonably available control measures are implemented.

3.4.1 District RACM

The District has adopted two attainment plans in less than 17 months, *2015 Plan for the 1997 PM2.5 Standard*[10] (adopted April 16, 2015) and the *2016 Plan for the 2008 8-Hour Ozone Standard*[11] (adopted June 16, 2016). Each of these attainment plans contains comprehensive analyses to identify all potential emission reduction opportunities and determine if any of the identified potential emission reduction opportunities are technologically and economically feasible to implement in the Valley. In fact, the *2015 Plan for the 1997 PM2.5 Standard* goes beyond Moderate nonattainment area requirements in that it demonstrates Best Available Control Measures (BACM) and Most Stringent Measures (MSM).

As a part of the development of this *2016 PM2.5 Plan* the District followed EPA guidance for the control measure evaluation process for RACM, Reasonably Available Control Measures (RACT), and additional reasonable measures. The District identified and evaluated all existing and potential control measures for direct PM2.5 and PM2.5 precursors to determine if there are any emission reduction opportunities that would qualify as RACT or as an additional feasible measure that could be made into commitments for rule amendments or rule adoptions to expedite attainment in the Valley and demonstrate RACM. As part of the District's evaluation, no new rules or regulations were found to be adopted at the federal, state, or local level since the adoption of the two plans. In addition, the District did not find any new emission control technologies that could further reduce emissions from source categories in the Valley. Furthermore, the cost of technologies that were recently determined not to be cost effective has not

[10] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard. (2015, April 16).* http://www.valleyair.org/Air_Quality_Plans/docs/PM25-2015/2015-PM2.5-Plan_Bookmarked.pdf

[11] SJVUAPCD. 2016 Plan for the 2008 8-Hour Ozone Standard. (2016, June 16). http://www.valleyair.org/Air_Quality_Plans/Ozone-Plan-2016/Adopted-Plan.pdf

changed; therefore those technologies remain economically infeasible to implement in the Valley. As such, the District has determined that the analyses and the feasibility determinations presented in the two aforementioned plans are still current and correct. In light of these determinations, this *2016 PM2.5 Plan* includes the stationary source control measure analyses from each of the two attainment plans as attachments (Attachments 1 and 2).

The *2016 PM2.5 Plan* therefore satisfies RACM.

3.4.2 ARB RACM

Given the severity of California's air quality challenges, ARB has implemented the most stringent mobile source emissions control program in the nation. ARB's comprehensive strategy to reduce emissions from mobile sources includes stringent emissions standards for new vehicles, in-use programs to reduce emissions from existing vehicle and equipment fleets, cleaner fuels that minimize emissions, and incentive programs to accelerate the penetration of the cleanest vehicles beyond that achieved by regulations alone. ARB staff's analysis of these currently in place measures are presented in the District's *2015 Plan for the 1997 PM2.5 Standard* and the *2016 Plan for the 2008 8-Hour Ozone Plan,* and are included as Attachment 2.

ARB finds there are no additional reasonably available control measures that would advance attainment of the PM2.5 standard in the Valley. There are no reasonable regulatory control measures excluded from use in this plan; therefore, there are no emission reductions associated with unused regulatory control measures. Taken together, California's mobile program meets RACM requirements in the context of a Moderate area PM2.5 Plan.

3.4.3 Metropolitan Planning Organizations (MPOs) RACM:

As a part of the development of this *2016 PM2.5 Plan,* the Valley MPO's identified and evaluated all transportation control measures, as described in Section 3.9.6. As such, the District has determined that, at this time, all reasonable transportation control measures under MPO jurisdiction are being implemented and the adoption of any additional transportation control measures would not expedite attainment. Additionally, since the adoption of the District's *2015 Plan for the 1997 PM2.5 Standard* and the *2016 Plan for the 2008 8-Hour Ozone Plan*, no new control measures have been adopted. There are no reasonable regulatory control measures excluded from use; therefore, there are no emissions reductions associated with unused regulatory control measures.

3.5 REASONABLE FURTHER PROGRESS

CAA §171(1) defines reasonable further progress (RFP) as incremental emission reductions leading to the attainment date. Pursuant to EPA guidance provided in the Implementation Rule, the state must submit an RFP plan that includes three components: (1) an implementation schedule; (2) RFP projected emissions for each

quantitative milestone year (in this case, 2019 and 2022); and (3) an analysis demonstrating this schedule of aggregate emissions reductions achieves sufficient progress.

3.5.1 Implementation Schedule

Pursuant to the final Implementation Rule, an area that demonstrates impracticability of attainment shall provide an implementation schedule for all control measures identified as RACM and RACT and additional reasonable measures.

This requirement is demonstrated in Section 3.4 and in Table 3-2 and Table 3-3. All measures that demonstrate RACM and RACT for stationary, area, and mobile sources have been identified and adopted pursuant to commitments in previously adopted District attainment plans. Table 3-2 identifies many of the adopted District rules achieving new emissions reductions after 2013, the base year for this plan. However, even pre-2013 adopted/amended rules will continue to contribute emissions reductions that will assist the Valley in its progress toward attainment.

Table 3-2 Adopted District Rules Achieving Reductions Post-2013 and Contributing to PM2.5 Attainment Progress

District Rules		*Date Adopted or Last Amended*
4103	Open Burning	4/15/2010
4307	Boilers, Steam Generators, and Process Heaters 2 to 5 MMBtu/hr	5/19/2011
4308	Boilers, Steam Generators, and Process Heaters 0.075 to <2 MMBtu/hr	11/14/2013
4311	Flares	6/18/2009
4306/ 4320	Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr	10/16/2008
4352	Solid Fuel Fired Boilers, Steam Generators and Process Heaters	12/15/2011
4354	Glass Melting Furnaces	5/19/2011
4702	Internal Combustion Engines	8/18/2011
4901	Wood Burning Fireplaces and Wood Burning Heaters	9/18/2014
9610	State Implementation Plan Credit for Emission Reductions Generated Through Incentive Programs	6/20/2013

Table 3-3 Adopted or Amended ARB Regulations Contributing to Attainment

ARB Regulation	Adoption Date	Category
Revisions to On-Board Diagnostics System Requirements	09/24/2015	On-Road
2015 Low Carbon Fuel Standard Amendments	02/19/2015	Fuel
Commercialization of Alternative Diesel Fuels Regulation	02/19/2015	Fuel
2014 Amendments to Zero Emission Vehicle Regulation	10/23/2014	On-road

ARB Regulation	Adoption Date	Category
Amendments to Low Emission Vehicle III Criteria Pollutant Requirements for Light-and Medium-Duty Vehicles the Hybrid Electric Vehicle Test Procedures, and the Heavy-Duty Otto-Cycle and Heavy-Duty Diesel Test Procedures	10/23/2014	On-road
Amendments to the Enhanced Fleet Modernization Program Regulation	06/26/2014	On-road
Truck and Bus Rule Update	04/24/2014	On-road
Heavy-Duty Greenhouse Gas Phase 1: On-Road Heavy Duty Greenhouse Gas Emissions Rule, Tractor-Trailer Rule, Commercial Motor Vehicle Idling Rule, Optional Emission Standards	12/12/2013	On-road
Minor Modifications to the Zero Emission Vehicle Regulation	10/24/2013	On-road
Alternative Fuel Certification Procedures	09/26/2013	Fuel
Gasoline and Diesel Fuel Test Methods	01/25/2013	Fuel
Low Emission Vehicle III Greenhouse Gas and Zero Emission Vehicle Regulation Amendments for Federal Compliance Option	11/15/2012	On-road
Amendments to On-Board Diagnostics (OBD I and II) Regulations	08/23/2012	On-road
Amendments to Verification Procedures, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines	08/23/2012	On-road
Emergency Regulatory Amendments to the Tractor-Trailer Greenhouse Gas Regulation	02/29/2012	On-Road
Zero Emission Vehicle Standards for 2009 through 2017	01/26/2012	On-road
Advanced Clean Car Program	1/27/2012	On-road
Expanded Off-Road Recreational Vehicle Emission Standards	12/16/2011	Off-road
Cleaner In-Use Off-Road Equipment	12/17/2010	Off-road
Port Truck Modernization	12/17/2010	Off-road
Cleaner In-Use Heavy-Duty Trucks	12/16/2010	On-road
Accelerated Introduction of Cleaner Line-Haul Locomotives	06/24/2010	Other
Enhanced Fleet Modernization Program (formerly called the Expanded Vehicle Retirement Program)	06/24/2010	On-road
Smog Check Improvements	08/31/2009	On-road
Portable Outboard Marine Tanks	09/25/2008	Off-road
In-Use Heavy-Duty Trucks Regulation	12/11/2008	On-road
On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities	12/6/2007	On-road
In-Use Off-Road diesel Equipment Regulation	07/26/2007	Off-road
Clean Up Existing Harbor Craft	11/15/2007	Other
Voluntary Accelerated Retirement Regulation	12/07/2006	On-road
Emergency Regulation for Portable Equipment Registration Program, Airborne Toxic Control Measures and Portable and Stationary diesel-Fueled Engines	12/06/2006	Off-road
Airborne Toxic Control Measure for Stationary Compression Ignition Engines (Agricultural Eng. Exemption removal)	11/16/2006	Other
Distributed Generation Guidelines and Regulations	10/19/2006	Other
Zero Emission Bus Regulation	10/19/2006	On-road
Heavy-Duty In-Use Compliance Regulation	09/28/2006	On-road
On-Board Diagnostic II	09/28/2006	On-road
Off-Highway Recreational Vehicles and Engines	07/20/2006	Off-road
California Motor Vehicle Service Information Rule	06/22/2006	On-road
Portable Equipment Registration Program	06/22/2006	Off-road
Fork Lifts and Other Industrial Equipment (Large Off-Road Spark Ignition Engines > 1 liter)	05/26/2006	Off-road
Technical Amendments to Evaporative Exhaust and Evaporative Emissions Test Procedures	05/25/2006	On-road

ARB Regulation	Adoption Date	Category
Diesel Verification Procedure, Warranty & In-Use	03/23/2006	On-road
AB1009 Heavy-Duty Vehicle Smoke Inspection Program	01/26/2006	On-road
Diesel Particulate Matter Control Measure for On-Road Heavy-Duty Diesel-Fueled Vehicles Owned or Operated by Public Agencies and Utilities	12/08/2005	On-road
Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards	12/08/2005	Off-road
Marine Inboard Sterndrive Engines	11/17/2005	Off-road
Requirements to Reduce Idling Emissions from New and In-Use Trucks, Beginning in 2008	10/20/2005	On-road
2007-2009 Model-Year Heavy Duty Urban Bus Engines and the Fleet Rule for Transit Agencies	09/15/2005	On-road
Portable Fuel Containers (PFC) [Part 1 of 2]	09/15/2005	Off road
Portable Fuel Containers (PFC) [Part 2 of 2]	09/15/2005	Off road
On-Board Diagnostic System Requirements for 2010 and Subsequent Model-Year Heavy-Duty Engines (HD OBD)	07/21/2005	On-road
Airborne Toxic Control Measure for Stationary Compression Ignition Engines amendments	05/26/2005	Other
Transit Fleet Rule	02/24/2005	On-road
Off-Road Compression Ignition Engines	12/09/2004	Off-road
Emergency Regulation for Temporary Delay of Diesel Fuel Lubricity Standard	11/24/2004	Fuels
Diesel Fuel Standards for Harbor Craft & Locomotives	11/18/2004	Fuels
Greenhouse Gas	09/23/2004	On-road
Airborne Toxic Control Measure for Diesel Particulate from Diesel Fueled Commercial Vehicle Idling	07/22/2004	On-road
Urban Bus Engines/Fleet Rule for Transit Agencies	06/24/2004	On-road
Engine Manufacturer Diagnostic System Requirements for 2007 and Subsequent Model Heavy Duty Engines	05/20/2004	On-road
Heavy Duty Diesel Engine-Chip Reflash	03/27/2004	On-road
Airborne Toxic Control Measure for Diesel-Fueled Portable Engines	02/26/2004	Off-road
Modifications to the Statewide Portable Equipment Registration Program (PERP) Regulations	02/26/2004	Off-road
CA Motor Vehicle Service Information Rule	01/22/2004	On-road
Airborne Toxic Control Measure for Diesel Particulate for Transport Refrigeration Units	12/11/2003	On-road
Airborne Toxic Control Measure for Stationary Compression Ignition Engines	12/11/2003	Other
Diesel Retrofit Verification Procedure, Warranty and In-Use Compliance Requirements Amendments	12/11/2003	On-road
Small Off-Road Engines (SORE)	09/25/2003	Off-road
Solid Waste Collection Vehicles	09/24/2003	On-road
Off-Highway Recreation Vehicles	07/24/2003	Off-road
Specifications for Motor Vehicle Diesel Fuel	07/24/2003	Fuels
Zero Emission Vehicle Amendments for 2003	03/25/2003	On-road
Airborne Toxic Control Measure for Diesel Particulate from School Bus Idling	12/12/2002	On-road
Low Emission Vehicles II. Align Heavy Duty Gas Engine Standards with Federal Standards; minor administrative changes	12/12/2002	On-road
Revision to Transit Bus Regulations Amendments	10/24/2002	On-road
Diesel Retrofit Verification Procedure, Warranty and In-Use Compliance Requirements	05/16/2002	On-road
On-Board Diagnostic II Review Amendments	04/25/2002	On-road
Airborne Toxic Control Measure for Outdoor Residential Waste Burning	02/21/2002	Other
Voluntary Accelerated Light Duty Vehicle Retirement Regulations	02/21/2002	On-road
California Motor Vehicle Service Information Rule	12/13/2001	On-road
Distributed Generation Guidelines and Regulations	11/15/2001	Other

ARB Regulation	Adoption Date	Category
Low Emission Vehicle Regulations	11/15/2001	On-road
Heavy Duty Diesel Engine Standards for 2007 and Later	10/25/2001	On-road
Marine Inboard Engines	07/26/2001	Off-road
Zero Emission Vehicle Infrastructure and Standardization of Electric Vehicle Charging Equipment	06/28/2001	On-road
Zero Emission Vehicle Regulation Update	01/25/2001	On-road
Heavy Duty Diesel Engines "Not-to-Exceed (NTE)" Test Procedures	12/07/2000	On-road
Light-and Medium Duty Low Emission Vehicle Alignment with Federal Standards. Exhaust Emission Standards for Heavy Duty Gas Engines	12/07/2000	On-road
Air Toxic Control Measure for Chlorinated Toxic Air Contaminants from Automotive Maintenance and Repair Facilities	04/27/2000	Other
Transit Bus Standards	02/24/2000	On-road
Off-Road Compression Ignition Engines	01/27/2000	Off-road

3.5.2 RFP projected emissions for direct PM2.5 and all PM2.5 plan precursors for each applicable milestone year

The emissions inventory for direct PM2.5 and PM2.5 precursors for the two applicable milestone years (2019 and 2022) are included in Appendix B (Emissions Inventory).

3.5.3 Reasonable Further Progress Demonstration

CAA §171(1) defines RFP as incremental emission reductions leading to the attainment date. Pursuant to the Final Implementation Rule issued by EPA, for areas that demonstrate impracticability of attainment by the Moderate area deadline "the state must demonstrate either generally linear or stepwise emissions reductions toward the full amount of reductions that will be achieved by that deadline, *i.e*., the amount that reflects implementation of all of the control measures identified as RACM and RACT and additional reasonable measures for the entire period of the applicable attainment plan."

Additionally, in the EPA proposed approval of the District's *2012 PM2.5 Plan,* EPA states that it is reasonable to find that full implementation of a control strategy that satisfies the Moderate area control requirements represents reasonable further progress toward attainment.[12]

Since the entire period of this plan is through 2022, and the Final Implementation Rule does not require an attainment date when the Moderate area is demonstrating impracticability, the RFP demonstration shows linear progress from the base year through the 2019 milestone year to the 2022 planning horizon. RFP is demonstrated for direct PM2.5 and for oxides of nitrogen (NOx). VOC, SOx, and ammonia are not significant precursors (see Appendix A) and are therefore not included in this

[12] Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; California; San Joaquin Valley Moderate Area Plan and Reclassification as Serious Nonattainment for the 2006 PM2.5 NAAQS; Proposed Rule. 80 Fed. Reg. 8, pp. 1816-1846. (2015, January 13) (to be codified at 40 CFR Parts 52 and Part 81). http://www.gpo.gov/fdsys/pkg/FR-2015-01-13/pdf/2015-00270.pdf

demonstration. This RFP is demonstrated for the nonattainment area as a whole and is shown below:

Step 1: Determine the total reductions from the 2013 baseline emission inventory that must be achieved to show progress toward the full amount of reductions projected for the entire period of this plan (2022).

Table 3-4 Total Reductions Necessary to Show Progress Toward 2022 (annual average tpd)

Pollutant	2013 Baseline Emissions Inventory	Emissions Level in 2022	Reductions with Implemented Control Measures
Direct PM2.5	63.4	59.5	3.9
NOx	318.1	185.2	132.9

Step 2: Determine the fraction of reductions that are achieved in each RFP milestone year. The base year of 2013 and final plan year of 2022 span a 9-year period.

- 2019 occurs at year six of nine (6÷9), so **67%** of emissions reductions must occur by 2019.
- 2022 occurs at year nine of nine (9÷9), so **100%** of emissions reductions must occur by 2022.

Step 3: Determine the RFP target emissions levels using reduction fractions.

Table 3-5 Target Emissions Levels for RFP (annual average tpd)

Pollutant	2013 Emissions Inventory	Reductions with Implemented Control Measures	2019		2022	
			Tons to be reduced *(B x 67%)*	RFP target emissions level *(A-C)*	Tons to be reduced *(B x 100%)*	RFP target emissions level *(A-E)*
	A	*B*	*C*	*D*	*E*	*F*
Direct PM2.5	63.4	3.9	2.6	60.8	3.9	59.5
NOx	318.1	132.9	88.6	229.5	132.9	185.2

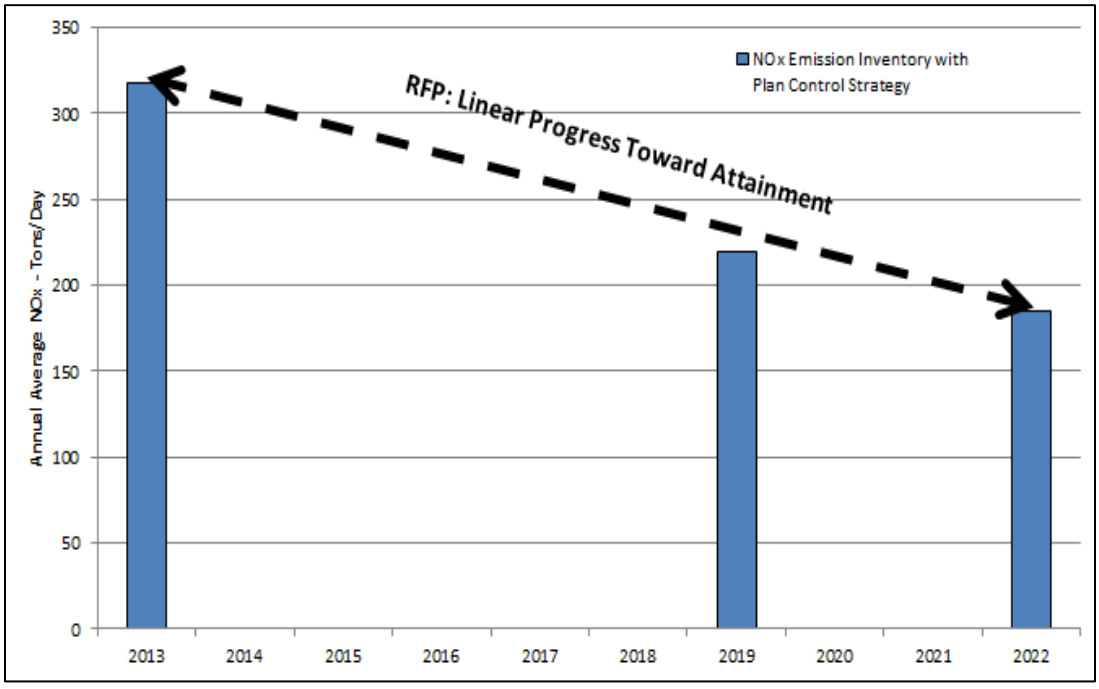
Step 4: Compare RFP target emissions level (Table 3-5) to the projected emissions inventory (Table 3-4) to determine compliance with RFP targets.

Table 3-6 RFP Target Demonstration (2019 and 2022)

	2019			2022		
	RFP target emissions level	Projected emissions inventory	RFP target met?	RFP target emissions level	Projected emissions inventory	RFP target met?
Direct PM2.5	60.8	60.2	**Yes**	59.5	59.5	**Yes**
NOx	229.1	219.4	**Yes**	185.2	185.2	**Yes**

Figure 3-1 below is the visual representation of the NOx required to demonstrated Reasonable Further Progress.

Figure 3-1 NOx Emissions Required to Demonstrate Reasonable Further Progress



3.6 QUANTITATIVE MILESTONES

Pursuant to CAA §189(c)(1), states must demonstrate quantitative milestones which are to be achieved every three years until the area is redesignated attainment and which demonstrate reasonable further progress toward attainment of the applicable attainment date. Additionally, under CAA §189(c)(2), no later than 90 days after the date on which a milestone applicable to the area occurs, each State in which all or part of such area is

located shall submit to EPA a demonstration that all measures in the approved plan have been implemented and that the milestone has been met. The quantitative milestone years for this *2016 PM2.5 Plan* are 2019 and 2022.

These milestones focus on implementation of regulatory efforts, as well as characterization of ongoing air quality progress. Together they supplement the emission inventory reporting and serve as a quantifiable means to measure progress towards attainment. The District will submit reports to EPA at a later date documenting the following milestones:

2019 Milestone:

1. A list of measures in the SIP control strategy and key implementation requirements through 2019, in accordance with the RFP plan, including:
    a. Compliance milestones in the ARB Truck and Bus Rule and related implementation or enforcement actions that ARB will complete in 2019.
    b. Compliance milestones in District Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) and related implementation or enforcement actions that the District will complete in 2019.
2. Updated emission inventories.

2022 Milestone:

1. A list of measures in the SIP control strategy and key implementation requirements through 2022, in accordance with the RFP plan, including:
    a. Compliance milestones in the ARB Truck and Bus Rule and related implementation or enforcement actions that ARB will complete in 2022.
2. Updated emissions inventories.

3.7 CONTINGENCY MEASURES

Contingency measures are extra emissions reductions that go into effect without further regulatory action in the event the State fails to reach an RFP target or attainment. The measures must be “extra” in the sense that the reductions are not accounted for in RFP or in the attainment demonstration. Contingency reductions must be fully adopted rules or controls that are ready to be implemented upon a determination of failure to meet RFP, a quantitative milestone (or report), or to attain. Per the EPA implementation rule, crediting an area for “excess” emission reductions to satisfy contingency is not allowable for Moderate areas that cannot practicably attain. For areas that cannot attain by the attainment date, states must implement all control measures determined to be reasonable. In such cases, the contingency measures for attainment for such nonattainment areas would necessarily exceed the criteria for determining whether a measure is reasonable for purposes of RACM/RACT and additional reasonable measures. Contingency measures should occur with minimal to no further regulatory action by local, state, or federal governments. The *2016 PM2.5 Plan* should contain trigger mechanisms and a schedule for the contingency measure implementation.

3.7.1 Contingencies for Failure to Attain

Per EPA guidance, this *2016 PM2.5 Plan* does not include contingencies for failure to attain. Contingencies for attainment are implemented if a region fails to attain a NAAQS by the attainment date. Attainment year contingencies for nonattainment by the Moderate area date are not applicable to the Valley for this *2016 PM2.5 Plan.* As stated in the final implementation rule, EPA does not interpret the requirement for contingency measures for failing to attain the NAAQS by the applicable attainment date to apply to a Moderate area that a state demonstrates cannot practicably attain the NAAQS by the statutory attainment date. Rather, it is appropriate for the state to identify and adopt contingency measures for failing to attain the NAAQS in a timely way as part of the Serious area attainment plan that will be developed once the EPA reclassifies such area. This approach is further supported by the EPA proposed approval of the District's *2012 PM2.5 Plan* whereby EPA determines that contingency measures for failure to attain need not be included as part of a Moderate area plan. "Section 189(b)(1)(A) differentiates between attainment plans that provide for timely attainment and those that demonstrate that attainment is impracticable. Where the SIP includes a demonstration that attainment by the applicable attainment date is impracticable, the state need only submit contingency measures to be implemented if an area fails to meet RFP."[13]

3.7.2 Contingency Demonstration

The contingency year for this *2016 PM2.5 Plan* is 2019. Since the District does not have an attainment date per the impracticability demonstration, the year 2022 was used in lieu of an attainment date strictly for the purpose of calculating the linear reductions needed for the RFP milestone of 2019, and is therefore not a milestone year requiring a contingency demonstration. As demonstrated in Appendix A, SOx, VOC, and ammonia are not significant precursors and are therefore not included in this demonstration. Per the EPA Implementation Rule, contingency should be equivalent to one year's worth of reductions needed for RFP. In the rare event that an area is unable to identify contingency measures, the state should provide a reasoned justification why a smaller amount of emissions reductions is appropriate.

Areas, like the Valley, that have significant nonattainment challenges have developed several generations of aggressive and far-reaching emission reduction measures to meet various Clean Air Act requirements. The result of this "no stone left unturned" policy is that when viable emission reductions are identified, they are implemented to contribute to expeditious attainment. Reductions are not usually held in reserve to be used only if an area fails to meet a milestone. As a result, contingency measure demonstrations in the Valley have been a challenge, historically. Table 3-7 shows how these approaches together generate enough emissions reductions to meet the contingency reductions required for this plan.

[13] Approval and Promulgation of Implementation Plans; Designation of Areas for Air Quality Planning Purposes; California; San Joaquin Valley Moderate Area Plan and Reclassification as Serious Nonattainment for the 2006 PM2.5 NAAQS; Proposed Rule. 80 Fed. Reg. 8, pp. 1816-1846. (2015, January 13) (to be codified at 40 CFR Parts 52 and Part 81). http://www.gpo.gov/fdsys/pkg/FR-2015-01-13/pdf/2015-00270.pdf

Table 3-7 Demonstration of Sufficient Contingency Reductions

	2019	Data reference
PM2.5		
Surplus from RFP	*0.6*	Table 3-9
Subtract PM2.5 reductions, trade for NOx	*-0.2*	1:8.8 trading ratio*
Total contingency reductions achieved	0.4	
Contingency reductions required	0.4	Table 3-8
Contingency need met?	**YES**	
NOx		
Surplus from RFP	*9.7*	Table 3-9
Surplus from amendments to Rule 4905	*0.3*	Section 3.7.2
Substitute PM2.5 reductions	*1.8*	1:8.8 trading ratio*
SIP-creditable Incentives	*3.0*	n/a
Total contingency reductions achieved	14.8	
Contingency reductions required	14.8	Table 3-8
Contingency need met?	**YES**	
* 1 ton of direct PM2.5 emissions reduced is equivalent to 8.8 tons of NOx reductions as demonstrated in Appendix A and summarized in Section 3.7.3. These ratios are conservative estimates summarizing the plan as a whole, not reflecting ratios appropriate for New Source Review (NSR)		

This demonstration was made using the following steps:

Step 1: Determine 1-Year's worth of RFP

Table 3-8 Contingency Emissions Reductions Target (in tons per day, or tpd)

	A	B	C	D
Pollutant	**2013 Inventory**	**2022 Inventory**	**Emissions Reduced**	**1 year's worth of RFP**
	(Appendix B)	(Appendix B)	(A-B)	(C / 9 years)
PM2.5	63.4	59.5	3.9	0.4
NOx	318.1	185.2	132.9	14.8

Step 2: Identify surplus reductions to satisfy contingency

Contingency measures can include measures already adopted and scheduled for implementation, as long as these measures are not relied on to provide emission reductions needed to provide for RFP or expeditious attainment. Based on general contingency requirements, the District is utilizing two types of contingency measures:

A. Surplus reductions from implementation of traditional regulations
B. SIP-creditable incentive based emissions reductions

Step 2A: Quantify surplus reductions from implementation of traditional regulations

As shown in the RFP demonstration, more emissions reductions than the minimum needed to demonstrate RFP in 2019 are being achieved. The difference between the RFP target emissions level and the actual projected emissions level can serve as

contingency reductions. The control measures achieving the contingency reductions are summarized in Tables 3-2 and 3-3.

Table 3-9 Reductions Surplus to RFP (2019, tpd)

	A	B	C
	RFP target emissions level	**Projected emissions inventory**	**Surplus to RFP** (A-C)
PM2.5	60.8	60.2	0.6
NOx	229.1	219.4	9.7

In addition to the emissions in the emission inventory that are surplus to the RFP (see Table 3-9) an additional source of surplus reductions from RFP include the NOx emissions reduced from the January 2015 amendments to District Rule 4905 (Natural Gas-Fired, Fan-Type Central Furnaces). These reductions are not included in the inventory for this *2016 PM2.5 Plan* and are therefore surplus. Amendments to Rule 4905 resulted in a reduction of 0.32 tpd of NOx in 2019.

Step 2B: Quantify SIP-creditable incentive based emission reductions

Voluntary incentive programs achieve emissions reductions beyond those achieved by regulations alone. Incentive programs accelerate the adoption of cleaner technologies and encourage the use of cleaner technologies by those not yet subject to air quality regulations. Incentives allow the District to reduce emissions from source categories outside of the District's traditional regulatory authority, as well as source categories where financial hardship would otherwise prevent traditional control strategies from being implemented. The District will continue to seek opportunities for additional incentive reductions Valley-wide to achieve emissions reductions for contingency and expedite public health benefits.

The District proposes to claim **3.0 tpd of NOx reductions** through Rule 9610 and related incentive programs to use as contingency for 2019. The specific grant programs expected to provide the requisite emission reductions, and provides the documentation and related enforceable commitments necessary to support a SIP submission that relies on incentive programs for SIP emission reductions credits, similar to the ARB *Report on Reductions Achieved from Incentive-Based Emission Reduction Measures in the San Joaquin Valley* as approved by EPA on August 12, 2016,[14] are included in Appendix C.

[14] EPA. R*evision to the California State Implementation Plan; San Joaquin Valley; Demonstration of Creditable Emission Reductions from Economic Incentive Programs.* Final Action. 81 Fed. Reg. 156, pp. 53300-53309. (2016, August 12) (to be codified at 40 CFR Part 52). https://www.gpo.gov/fdsys/pkg/FR-2016-08-12/pdf/2016-18903.pdf

3.7.3 Trading Ratios

Results from sensitivity simulations involving ±15% scaling of controllable $PM_{2.5}$ precursors were also used to calculate inter-pollutant trading ratios. The inter-pollutant trading ratios (relative to NO_x) were calculated as the ratio in the reduction of annual $PM_{2.5}$ DV at a particular location by reducing a ton of other $PM_{2.5}$ precursors (i.e., primary $PM_{2.5}$, SO_x, NH_3, and VOCs) emissions as compared to a ton of NO_x emission reductions. To be consistent with past trading ratio determination in the SJV, here, we focused on the response of $PM_{2.5}$ concentrations at the two Bakersfield sites to emission reductions. Among them, the Bakersfield – Planz site has the highest future year annual $PM_{2.5}$ DV. Table 3-10 shows the trading ratios at Bakersfield – Planz and Bakersfield – California as well as the average ratio of these two sites. The primary $PM_{2.5}$ to NO_x trading ratio was determined to be approximately 9, which is consistent with that from the 2008 PM2.5 SIP.[15]

Table 3-10 Inter-pollutant trading ratios for annual PM2.5 in the Valley

	$PM_{2.5}$ relative to NO_x	NH_3 relative to NO_x	SO_x relative to NO_x	VOC relative to NO_x
Bakersfield – Planz	8.9	0.06	2.8	0.0
Bakersfield – California	8.7	0.06	2.5	0.0
Average	8.8	0.06	2.7	0.0

3.8 PERMITTING PROGRAM

Pursuant to CAA §189(a)(1)(A), a Moderate nonattainment area shall submit a SIP that includes a permit program meeting the requirements of §173 for the construction and operation of new and modified major sources of PM10. The District's April 21, 2011 version of Rule 2201 (New and Modified Stationary Source Review Rule) fully complies with and satisfies Subpart 4 requirements for Moderate areas.

On April 21, 2011, the District's NSR rule (Rule 2201) was amended to address the federal PM2.5 nonattainment NSR permitting requirements of Subpart 1. These amendments were based on EPA's two final rules called "Clean Air Fine Particle Implementation" (promulgated on April 25, 2007, 72 FR20586)[16] and "Implementation of the New Source Review (NSR) Program for Particulate Matter Less than 2.5 Microns" (PM2.5 NSR Rule) requirements (promulgated on May 16, 2008, 73 FR28321[17]) which outlined the necessary requirements of Subpart 1 of Part D of Title I of the CAA. Items addressed in the April 2011 amendments to Rule 2201 included defining major sources

[15] SJVAPCD (2013), Quantification of Contingency Reductions for the 2008 PM2.5 Plan, available at http://www.valleyair.org/air_quality_plans/docs/American-Lung-Association.pdf
[16] https://www.gpo.gov/fdsys/pkg/FR-2007-04-25/pdf/E7-6347.pdf
[17] https://www.gpo.gov/fdsys/pkg/FR-2008-05-16/pdf/E8-10768.pdf

of PM2.5 at 100 tons per year, establishing PM2.5 significant emissions rates to determine when NSR requirements apply to modified sources, establishing the PM2.5 offset ratio, and allowing for PM2.5 interpollutant emission offset ratios.

Rule 2201 requirements are more stringent than those required to satisfy Subpart 4 for areas designated as Moderate nonattainment. On February 18, 2016, District Rule 2201 was amended to comply with federal requirements for Serious nonattainment areas for federal PM2.5 standards by lowering the PM2.5 major source emission threshold from 100 tpy to 70 tpy. Although the 2016 amendments have not been forwarded by ARB to EPA for inclusion into the SIP, the District is fully implementing the rule as a locally and federally enforceable program that implements the Serious area NSR requirements.

3.8.1 Permitting PM2.5 Precursors at Major Sources

Clean Air Act §189(e) requires the control of PM10 precursors at major stationary sources "except where the Administrator determines that such sources do not contribute significantly to PM10 levels which exceed the standard in the area." By definition, PM2.5 is a subset of PM10 and therefore this section of the Clean Air Act is also applicable to PM2.5.[18]

PM2.5 precursors are emissions that potentially contribute to PM2.5 formation, including NOx, SOx, VOC or ammonia. In the Valley, VOC and ammonia are not precursors that contribute significantly to the formation of PM2.5, as demonstrated in the multiple District attainment plans already adopted and submitted to EPA.

Under the current SIP-approved Rule 2201, section 3.31, NOx and SOx are currently identified and controlled as precursors to PM2.5, and thus Rule 2201 meets the requirements of Subpart 4 with respect to NOx and SOx as precursors.

3.8.1.1 Precursor Sensitivity Analysis for Ammonia and VOC

The CAA recognized that there may be circumstances in which it is not appropriate to subject certain precursors to permitting control requirements. Based on the scientific data and modeling analyses outlined for this plan, VOC, SOx and ammonia do not significantly contribute to PM2.5 formation in the Valley (see Appendix A) for plan-development purposes.

However, the newly revised guidance on precursor sensitivity analyses for NSR purposes in EPA's recently signed (July 29, 2016) PM2.5 implementation rule comes too late to be implemented with this plan. Therefore, the District expects to submit such precursor sensitivity modeling as a SIP amendment with the District's next NSR Rule adoption staff report. This rule adoption process, to address Serious area NSR requirements, is expected to take place prior to August of 2017. In the meantime, no

[18] U.S. Court of Appeals, District of Columbia Circuit. Natural Resources Defense Council (NRDC) and Sierra Club, Petitioners v. EPA January 4, 2013. D.C. Circuit Court

interpollutant trading of precursors for PM 2.5, or visa versa, will be allowed under the District's NSR rule requirements until such time as the District's NSR rule can be updated to include the appropriate NSR precursor sensitivity modeling.

3.8.1.2 Major Source and Major Modification Thresholds

On June 2, 2014, EPA classified the Valley as a Moderate nonattainment area for PM2.5 under Subpart 4. Under this classification, major sources of PM2.5 are defined as sources with a potential to emit equal to or greater than 100 tons per year (tpy). Rule 2201, as amended April 2011, includes this threshold.

In addition, Rule 2201 specifically identifies SOx and NOx as precursors of PM2.5, and includes appropriate thresholds for determining whether proposed emission increases of PM2.5, SOx or NOx constitute a major modification of a major PM2.5 source under Subpart 4. Rule 2201 also includes all the appropriate federal requirements for proposed major sources and major modifications (notification, BACT, offsets, etc.), none of which are specific to Subpart 4 and are therefore already included in the latest SIP-approved version of Rule 2201.

3.9 TRANSPORTATION CONFORMITY

Section 176(c) of the Federal Clean Air Act (CAA) establishes transportation conformity requirements which are intended to ensure that transportation activities do not interfere with air quality progress. The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals *conform to* applicable state implementation plans (SIP) before being approved by a Metropolitan Planning Organization (MPO). Conformity to a SIP means that proposed activities must not:

(1) Cause or contribute to any new violation of any standard,
(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.

A SIP analyzes the region's total emissions inventory from all sources for purposes of demonstrating rate of progress (RFP), attainment, or maintenance. The portion of the total emissions inventory from on-road highway and transit vehicles in these analyses becomes the "motor vehicle emissions budget." [19] Motor vehicle emissions budgets are the mechanism for ensuring that transportation planning activities conform to the SIP. Budgets are set for each criteria pollutant or its precursors, and it is set for each RFP milestone year and the attainment year. Subsequent transportation plans and programs produced by transportation planning agencies are required to conform to the SIP by

[19] 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. of the Federal Transit Laws. Part 93, Subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.

demonstrating that the emissions from the proposed plan, program, or project do not exceed the budget levels established in the applicable SIP.

3.9.1 PM2.5 Requirements for Conformity

On April 25, 2007 EPA published in the Federal Register the *Clean Air Fine Particle Implementation Rule* (Final Rule) implementing the 1997 PM2.5 NAAQS (see 72 FR 20586). The Final Rule addresses the types of motor vehicle emissions that must be addressed when setting transportation conformity budgets. In the Final Rule, EPA notes that: "RFP plans, attainment demonstrations, and maintenance plans must include a budget for direct PM2.5 emissions, except for certain cases as described below. All PM2.5 SIP budgets would include directly emitted PM2.5 motor vehicle emissions from tailpipe, brake wear, and tire wear. States should also consider whether re-entrained road dust or highway and transit construction dust are significant contributors and should be included in the PM2.5 budget." (72 FR 20645) The rule goes on to state that: 'Under certain circumstances, directly emitted PM2.5 from on-road mobile sources may be found an insignificant contributor to the air quality problem and NAAQS.'

The conformity rule applies for particles with aerodynamic diameter less than or equal to a nominal 2.5 micrometers (PM2.5). NOx must also be addressed as a precursor unless there is a finding of insignificance.

Section 93.102(b)(2)(iv and v) of the conformity rule also identifies Volatile Organic Compounds (VOC), SOx, and/or ammonia as PM2.5 precursor pollutants that must also have a motor vehicle emissions budget if that precursor is deemed significant. In addition, Section 93.102(b)(3) identifies re-entrained road dust from paved and unpaved roads as PM2.5 emissions that must also have a motor vehicle emissions budget if deemed significant. While the applicability section of the rule does not address fugitive dust from road construction specifically, the rule does indicate that the interagency consultation process should be used during the development of PM2.5 SIPs to determine when construction emissions are a significant contributor.

3.9.2 Factors for Determining Significance

The conformity rule states that the following factors will be considered in making significance or insignificance findings for PM2.5 precursors: the contribution of on-road emissions of the precursor to the total 2013 baseline SIP inventory; the current state of air quality for the area; the results of speciation monitoring for the area; the likelihood that future motor vehicle control measures will be implemented for a given precursor; and projections of future on-road emissions of the precursor.

Significance findings for re-entrained road dust emissions will be based on a review of the following factors: the contribution of road dust to current and future PM2.5 nonattainment; an area's current design value for the PM2.5 standard; whether control of road dust appears necessary to reach attainment; and whether increases in re-entrained dust emissions may interfere with attainment. Such a review would include

consideration of local air quality data, air quality modeling results, or emissions modeling results.

3.9.3 Assessment of Significance

This SIP submittal establishes motor vehicle emission budgets for primary emissions of PM2.5 from vehicle exhaust, tire and brake wear, and the precursor NOx. Other precursors are not considered significant for the reasons discussed in the following sections.

VOC: On-road mobile emissions account for approximately 10 percent of the Valley's total VOC emissions in the budget years. Air quality modeling for this *2016 PM2.5 Plan* indicates that control of VOC is generally ineffective in the control of PM2.5 and in some cases may actually result in increases in PM2.5 levels. Therefore, on road VOC emissions are considered insignificant and this *2016 PM2.5 Plan* does not establish VOC motor vehicle emissions budgets for conformity purposes.

SOx: On road mobile exhaust estimates are less than 1 ton per day Valley-wide in the budget years which equates to less than 10 percent of the total SOx emissions inventory. SOx controls are focused on industrial sources, which contribute almost 80 percent of the total inventory. Therefore, on road SOx emissions are considered insignificant and this *2016 PM2.5 Plan* does not establish SOx motor vehicle emissions budgets for conformity purposes.

Paved Road Dust: Paved road dust PM2.5 emissions account for up to 10 percent of the Valley's total direct PM2.5 emissions inventory in the budget years. While there are no additional fugitive dust controls included in the attainment demonstration for this *2016 PM2.5 Plan*, paved road dust is controlled through the PM10 Plan and evaluated as part of PM10 conformity determinations. Analysis of average composition data from ambient air monitoring show paved road dust contributes about 2 percent to the design values in the Valley. Therefore, paved road dust emissions are considered insignificant and this *2016 PM2.5 Plan* does not establish paved road dust motor vehicle emissions budgets for conformity purposes.

Unpaved Road Dust: Total unpaved road dust is less than 10 percent of the Valley's total direct PM2.5 emissions inventory in the budget years. Local roads are one of seven subcategories of unpaved road dust, and as noted above on-road dust makes a small contribution to design values in the Valley. While there are no additional fugitive dust controls included in the *2016 PM2.5 Plan*, unpaved road dust is controlled via the PM10 Plan, (including the prohibition of any new local unpaved roads), and unpaved road dust is evaluated as part of PM10 conformity determinations. Analysis of average composition data from ambient air monitoring shows unpaved road dust contributes less than 2 percent to the design values in the Valley. Therefore, unpaved road dust is considered insignificant and this *2016 PM2.5 Plan* does not establish emissions budgets for unpaved road dust for conformity purposes.

Construction Dust: Total construction and demolition dust is less than 5 percent of the Valley's total direct PM2.5 emissions inventory in the budget years. Because road construction is one of five subcategories of construction dust, its contribution to the total direct PM2.5 inventory would be even less than the total construction and demolition category. While there are no additional fugitive dust controls included in the *2016 PM2.5 Plan*, road construction dust is controlled extensively via the PM10 Plan and is evaluated as part of PM10 conformity determinations. Therefore, road construction dust is considered insignificant and this *2016 PM2.5 Plan* does not establish emissions budgets for road construction dust for conformity purposes.

Ammonia: The contribution of ammonia from on-road motor vehicles is approximately 1 percent of the total valley-wide ammonia inventory and is therefore considered insignificant. This *2016 PM2.5 Plan* also establishes ammonia is not a limiting precursor in the formation of PM2.5. Therefore, ammonia on road emissions budgets are not established by this *2016 PM2.5 Plan*.

3.9.4 Conformity Budgets

This *2016 PM2.5 Plan* includes reasonable further progress demonstrations for 2019 and 2022. Annual average daily emissions are used in the plan consistent with the way the standard is measured. Consequently, conformity budgets have been set with EMFAC2014 for annual average daily emissions in the analysis years 2019 and 2022.

Section 93.124(e) of the federal conformity rule states that nonattainment areas with more than one MPO may establish motor vehicle emission budgets for each MPO in the non-attainment area. This *2016 PM2.5 Plan* establishes county-level emission budgets for each MPO in the Valley.

The transportation conformity budgets developed for this *2016 PM2.5 Plan* include more recent travel activity projections provided by the Valley MPOs. This travel activity is consistent with the Draft 2017 Federal Transportation Improvement Plan (2017 FTIP) for each of the eight Valley MPOs. Using this more recent activity results in on road emissions less than one percent lower in 2018 and less than two percent lower than the 2020 attainment demonstration inventory.

The budgets have been constructed to be consistent with the on-road emissions inventory using the following method:

1) Sum the emissions results for each county.
2) Calculate the budget by rounding each county's values to the nearest tenth ton (for both NOx and PM2.5) using conventional rounding.

This *2016 PM2.5 Plan* establishes subarea county emission budgets for PM2.5 and NOx for the horizon years 2019 and 2022 and are summarized in Table 3-11. The attachment on the following page provides more detailed calculations.

Table 3-11 San Joaquin Valley Transportation Conformity Budgets* (Annual average tons per day)

County	2019		2022	
	PM2.5	NOx	PM2.5	NOx
Fresno	0.9	27.6	0.9	21.3
Kern (SJV)	0.8	25.1	0.8	19.4
Kings	0.2	5.1	0.2	4.1
Madera	0.2	4.6	0.2	3.4
Merced	0.3	9.4	0.3	7.5
San Joaquin	0.6	12.7	0.6	9.3
Stanislaus	0.4	10.5	0.4	8.0
Tulare	0.4	9.3	0.4	6.9

* Budgets based on Draft 2017 FTIP data from each of the 8 Valley MPOs. Budgets are rounded up to the nearest tenth of a ton.

3.9.5 Emissions Trading Mechanism

Section 93.124(b) of the federal conformity rule allows for the SIP to establish emissions trading mechanisms between budgets for pollutants or precursors, or among budgets allocated to mobile and other sources. The *2008 PM2.5 Plan* (as revised in 2011) included an emissions trading mechanism, which was approved by EPA effective January 9, 2012, to be used for analysis years after 2014. This SIP allows trading from the motor vehicle emissions budget for the PM2.5 precursor NOx to the motor vehicle emissions budget for primary PM2.5 using a 9 to 1 ratio. See *Appendix A Air Quality Modeling* for details on the air quality modeling that supports the trading ratio.

The NOx emissions reductions available for trading are only those remaining after the NOx budget is met. For example, for a proposed plan that has a total of 7 tons of NOx, and a NOx budget of 10 tons, there are 3 tons of NOx available to meet the PM2.5 emissions budget. Each agency responsible for demonstrating transportation conformity shall clearly document the calculations used in the trading, along with any additional reductions of NOx or PM2.5 emissions in the conformity analysis.

3.9.6 Local Transportation Control Measures

Transportation Control Measures (TCMs) in CAA §108(f) are currently being implemented by the Valley MPOs as part of the adopted Congestion Mitigation and Air Quality (CMAQ) cost effectiveness policy and in the development of each Regional Transportation Plan (RTP). In addition, existing and new transportation legislation (MAP-21 and FAST Act) include enhanced emphasis on funding PM2.5 projects.

Valley MPOs continue to implement the adopted San Joaquin Valley CMAQ Policy, which was included in the District's *2007 Ozone Plan* and *2008 PM2.5 Plan*. The CMAQ policy includes a standardized process for distributing 20 percent of the CMAQ funds to projects that meet a minimum cost effectiveness beginning in fiscal year 2011. This policy focuses on achieving the most cost effective emissions reductions, while

maintaining flexibility to meet local needs. The minimum cost effectiveness standard was revisited in 2016 as part of the 2017 Federal Transportation Improvement Program (FTIP) development, consistent with the Valley CMAQ Policy. As shown in the Adopted Transportation Control Measures tables in Attachment 2, the Valley MPOs are implementing all reasonable transportation control measures at this time.

Each Valley MPO is required to update its RTP every four years. The RTP is a long-term regional transportation plan that provides a vision for transportation investments throughout the Valley. The 2014 RTPs integrate land use and transportation planning to achieve, where feasible, regional greenhouse gas (GHG) targets set by ARB pursuant to Senate Bill 375 (SB-375).

To further illustrate the eight SJV MPOs commitment to the implementation of TCMs throughout the Valley, the RTPs contains a host of improvements to every component of the regional multimodal transportation system including:

- Active transportation (non-motorized transportation, such as biking and walking)
- Transportation demand management (TDM)
- Transportation system management (TSM)
- Transit
- Passenger rail
- Goods movement
- Aviation and airport ground access
- Highways
- Arterials
- Operations and maintenance

Included within these transportation system improvements are TCM projects that reduce vehicle use or change traffic flow or congestion conditions. TCMs include the following categories of transportation improvement projects and programs:

- Improved Transit
- High Occupancy Vehicle Lanes
- Traffic Flow Improvements
- Park and Ride Lots
- Ridesharing/Trip Reduction Programs
- Bicycle/Pedestrian Facilities

3.9.7 SB-375

The Sustainable Communities and Climate Protection Act of 2008 (Sustainable Communities, SB-375) enhances California's strategy to reduce GHG emissions through the coordination of transportation and land-use to reduce vehicle miles traveled per person through the development of a Sustainable Community Strategy. SB-375 identifies specific reduction goals for each of California's MPOs in 2020 and 2035 which the Sustainable Community Strategy must meet, if feasible. For the Valley, the current SB-375 target reductions are a 5% per capita GHG emissions reduction from 2005 by 2020 and a 10% per capita GHG emissions reduction from 2005 by 2035. The strategies contained in the RTP/SCS produce benefits for the region far beyond simply reducing GHG emissions. The SCS integrates the transportation network and related strategies with an overall land use pattern that responds to projected growth, housing needs, changing demographics, and transportation demands. As a result, Sustainable Community Strategy development is anticipated to complement the *2016 PM2.5 Plan*.

Table 3-12 2019 Motor Vehicle Emissions Budgets

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx
EMFAC2014 V1.0.7 exhaust, tire and brake wear	0.88	27.53	0.76	25.04	0.14	5.09	0.16	4.54	0.26	9.31	0.58	12.68	0.38	10.43	0.35	9.22
Total	0.88	27.53	0.76	25.04	0.14	5.09	0.16	4.54	0.26	9.31	0.58	12.68	0.38	10.43	0.35	9.22
Budget*	**0.9**	**27.6**	**0.8**	**25.1**	**0.2**	**5.1**	**0.2**	**4.6**	**0.3**	**9.4**	**0.6**	**12.7**	**0.4**	**10.5**	**0.4**	**9.3**

Table 3-13 2022 Motor Vehicle Emissions Budgets

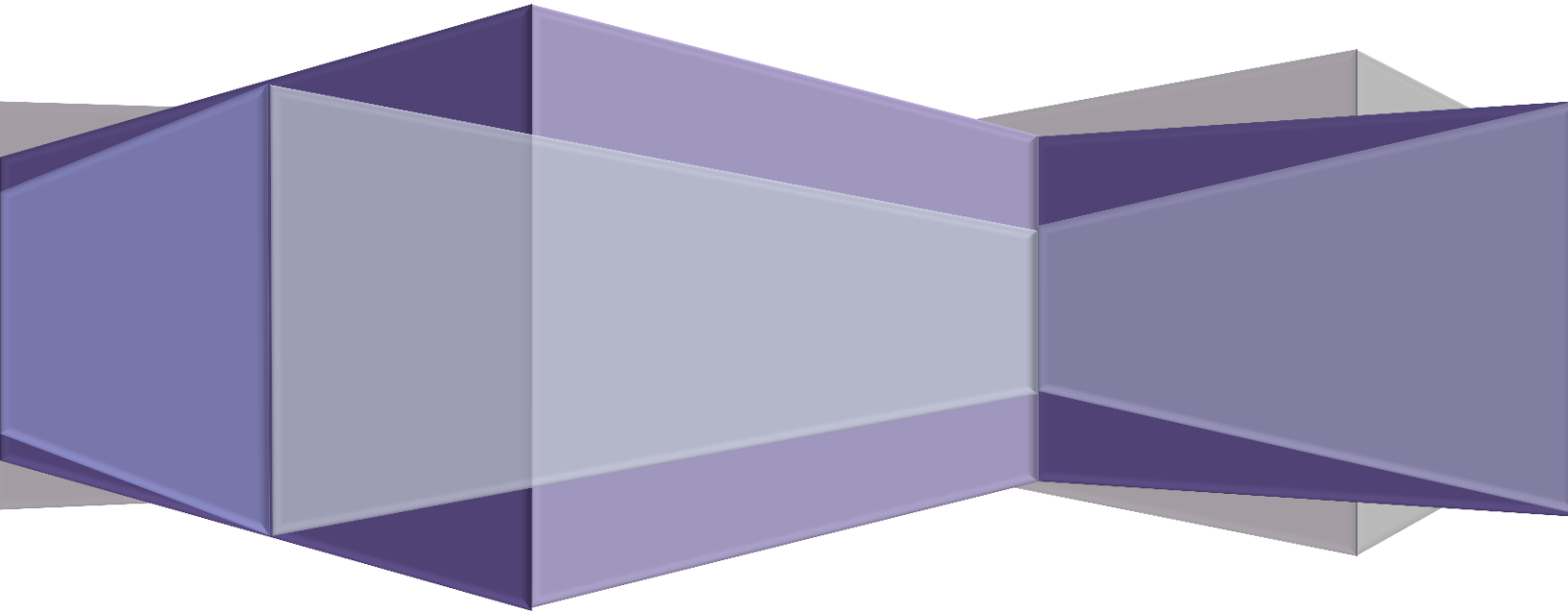
County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare	
	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx
EMFAC2014 V1.0.7 exhaust, tire and brake wear	0.81	21.24	0.71	19.39	0.13	4.02	0.14	3.37	0.26	7.44	0.53	9.27	0.35	7.96	0.32	6.89
Total	0.81	21.24	0.71	19.39	0.13	4.02	0.14	3.37	0.26	7.44	0.53	9.27	0.35	7.96	0.32	6.89
Budget*	**0.9**	**21.3**	**0.8**	**19.4**	**0.2**	**4.1**	**0.2**	**3.4**	**0.3**	**7.5**	**0.6**	**9.3**	**0.4**	**8.0**	**0.4**	**6.9**

*tons per average annual day, based on Draft 2017 FTIP data from each of the 8 Valley MPOs. Budgets are rounded up to the nearest tenth of a ton.

Appendix A

Air Quality Modeling

PROPOSED 2016 Moderate Area Plan for the 2012 PM2.5 Standard



[This Appendix provided by the California Air Resources Board]

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MODELING ASSESSMENT

Photochemical Modeling for the 2016 San Joaquin Valley Annual $PM_{2.5}$ State Implementation Plan

Prepared by

California Air Resources Board
San Joaquin Valley Air Pollution Control District

Prepared for

United States Environmental Protection Agency Region IX

July 26, 2016

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ACRONYMS

ARB – Air Resources Board

BCs – Boundary Conditions

CMAQ Model – Community Multi-scale Air Quality Model

CRPAQS – California Regional Particulate Air Quality Study

CSN – Chemical Speciation Network

DISCOVER-AQ – Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality

DV – Design Value

EC – Elemental Carbon

FEM – Federal Equivalent Method

FRM – Federal Reference Method

GEOS-5 – Goddard Earth Observing System Model, Version 5

GMAO – Global Modeling and Assimilation Office

ICs – Initial Conditions

MEGAN – Model of Emissions of Gases and Aerosols from Nature

MFB – Mean Fractional Bias

MFE – Mean Fractional Error

MOZART – Model for Ozone and Related chemical Tracers

NARR – North American Regional Reanalysis

NASA – National Aeronautics and Space Administration

NCR – National Center for Atmospheric Research

NMB – Normalized Mean Bias

NME – Normalized Mean Error

NO_x – Oxides of Nitrogen

OC – Organic Carbon

OM – Organic Matter

$PM_{2.5}$ – Particulate Matter of Aerodynamic Diameter less than 2.5 micrometers

RMSE – Root Mean Square Error

ROG – Reactive Organic Gases

RRF – Relative Response Factors

SANWICH – Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid material balance

SAPRC – Statewide Air Pollution Research Center

SIP – State Implementation Plan

SJV – San Joaquin Valley

SOA – Secondary Organic Aerosol

SO_x – Sulfur oxides

U.S. EPA – United States Environmental Protection Agency

VOCs – Volatile Organic Compounds

WRF – Weather and Research Forecasting

1 INTRODUCTION

The purpose of this document is to summarize the findings of the modeling assessment for the annual $PM_{2.5}$ (12 µg/m^3) standard in the San Joaquin Valley nonattainment area (SJV or the Valley), which forms the scientific basis for the SJV 2016 annual $PM_{2.5}$ SIP. The 12 µg/m^3 standard was promulgated by the U.S. EPA in 2012, and EPA issued final designations in 2014. Currently, the Valley is designated as a Moderate nonattainment area for this standard with an attainment date of 2012. However, recent $PM_{2.5}$ trends in the Valley brought on by a sustained drought coupled with the modeling assessment described below, illustrates the impracticability of attaining the standard by 2021. This would lead to a reclassification of the Valley from a Moderate to Serious nonattainment area, as well as a new SIP timeline and attainment date of 2025.

The remainder of the document is organized as follows: Section 2 describes the general approach for projecting design values (DVs) to the future (2021), Section 3 discusses the meteorological modeling and evaluation, while Sections 4 and 5 describe the emissions inventory and $PM_{2.5}$ modeling and evaluation, respectively. A more detailed description of the modeling and development of the model-ready emissions inventory can be found in the Photochemical Modeling Protocol Appendix.

2 APPROACHES

This section briefly describes the Air Resources Board's (ARB's) procedures, based on U.S. EPA guidance (U.S. EPA, 2014), for projecting future year annual $PM_{2.5}$ Design Values (DVs) using model output and a Relative Response Factor (RRF) approach.

2.1 METHODOLOGY

The U.S. EPA modeling guidance (U.S. EPA, 2014) outlines the approach for using models to predict future year annual $PM_{2.5}$ DVs. The guidance recommends using model predictions in a "relative" rather than "absolute" sense. In this relative approach, the fractional change (or ratio) in $PM_{2.5}$ concentration between the model future year and model baseline year are calculated for all valid monitors. These ratios are called relative response factors (RRFs). Since $PM_{2.5}$ is comprised of different chemical species, which respond differently to changes in emissions of various pollutants, separate RRFs are calculated for the individual $PM_{2.5}$ species. Baseline DVs are then projected to the future on a species-by-species basis, where the DV is separated into individual $PM_{2.5}$ species and each species is multiplied by its corresponding RRF. The individual species are then summed to obtain the future year $PM_{2.5}$ DV.

A brief summary of the modeling procedures utilized in this attainment analysis, as prescribed by the U.S. EPA modeling guidance (U.S. EPA, 2014), is provided below. A

more detailed description can be found in the Photochemical Modeling Protocol Appendix.

2.2 MODELING PERIOD

Based on analysis of recent years' ambient $PM_{2.5}$ levels and meteorological conditions leading to elevated $PM_{2.5}$ concentrations, the year 2013 was selected for baseline modeling calculations. The National Aeronautics and Space Administration (NASA) launched the DISCOVER-AQ (Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality) field campaign in the SJV from January 16th to Mid-February, 2013. This field study provided unprecedented observations of wintertime $PM_{2.5}$ and its precursors not available in the SJV since the CRPAQS (i.e., California Regional Particulate Air Quality Study) study more than 15 years ago. These observations aided in development of the modeling platform used in this SIP work.

2.3 BASELINE DESIGN VALUES

Specifying the baseline DV is a key consideration in the model attainment test, because this value is projected forward to the future and used to test for future attainment of the standard at each monitor. U.S. EPA guidance (2014) defines the annual $PM_{2.5}$ DV for a given year as the 3-year average (ending in that year) of the annual average $PM_{2.5}$ concentrations, where the annual average is calculated as the average of the quarterly averages for each calendar quarter (e.g., January-March, April-June, July-September, October-December). For example, the 2012 $PM_{2.5}$ DV is the average of the annual $PM_{2.5}$ concentrations from 2010, 2011, and 2012.

To minimize the influence of year-to-year variability in demonstrating attainment, the U.S. EPA (2014) optionally allows the averaging of three DVs, where one of the years is the baseline emissions inventory and modeling year. This average DV is referred to as the baseline DV. For a baseline modeling year of 2013, this would typically mean that the average of the 2013, 2014, and 2015 DVs would be used. However, at the time of this work the 2015 DVs were still preliminary (i.e., 2015 measurements had not been finalized), so the average DV will instead include 2012, 2013, and 2014. Since each DV represents an average over three years, observational data from 2010, 2011, 2012, 2013, and 2014 will influence the average DV, with each year receiving a different weighting. Table 1 illustrates the observational data from each year that goes into the baseline DV.

Table1. Illustrates the data from each year that are utilized in the baseline Design Value calculation.

DV Year	Years averaged for the DV (average of quarterly average $PM_{2.5}$)				
2012	2010	2011	2012		
2013		2011	2012	2013	
2014			2012	2013	2014
Yearly weighting for the baseline DV calculation					
$2012-2014\ Average = \frac{PM2.5_{2010} + 2 \times PM2.5_{2011} + 3 \times PM2.5_{2012} + 2 \times PM2.5_{2013} + PM2.5_{2014}}{9}$					

Table 2 shows the 2012-2014 average DVs (or baseline DVs) for each Federal Reference Method (FRM) /Federal Equivalent Method (FEM) site in the SJV. For three sites with incomplete data, assumptions were made to calculate the baseline DVs and those assumptions were annotated following Table 2. The highest DV occurred at the Bakersfield – Planz site with a baseline DV of 17.3 µg/m^3.

Table 2. Average baseline DVs for each FRM monitoring site in the SJV, as well as the yearly design values from 2012-2014 utilized in calculating the baseline DVs.

AQS site ID	Monitoring Site Name	2012	2013	2014	2012-2014 Average Baseline
60290016	Bakersfield - Planz	15.6	16.9	19.3	17.3
60392010	Madera		18.1	15.8	16.9*
60311004	Hanford	15.8	17.0	16.8	16.5
60310004	Corcoran				16.3*
61072002	Visalia	14.8	16.6	17.2	16.2
60195001	Clovis	16.0	16.4	16.0	16.1
60290014	Bakersfield – California Ave.	14.5	16.4	17.2	16.0
60190011	Fresno –Garland	14.2	15.4	15.3	15.0
60990006	Turlock	14.9	15.7	14.1	14.9
60195025	Fresno –Hamilton & Winery	13.9	14.7	14.1	14.2

60771002	Stockton	11.6	13.8	14.1	13.1
60470003	Merced - Coffee	14.3	13.3	11.7	13.1
60990005	Modesto	12.9	13.6	12.5	13.0
60472510	Merced -Main Street	10.4	11.1	11.4	11.0
60772010	Manteca		10.2	9.9	10.1*
60192009	Tranquility	7.5	7.9	7.7	7.7

*: Because of incomplete data, at Madera and Manteca, only DVs from 2013 and 2014 were averaged to determine the baseline DV; at Corcoran, annual average concentrations from 2010, 2013, and 2014 were averaged to obtain baseline DV.

2.4 BASE, REFERENCE, AND FUTURE YEARS

The modeling assessment consists of the following three primary model simulations, which all used the same model inputs for meteorology, chemical boundary conditions, and biogenic emissions. The only difference between the simulations was the year represented by the anthropogenic emissions (2013 or 2021) and certain day-specific emissions.

1. *Base Year (or Base Case) Simulation*
   The base year simulation for 2013 was used to assess model performance and includes as much day-specific detail as possible in the emissions inventory such as hourly adjustments to the motor vehicle and biogenic inventories based on observed local meteorological conditions, as well as known wildfire and agricultural burning events.

2. *Reference (or Baseline) Year Simulation*
   The reference year simulation was identical to the base year simulation, except that certain emissions events which are either random and/or cannot be projected to the future were removed from the emissions inventory. For the 2013 reference year modeling, the only category/emissions source that was excluded was wildfires, which are difficult to predict in the future and can significantly influence the model response to anthropogenic emissions reductions in regions with large fires.

3. *Future Year Simulation*
   The future year simulation is identical to the reference year simulation, except that projected future year (2021) anthropogenic emission levels were used rather than 2013 emission levels. All other model inputs (e.g., meteorology, chemical

boundary conditions, biogenic emissions, and calendar for day-of-week specifications in the inventory) are the same as those used in the reference year simulation.

To summarize (Table 3), the base year 2013 simulation was used for evaluating model performance, while the reference (or baseline) 2013 and future year 2021 simulations were used to project the average DVs to the future as described in the Photochemical Modeling Protocol Appendix and in subsequent sections of this document.

Table 3. Description of CMAQ model simulations used to evaluate model performance and project baseline design values to the future.

Simulation	Anthropogenic Emissions	Biogenic Emissions	Meteorology	Chemical Boundary Conditions
Base year (2013)	2013 w/ wildfires	2013 MEGAN	2013 WRF	2013 MOZART
Reference year (2013)	2013 w/o wildfires	2013 MEGAN	2013 WRF	2013 MOZART
Future year (2021)	2021 w/o wildfires	2013 MEGAN	2013 WRF	2013 MOZART

2.5 $PM_{2.5}$ SPECIES CALCULATIONS

Since $PM_{2.5}$ consists of different chemical components, it is necessary to assess how each individual component will respond to emission reductions. As a first step in this process, the measured total $PM_{2.5}$ must be separated into its various components. In the SJV, the primary components on the filter based $PM_{2.5}$ measurements include sulfates, nitrates, ammonium, organic carbon (OC), elemental carbon (EC), particle-bound water, other primary inorganic particulate matter, and passively collected mass (blank mass). Species concentrations were obtained from the four chemical speciation network (CSN) sites in the SJV. These four CSN sites are located at: Bakersfield – California Avenue, Fresno – Garland, Visalia – North Church, and Modesto – 14th Street. Chemical species were measured once every three or six days at those sites. Since not all of the 16 FRM $PM_{2.5}$ sites in the Valley have collocated speciation monitors, it was necessary to utilize the speciated $PM_{2.5}$ measurements at one of the four CSN sites to represent the speciation profile at each of the FRM sites. The choice of which CSN site to represent the speciation profile at a given FRM monitor (Table 4) was determined based on geographic proximity, analysis of local emission sources, and

measurements from previous field studies (e.g., CRPAQS), and is consistent with previous $PM_{2.5}$ SIPs in the Valley.

Table 4. $PM_{2.5}$ speciation data used for each $PM_{2.5}$ design site.

AQS Site ID	$PM_{2.5}$ Design Site (FRM/FEM Monitor)	$PM_{2.5}$ Speciation Site
60290016	Bakersfield – Planz	Bakersfield – California
60392010	Madera	Fresno – Garland
60311004	Hanford	Visalia – Church
60310004	Corcoran	Visalia – Church
61072002	Visalia	Visalia – Church
60195001	Clovis	Fresno – Garland
60290014	Bakersfield – California Ave.	Bakersfield – California
60190011	Fresno – Garland	Fresno – Garland
60990006	Turlock	Modesto – 14th
60195025	Fresno – Hamilton & Winery	Fresno – Garland
60771002	Stockton	Modesto – 14th
60470003	Merced – Coffee	Modesto – 14th
60990005	Modesto	Modesto – 14th
60472510	Merced – Main Street	Modesto – 14th
60772010	Manteca	Modesto – 14th
60192009	Tranquility	Fresno – Garland

Since the FRM $PM_{2.5}$ monitors do not retain all of the $PM_{2.5}$ mass that is measured by the speciation samplers, the U.S. EPA (2014) recommends using the SANDWICH approach (Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid material balance) described by Frank (2006) to apportion the FRM $PM_{2.5}$ mass to individual $PM_{2.5}$ species based on nearby CSN speciation data. A detailed description of the SANDWICH method can be found in the modeling protocol and in the U.S. EPA (2014) modeling guidance. In addition, based on completeness of the data, $PM_{2.5}$ speciation data from 2010 – 2013 were utilized. For each quarter, percent contributions from individual chemical species to FRM $PM_{2.5}$ mass were calculated as the average of the corresponding quarter from 2010-2013. In general, the inter-annual variability of the species fractions is small compared to the variability in the species concentrations and so the use of average data from 2010 – 2013 is appropriate.

2.6 FUTURE YEAR DESIGN VALUES

Projecting baseline annual $PM_{2.5}$ DVs to the future is a multi-step process as outlined below. See U.S. EPA (2014) and the Photochemical Modeling Protocol Appendix for additional details.

Step 1: Compute observed quarterly weighted average concentrations (consistent with the weighted average DV calculation) at each monitor for the following species: ammonium, nitrate, sulfate, organic carbon, elemental carbon, and other primary PM. This is done by multiplying quarterly weighted average FRM $PM_{2.5}$ concentrations by the fractional composition of $PM_{2.5}$ species for each quarter.

Step 2: Compute the component-specific RRF for each quarter and each species at each monitor based on the reference and future year modeling. The RRF for a specific component *j* is calculated using the following expression:

$$RRF_j = \frac{[C]_{j,\ future}}{[C]_{j,\ reference}} \quad (1)$$

Where $[C]_{j,\ future}$ is the modeled quarterly mean concentration for component *j* predicted for the future year averaged over the 3x3 array of grid cells surrounding the monitor, and $[C]_{j,reference}$ is the same, but for the reference year simulation. An RRF was calculated for each species in Step 1 and at each monitor and for each quarter.

Step 3: Apply the component specific RRF from Step 2 to the observed quarterly weighted average concentrations from Step 1 to obtain projected quarterly species concentrations.

Step 4: Use the online E-AIM model (http://www.aim.env.uea.ac.uk/aim/aim.php) to calculate future year particle-bound water for each quarter at each monitor based on projected ammonium sulfate and ammonium nitrate concentrations.

Step 5: The projected concentration for each quarter is summed over all species, including particle bound water from Step 4, as well as a blank mass of 0.5 µg/m^3 to obtain the future quarterly average $PM_{2.5}$ concentration. Finally, the future annual $PM_{2.5}$ DVs are calculated as the average of the projected $PM_{2.5}$ concentrations from the four quarters.

Projected future year $PM_{2.5}$ DVs are discussed in Section 5.3.

3 METEOROLOGICAL MODELING

California's proximity to the ocean, complex terrain, and diverse climate represent a unique challenge for developing meteorological fields that adequately represent the synoptic and mesoscale features of the regional meteorology. In summertime, the majority of the storm tracks are far to the north of the state and a semi-permanent Pacific high typically sits off the California coast. Interactions between this eastern Pacific subtropical high pressure system and the thermal low pressure further inland over the Central Valley or South Coast lead to conditions conducive to pollution buildup (Fosberg and Schroeder, 1966; Bao et al., 2008). In wintertime, periods of high atmospheric pressure bring light winds and, sometimes, low solar insolation (Daly et al. 2009) to the Central Valley. Because of the topographical features surrounding San Joaquin Valley, under such conditions, a layer of cold and wet air can be overlaid by warm air aloft creating strong and long-lasting stagnation in the area (Whiteman et al. 2001). It is under such conditions that high surface particulate matter concentrations typically occur (Gilles et al. 2010; Baker et al. 2011).

In the past, the ARB has utilized both prognostic and diagnostic meteorological models, as well as hybrid approaches in an effort to develop meteorological fields for use in air quality modeling that most accurately represent the meteorological processes which are important to air quality (e.g., Jackson et al., 2006). In this work, the state-of-the-science Weather and Research Forecasting (WRF) prognostic model (Skamarock et al., 2005) version 3.6 was utilized to develop the meteorological fields used in the subsequent photochemical model simulations.

3.1 WRF MODEL SETUP

The WRF meteorological modeling domain consisted of three nested Lambert projection grids of 36-km (D01), 12-km (D02), and 4-km (D03) uniform horizontal grid spacing (Figure 1). WRF was run simultaneously for the three nested domains with two-way feedback between the parent and the nest grids. The D01 and D02 grids were used to resolve the larger scale synoptic weather systems, while the D03 grid resolved the finer details of the atmospheric conditions and was used to drive the air quality model simulations. All three domains utilized 30 vertical sigma layers (defined in Table 5), with the major physics options for each domain listed in Table 6.

Initial and boundary conditions (IC/BCs) for the WRF modeling were based on the 32-km horizontal resolution North American Regional Reanalysis (NARR) data that are archived at the National Center for Atmospheric Research (NCAR). Boundary conditions to WRF were updated at 6-hour intervals for the 36-km grid (D01). In addition, surface and upper air observations obtained from NCAR were used to further refine the analysis data that were used to generate the IC/BCs. Analysis nudging was

employed in the outer 36-km grid (D01) to ensure that the simulated meteorological fields were adequately constrained and did not deviate from the observed meteorology. No nudging was used on the two inner domains to allow model physics to work fully without externally imposed forcing (Rogers et al., 2013).

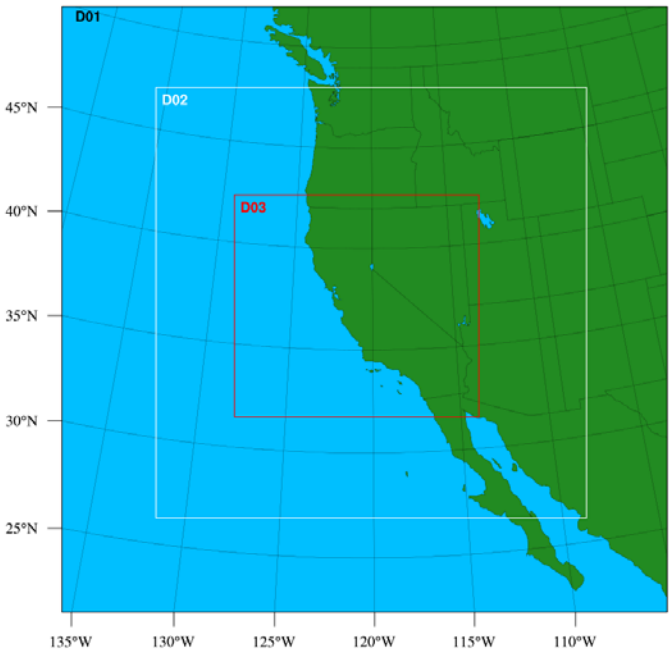

Figure 1. WRF modeling domains (D01 36km; D02 12km; and D03 4km).

Table 5. WRF vertical layer structure.

Layer Number	Height (m)	Layer Thickness (m)	Layer Number	Height (m)	Layer Thickness (m)
30	16082	1192	14	1859	334
29	14890	1134	13	1525	279
28	13756	1081	12	1246	233
27	12675	1032	11	1013	194
26	11643	996	10	819	162
25	10647	970	9	657	135
24	9677	959	8	522	113
23	8719	961	7	409	94
22	7757	978	6	315	79
21	6779	993	5	236	66
20	5786	967	4	170	55
19	4819	815	3	115	46
18	4004	685	2	69	38
17	3319	575	1	31	31
16	2744	482	0	0	0
15	2262	403			

Note: Shaded layers denote the subset of vertical layers used in the CMAQ photochemical model simulations.

Table 6. WRF Physics Options.

Physics Option	**Domain**		
	D01 (36 km)	**D02 (12 km)**	**D03 (4 km)**
Microphysics	WSM 6-class graupel scheme	WSM 6-class graupel scheme	WSM 6-class graupel scheme
Longwave radiation	RRTM	RRTM	RRTM
Shortwave radiation	Dudhia scheme	Dudhia scheme	Dudhia scheme
Surface layer	Revised MM5 Monin-Obukhov	Revised MM5 Monin-Obukhov	Revised MM5 Monin-Obukhov
Land surface	TD Scheme (Jan., Feb., Nov. and Dec.) Pleim-Xiu LSM (others)	TD Scheme (Jan., Feb., Nov. and Dec.) Pleim-Xiu LSM (others)	TD Scheme (Jan., Feb., Nov. and Dec.) Pleim-Xiu LSM (others)
Planetary Boundary Layer	YSU	YSU	YSU
Cumulus Parameterization	Kain-Fritsch scheme	Kain-Fritsch scheme	None

3.2 WRF MODEL RESULTS AND EVALUATION

Simulated surface wind speed, temperature, and relative humidity from the 4 km domain were validated against hourly observations at 77 surface stations in the SJV. Observational data for the surface stations were obtained from the ARB's archived meteorological database (http://www.arb.ca.gov/aqmis2/aqmis2.php). Table 7 lists the observational stations and the parameters measured at each station, including wind speed and direction (wind), temperature (T) and relative humidity (RH). The location of each of these sites is shown in Figure 2. Quarterly and annual quantitative performance metrics for 2013 were used to compare hourly surface observations and modeled estimates: mean bias (MB), mean error (ME) and index of agreement (IOA) based on recommendations from Simon et al. (2012). A summary of these statistics by performance region is shown in Tables 8 through 12. The performance regions cover roughly the Modesto, Fresno, Visalia, and Bakersfield regions, as well as one for the entire San Joaquin Valley (SJV), respectively. The region around Modesto includes sites 5737, 2833, and 2080. The region surrounding Fresno encompasses sites 5741, 2449, 2013, and 2844. The region around Visalia includes sites 2032, 5386, and 3250, while the region covering Bakersfield includes sites 5287 and 3146 (note that valid relative humidity observations in the Bakersfield area were only available at site 5287 for the months of January through May 2013). Model performance statistical metrics were calculated using all of the available data. All the sites in the valley are included in the SJV performance region (in addition to the sites mentioned above). The distribution of daily mean bias and mean error are shown in Figures 3 and 4. Figures 5 and 6 show observed vs. modeled scatter plots.

From a valley-wide perspective, the wind speed biases were positive in each quarter of 2013. At Bakersfield the biases turn slightly negative throughout the year, and are mostly less than 0.6 m/s. The annual temperature biases are less than 1 K in all performance regions, with the quarterly temperature biases reaching as high as -1.87 K in Bakersfield during the second quarter of 2013. Simulated temperature is generally in good agreement with the observations in all regions with the index of agreement (IOA) above 0.90 (1.0 represents perfect agreement). Relative humidity biases are positive except in the Modesto region. The annual bias values range from -1.53% to 12.47%, with the largest bias occurring in Visalia. These results are comparable to other recent WRF modeling efforts in California investigating ozone formation in Central California (e.g., Hu et al., 2012) and modeling analysis for the CalNex and CARES field studies (e.g., Fast et al., 2014; Baker et al., 2013; Kelly et al., 2014; Angevine et al., 2012). Detailed hourly time-series of surface temperature, relative humidity, wind speed, and wind direction for SJV can be found in the supplementary material, together with 2013 quarterly mean bias and mean error distributions of these parameters.

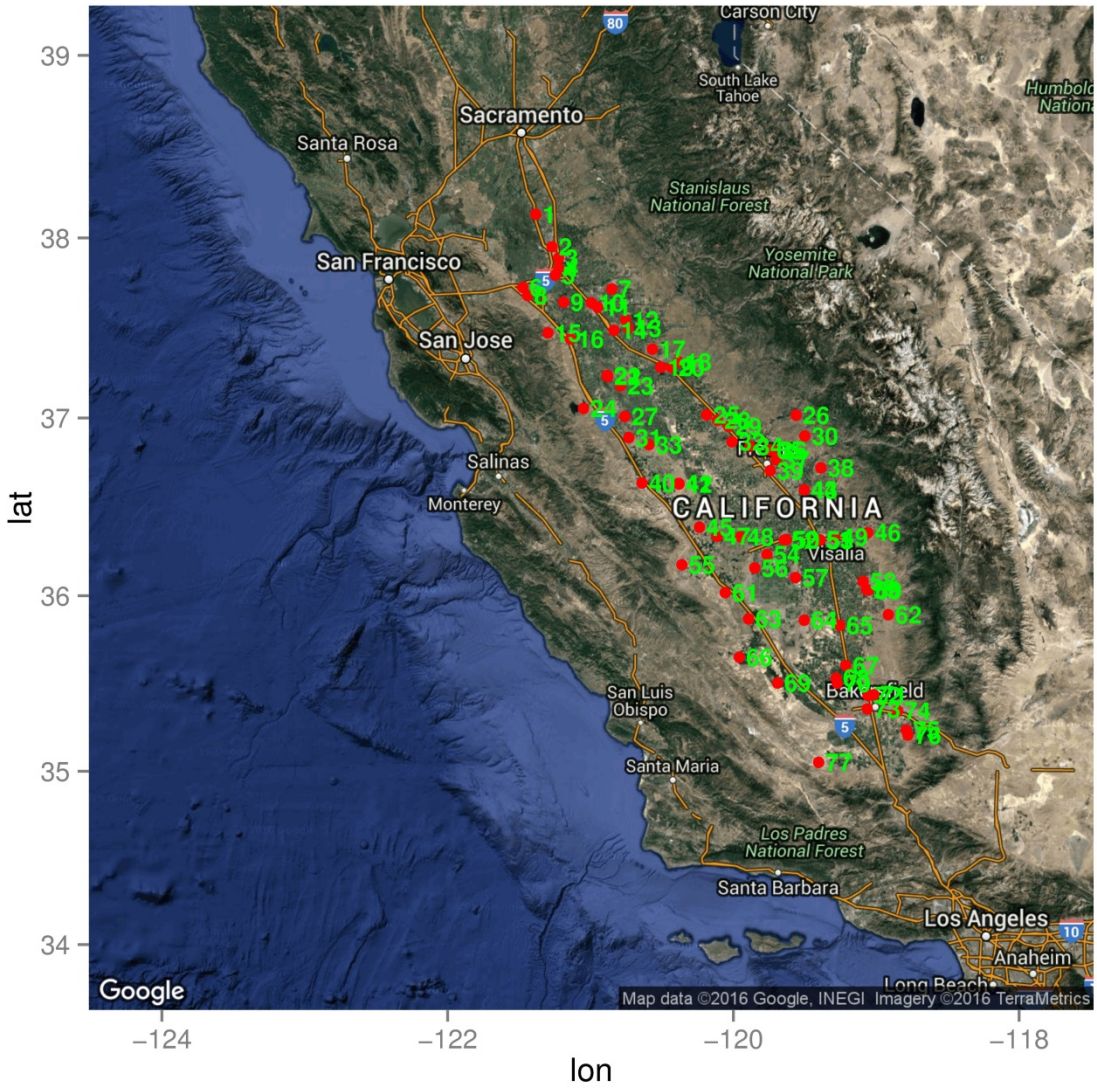

Figure 2. Meteorological observation sites in San Joaquin Valley. The numbers correspond to the sites listed in Table 7.

Table 7. Meteorological monitor location and parameter(s) measured.

Site	Site ID	Site Name	Parameter Measured	Site	Site ID	Site Name	Parameter Measured
1	5809	LodiWest	T, RH	40	3309	PanocheRd	Wind, T, RH
2	2094	Stockton-Haz	Wind, T, RH	41	3759	Tranquility	Wind, T
3	5362	StocktonArpt	Wind, T	42	5757	Westlands	T, RH
4	5736	Manteca	T, RH	43	5723	Parlier2	T, RH
5	3772	Manteca-Fish	Wind, T	44	2114	Parlier	Wind, T, RH
6	5810	Tracy	T, RH	45	5828	FivePointsSW	T, RH
7	5831	Oakdale2	T, RH	46	5746	Lindcove	T, RH
8	3696	Tracy_Air	Wind, T	47	5708	FivePoints2	T, RH
9	5737	Modesto3	T, RH	48	2544	Lemoore-Met	Wind, T
10	2833	Modesto-14th	Wind	49	2032	Visalia-NChu	Wind, T
11	2080	Modesto-Met	Wind, T	50	5308	HanfordMuni	Wind, T
12	7233	DenairII	T, RH	51	5386	VisaliaMuni	Wind, T
13	3303	RosePeak	Wind, T, RH	52	3129	Hanford-Irwn	Wind, T
14	2996	Turlock-SMin	Wind, T	53	3250	Visalia-Airp	Wind, T, RH
15	3449	Pulgas	Wind, T, RH	54	3712	StRosaRnchria	Wind, T
16	5805	Patterson2	T, RH	55	6028	CoalingaCIM	T, RH
17	2814	Merced-AFB	Wind, T	56	5715	Stratford2	T, RH
18	5793	Merced	T, RH	57	3194	Corcoran-Pat	Wind, T
19	5318	MercedMuni	Wind, T	58	5812	Portervl	T, RH
20	3022	Merced-SCofe	Wind, T	59	5351	PortervlMuni	Wind, T
21	6079	MERCED 23WSW	T	60	3763	Portrvlle-Ne	Wind, T
22	5752	Kesterson	T, RH	61	3330	KettlemanHls	Wind, T, RH
23	3647	SanLuisNWR	Wind, T, RH	62	3350	FountnSpr	Wind, T, RH
24	3307	LosBanos	Wind, T, RH	63	5717	Kettleman	T, RH
25	5790	Madera	T, RH	64	6813	Alpaugh	T, RH
26	3522	Hurley1	Wind, T, RH	65	5823	Delano2	T, RH
27	5730	LosBanos2	T, RH	66	5729	BlackwllCnr	T, RH
28	5317	MaderaMuni	Wind, T	67	5783	Famoso	T, RH
29	3771	Madera-Av14	Wind, T, RH	68	5709	ShafterUSDA	T, RH
30	3346	FancherCreek	Wind, T, RH	69	5791	Belridge	T, RH
31	5770	Panoche	T, RH	70	2981	Shafter-Wlkr	Wind, T, RH
32	3211	Madera-Rd29	Wind, T, RH	71	2772	Oildale-3311	Wind, T
33	5711	Firebgh-Tel	T, RH	72	5287	MeadowsFld	Wind, T
34	2844	Fresno-Sky#2	Wind, T	73	3146	Baker-5558Ca	Wind, T, RH
35	5741	FSU2	T, RH	74	2312	Edison	Wind, T
36	3026	Clovis	Wind, T, RH	75	3758	Arvin-DiG	Wind, T
37	2449	Fresno-FAT	Wind, T	76	5771	Arvin-Edison	T, RH
38	5787	OrangeCove	T, RH	77	2919	Maricopa-Stn	Wind, T
39	2013	Fresno-Drmnd	Wind, T				

Table 8. Hourly surface wind speed, temperature and relative humidity statistics in Modesto.

Quarter	Observed Mean	Modeled Mean	Mean Bias	Mean Error	IOA
		Wind Speed (m/s)			
Q1	2.08	2.62	0.54	1.16	0.74
Q2	3.04	3.51	0.46	1.43	0.73
Q3	2.64	2.94	0.30	1.18	0.65
Q4	1.66	2.35	0.69	1.23	0.68
Annual	2.41	2.89	0.49	1.26	0.73
		Temperature (K)			
Q1	282.62	282.93	0.31	2.16	0.94
Q2	293.18	292.86	-0.32	2.07	0.96
Q3	295.98	297.06	1.07	2.35	0.93
Q4	283.95	285.73	1.78	2.73	0.93
Annual	288.93	289.65	0.71	2.33	0.97
		Relative Humidity (%)			
Q1	73.52	74.38	0.86	9.14	0.89
Q2	57.03	53.28	-3.75	10.99	0.86
Q3	62.17	55.26	-6.91	13.98	0.72
Q4	67.75	71.40	3.66	11.48	0.85
Annual	65.10	63.57	-1.53	11.40	0.86

Table 9. Hourly surface wind speed, temperature and relative humidity statistics in Fresno.

Quarter	Observed Mean	Modeled Mean	Mean Bias	Mean Error	IOA
		Wind Speed (m/s)			
Q1	1.47	1.90	0.43	1.11	0.56
Q2	2.54	3.12	0.58	1.53	0.59
Q3	2.14	2.65	0.51	1.42	0.47
Q4	1.12	1.69	0.57	1.05	0.52
Annual	1.85	2.37	0.52	1.29	0.61
		Temperature (K)			
Q1	283.76	282.90	-0.86	1.79	0.96
Q2	295.23	294.04	-1.19	2.16	0.95
Q3	299.69	299.22	-0.47	2.22	0.94
Q4	285.65	286.01	0.36	1.93	0.96
Annual	291.18	290.65	-0.53	2.03	0.98
		Relative Humidity (%)			
Q1	71.46	76.39	4.93	10.71	0.86
Q2	48.01	53.07	5.06	11.88	0.83
Q3	45.12	51.45	6.33	14.95	0.65
Q4	64.03	70.79	6.77	13.49	0.83
Annual	57.09	62.87	5.78	12.77	0.86

Table 10. Hourly surface wind speed, temperature and relative humidity statistics in Visalia.

Quarter	Observed Mean	Modeled Mean	Mean Bias	Mean Error	IOA
		Wind Speed (m/s)			
Q1	1.48	1.64	0.16	0.82	0.55
Q2	2.07	2.53	0.45	1.04	0.65
Q3	1.91	2.22	0.31	0.86	0.59
Q4	1.62	1.58	-0.04	0.73	0.60
Annual	1.77	2.00	0.24	0.88	0.65
		Temperature (K)			
Q1	283.66	282.87	-0.79	1.85	0.95
Q2	294.38	293.09	-1.29	2.23	0.95
Q3	298.73	298.42	-0.31	2.56	0.91
Q4	285.19	286.03	0.84	2.11	0.95
Annual	290.03	289.55	-0.48	2.16	0.97
		Relative Humidity (%)			
Q1	73.28	80.72	7.44	11.11	0.82
Q2	47.80	59.94	12.13	17.23	0.73
Q3	47.08	63.07	15.99	21.49	0.49
Q4	61.22	75.43	14.21	16.36	0.77
Annual	57.37	69.84	12.47	16.56	0.76

Table 11. Hourly surface wind speed, temperature and relative humidity statistics in Bakersfield (valid RH data available from January through May only; statistics are based on the available data).

Quarter	Observed Mean	Modeled Mean	Mean Bias	Mean Error	IOA
		Wind Speed (m/s)			
Q1	1.84	1.80	-0.04	0.88	0.59
Q2	2.63	2.47	-0.15	1.03	0.74
Q3	2.12	2.10	-0.02	1.10	0.68
Q4	2.23	1.86	-0.37	0.98	0.61
Annual	2.21	2.09	-0.12	1.00	0.70
		Temperature (K)			
Q1	284.94	283.97	-0.97	1.91	0.95
Q2	295.66	293.78	-1.87	2.44	0.94
Q3	301.17	299.54	-1.63	2.63	0.90
Q4	286.85	286.97	0.12	1.73	0.97
Annual	291.33	290.17	-1.16	2.16	0.97
		Relative Humidity (%)			
Q1	62.65	72.70	10.04	15.15	0.81
Q2	36.94	51.46	14.52	16.82	0.74
Annual	52.27	64.12	11.85	15.83	0.83

Table 12. Hourly surface wind speed, temperature and relative humidity statistics in the San Joaquin Valley.

Quarter	Observed Mean	Modeled Mean	Mean Bias	Mean Error	IOA
		Wind Speed (m/s)			
Q1	2.08	2.62	0.54	1.16	0.74
Q2	3.04	3.51	0.46	1.43	0.73
Q3	2.64	2.94	0.30	1.18	0.65
Q4	1.66	2.35	0.69	1.23	0.68
Annual	2.41	2.89	0.49	1.26	0.73
		Temperature (K)			
Q1	283.31	283.30	-0.01	2.17	0.94
Q2	294.23	293.42	-0.81	2.46	0.94
Q3	298.22	298.21	-0.02	2.82	0.90
Q4	285.08	286.20	1.12	2.65	0.93
Annual	290.19	290.25	0.07	2.52	0.96
		Relative Humidity (%)			
Q1	69.36	71.65	2.29	12.87	0.81
Q2	47.95	52.53	4.57	13.73	0.79
Q3	46.35	54.48	8.12	17.33	0.59
Q4	58.62	68.35	9.72	16.00	0.75
Annual	55.70	61.84	6.14	14.96	0.79

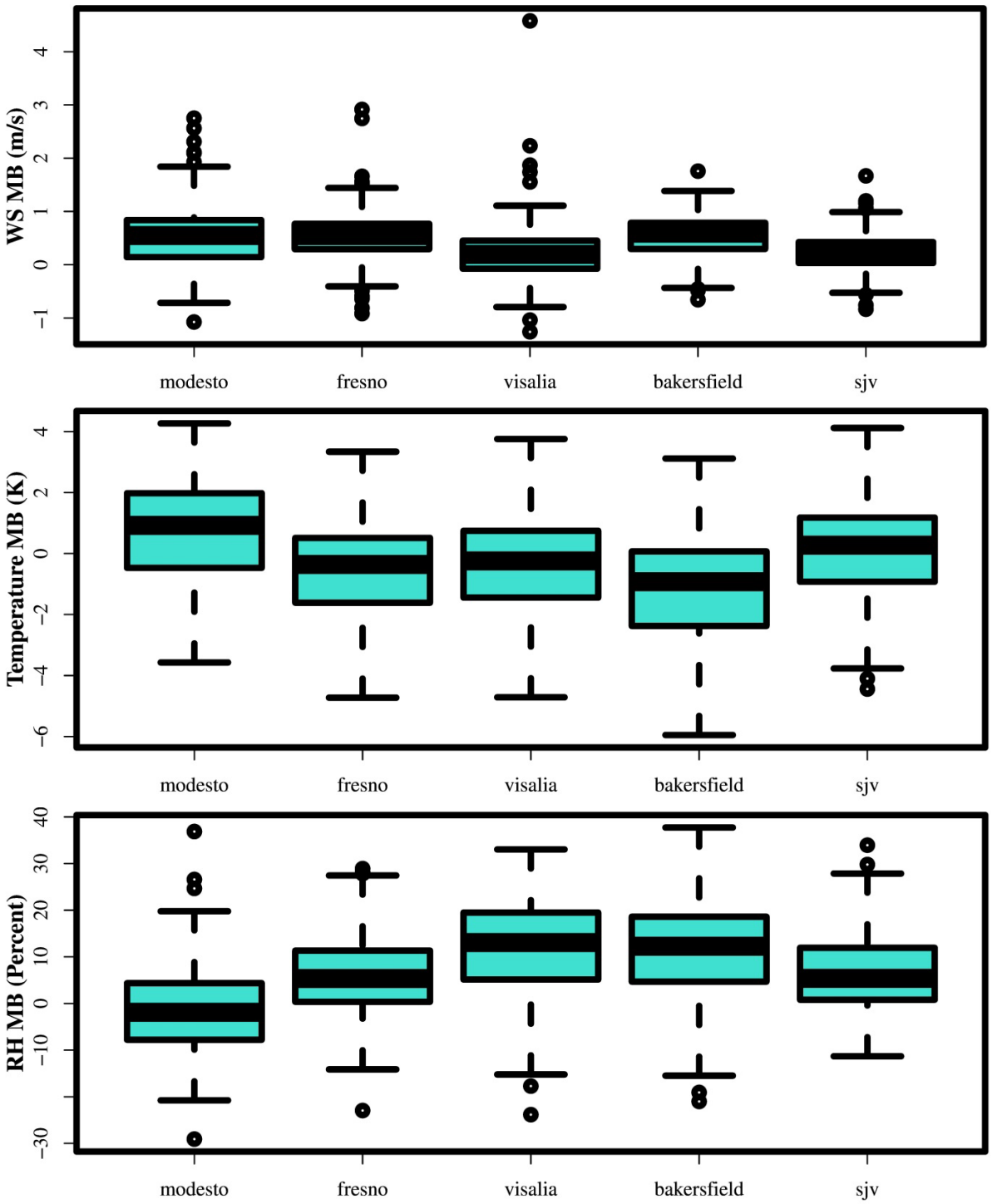

Figure 3. Distribution of model daily mean bias for Modesto, Fresno, Visalia, Bakersfield and SJV. Results are shown for wind speed (top), temperature (middle), and Relative Humidity (bottom).

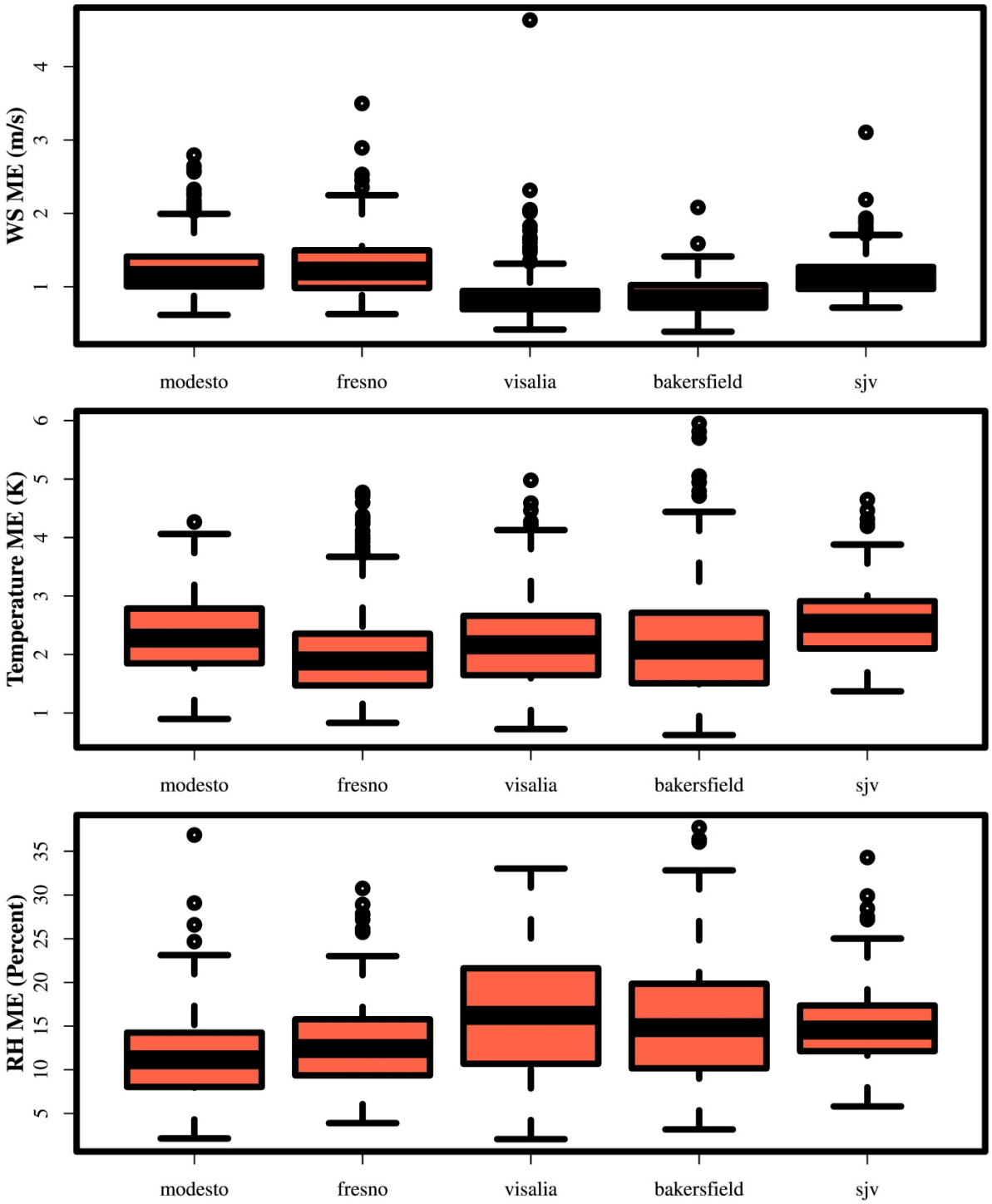

Figure 4. Distribution of model daily mean error for Modesto, Fresno, Visalia, Bakersfield and SJV. Results are shown for wind speed (top), temperature (middle), and Relative Humidity (bottom).

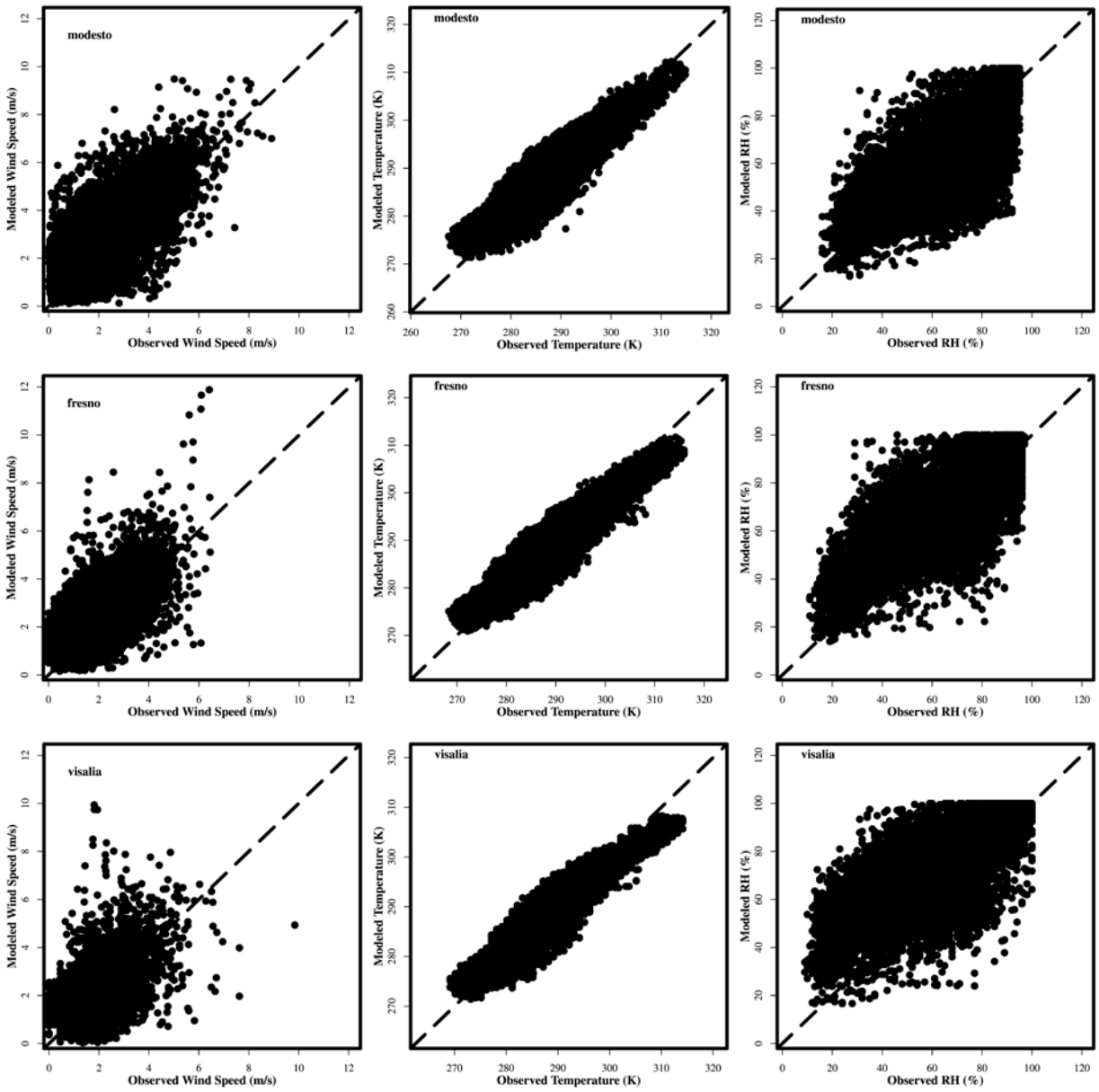

Figure 5. Comparison of modeled and observed hourly wind speed (left column), 2-meter temperature (middle column), and relative humidity (right column). Results for Modesto are shown in the top row, Fresno in the middle row, and Visalia in the bottom row.

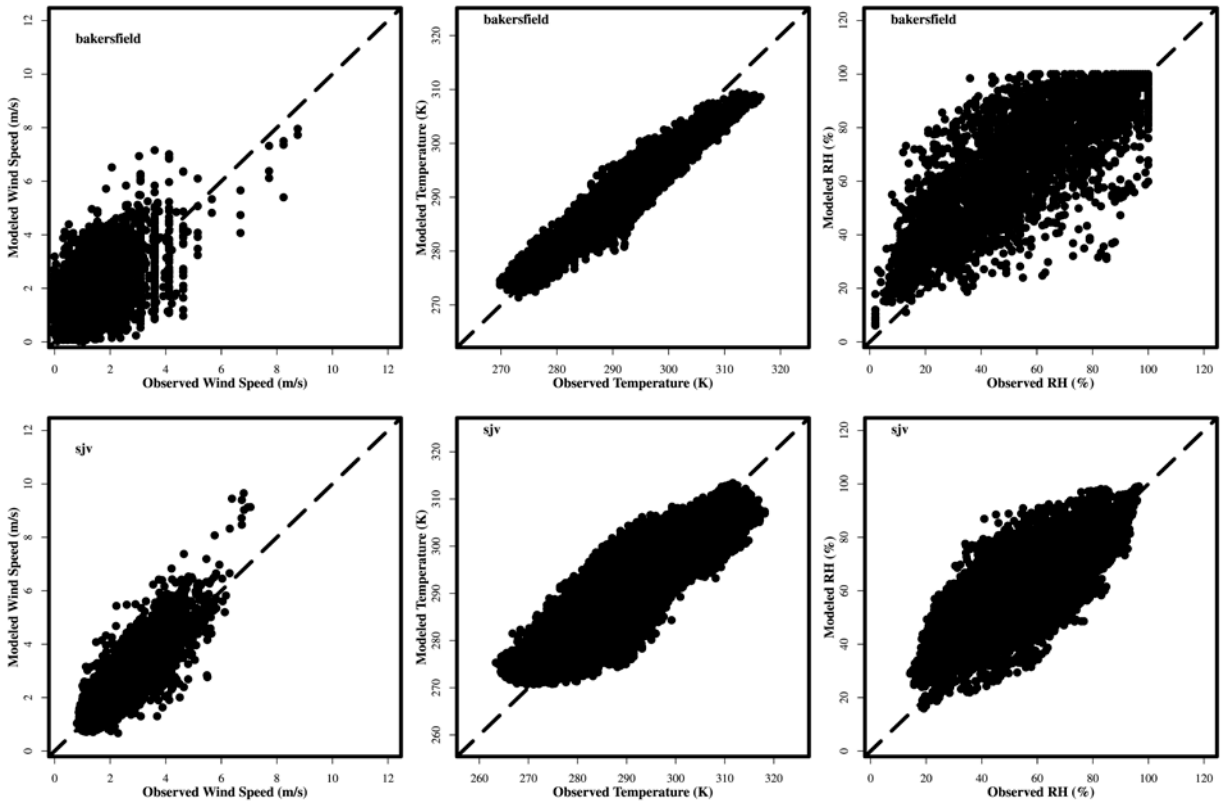

Figure 6. Comparison of modeled and observed hourly wind speed (left column), 2-meter temperature (middle column), and relative humidity (right column). Results for Bakersfield are shown in the top row and SJV in the bottom row.

3.2.1 PHENOMENOLOGICAL EVALUATION

Conducting a detailed phenomenological evaluation for all modeled days can be resource intensive given that the entire year was modeled. However, some insight and confidence that the model is able to reproduce the meteorological conditions leading to elevated particulate matter can be gained by investigating the meteorological conditions during a period of peak PM within the Valley in more detail. The highest $PM_{2.5}$-conducive meteorological conditions in the Valley occurred around January 20, 2013. Surface weather analysis shows that on January 20, the western US was under a typical Great Basin high pressure system. In the 500 hPa map (not shown), a strong high pressure ridge extends from Northern California along the west Pacific coast all the way to Alaska. As shown in Figures 7, 8, and 9, the winds, though weak, are mainly offshore along the northern California coast. Under this type of weather system, conditions in SJV are driven by diurnal cycles of the local winds. Figure 7 shows that at 13:00 PST, January 20, the upslope flows along the eastern side of the Coastal Ranges and the western side of the Sierras, lead to a weak northwesterly flow on the floor of the valley. The downslope winds form at nighttime and in the early morning (Figure 8 and Figure 9). They converge towards the valley and the winds in the center of the valley floor turn southeasterly. At the southern end of the valley, an eddy-like pattern occurs due to the interaction of the katabatic flows. The surface wind distributions of the modeled and observed winds indicate the model was able to capture many of the important features of the meteorological fields in the SJV.

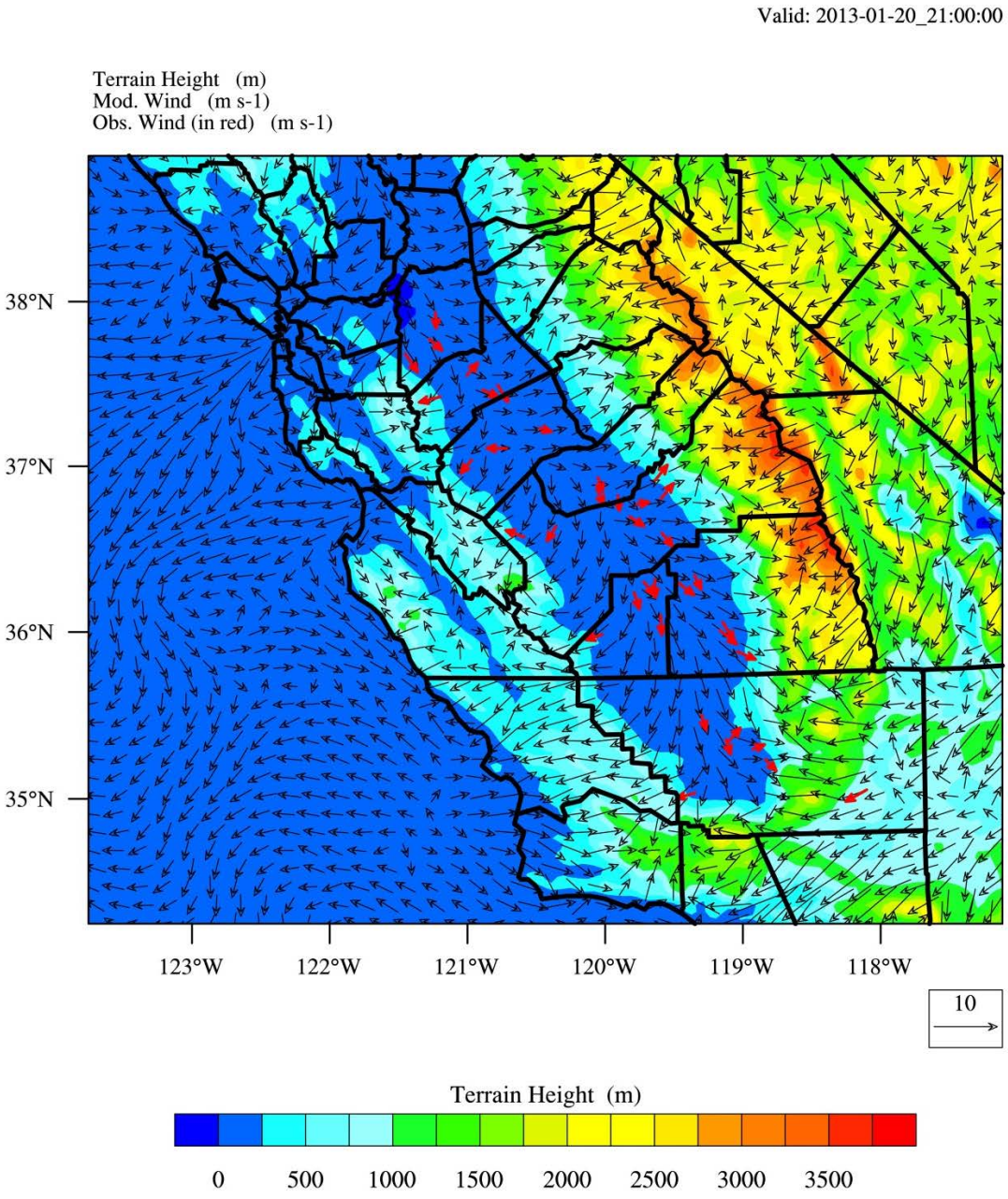

Figure 7. Surface wind field at 13:00 PST January 20, 2013.

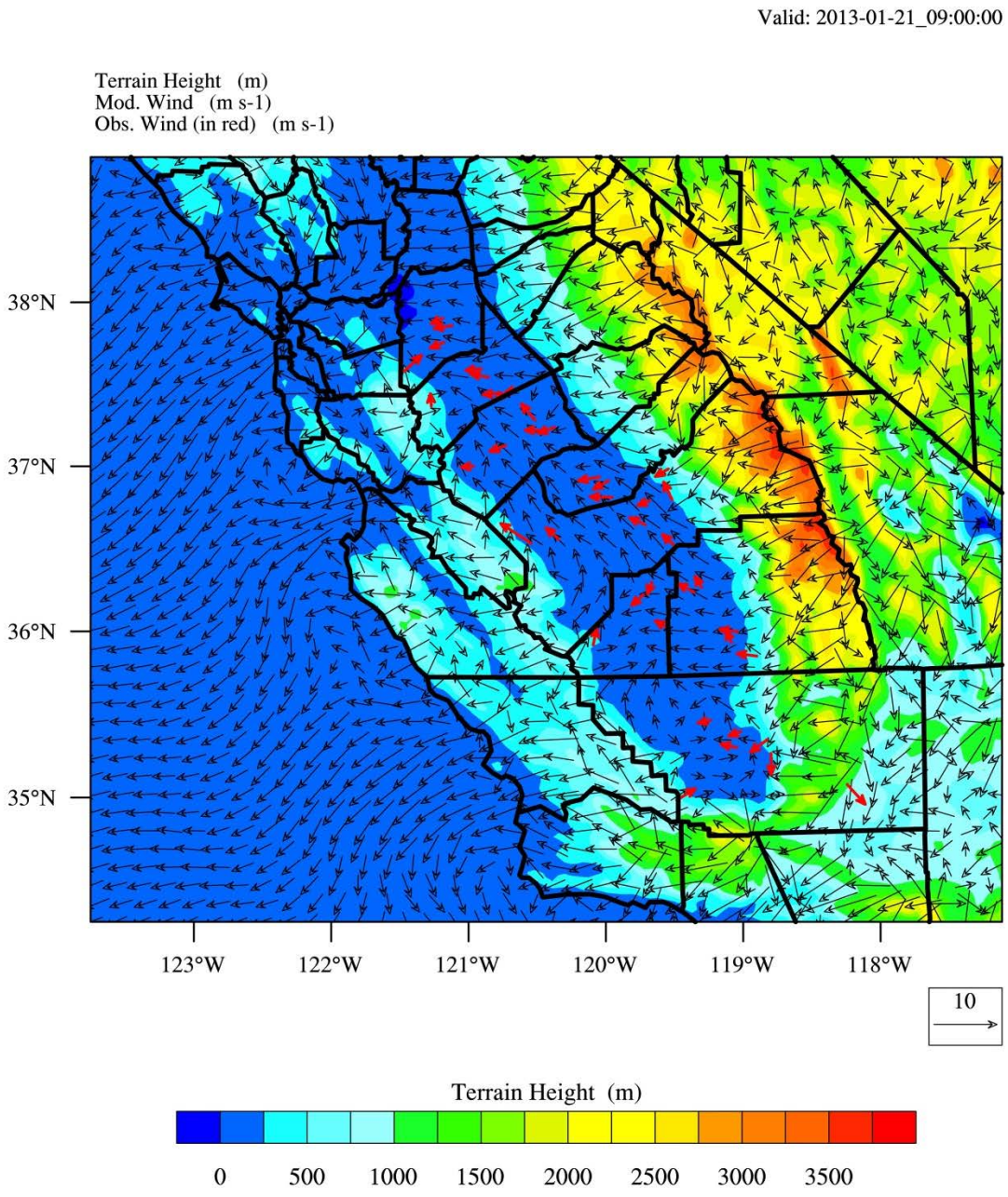

Figure 8. Surface wind field at 01:00 PST January 21, 2013.

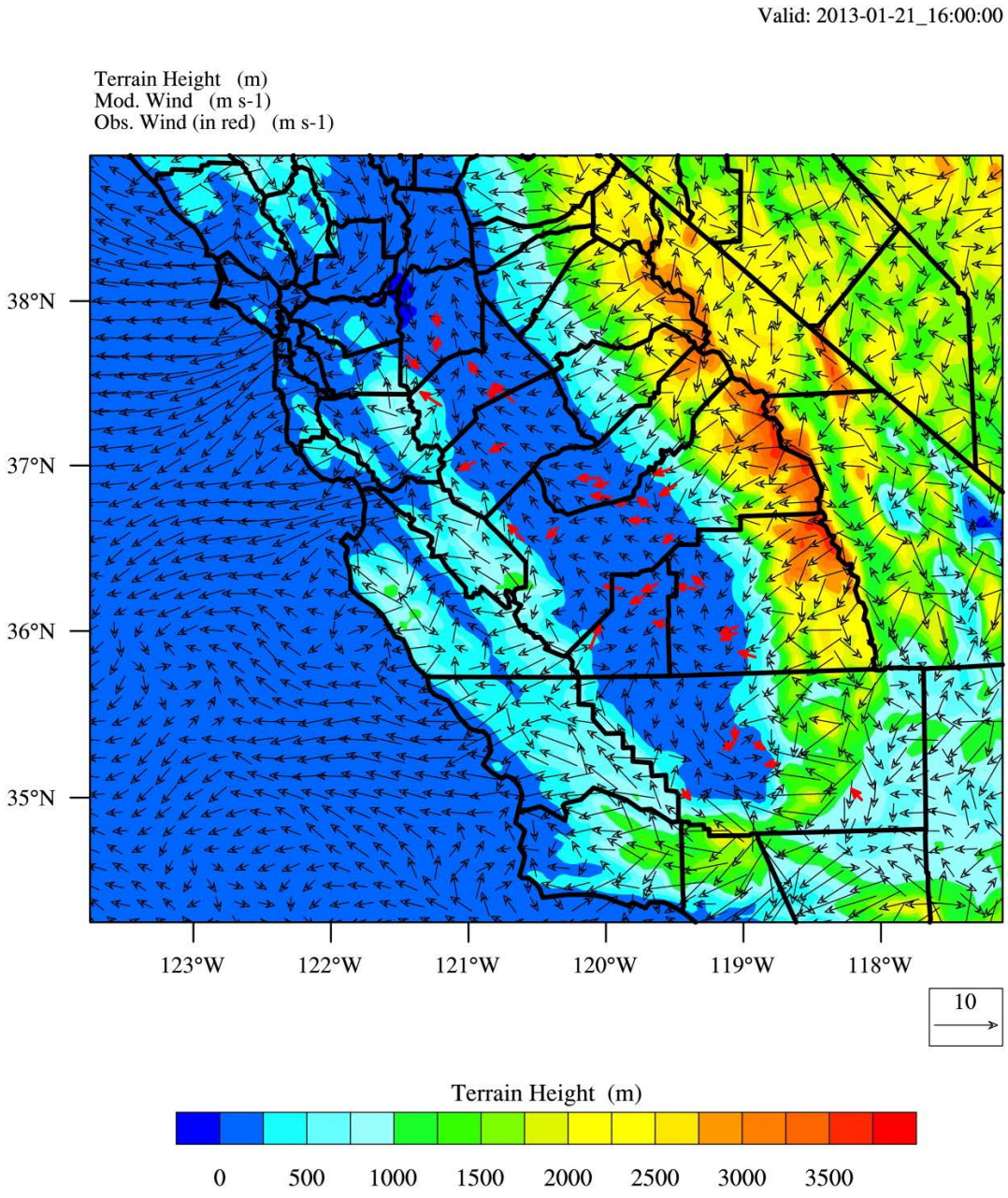

Figure 9. Surface wind field at 08:00 PST January 21, 2013.

4 EMISSIONS

The emissions inventory used in this modeling was based on the most recent inventory submitted to the U.S. EPA, with base year 2012 and projected to 2013 under growth and control conditions (http://www.arb.ca.gov/planning/sip/2012iv/2012iv.htm). For a detailed description of the emissions inventory, updates to the inventory, and how it was processed from the planning totals to a gridded inventory for modeling, see the Modeling Emissions Inventory Appendix.

4.1 EMISSIONS SUMMARIES

Table 13 summarizes 2013, 2021, and 2025 SJV annual anthropogenic emissions for the five $PM_{2.5}$ precursors. Emissions totals in Table 13 do not reflect reductions to residential wood burning (RWC) emissions applied to the modeling inventory to reflect actual no burn days in 2013 and projected no burn days in 2021/2025. Under the 2014 amendment to the RWC rule (two curtailment levels), 2021 emissions were reduced by 85% (level 1: no burning unless registered) and 90% (level 2: no burning for all) on projected no burn days. In addition, emissions totals also do not reflect the 20% reduction in commercial charbroiling applied to the modeling inventory per commitments made in the SJV 2012 24-hour $PM_{2.5}$ SIP. From 2013 to 2021, anthropogenic emissions in the SJV will drop approximately 38%, 8%, 7%, 2%, and 1% for NO_x, ROG, primary $PM_{2.5}$, SO_x, and NH_3, respectively. Among these five precursors, anthropogenic NO_x emissions show the largest relative reduction, dropping from 318.2 tons/day in 2013 to 196.1 tons/day in 2021. Anthropogenic ROG emissions will drop from 319.2 tons/day to 292.8 tons/day, reflecting an 8% reduction from 2013 to 2021. From 2021 to 2025, NO_x emissions will further drop by 24%, while emissions of other pollutants will stay nearly flat. Monthly biogenic ROG totals for 2013 in the SJV are shown in Figure 10 (note that the 2013 biogenic emissions were used for all model runs). Biogenic ROG emissions are highest in the summer at nearly 1800 tons/day in July when temperature, insolation, and leaf area are generally at their peak, and drop to near zero during winter months.

Table 13. SJV Annual Planning Emissions for 2013, 2021, and 2025

Category	NO_x	ROG	$PM_{2.5}$	SO_x	NH_3
2013 (tons/day)					
Stationary	38.6	85.1	8.9	7.2	13.8
Area	8.1	150.3	42.3	0.3	310.7
On-road Mobile	183.2	49.9	6.4	0.6	4.5
Other Mobile	88.3	33.9	5.8	0.2	0.0
Total	318.2	319.2	63.5	8.4	329.1
2021 (tons/day)					
Stationary	29.8	90.5	9.1	6.9	15.3
Area	8.1	152.4	41.9	0.3	306.4
On-road Mobile	88.0	23.3	3.3	0.6	4.2
Other Mobile	70.2	26.7	5.0	0.3	0.0
Total	196.1	292.8	59.3	8.2	325.9
2025 (tons/day)					
Stationary	29.2	94.3	9.3	7.1	16.3
Area	8.0	154.1	42.2	0.3	304.3
On-road Mobile	54.3	18.9	3.3	0.6	4.3
Other Mobile	58.3	24.1	4.3	0.3	0.0
Total	149.8	291.4	59.1	8.4	324.9

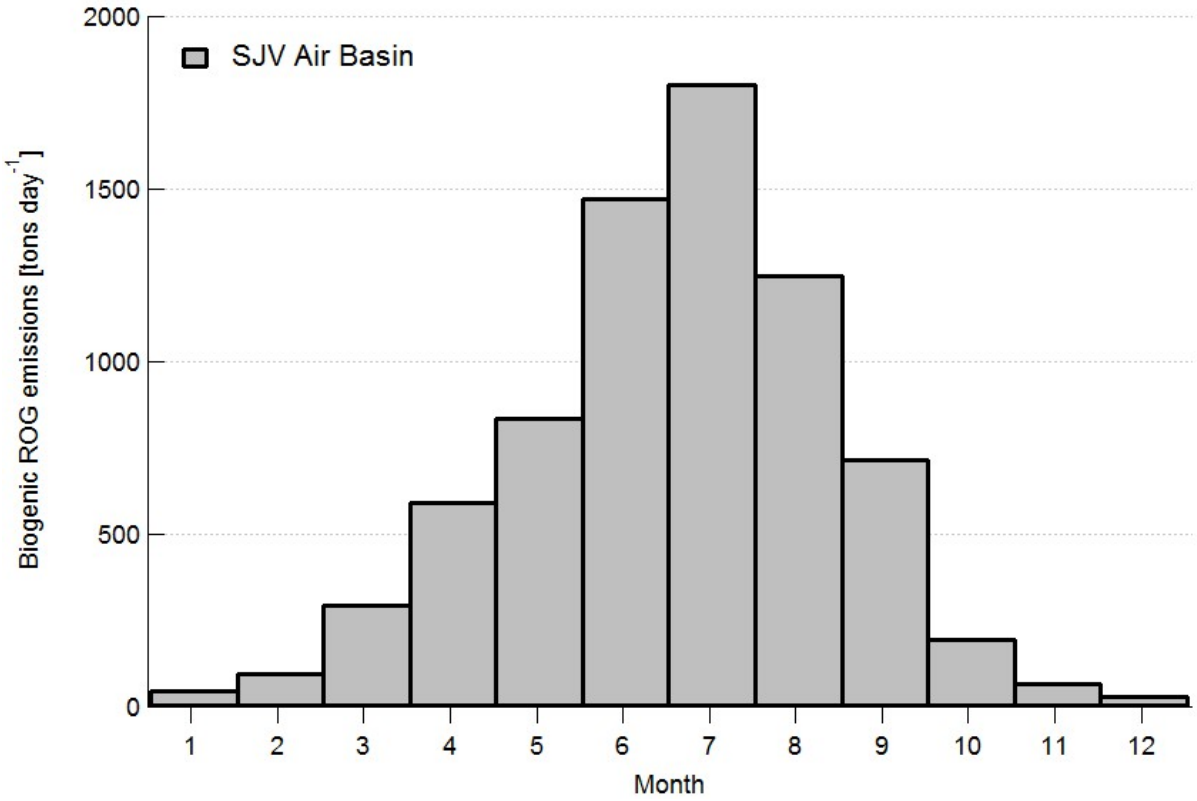

Figure 10. Monthly average biogenic ROG emissions for 2013.

5 $PM_{2.5}$ MODELING

5.1 CMAQ MODEL SETUP

Figure 11 shows the CMAQ modeling domains used in this work. The larger domain covering all of California has a horizontal grid resolution of 12 km with 107 x 97 lateral grid cells for each vertical layer and extends from the Pacific Ocean in the west to Eastern Nevada in the east and runs from the U.S.-Mexico border in the south to the California-Oregon border in the north. The smaller nested domain covering the SJV region has a finer scale 4 km grid resolution and includes 87 x 103 lateral grid cells. While the nested domain is smaller than that used for ozone modeling in the Valley (see the Photochemical Modeling Protocol), as long as the larger statewide 12 km domain is utilized to provide dynamic boundary condition inputs to the smaller 4 km domain, there is no appreciable difference in simulated $PM_{2.5}$ predictions between the smaller domain utilized for $PM_{2.5}$ modeling and the larger domain used for ozone modeling. Both the 12 km and 4 km domains are based on a Lambert Conformal Conic projection with reference longitude at – 120.5ºN and 60ºN, which is consistent with WRF domain settings. The 30 vertical layers from WRF were mapped onto 18 vertical layers for CMAQ, extending from the surface to 100 mb such that a majority of the vertical layers

fall within the planetary boundary layer (see the Photochemical Modeling Protocol for details).

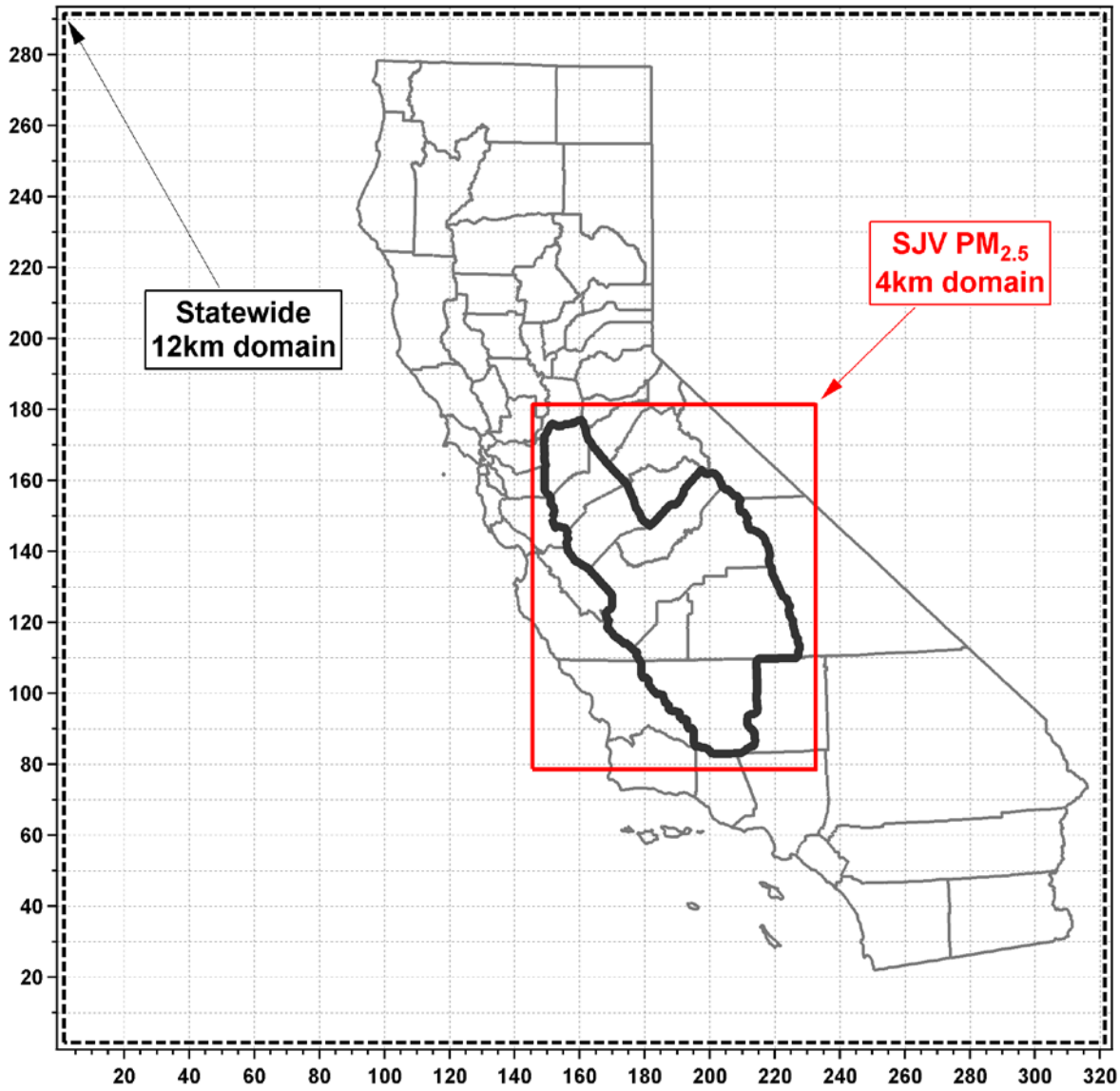

Figure 11. CMAQ modeling domains utilized in the modeling assessment.

The CMAQ model version 5.0.2 (http://www.airqualitymodeling.org/cmaqwiki/index.php?title=CMAQ_version_5.0.2_%28April_2014_release%29_Technical_Documentation) released by the U.S. EPA in May 2014 was used for all air quality model simulations. The SAPRC07 chemical mechanism and aerosol module aero6 were selected as the gas-phase and aerosol modules, respectively. Further details of the CMAQ configuration can be found in

Table14 and in the Photochemical Modeling Protocol. The same configuration was used for all simulations.

Annual simulations were conducted on a simultaneous month-by-month basis, rather than one single continuous simulation. For each month, the CMAQ simulations included a seven day spin-up period (i.e., the last seven days of the previous month) for the outer 12 km domain, where initial conditions were set to the default CMAQ initial conditions. These outer domain simulations were used to provide initial and lateral boundary conditions for the inner 4 km simulation, which utilized a three day spin-up period.

Chemical boundary conditions for the outer 12 km domain were extracted from the global chemical transport Model for Ozone and Related chemical Tracers, version 4 (MOZART-4; Emmons et al., 2014). The MOZART-4 model output for 2013 was obtained from the National Center for Atmospheric Research (NCAR; https://www2.acom.ucar.edu/gcm/mozart) using the simulations driven by meteorological fields from the NASA GMAO GEOS-5 model. The same MOZART derived BCs for the 12 km outer domain were used in all simulations.

Table 14. CMAQ configuration and settings.

Process	Scheme
Horizontal advection	Yamo (Yamartino scheme for mass-conserving advection)
Vertical advection	WRF-based scheme for mass-conserving advection
Horizontal diffusion	Multi-scale
Vertical diffusion	ACM2 (Asymmetric Convective Model version 2)
Gas-phase chemical mechanism	SAPRC-07 gas-phase mechanism version “B”
Chemical solver	EBI (Euler Backward Iterative solver)
Aerosol module	Aero6 (the sixth-generation CMAQ aerosol mechanism with extensions for sea salt emissions and thermodynamics; includes a new formulation for secondary organic aerosol yields)

Cloud module	ACM_AE6 (ACM cloud processor that uses the ACM methodology to compute convective mixing with heterogeneous chemistry for AERO6)
Photolysis rate	phot_inline (calculate photolysis rates in-line using simulated aerosols and ozone concentrations)

5.2 CMAQ MODEL EVALUATION

CMAQ model performance was evaluated for $PM_{2.5}$ mass, individual $PM_{2.5}$ chemical species, as well as a number of gas-phase species based on observations from an extensive network of monitors in the SJV.

Time series of observed and modeled $PM_{2.5}$ chemical species based on CSN measurements are shown in the supplemental material (Figures S37-S40 of the supplemental materials for Bakersfield, Fresno, Modesto, and Visalia, respectively). $PM_{2.5}$ species are measured every 3 or 6 days at these sites. Generally, observed $PM_{2.5}$ concentrations are higher in winter months and are much lower in summer months. During winter months, $PM_{2.5}$ in the SJV is dominated by ammonium nitrate and directly emitted OC. The CMAQ model was able to reasonably reproduce these key characteristics of $PM_{2.5}$ pollution in the SJV, including successfully capturing many elevated wintertime nitrate events, which is key for accurately simulating both peak wintertime $PM_{2.5}$ as well as annual average $PM_{2.5}$ in the SJV.

Tables 15-18 summarize the key model performance metrics for major $PM_{2.5}$ chemical species at the four CSN sites. Model performance was evaluated quarterly as well as on an annual basis. Average observations, average modeled values, mean bias, mean error, mean fractional bias (MFB), and mean fractional error (MFE) are given for individual $PM_{2.5}$ species at these four sites. Detailed definitions for these metrics can be found in the Photochemical Modeling Protocol Appendix. In general, model performance was consistent across different quarters and at different monitors. Mean bias of the simulated annual average $PM_{2.5}$ was within +/-1 $\mu g/m^3$ at all the CSN sites except Bakersfield, which showed an annual mean bias of -2.5 $\mu g/m^3$. The larger negative bias at Bakersfield was the result of a slight over prediction during winter months, which was offset by a larger under prediction during summer months (likely due to uncertainty in the unspecified $PM_{2.5}$ category – not shown). This is consistent with the other sites, which also generally showed over predictions in the first and fourth quarters, and under predictions in the second and third quarters. The two primary components of $PM_{2.5}$ in

the SJV, nitrate and OC, exhibited somewhat different quarterly biases, with nitrate closely following total $PM_{2.5}$ and OC being under predicted during most quarters and at most sites.

A graphical representation of the annual MFB and MFE values in Tables 15-18 is shown in Figure 12 for each CSN site, along with suggested model performance goals and criteria (green and red lines, respectively) from Boylan and Russell (2006). According to Boylan and Russell (2006), model performance goals are defined as the level of accuracy that is considered to be close to the best a model can achieve while model performance criteria are defined as the level of accuracy that is considered to be acceptable for modeling applications. Based on these metrics, the current CMAQ modelling system met the model performance criteria and in many instances exceeded model performance goals.

Table 15. Quarterly and annual $PM_{2.5}$ model performance based on CSN measurement at Fresno – Garland.

Quarter	Species	# of Obs.	Avg. Obs. (µg/m^3)	Avg. Mod. (µg/m^3)	Mean bias (µg/m^3)	Mean error (µg/m^3)	MFB	MFE
1	$PM_{2.5}$	30	21.1	22.7	1.6	6.5	0.18	0.36
1	Ammonium	30	1.7	2.8	1.1	1.3	0.56	0.67
1	Nitrate	30	5.8	9.4	3.6	4.1	0.46	0.60
1	Sulfate	30	0.8	1.0	0.2	0.3	0.28	0.41
1	OC	28	4.9	4.1	-0.8	1.6	-0.03	0.34
1	EC	28	1.2	1.4	0.1	0.5	0.27	0.45
2	$PM_{2.5}$	30	7.8	6.4	-1.4	2.4	-0.23	0.37
2	Ammonium	30	0.4	0.3	-0.2	0.2	-0.50	0.62
2	Nitrate	30	0.9	0.6	-0.2	0.4	-0.53	0.72
2	Sulfate	30	1.1	0.7	-0.4	0.4	-0.37	0.46
2	OC	29	1.8	1.9	0.2	0.5	0.02	0.25
2	EC	29	0.3	0.6	0.3	0.3	0.61	0.62
3	$PM_{2.5}$	30	9.4	6.4	-3.0	3.7	-0.35	0.44
3	Ammonium	30	0.4	0.2	-0.2	0.2	-0.61	0.77
3	Nitrate	30	0.7	0.3	-0.4	0.5	-1.18	1.25
3	Sulfate	30	0.9	0.8	-0.2	0.3	-0.10	0.33
3	OC	30	2.4	1.8	-0.6	0.9	-0.21	0.34
3	EC	30	0.5	0.6	0.1	0.2	0.23	0.32
4	$PM_{2.5}$	29	25.8	25.1	-0.7	8.5	0.07	0.36
4	Ammonium	29	2.9	2.7	-0.2	1.4	0.06	0.52
4	Nitrate	28	9.0	9.4	0.4	3.6	0.02	0.43
4	Sulfate	28	1.0	1.0	-0.1	0.3	-0.03	0.26
4	OC	29	6.0	4.6	-1.4	2.1	-0.13	0.38
4	EC	29	1.6	1.6	0.0	0.5	0.14	0.41
Annual	$PM_{2.5}$	119	16.0	15.1	-0.9	5.2	-0.08	0.38
Annual	Ammonium	119	1.3	1.5	0.2	0.8	-0.12	0.65
Annual	Nitrate	118	4.0	4.9	0.9	2.1	-0.32	0.75
Annual	Sulfate	118	1.0	0.9	-0.1	0.3	-0.06	0.36
Annual	OC	116	3.8	3.1	-0.7	1.3	-0.09	0.33
Annual	EC	116	0.9	1.0	0.1	0.4	0.31	0.45

Table 16. Quarterly and annual $PM_{2.5}$ model performance based on CSN measurement at Visalia.

Quarter	Species	# of Obs.	Avg. Obs. ($\mu g/m^3$)	Avg. Mod. ($\mu g/m^3$)	Mean bias ($\mu g/m^3$)	Mean error ($\mu g/m^3$)	MFB	MFE
1	$PM_{2.5}$	15	20.5	22.8	2.4	4.9	0.17	0.29
1	Ammonium	15	2.0	3.1	1.2	1.4	0.50	0.65
1	Nitrate	15	6.7	10.6	4.0	4.4	0.45	0.55
1	Sulfate	15	1.0	0.8	-0.3	0.4	-0.20	0.36
1	OC	15	4.6	3.5	-1.1	1.3	-0.18	0.27
1	EC	15	0.9	1.1	0.3	0.3	0.37	0.40
2	$PM_{2.5}$	15	9.8	8.0	-1.8	2.6	-0.30	0.37
2	Ammonium	15	0.7	0.5	-0.2	0.2	-0.33	0.45
2	Nitrate	10	2.2	1.9	-0.2	0.8	-0.21	0.48
2	Sulfate	15	1.6	0.7	-0.9	0.9	-0.77	0.77
2	OC	17	2.6	1.8	-0.8	0.8	-0.46	0.46
2	EC	17	0.4	0.6	0.2	0.2	0.36	0.37
3	$PM_{2.5}$	17	10.5	7.4	-3.2	3.8	-0.31	0.41
3	Ammonium	17	0.6	0.3	-0.2	0.3	-0.47	0.63
3	Nitrate	17	1.6	0.7	-0.9	1.0	-0.91	0.95
3	Sulfate	17	1.4	0.8	-0.5	0.5	-0.41	0.43
3	OC	17	2.9	1.8	-1.1	1.3	-0.49	0.53
3	EC	17	0.5	0.6	0.2	0.2	0.26	0.30
4	$PM_{2.5}$	16	33.1	33.1	-0.1	13.0	0.11	0.38
4	Ammonium	16	4.3	4.0	-0.3	2.1	0.11	0.48
4	Nitrate	16	14.3	13.9	-0.4	6.9	0.14	0.48
4	Sulfate	16	1.4	1.0	-0.4	0.6	-0.28	0.41
4	OC	16	5.8	4.4	-1.4	1.8	-0.27	0.36
4	EC	16	1.3	1.5	0.3	0.5	0.17	0.32
Annual	$PM_{2.5}$	63	18.5	17.7	-0.7	6.1	-0.09	0.37
Annual	Ammonium	63	1.9	2.0	0.1	1.0	-0.06	0.55
Annual	Nitrate	58	6.5	7.1	0.6	3.5	-0.15	0.64
Annual	Sulfate	63	1.4	0.8	-0.5	0.6	-0.41	0.49
Annual	OC	65	3.9	2.8	-1.1	1.3	-0.36	0.41
Annual	EC	65	0.7	1.0	0.2	0.3	0.29	0.35

Table 17. Quarterly and annual $PM_{2.5}$ model performance based on CSN measurement at Bakersfield.

Quarter	Species	# of Obs.	Avg. Obs. ($\mu g/m^3$)	Avg. Mod. ($\mu g/m^3$)	Mean bias ($\mu g/m^3$)	Mean error ($\mu g/m^3$)	MFB	MFE
1	$PM_{2.5}$	21	20.5	23.2	2.7	8.7	0.34	0.49
1	Ammonium	21	2.2	2.8	0.7	1.6	0.57	0.74
1	Nitrate	19	7.9	9.4	1.5	3.9	0.28	0.47
1	Sulfate	21	0.9	0.9	0.1	0.4	0.26	0.52
1	OC	22	3.9	4.6	0.7	1.3	0.27	0.36
1	EC	22	1.1	1.5	0.4	0.4	0.36	0.41
2	$PM_{2.5}$	25	11.0	7.8	-3.3	4.0	-0.36	0.45
2	Ammonium	25	0.6	0.4	-0.2	0.3	-0.52	0.59
2	Nitrate	25	1.1	0.9	-0.2	0.6	-0.46	0.74
2	Sulfate	25	1.4	0.8	-0.6	0.6	-0.49	0.54
2	OC	22	2.2	2.4	0.2	0.5	0.09	0.24
2	EC	22	0.4	0.7	0.4	0.4	0.75	0.75
3	$PM_{2.5}$	19	15.5	8.2	-7.3	8.0	-0.55	0.60
3	Ammonium	19	0.5	0.3	-0.2	0.3	-0.61	0.68
3	Nitrate	19	0.8	0.6	-0.2	0.6	-0.69	0.93
3	Sulfate	19	1.3	0.9	-0.5	0.5	-0.38	0.38
3	OC	17	2.6	2.5	0.0	0.9	-0.05	0.33
3	EC	17	0.5	0.8	0.4	0.4	0.58	0.58
4	$PM_{2.5}$	0	NA	NA	NA	NA	NA	NA
4	Ammonium	0	NA	NA	NA	NA	NA	NA
4	Nitrate	0	NA	NA	NA	NA	NA	NA
4	Sulfate	0	NA	NA	NA	NA	NA	NA
4	OC	0	NA	NA	NA	NA	NA	NA
4	EC	0	NA	NA	NA	NA	NA	NA
Annual	$PM_{2.5}$	65	15.4	12.9	-2.5	6.7	-0.19	0.50
Annual	Ammonium	65	1.1	1.2	0.1	0.7	-0.19	0.67
Annual	Nitrate	63	3.0	3.4	0.3	1.6	-0.30	0.71
Annual	Sulfate	65	1.2	0.9	-0.3	0.5	-0.22	0.49
Annual	OC	61	2.9	3.2	0.3	0.9	0.11	0.31
Annual	EC	61	0.7	1.0	0.4	0.4	0.56	0.58

Table 18. Quarterly and annual $PM_{2.5}$ model performance based on CSN measurement at Modesto.

Quarter	Species	# of Obs.	Avg. Obs. ($\mu g/m^3$)	Avg. Mod. ($\mu g/m^3$)	Mean bias ($\mu g/m^3$)	Mean error ($\mu g/m^3$)	MFB	MFE
1	$PM_{2.5}$	15	17.3	18.4	1.1	4.2	0.18	0.34
1	Ammonium	15	1.0	2.2	1.2	1.2	0.70	0.73
1	Nitrate	15	5.0	7.1	2.1	2.3	0.27	0.42
1	Sulfate	15	0.8	1.1	0.3	0.4	0.31	0.41
1	OC	14	5.5	3.9	-1.6	2.2	-0.09	0.37
1	EC	14	1.2	1.2	0.0	0.4	0.21	0.42
2	$PM_{2.5}$	15	6.5	5.4	-1.1	2.2	-0.18	0.36
2	Ammonium	15	0.3	0.4	0.1	0.1	0.27	0.48
2	Nitrate	13	0.7	0.6	-0.1	0.4	-0.35	0.63
2	Sulfate	15	1.0	0.8	-0.1	0.3	-0.10	0.33
2	OC	15	1.6	1.3	-0.3	0.4	-0.20	0.27
2	EC	15	0.3	0.4	0.1	0.1	0.38	0.38
3	$PM_{2.5}$	14	7.9	6.0	-1.8	3.2	-0.13	0.37
3	Ammonium	15	0.3	0.2	0.0	0.1	0.22	0.50
3	Nitrate	15	0.7	0.2	-0.5	0.5	-1.12	1.12
3	Sulfate	15	1.1	1.0	-0.1	0.3	-0.04	0.28
3	OC	15	2.6	1.7	-1.0	1.1	-0.29	0.36
3	EC	15	0.4	0.5	0.1	0.2	0.18	0.34
4	$PM_{2.5}$	17	25.6	30.3	4.7	6.5	0.25	0.31
4	Ammonium	17	2.4	3.3	0.9	1.0	0.50	0.53
4	Nitrate	17	8.2	11.2	3.0	3.5	0.42	0.48
4	Sulfate	17	1.1	1.2	0.1	0.3	0.12	0.25
4	OC	17	6.2	4.7	-1.6	1.8	-0.20	0.29
4	EC	17	1.6	1.5	-0.1	0.3	0.02	0.24
Annual	$PM_{2.5}$	61	14.8	15.7	0.9	4.1	0.04	0.34
Annual	Ammonium	62	1.0	1.6	0.6	0.6	0.43	0.56
Annual	Nitrate	60	3.9	5.1	1.2	1.8	-0.17	0.66
Annual	Sulfate	62	1.0	1.0	0.0	0.3	0.07	0.32
Annual	OC	61	4.0	2.9	-1.1	1.4	-0.19	0.32
Annual	EC	61	0.9	0.9	0.0	0.2	0.19	0.34

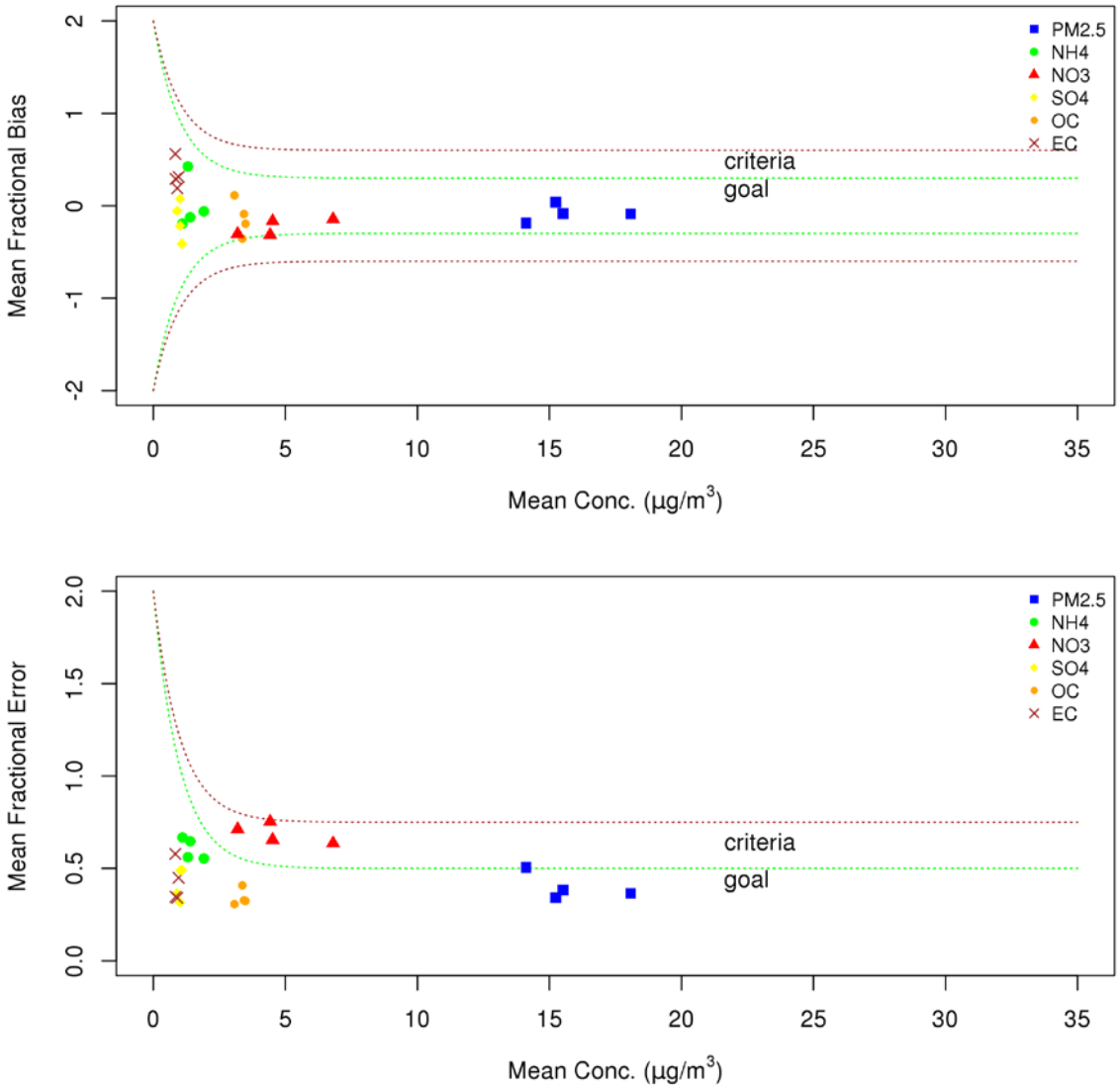

Figure 12. Bugle plot of annual $PM_{2.5}$ model performance in terms of MFB and MFE at four CSN sites in the SJV (i.e., Bakersfield, Fresno, Modesto, and Visalia).

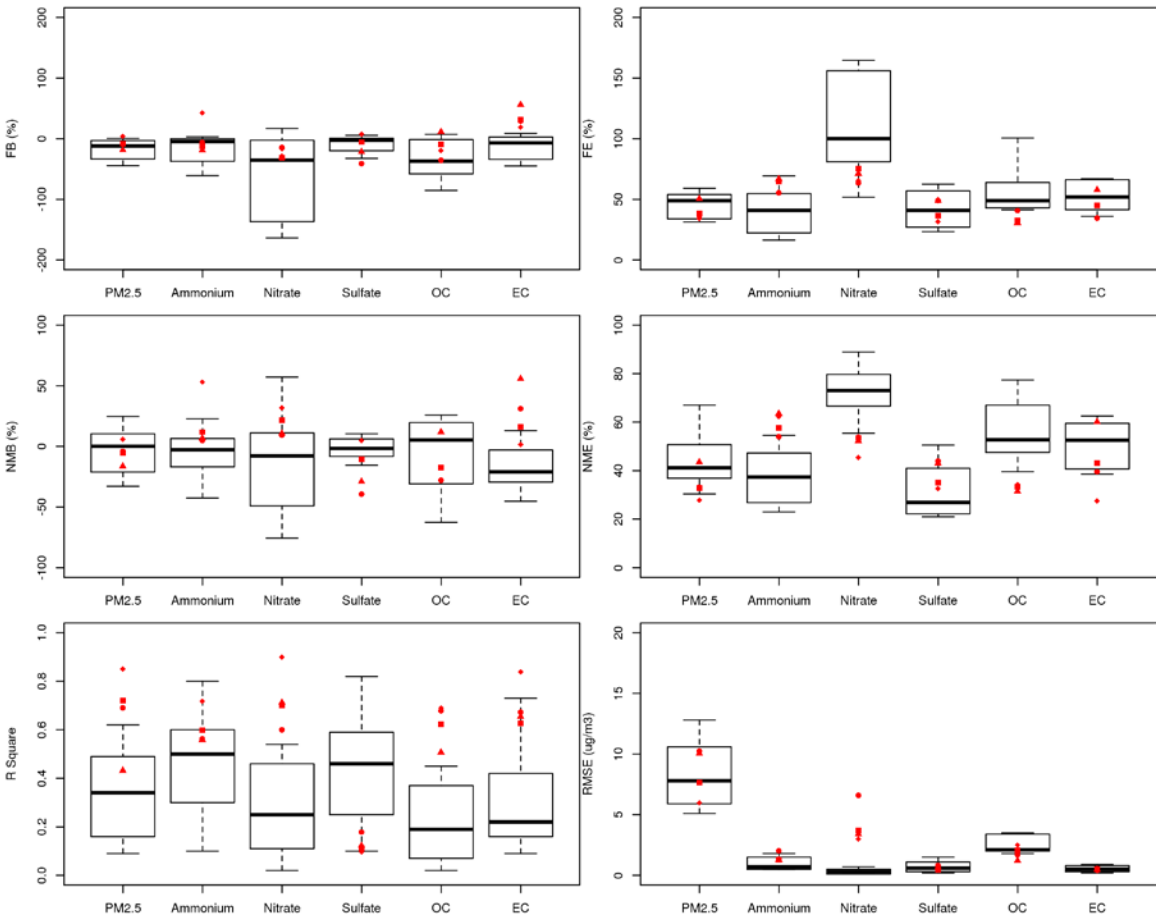

Figure 13. Comparison of annual $PM_{2.5}$ model performance to other modeling studies in Simon et al. (2012). Red symbols represent performance at the four CSN sites in the SJV.

In addition to evaluating the standard statistical performance metrics, it is also informative to put these performance statistics in the context of other studies published in the scientific literature. Figure 13 compares key performance statistics from the modeling platform presented in this document to the range of published performance statics from 2006 to 2012 and summarized in Simon et al. (2012). In Figure 13, the black centerline shows the median value (i.e., median model performance) from those studies, the boxes outline the 25th and 75th percentile values, and the whiskers show the 10th and 90th percentile values. The model performance for each of the four CSN sites in the SJV is shown in red. Performance metrics including MFB, MFE, normalized mean bias (NMB), normalized mean error (NME), R squared, and root mean square error (RMSE) are compared. Definitions of the statistics can be found in the Photochemical

Modeling Protocol or Simon et al. (2012). Model performance metrics in the SJV are typically equal to or better than the corresponding statistics from other studies. One exception is the higher RMSE for nitrate in the SJV, which is simply a reflection of the higher nitrate concentrations in the SJV compared to other regions. In fact, MFB, MFE, NME, and R squared for nitrate in the SJV is consistently better than the majority of the model studies summarized in Simon et al. (2012).

Since CSN monitors do not measure $PM_{2.5}$ on a daily basis, it is also advantageous to compare modeled 24-hour average $PM_{2.5}$ concentrations to observations from continuous $PM_{2.5}$ samplers, which typically report 24-hour average $PM_{2.5}$ concentrations on a daily basis. Figures S-41 – S-52 show the time series of modeled and observed 24-hour average $PM_{2.5}$ concentrations at these sites located throughout the SJV. Distinct seasonal variations in $PM_{2.5}$ concentrations are observed throughout the Valley, and are also reasonably captured by the model. Of particular importance, the modeling system was able to capture the elevated $PM_{2.5}$ events during the winter months and the lower $PM_{2.5}$ common in the summer months. In addition, Table 19 summarizes the corresponding model performance statistics at these sites. All the sites met or exceeded the $PM_{2.5}$ model performance criteria defined in Boyland and Russell (2006).

In addition to the $PM_{2.5}$ performance evaluation, gas phase model performance was also evaluated for NO_2 and ozone, which are key products of the photochemical processes in the atmosphere. Scatter plots of observed and modeled one-hour NO_2 mixing ratios at 16 sites are shown in Figures S-53 to S-68 in the supplemental materials. On average, there is good agreement between observed and modeled NO_2 mixing ratios. The slope of the regression line between the observed and modeled hourly NO_2 mixing ratios is within ±30% of the 1:1 line at most of the sites. Scatter plots of observed and modeled hourly O_3 mixing ratios at 25 sites are shown in Figures S-69 to S-93 in the supplemental materials. Modeled O_3 mixing ratios showed excellent agreement with observed mixing ratios and the slopes of the regression lines between observed and modeled O_3 are all within ±15% of the 1:1 line.

Table 19. Model performance for 24-hour $PM_{2.5}$ concentrations measured from continuous $PM_{2.5}$ monitors

Sites	# of Obs.	Avg. Obs. (µg/m^3)	Avg. Mod. (µg/m^3)	Mean bias (µg/m^3)	Mean error (µg/m^3)	MFB	MFE
Fresno-Drummond Street	246	14.8	13.5	-1.2	4.4	-0.16	0.36
Clovis	300	16.4	14.5	-1.9	5.6	-0.22	0.42
Bakersfield-California Avenue	267	20.2	16.2	-4.0	7.0	-0.29	0.44
Tranquility	301	8.5	10.1	1.5	5.0	-0.11	0.52
Fresno-Garland	312	19.3	15.7	-3.6	6.1	-0.33	0.44
Stockton	302	18.0	13.1	-4.9	7.3	-0.55	0.63
Merced	326	13.2	13.3	0.1	5.3	-0.14	0.44
Hanford	329	18.0	15.8	-2.2	5.9	-0.27	0.46
Madera	323	18.0	13.1	-4.9	7.7	-0.51	0.64
Manteca	325	11.7	13.4	1.7	6.2	-0.10	0.55
Visalia	309	18.6	19.1	0.5	6.9	-0.09	0.41
Modesto	315	14.4	14.5	0.1	5.0	-0.05	0.42
Turlock	316	14.8	14.6	-0.2	4.5	-0.05	0.41

5.3 FUTURE YEAR DESIGN VALUES

Future DVs for each site are given in Table 20. Correspondingly, Relative Response Factors (RRFs) and the base and the projected future year annual $PM_{2.5}$ composition at each monitor are given in Tables 21-23 (Note that the annual RRFs and composition are for reference only and that in the actual future year DV calculation, separate calculations were performed for each quarter and not on the annual average). The Bakersfield-Planz site has the highest projected future year DV at 14.8 µg/m^3, which is well above the 2012 annual $PM_{2.5}$ standard of 12 µg/m^3, but below the 2006 annual $PM_{2.5}$ standard of 15 µg/m^3. From the base to future year, there are significant reductions projected for ammonium nitrate and EC, modest reduction in OM, almost no change in sulfate, and a slight increase in crustal material (i.e., other primary $PM_{2.5}$ such as fugitive dust emissions).

Table 20. Projected future year $PM_{2.5}$ DVs at each monitor

Site AQS ID	Name	Base DV ($\mu g/m^3$)	Future 2021 DV ($\mu g/m^3$)
60290016	Bakersfield - Planz	17.3	14.8
60392010	Madera	16.9	14.4
60311004	Hanford	16.5	13.4
60310004	Corcoran	16.3	14.4
61072002	Visalia	16.2	13.7
60195001	Clovis	16.1	14.1
60290014	Bakersfield - California	16.0	13.6
60190011	Fresno-Garland	15.0	12.9
60990006	Turlock	14.9	12.8
60195025	Fresno - Hamilton & Winery (H &W)	14.2	12.2
60771002	Stockton	13.1	11.7
60470003	Merced - S Coffee	13.1	11.2
60990005	Modesto	13.0	11.2
60472510	Merced - Main Street	11.0	9.7
60772010	Manteca	10.1	8.8
60192009	Tranquility	7.7	6.5

Table 21. Annual RRFs for $PM_{2.5}$ components

Site	RRF for $PM_{2.5}$	RRF for NH_4	RRF for NO_3	RRF for SO_4	RRF for OM	RRF for EC	RRF for Crustal
Bakersfield - Planz	0.85	0.68	0.69	0.97	0.90	0.51	1.02
Madera	0.85	0.74	0.70	1.00	0.93	0.69	1.01
Hanford	0.81	0.71	0.67	1.02	0.94	0.70	0.92
Corcoran	0.88	0.70	0.68	1.04	0.97	0.76	0.95
Visalia	0.85	0.69	0.70	1.01	0.89	0.63	1.02
Clovis	0.87	0.70	0.70	1.00	0.91	0.66	1.07
Bakersfield - California	0.85	0.67	0.67	0.97	0.90	0.52	1.03
Fresno-Garland	0.86	0.72	0.72	0.99	0.89	0.59	1.05
Turlock	0.86	0.77	0.75	1.00	0.92	0.67	1.05

Fresno - H&W	0.86	0.74	0.74	0.99	0.89	0.58	1.05
Stockton	0.89	0.80	0.76	1.02	0.95	0.70	1.05
Merced - S Coffee	0.85	0.73	0.71	1.01	0.93	0.68	1.04
Modesto	0.86	0.77	0.74	1.01	0.92	0.67	1.05
Merced - Main Street	0.88	0.72	0.71	1.01	0.93	0.69	1.04
Manteca	0.87	0.81	0.77	1.02	0.92	0.68	1.04
Tranquility	0.84	0.69	0.63	1.00	0.96	0.73	1.02

Table 22. Base year $PM_{2.5}$ compositions*

Name	Base $PM_{2.5}$ ($\mu g/m^3$)	Base NH_4 ($\mu g/m^3$)	Base NO_3 ($\mu g/m^3$)	Base SO_4 ($\mu g/m^3$)	Base OM ($\mu g/m^3$)	Base EC ($\mu g/m^3$)	Base Crustal ($\mu g/m^3$)
Bakersfield - Planz	17.3	1.1	2.6	1.7	7.0	1.0	2.5
Madera	16.9	1.4	4.1	1.5	6.4	0.9	1.2
Hanford	16.5	1.9	5.5	1.5	4.1	0.7	1.2
Corcoran	16.3	1.2	2.9	1.5	7.4	0.7	1.2
Visalia	16.2	1.2	3.0	1.4	7.3	0.7	1.2
Clovis	16.1	0.9	2.1	1.3	8.7	0.9	1.1
Bakersfield – California	16.0	1.1	2.6	1.5	6.4	0.9	2.2
Fresno - Garland	15.0	0.9	2.2	1.1	8.0	0.8	0.9
Turlock	14.9	1.4	3.9	1.2	5.4	0.8	0.9
Fresno - H&W	14.2	0.8	2.1	1.0	7.6	0.8	0.8
Stockton	13.1	1.1	3.3	1.1	4.9	0.7	0.8
Merced - S Coffee	13.1	1.1	3.3	1.1	4.8	0.7	0.8
Modesto	13.0	1.2	3.4	1.1	4.7	0.7	0.8
Merced – Main Street	11.0	0.7	1.7	0.9	5.6	0.6	0.6
Manteca	10.1	0.9	2.6	0.8	3.6	0.5	0.6
Tranquility	7.7	0.6	1.9	0.6	2.8	0.4	0.5

*: Base year $PM_{2.5}$ compositions were based on CSN speciation measurement adjusted by the EPA SANDWICH method. Particle-bound water and blank mass are not shown.

Table 23. Projected future year $PM_{2.5}$ compositions

Name	Future $PM_{2.5}$ ($\mu g/m^3$)	Future NH_4 ($\mu g/m^3$)	Future NO_3 ($\mu g/m^3$)	Future SO_4 ($\mu g/m^3$)	Future OM ($\mu g/m^3$)	Future EC ($\mu g/m^3$)	Future Crustal ($\mu g/m^3$)	Future Water ($\mu g/m^3$)	Blank ($\mu g/m^3$)
Bakersfield - Planz	14.8	0.8	1.8	1.6	6.2	0.5	2.6	0.7	0.5
Madera	14.4	1.1	2.8	1.5	5.9	0.6	1.2	0.8	0.5
Hanford	13.4	1.4	3.6	1.5	3.8	0.5	1.1	0.9	0.5
Corcoran	14.4	0.8	2.0	1.5	7.1	0.5	1.1	0.7	0.5
Visalia	13.7	0.8	2.1	1.5	6.5	0.4	1.2	0.7	0.5
Clovis	14.1	0.6	1.5	1.3	7.9	0.6	1.1	0.6	0.5
Bakersfield - California	13.6	0.7	1.7	1.4	5.8	0.5	2.3	0.6	0.5
Fresno - Garland	12.9	0.6	1.6	1.1	7.1	0.5	0.9	0.5	0.5
Turlock	12.8	1.0	3.0	1.2	4.9	0.5	0.9	0.7	0.5
Fresno - H&W	12.2	0.6	1.5	1.0	6.7	0.4	0.9	0.5	0.5
Stockton	11.7	0.9	2.5	1.2	4.6	0.5	0.9	0.6	0.5
Merced - S Coffee	11.2	0.8	2.3	1.1	4.5	0.5	0.8	0.6	0.5
Modesto	11.2	0.9	2.5	1.1	4.3	0.4	0.8	0.6	0.5
Merced – Main Street	9.7	0.5	1.2	0.9	5.2	0.4	0.6	0.4	0.5
Manteca	8.8	0.7	2.0	0.8	3.3	0.3	0.6	0.5	0.5
Tranquility	6.5	0.4	1.2	0.6	2.7	0.3	0.5	0.3	0.5

5.4 PRECURSOR SENSITIVITY ANALYSIS

To evaluate the impact of reducing emissions of different $PM_{2.5}$ precursors on the projected future $PM_{2.5}$ DVs, a series of model sensitivity simulations were conducted, where emissions of the precursor species were scaled by ±15% from the future year baseline emissions. Comparing the difference in $PM_{2.5}$ DVs from the ±15% perturbations essentially produces the sensitivity of the future year $PM_{2.5}$ DVs to a 30% change in future year baseline precursor emissions. Specifically, the effect of reductions in the following $PM_{2.5}$ precursors was investigated: direct $PM_{2.5}$ (or primary $PM_{2.5}$), nitrogen oxides (NO_x), sulfur oxides (SO_x), ammonia, and volatile organic compounds (VOCs). For each precursor, only anthropogenic emissions in California were perturbed. Natural emissions and emissions outside of California (e.g., Mexico) were not perturbed.

Tables 24-28 show the change in $PM_{2.5}$ DV at each site from the 30% perturbation of controllable NO_x, direct $PM_{2.5}$, NH_3, VOCs, and SO_x emissions, respectively. The DV change is calculated as the difference in the projected DV from the +15% perturbation minus the projected DV from the -15% perturbation case. In addition, the differences are calculated for both the aggregate $PM_{2.5}$ DV as well as the component specific portion of the DV that is directly linked to each precursor. The $PM_{2.5}$ component(s) corresponding to each emissions precursor are as follows: NO_x is linked to ammonium nitrate; direct $PM_{2.5}$ is linked to primary sulfate, organic matter (OM), EC, and other primary $PM_{2.5}$ components; NH_3 is linked to ammonium nitrate plus the ammonium associated with ammonium sulfate (i.e., all ammonium); VOCs are linked to secondary organic aerosol (SOA); and SO_x is linked to the sulfate component of ammonium sulfate.

A threshold of 0.2 µg/m^3 for the annual $PM_{2.5}$ DV was used to determine the significance of a precursor to $PM_{2.5}$ formation (e.g., if a 30% change in precursor emissions leads to a change in component DV less than or equal to 0.2 µg/m^3 then the precursor is deemed not significant). For NO_x (Table 24), a 30% change in emissions resulted in a response of the component DV that is greater than 0.2 µg/m^3 at all sites, so NO_x is deemed a significant precursor. The same is true for direct $PM_{2.5}$ (Table 25), where sites show a response between 0.8 µg/m^3 at Tranquility and 2.8 µg/m^3 at Bakersfield-Planz and Clovis. For the other major precursors, ammonia, VOC, and SO_x (Tables 26-28), all are shown to be not significant based on the 0.2 µg/m^3 threshold and a 30% change in precursor emissions.

Table 24. Difference in $PM_{2.5}$ and ammonium nitrate DVs from a 30% perturbation in anthropogenic NO_x emissions.

Site	Difference in $PM_{2.5}$ DVs (µg/m^3)	Difference in component (i.e., ammonium nitrate, µg/m^3)
Bakersfield - Planz	0.8	0.7
Madera	1.1	1.0
Hanford	1.5	1.3
Corcoran	0.9	0.8
Visalia	0.9	0.8
Clovis	0.7	0.5
Bakersfield - California	0.8	0.7
Fresno-Garland	0.6	0.5
Turlock	1.1	1.0
Fresno - Hamilton & Winery	0.6	0.5
Stockton	0.9	0.8
Merced - S Coffee	0.9	0.8
Modesto	0.9	0.8
Merced - Main Street	0.5	0.4
Manteca	0.7	0.6
Tranquility	0.5	0.4

Table 25. Difference in $PM_{2.5}$ and components (including sulfate, OM, EC, and other) DVs from a 30% perturbation in anthropogenic $PM_{2.5}$ emissions

Site	Difference in $PM_{2.5}$ DVs ($\mu g/m^3$)	Difference in component (including sulfate, OM, EC, and other $PM_{2.5}$, $\mu g/m^3$)
Bakersfield - Planz	2.9	2.8
Madera	2.3	2.1
Hanford	1.6	1.5
Corcoran	2.4	2.3
Visalia	2.4	2.3
Clovis	2.9	2.8
Bakersfield - California	2.7	2.6
Fresno-Garland	2.7	2.6
Turlock	2.0	1.9
Fresno - Hamilton & Winery	2.6	2.5
Stockton	1.9	1.8
Merced - S Coffee	1.7	1.6
Modesto	1.8	1.7
Merced - Main Street	1.8	1.8
Manteca	1.3	1.2
Tranquility	0.9	0.8

Table 26. Difference in $PM_{2.5}$ and ammonium nitrate DVs from a 30% perturbation in ammonia emissions

Site	Difference in $PM_{2.5}$ DVs ($\mu g/m^3$)	Difference in component (i.e., ammonium nitrate, $\mu g/m^3$)
Bakersfield - Planz	0.1	0.1
Madera	0.2	0.2
Hanford	0.2	0.2
Corcoran	0.1	0.1
Visalia	0.1	0.1
Clovis	0.1	0.1
Bakersfield - California	0.1	0.1
Fresno-Garland	0.1	0.1
Turlock	0.2	0.1
Fresno - Hamilton & Winery	0.1	0.1
Stockton	0.1	0.1
Merced - S Coffee	0.1	0.1
Modesto	0.1	0.1
Merced - Main Street	0.1	0.1
Manteca	0.1	0.1
Tranquility	0.1	0.1

Table 27. Difference in $PM_{2.5}$ and SOA DVs from a 30% perturbation in VOCs emissions

Site	Difference in $PM_{2.5}$ DVs ($\mu g/m^3$)	Difference in component (i.e., SOA, $\mu g/m^3$)
Bakersfield - Planz	0.0	0.1
Madera	0.0	0.1
Hanford	-0.1	0.1
Corcoran	0.0	0.1
Visalia	0.0	0.1
Clovis	0.1	0.1
Bakersfield - California	0.0	0.1
Fresno-Garland	0.1	0.1
Turlock	0.0	0.0
Fresno - Hamilton & Winery	0.0	0.1
Stockton	0.0	0.0
Merced - S Coffee	0.0	0.1
Modesto	0.0	0.0
Merced - Main Street	0.0	0.1
Manteca	0.0	0.0
Tranquility	0.0	0.0

Table 28. Difference in $PM_{2.5}$ and sulfate DVs from a 30% perturbation in SO_x emissions

Site	Difference in $PM_{2.5}$ DVs ($\mu g/m^3$)	Difference in component (i.e., sulfate only, $\mu g/m^3$)
Bakersfield - Planz	0.1	0.1
Madera	0.2	0.1
Hanford	0.2	0.1
Corcoran	0.1	0.1
Visalia	0.2	0.1
Clovis	0.1	0.1
Bakersfield - California	0.1	0.1
Fresno-Garland	0.1	0.1
Turlock	0.2	0.1
Fresno - Hamilton & Winery	0.1	0.1
Stockton	0.2	0.1
Merced - S Coffee	0.2	0.1
Modesto	0.2	0.1
Merced - Main Street	0.1	0.1
Manteca	0.2	0.1
Tranquility	0.1	0.0

5.5 DISCUSSION ON PRECURSOR SENSITIVITY

In this section, we address three questions regarding precursor sensitivity:

1.) NO_x as the limiting precursor for ammonium nitrate vs. benefits of ammonia reductions on ammonium nitrate formation;
2.) On VOCs' indirect role in ammonium nitrate formation;
3.) Current status of secondary organic aerosol (SOA)

Ammonia's role in ammonium nitrate formation in the SJV

During the DISCOVER-AQ field campaign, aircraft measurements of $PM_{2.5}$ and its precursors were made in the planetary boundary layer over agricultural and urban areas within the SJV. Among the suite of measurements made, the measurements of total nitric acids (gas + particle phases, or g + p), gaseous ammonia, particulate ammonium, and sulfate allowed for an observation based evaluation of the precursor limitation for ammonium nitrate formation. The excess NH_3 in the atmosphere can be defined as the sum of gaseous NH_3 and particulate ammonium minus 2x particulate sulfate and total nitric acids (g + p) (Blanchard et al., 2000). While the calculation of excess NH_3 in Blanchard et al. (2000) also incorporated the impact from other ions, such as calcium, magnesium, potassium and chloride, those species should only have a minor effect on the analysis and so were not considered in order to maximize the data availability. If the value of excess NH_3 is greater than zero, this indicates that secondary particulate nitrate is in a NO_x-limited regime. Conversely, a value less than zero demonstrates an ammonia-limited regime.

Figure 14 shows the excess NH_3 in the bottom 1 km of the atmosphere, collected by NASA aircraft in the SJV on January 18 and 20, during which $PM_{2.5}$ concentrations in the SJV were elevated. Each data point of excess NH_3 was calculated based on 10 second observational data with no further averaging. For nearly all data points, excess NH_3 is clearly above zero, indicating that nitrate formation in the SJV is in a NO_x-limited regime, which is consistent with past observations (Lurmann et al., 2006; Markovic, 2014).

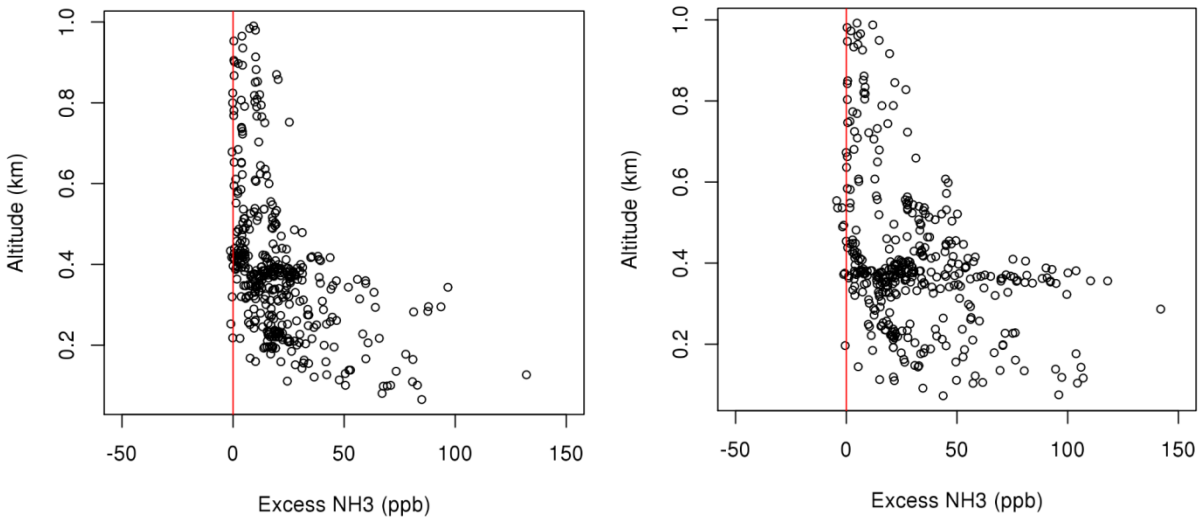

Figure 14. Excess NH_3 in the SJV on January 18 (Left) and January 20 (Right) based on NASA aircraft measurements in 2013.

While ammonium nitrate formation is in a NO_x limited regime, this does not conflict with modeling results that showed a small sensitivity of ammonium nitrate formation to ammonia emission reductions. At equilibrium state, the product of gaseous nitric acid and ammonia mixing ratios in the atmosphere is a constant, and the equilibrium constant depends on ambient conditions as well as particulate compositions (Seinfeld and Pandis, 2006). Even in a NO_x-limited regime, the perturbation of ammonia mixing ratios influences the partitioning of nitric acids. As ammonia becomes more and more excessive, the partitioning of nitric acids shifts towards the particulate phase. After the vast majority of nitric acids are in the particulate phase (e.g., > 98% of nitric acids in particulate phase), the formation of ammonium nitrate becomes far less sensitive to the excessive ammonia. In addition, the dry deposition velocity difference between gaseous nitric acid and particulate nitrate further adds to the complexity. When the partitioning of gaseous and particulate nitric acids is perturbed by changing ammonia, due to the different removal rates of gaseous and particulate nitric acids (Meng et al., 1997; Pusede et al., 2016), the mass of total nitric acids is perturbed as well, which could amplify the response to ammonia emissions changes. In the SJV, because of the excessive ammonia, the formation of ammonium nitrate is much more sensitive to the reductions of NO_x than to the reductions of ammonia, which has been widely documented in past modeling studies. Nevertheless, limited sensitivity of ammonium nitrate formation to large ammonia reductions has been shown in previous modeling studies as well (Kleeman et al., 2005). Overall, modeling demonstrated that ammonia is not a significant precursor to $PM_{2.5}$ as $PM_{2.5}$ DVs only exhibited a limited sensitivity to a reasonable level of ammonia reductions.

Indirect role of VOCs in ammonium nitrate formation

The integrated reaction rate (IRR) analysis in CMAQv5.0.2 was used to understand the impact of VOC emission reductions on nitrate formation in the model. IRR outputs the production or loss rates for individual gas-phase chemical pathways. Heterogeneous nitric acid formation rates were obtained from the aerosol module. Two separate simulations using the January 2013 meteorological fields were conducted for two future year emission scenarios. One utilized the baseline future year emissions inventory for 2025 and the other involved a 25% reduction in VOC emissions from the baseline scenario. When VOC emissions were reduced by 25%, daytime and nighttime nitric acid formation rates were only slightly impacted by the VOC emission reductions. Daytime homogeneous nitric acid formation is primarily through the gas-phase reaction of NO_2 and the hydroxyl radical. When VOC emissions were reduced, at urban locations such as Bakersfield, the daytime nitric acid formation rate decreased slightly because of the slight decrease in hydroxyl radical mixing ratios associated with VOC reductions. More specifically, reduced hydroxyl radical mixing ratio was due to reduced photolysis from formaldehyde (Pusede et al., 2016).

In addition to the effect that VOCs can have on daytime nitric acid formation rates, they can also indirectly affect nighttime heterogeneous nitric acid formation, which involves the heterogeneous reaction of N_2O_5 on particles. N_2O_5 is formed from NO_2 and NO_3, the latter of which is a product of the reaction between NO_2 and O_3 (Seinfeld and Pandis, 2006). In places like Visalia, the nighttime heterogeneous nitric acid formation rate above the surface was slightly enhanced when VOC emissions were reduced. Model output showed reduced peroxyacetyle nitrate (PAN) formation under reduced VOC emissions. The reduced PAN formation then resulted in increased availability of NO_2, which in turn enhanced N_2O_5 formation (Meng et al., 1997) and slightly increased its heterogeneous formation rate.

Overall, reducing VOC emissions by 25% increased ammonium nitrate only slightly (~ 1%) at $PM_{2.5}$ design sites, which is the net outcome of different chemical processes in competition with each other, as well as the physical transport and mixing processes in the atmosphere.

Current status of secondary organic aerosol (SOA)

Secondary organic aerosol (SOA) is formed in the atmosphere by oxidation of VOCs followed by gas to particle partitioning of the oxidation products (Kanakidou et al., 2005). In general, the importance of SOA is higher during the ozone season when VOC emissions are at their peak (e.g., Foley et al., 2010; Liu et al., 2012; Rollins et al., 2012;

Zhao et al., 2013) and is much smaller in winter (Lurmann et al., 2006). However, in the SJV, $PM_{2.5}$ concentrations are typically lower in summer compared to winter. In recent years, Aerosol Mass Spectrometer (AMS) measurements made in Fresno during winter showed that approximately a third of organic aerosol is oxygenated organic aerosol (OOA) and the remaining is primary (Ge et al., 2013; Young et al., 2016).At present, the sources and/or formation processes for OOA are not known yet. Potential sources for OOA could include SOA, atmospherically processed POA, or directly emitted POA as well.

In the CMAQ model, SOA is simulated using the two-product absorption model (Odum et al., 1996). Detailed description of the SOA model in CMAQ can be found in Carlton et al. (2010) and Simon et al. (2012). Briefly, CMAQ considers SOA formation from the following precursors: long chain alkanes, high-yield aromatics (e.g., toluene), low-yield aromatics (e.g., xylene), benzene, isoprene, monoterpenes, and sesquiterpenes. For most anthropogenic VOCs, SOA is formed via oxidation by the hydroxyl radical. For biogenic VOCs, such as monoterpenes and sesquiterpenes, SOA is also formed from oxidation by nitrate and ozone, in addition to oxidation by the hydroxyl radical (Carlton et al., 2010). CMAQ also incorporates a NO_x dependence on SOA yield, in-cloud SOA formation from glyoxal and mythylglyoxal, particle-phase oligomerization (Carlton et al., 2010) and aging of primary organic aerosol (Simon et al., 2012). Overall, CMAQ's SOA module represents a state-of-the-science treatment of known SOA precursors and processes. Various daytime and nighttime formation processes of SOA considered important at Bakersfield (Liu et al., 2012; Rollins et al., 2012; Zhao et al., 2013) are treated in the CMAQ model.

In general, current state-of-the-science SOA models are believed to under-predict the levels of SOA formation in the atmosphere. The under-prediction of SOA is not limited to the two-product SOA model used in CMAQ. Other SOA modeling formulations, such as the volatility bin based model (e.g., Ciarelli et al., 2015; Woody et al., 2015) and the statistical oxidation model (e.g., Jathar et al., 2016) under-predict SOA concentrations to a similar degree, especially when these models are calibrated to the same chamber SOA yield data and are based on the same SOA precursors

Two important issues have emerged in recent years that were deemed to be promising in reducing the gaps between modeled and observed SOA concentrations in the atmosphere. Robinson et al. (2007) demonstrated that SOA formation from emissions of intermediate-volatile/semi-volatile organic compounds (IVOCs/SVOCs) from combustion sources far exceeded known SOA precursors and that those emissions were not accounted for in the current emission inventories. Characterization and quantification of the emission factors and SOA formation potentials of the IVOCs/SVOCs are not trivial. In the past several years, collaborations among Professor Robinson's group at

Carnegie Mellon University (CMU), EPA, and CARB have been focusing on the characterization of IVOCs/SVOCs emissions from mobile sources. Follow-up studies have demonstrated the importance of SOA formation from motor vehicle emitted IVOCs/SVOCs (e.g., Jathar et al., 2014; Zhao et al., 2015), although these studies were based on 0-D calculations. Given the challenge of characterizing those emissions and SOA formation potentials, there is also a discrepancy regarding the relative importance of SOA formation from different motor vehicle sources (Bahreini et al., 2012; Gentner et al., 2012; Jathar et al., 2014; Zhao et al., 2015). However, CMU's latest 3-D air quality modeling assessment in Southern California including those IVOCs/SVOCs emissions shows only modest difference of OA prediction compared to the traditional method in CMAQv4.7 and that mobile sources (including gasoline and diesel vehicles/equipments) only contributed one-quarter of the OA burden in Southern California, as strict regulations have dramatically reduced motor vehicle emissions (Robinson, 2016). Zhang et al. (2014) found that SOA yield data measured from laboratory chamber experiments may be substantially suppressed due to losses of SOA-forming vapors to chamber walls. This can lead to an underestimate of SOA in air quality models because parameterizations in SOA models are calibrated against chamber measured SOA yields. While the significance of vapor wall loss has been recognized, more work is needed to understand the mechanisms of vapor wall loss and to correct the vapor wall loss for past experimental data (Krechmer et al., 2016; Yeh and Ziemann, 2015; Zhang et al., 2015).

Many ambient or laboratory measurements have demonstrated potential SOA formation from different chemical pathways beyond the absorption process treated in typical SOA models. For example, Zhao et al (2013) showed that SOA production from phthalic acid was substantially increased by reaction with ammonia to form ammonium salts that favor their partitioning into the particle phase. Smith (2014) demonstrated that aqueous oxidation of phenols can lead to SOA formation. While those findings are important under certain conditions, more coordinated ambient measurement, laboratory experiments, and computational modeling are needed to develop models that describe those formation pathways rigorously under different atmospheric conditions. From there, the importance of those processes and the implication to control programs can be assessed. Arbitrary use of findings may itself lead to simulated SOA formation that is not a true representation of the relevant atmospheric processes, even though the model performance of SOA/OA is improved. For example, Jathar et al. (2016) cautioned that the use of an unconstrained multi-generational aging scheme, commonly adopted in models recently (e.g., Lane et al., 2008; Shrivastava et al., 2008), is not an indication of improved representation of atmospheric chemistry, though it improved the agreement between observed and modeled OA concentrations. Hayes et al. (2015) showed that including SOA formation from IVOCs/SVOCs based on three different parameterizations

shows very large differences (e.g., a factor of 3 in SOA mass concentrations), which underscored the uncertainties associated with the current understanding. These all demonstrated that caution needs to be taken in terms of development and choice of parameterizations of SOA precursors/formation, particularly when these models are used for regulatory purposes.

Overall, continued assessment of SOA formation in the SJV is warranted as the scientific understanding of SOA contributing sources and formation mechanisms continues to be improved. However, based on modeling result from the current state-of-the-science SOA module in CMAQv5.0.2, VOC is not a significant precursor to $PM_{2.5}$ formation in the SJV based on its contribution to SOA formation.

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SUPPLEMENTAL MATERIALS

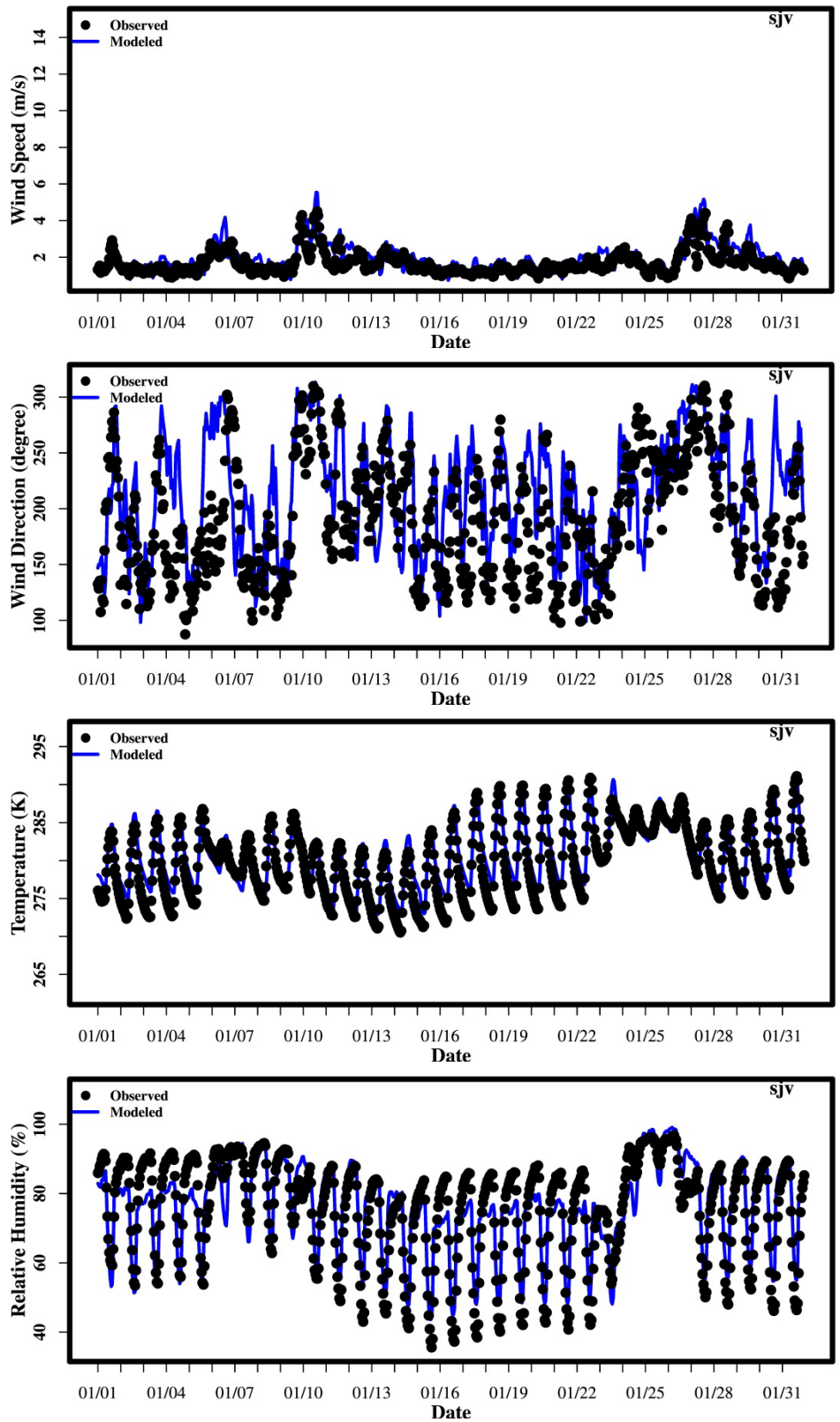


Figure S. 1 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in January 2013.

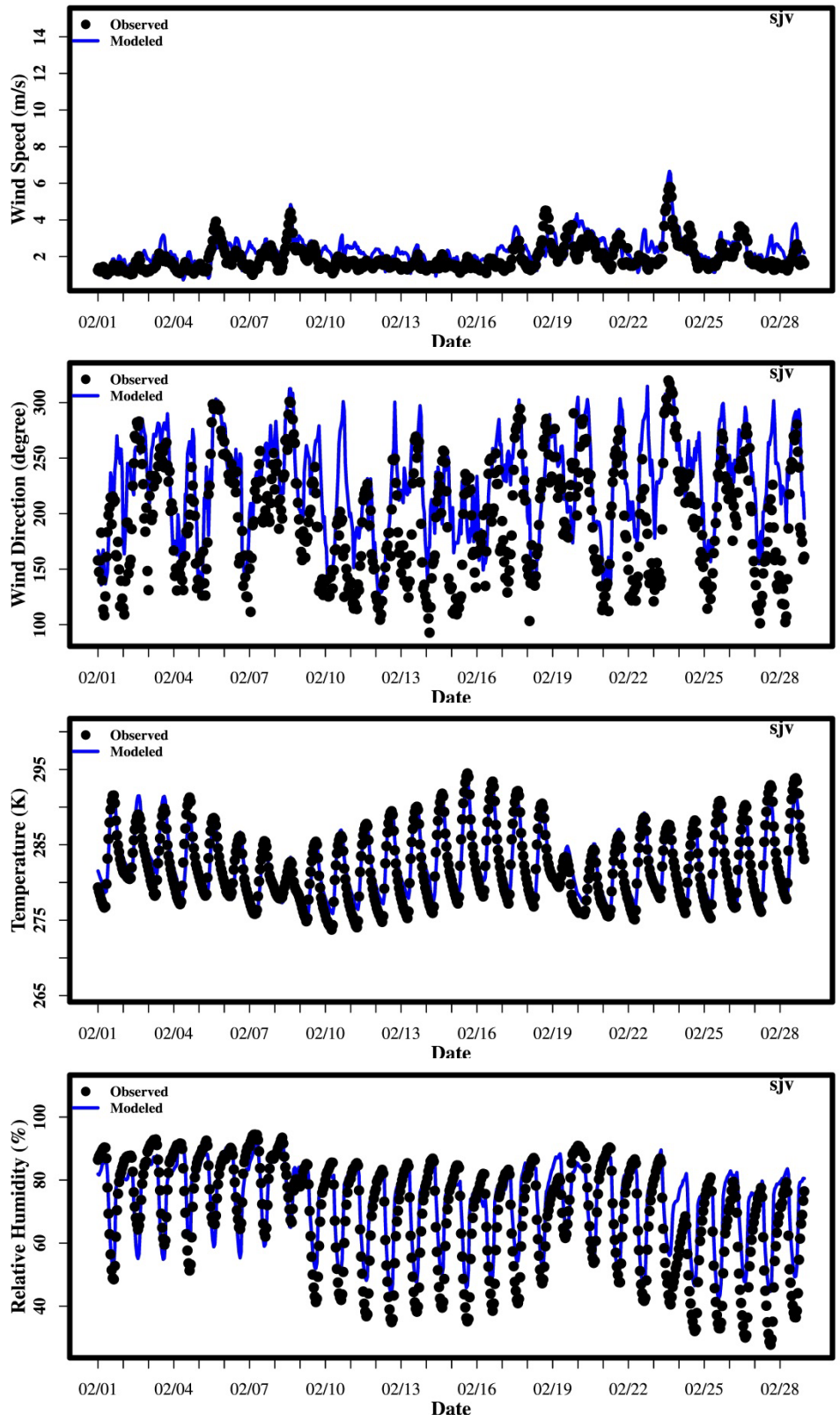


Figure S. 2 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in February 2013.

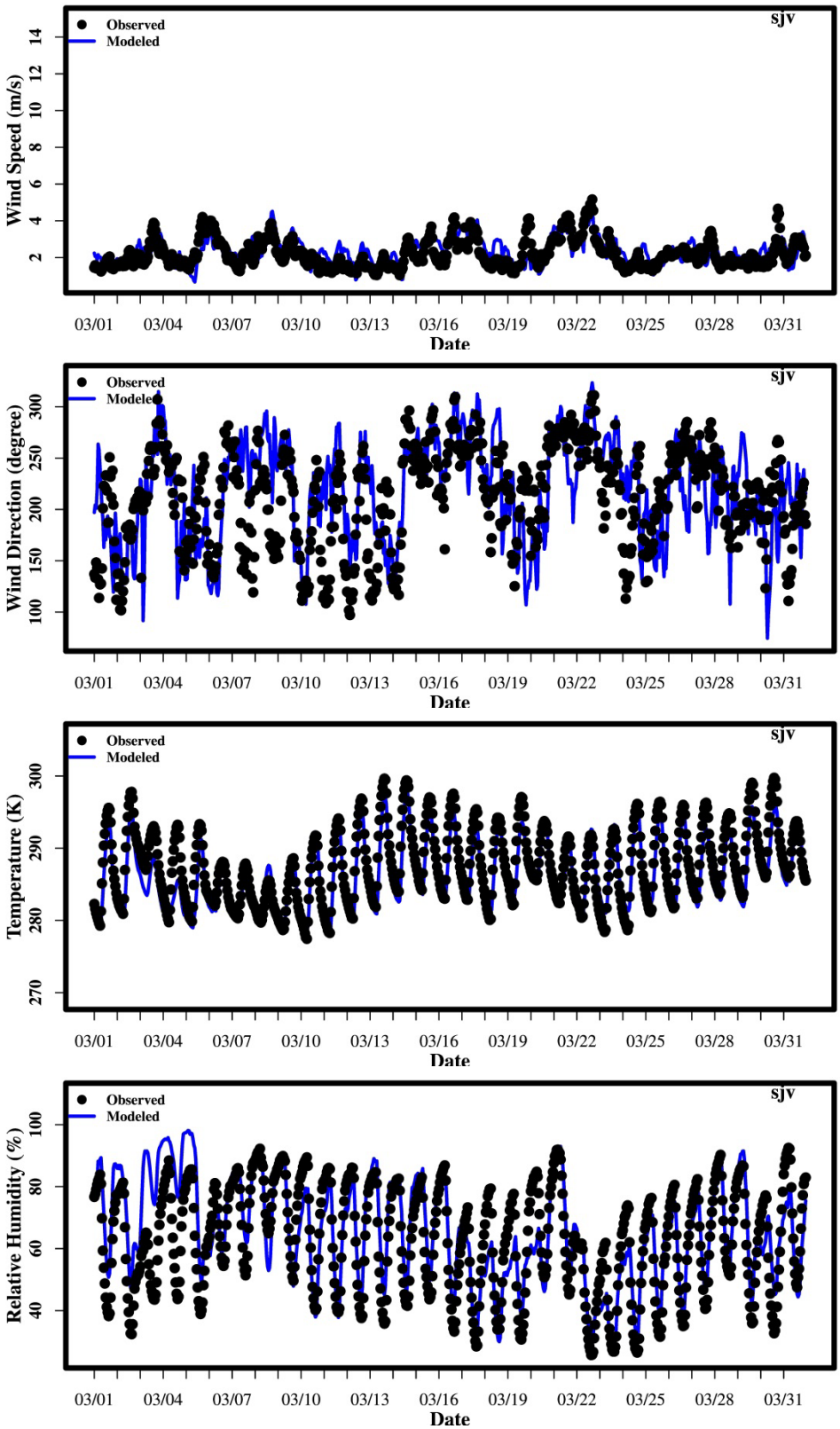


Figure S. 3 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in March 2013.

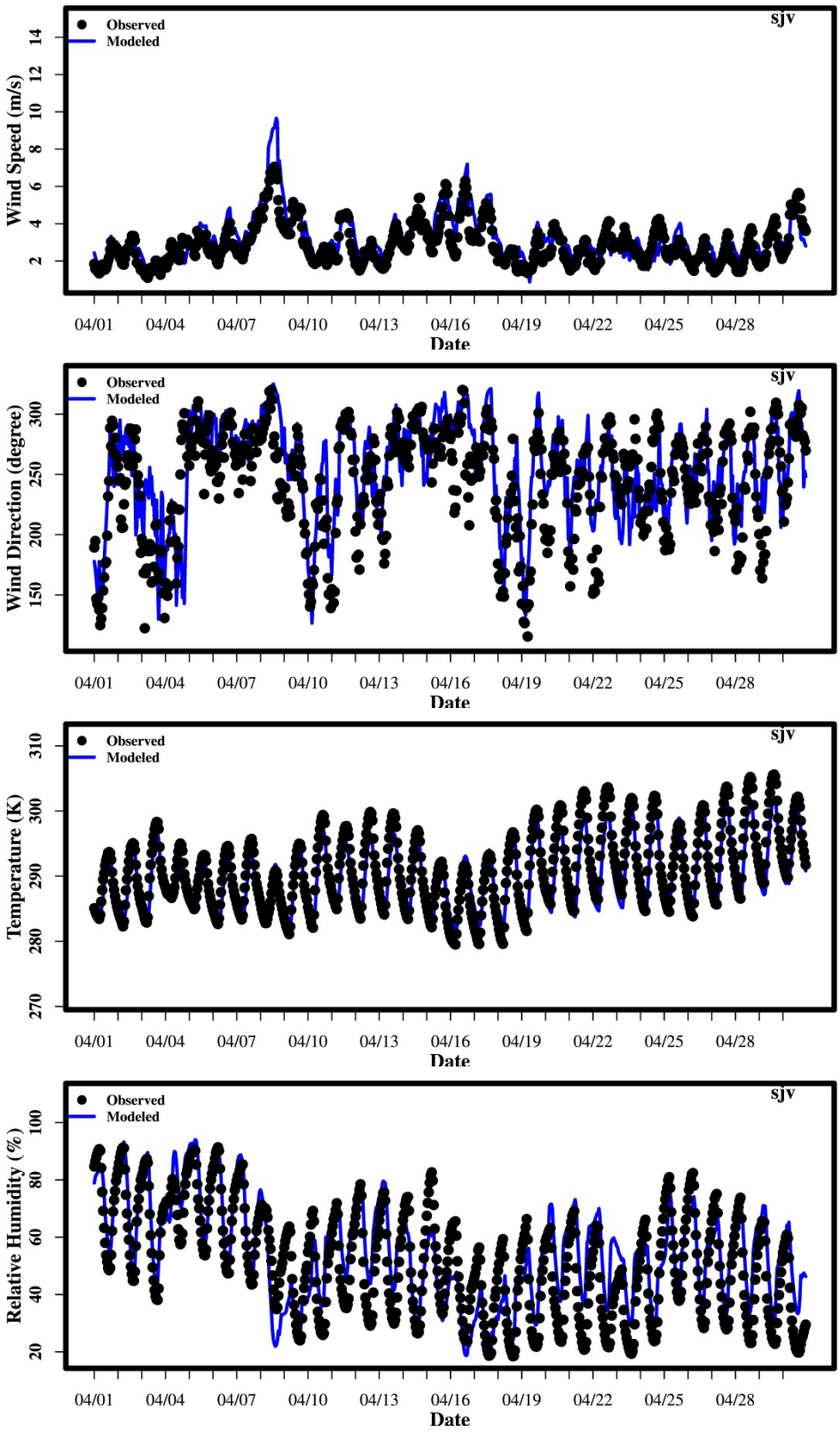


Figure S. 4 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in April 2013.

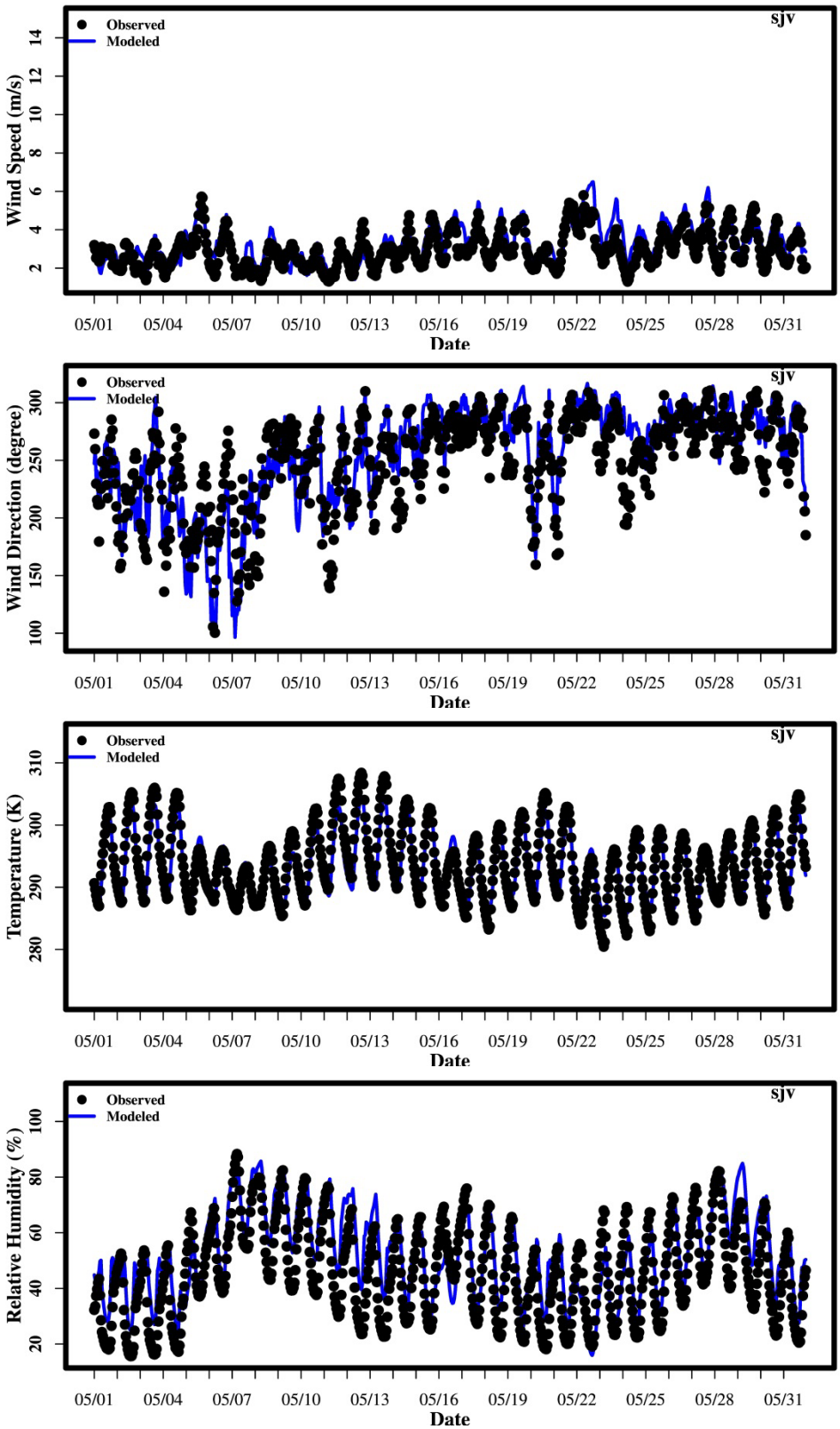


Figure S. 5 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in May 2013.

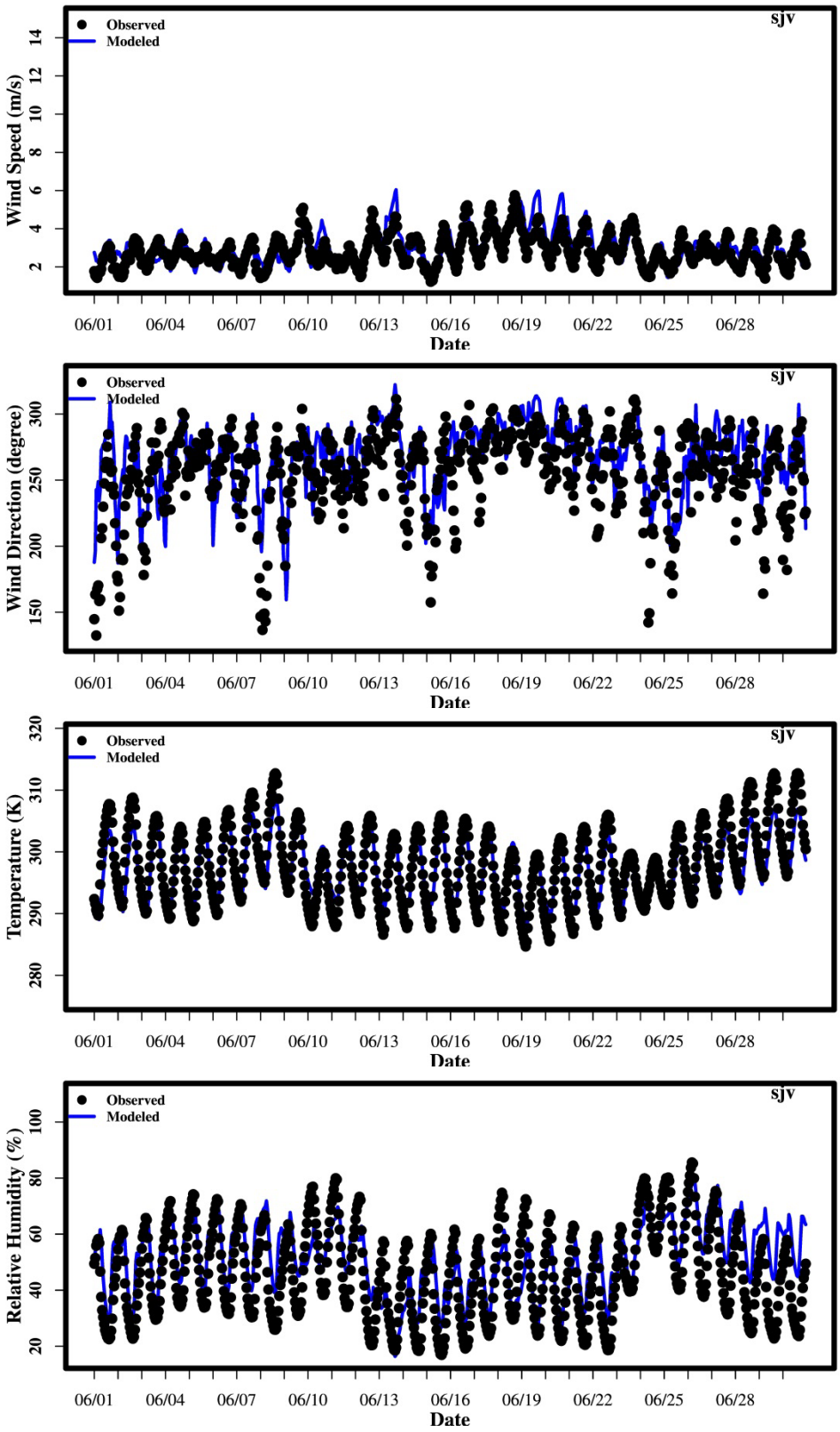


Figure S. 6 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in June 2013.

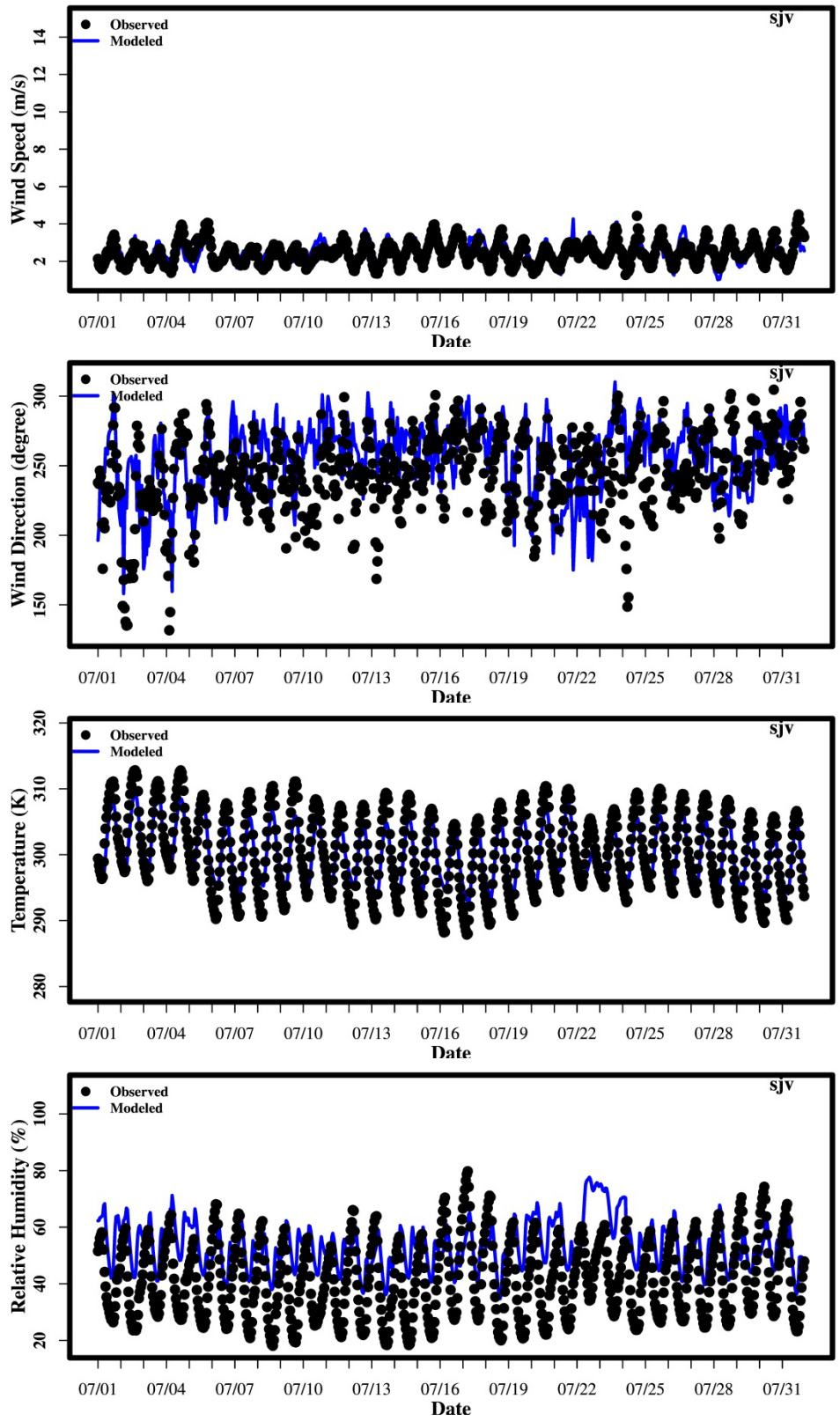


Figure S. 7 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in July 2013.

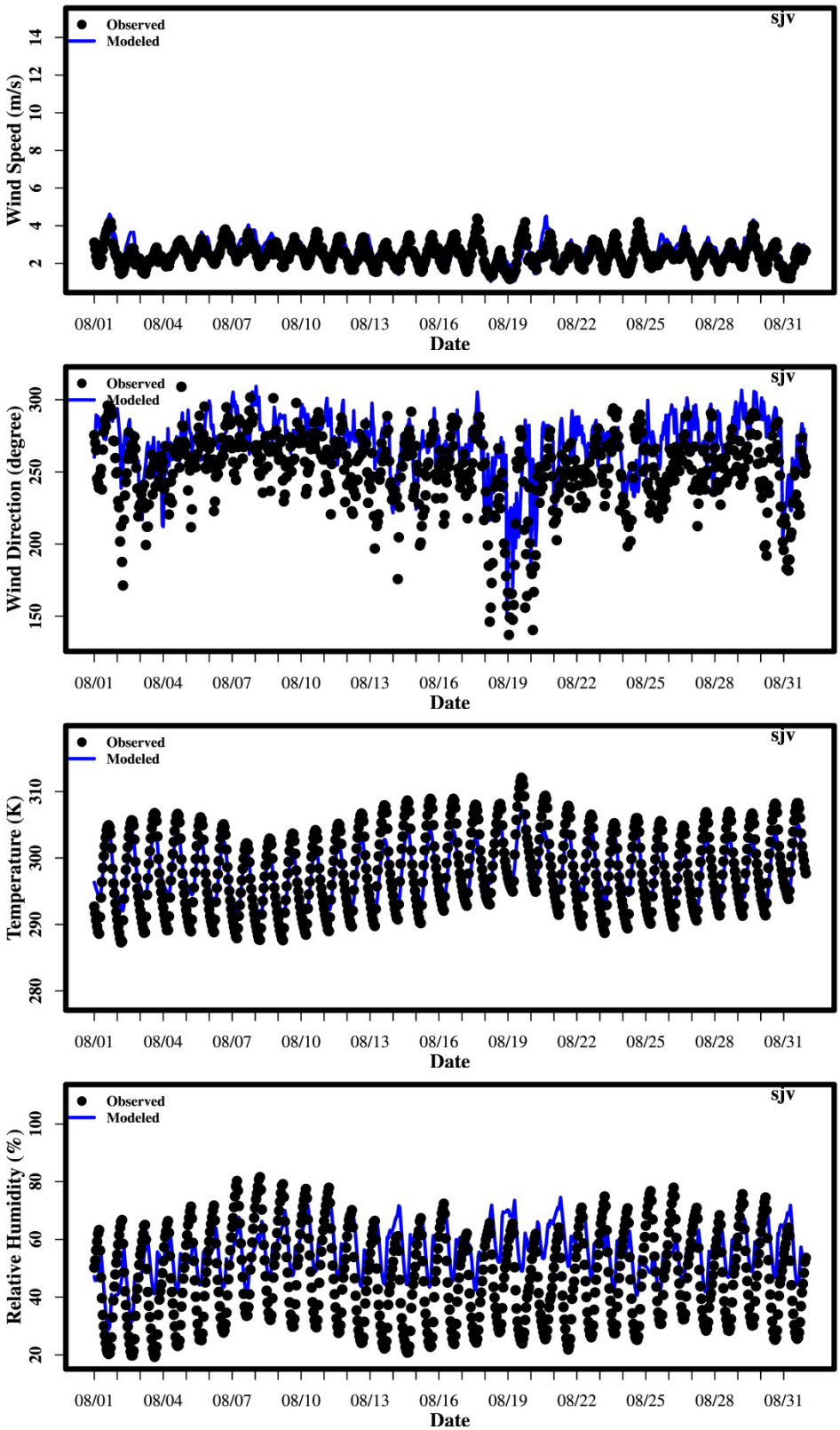


Figure S. 8 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in August 2013.

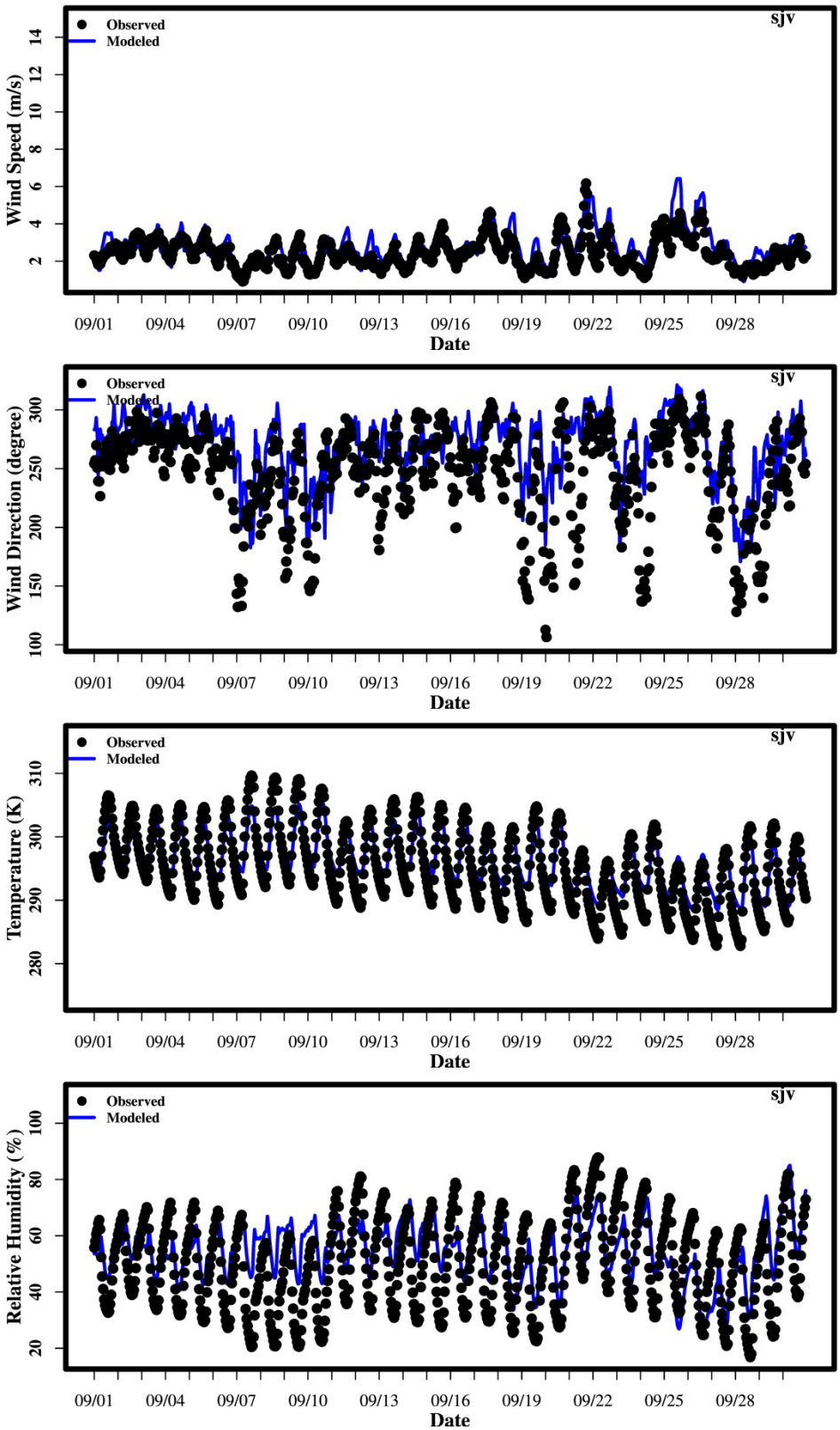


Figure S. 9 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in September 2013.

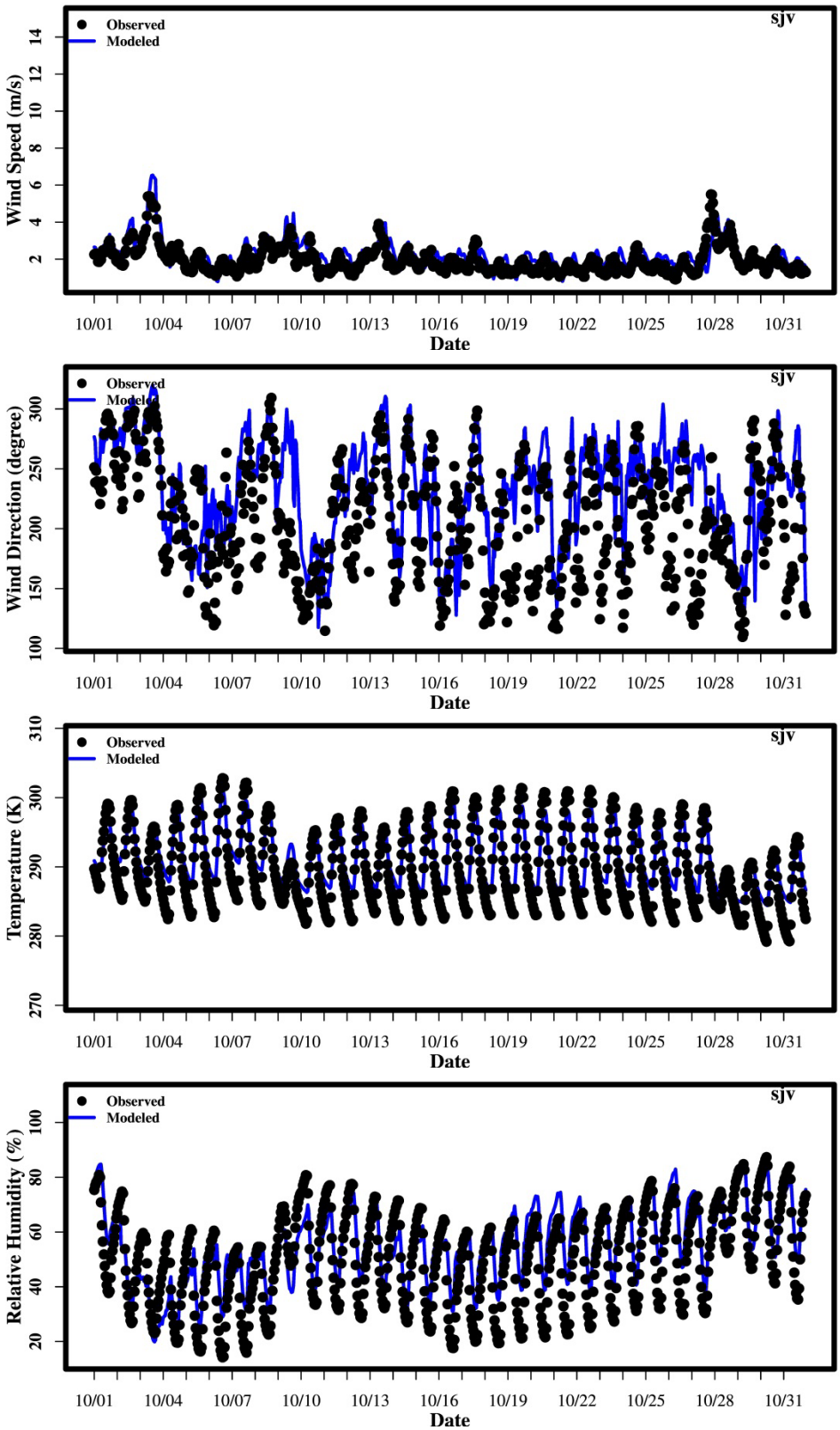


Figure S. 10 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in October 2013.

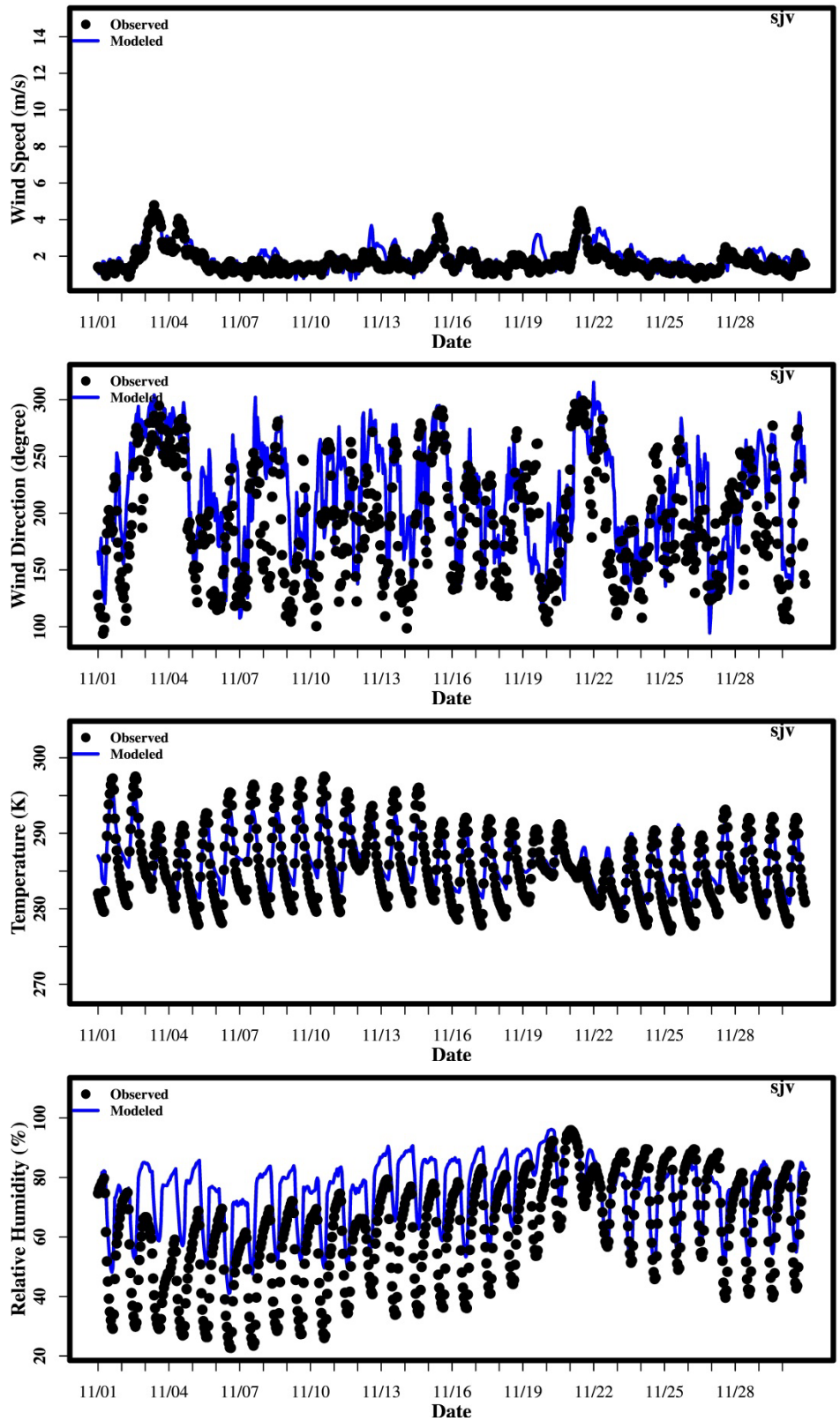


Figure S. 11 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in November 2013.

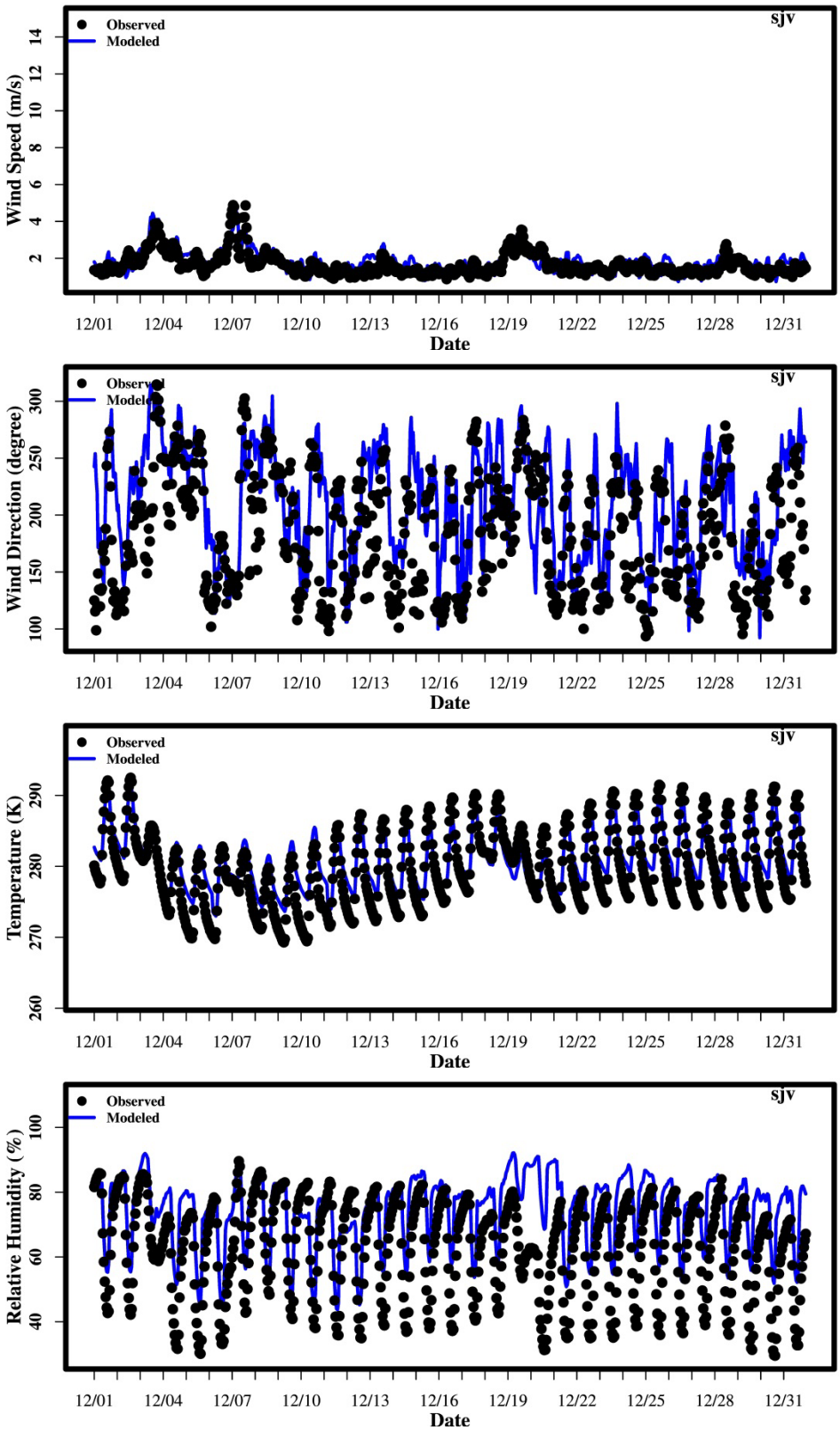


Figure S. 12 Time series of wind speed, direction, temperature and relative humidity for San Joaquin Valley in December 2013.

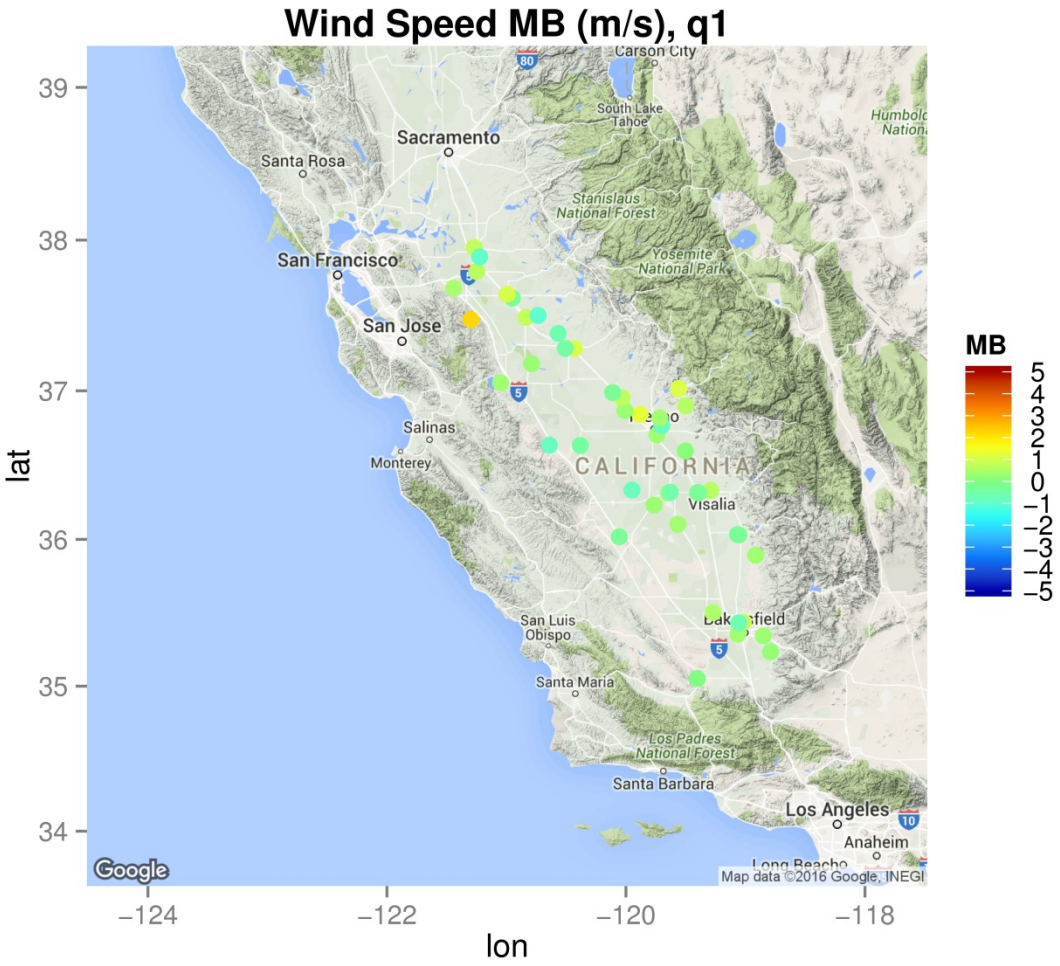


Figure S. 13 Hourly wind speed mean error in the first quarter of 2013

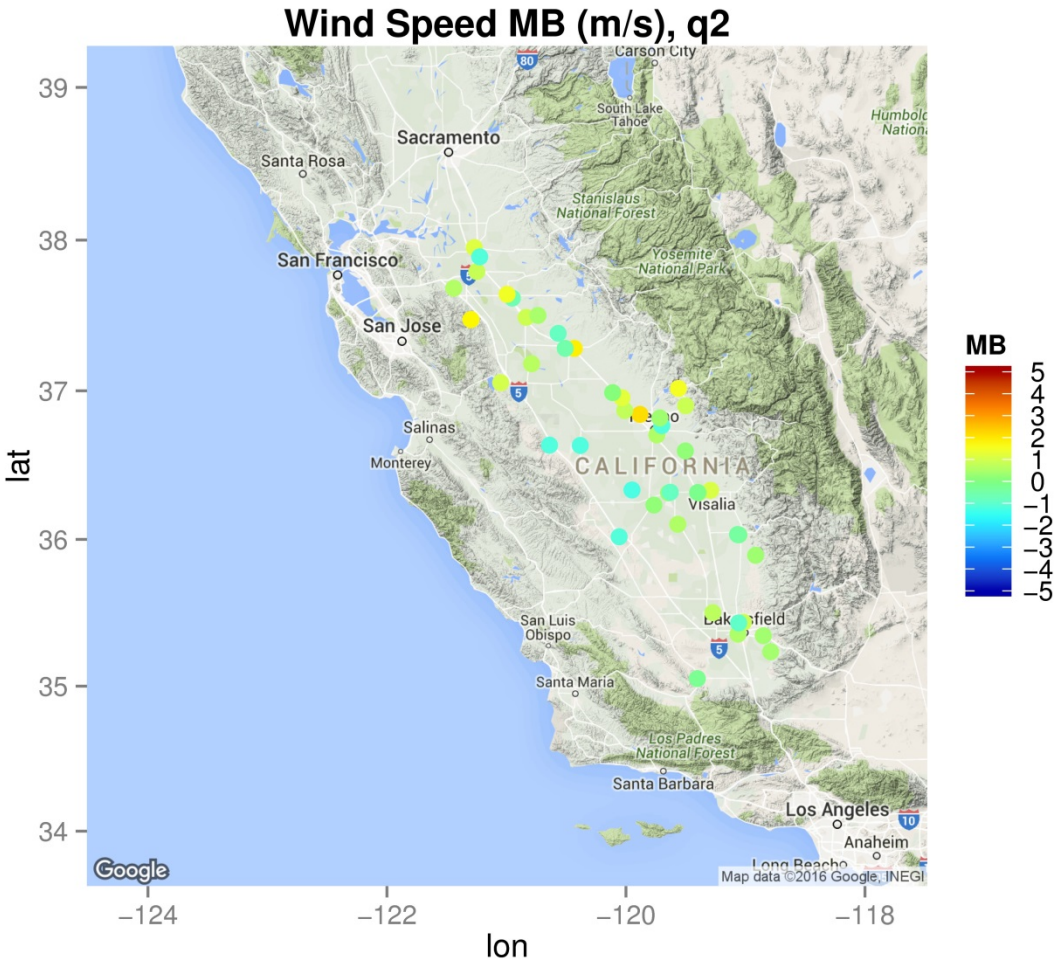


Figure S. 14 Hourly wind speed mean bias in the second quarter of 2013

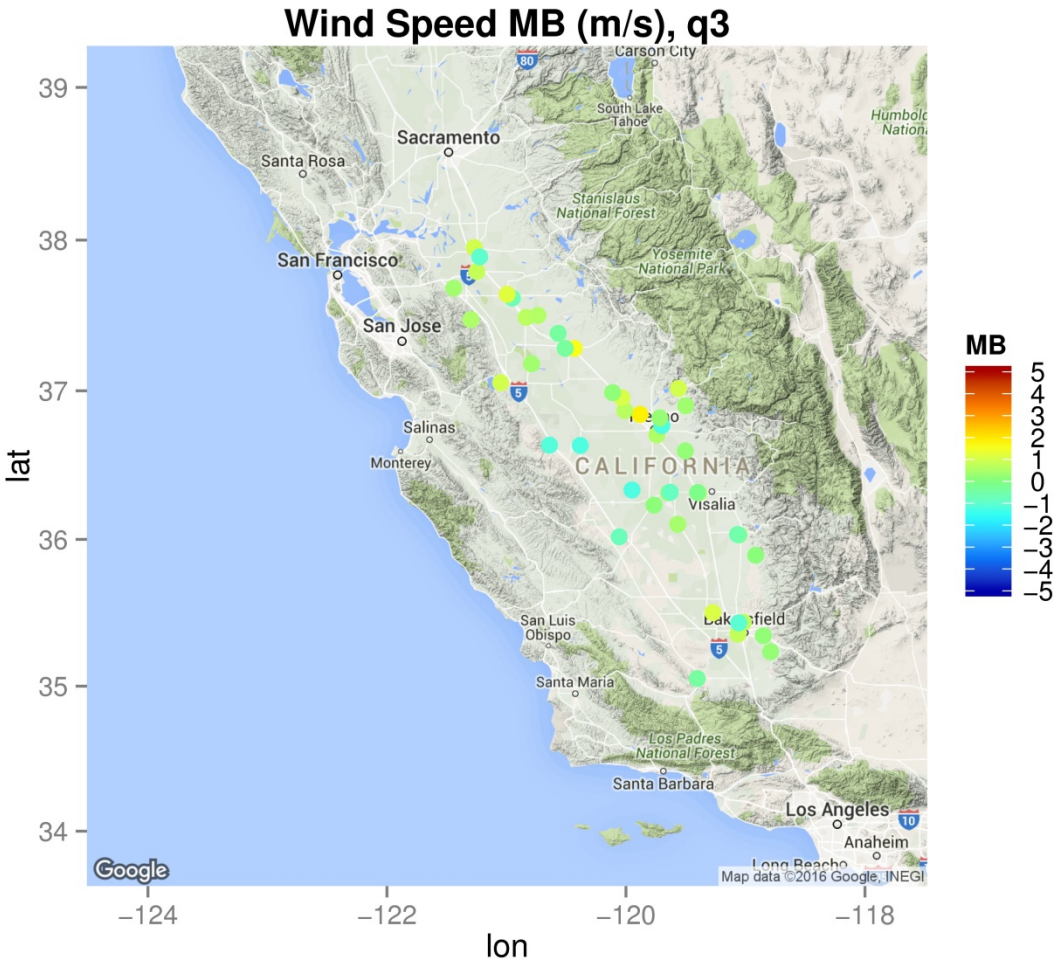


Figure S. 15 Hourly wind speed mean bias in the third quarter of 2013

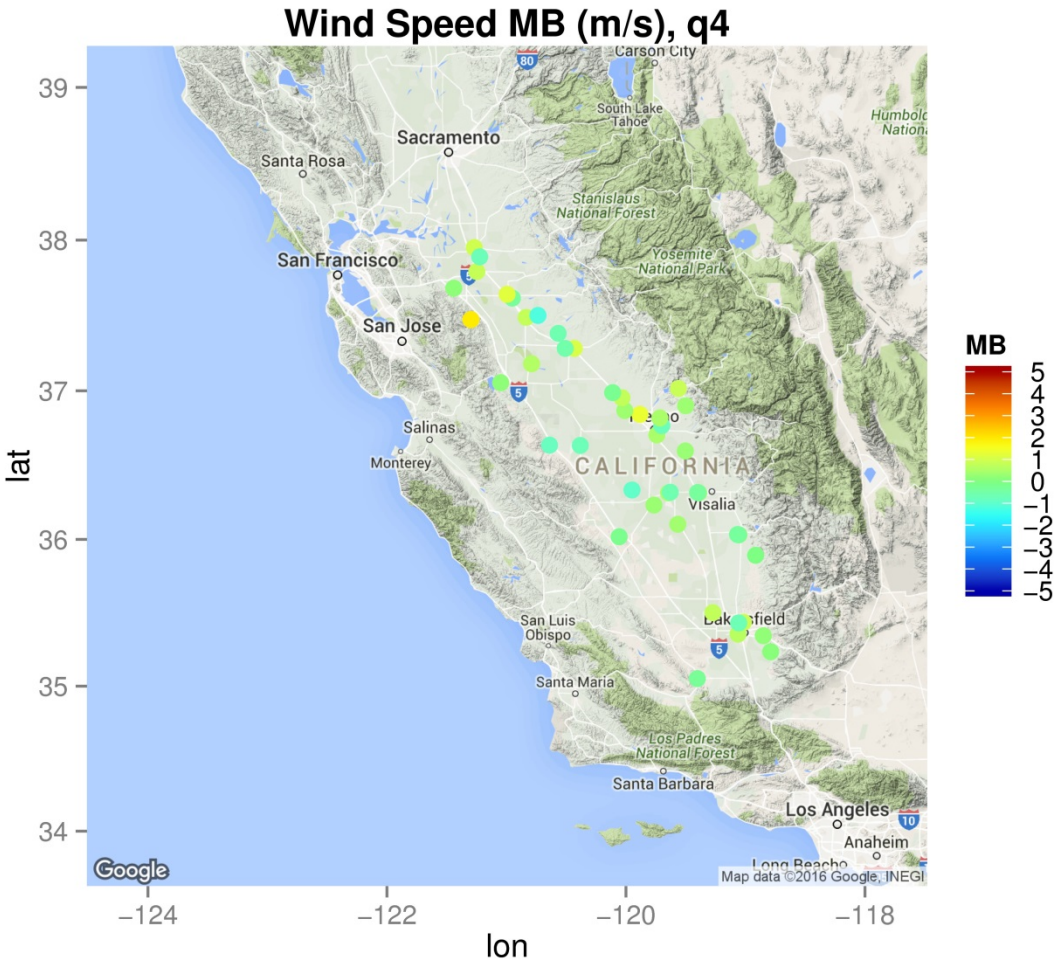


Figure S. 16 Hourly wind speed mean bias in the fourth quarter of 2013

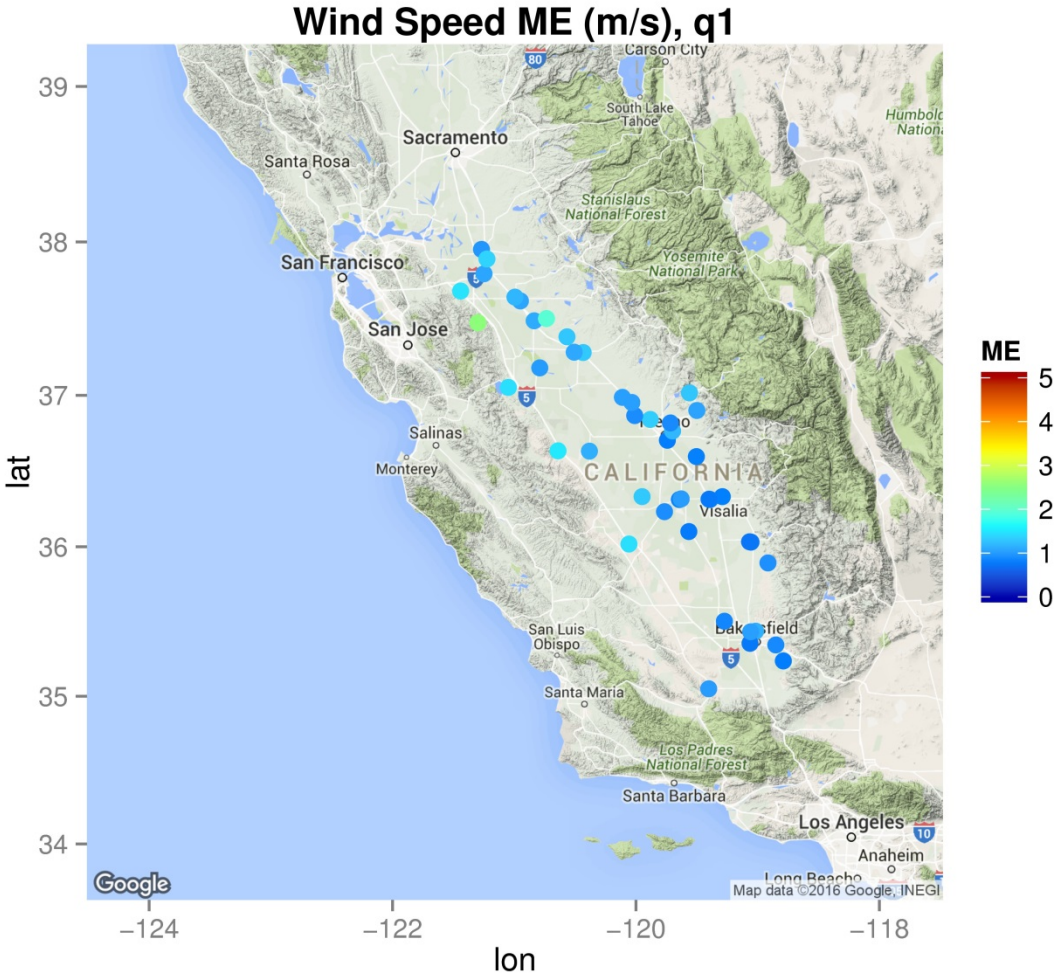


Figure S. 17 Hourly wind speed mean error in the first quarter of 2013

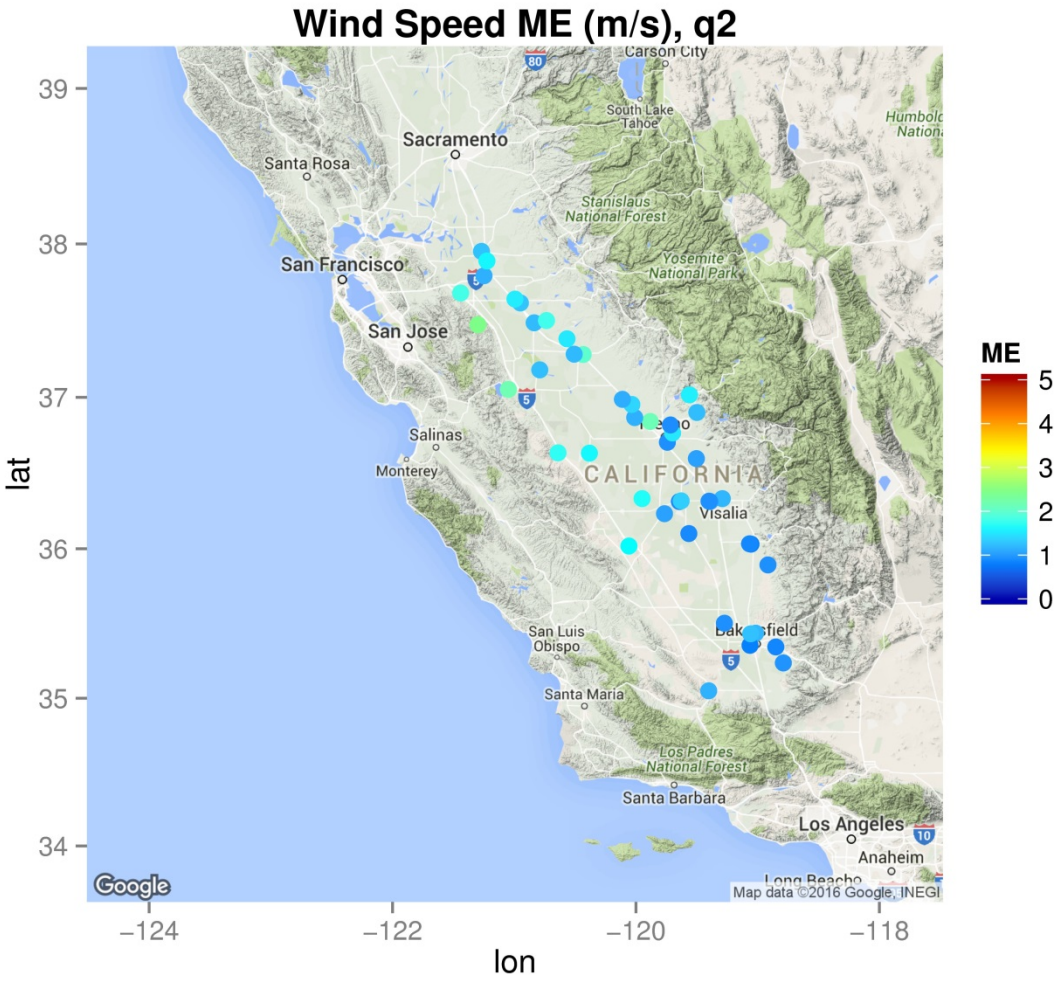


Figure S. 18 Hourly wind speed mean error in the second quarter of 2013

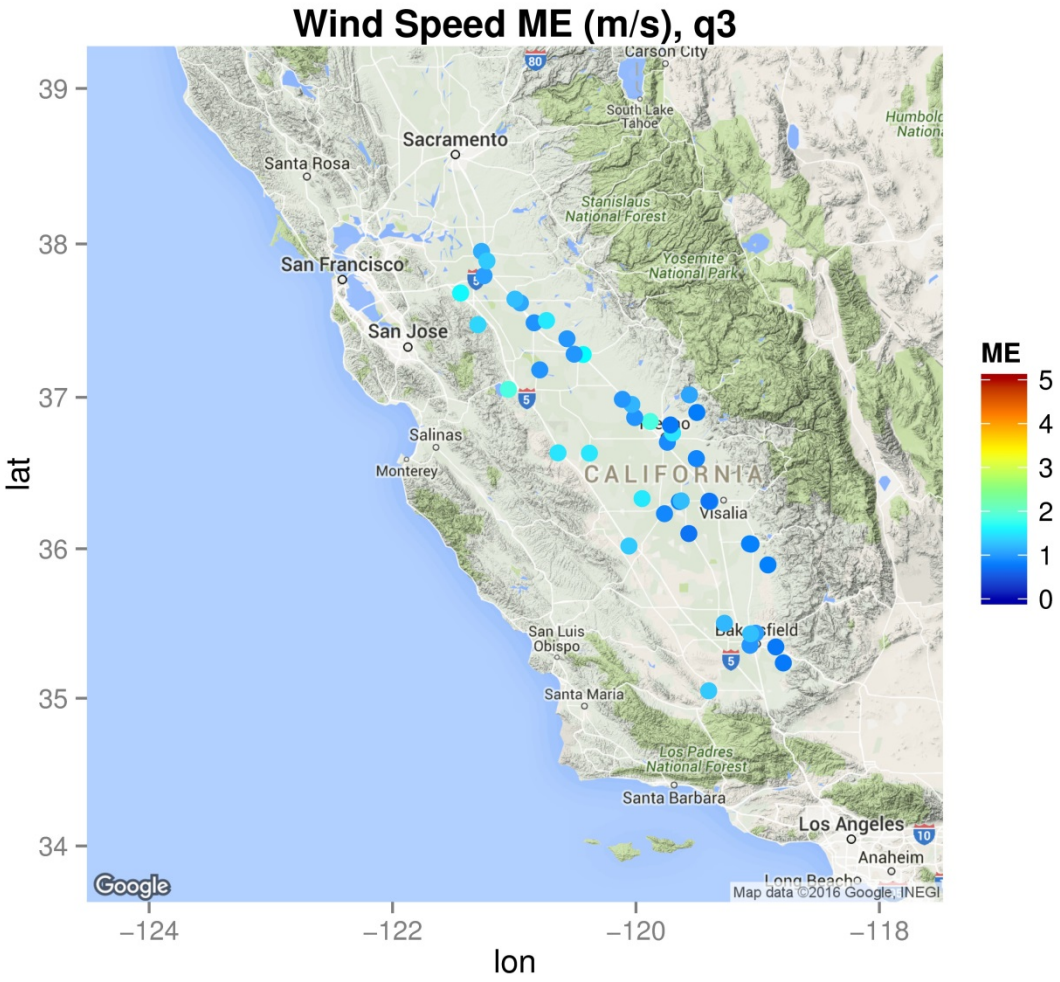


Figure S. 19 Hourly wind speed mean error in the third quarter of 2013

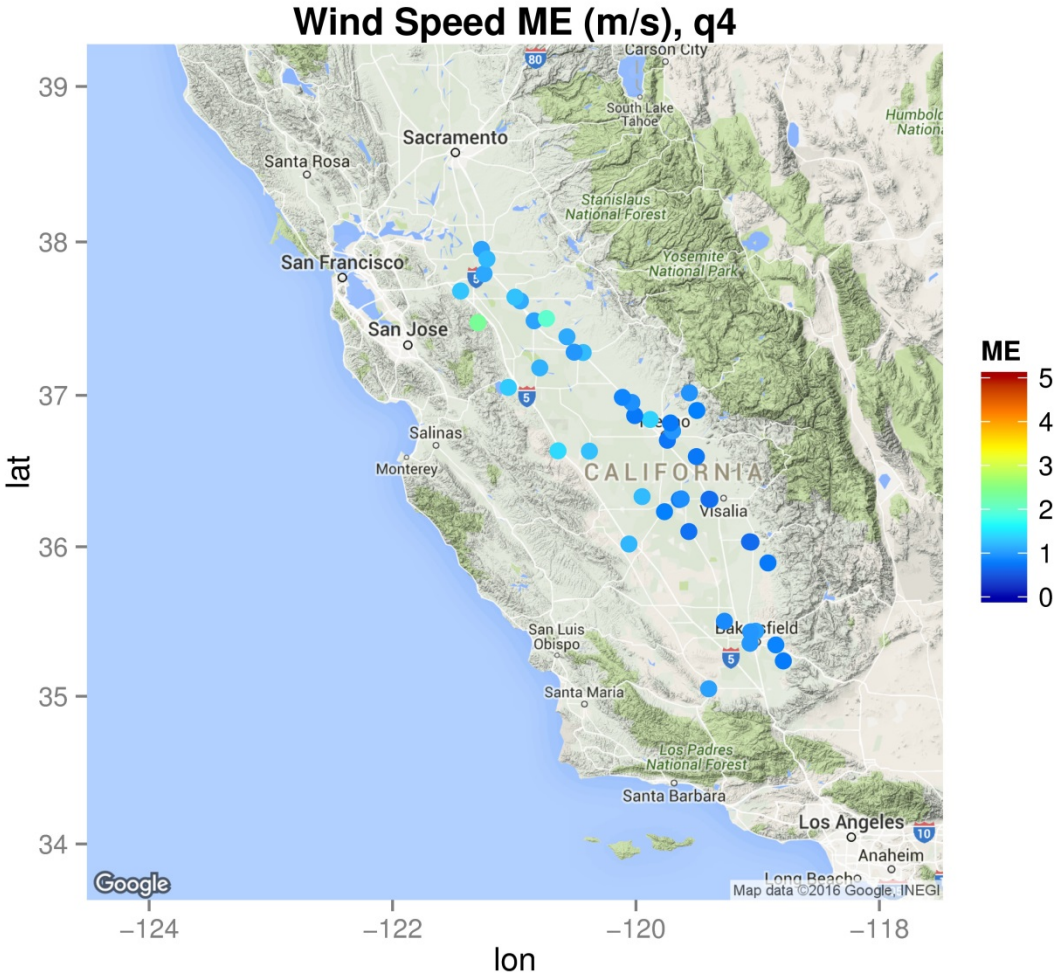


Figure S. 20 Hourly wind speed mean error in the fourth quarter of 2013

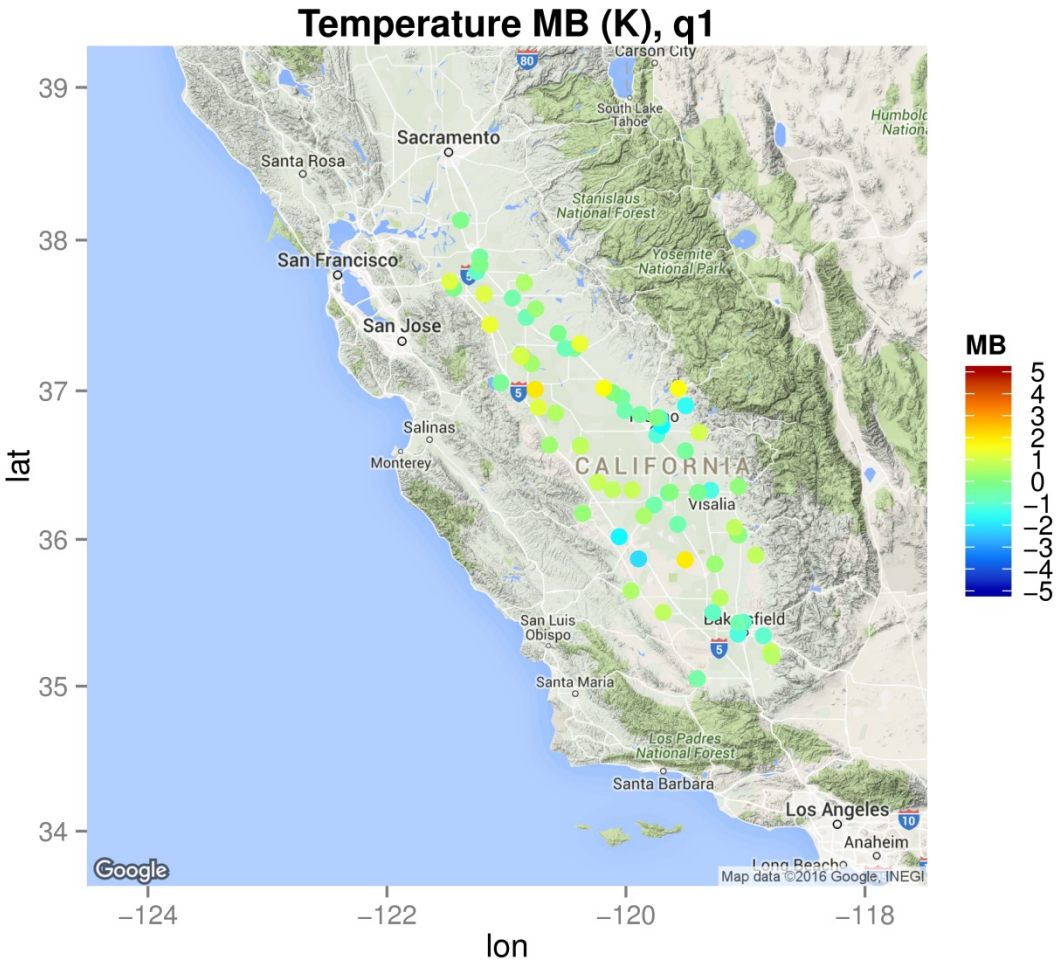


Figure S. 21 Hourly temperature mean bias in the first quarter of 2013

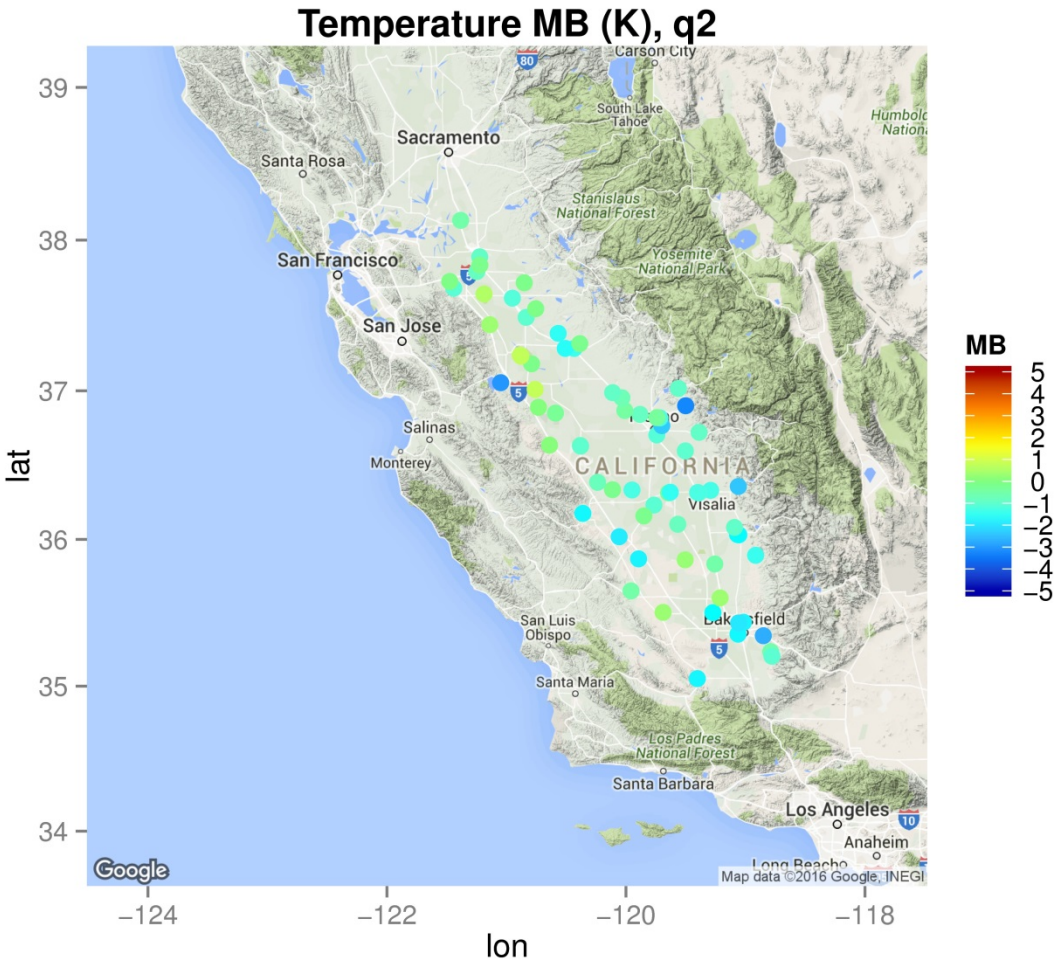


Figure S. 22 Hourly temperature mean bias in the second quarter of 2013

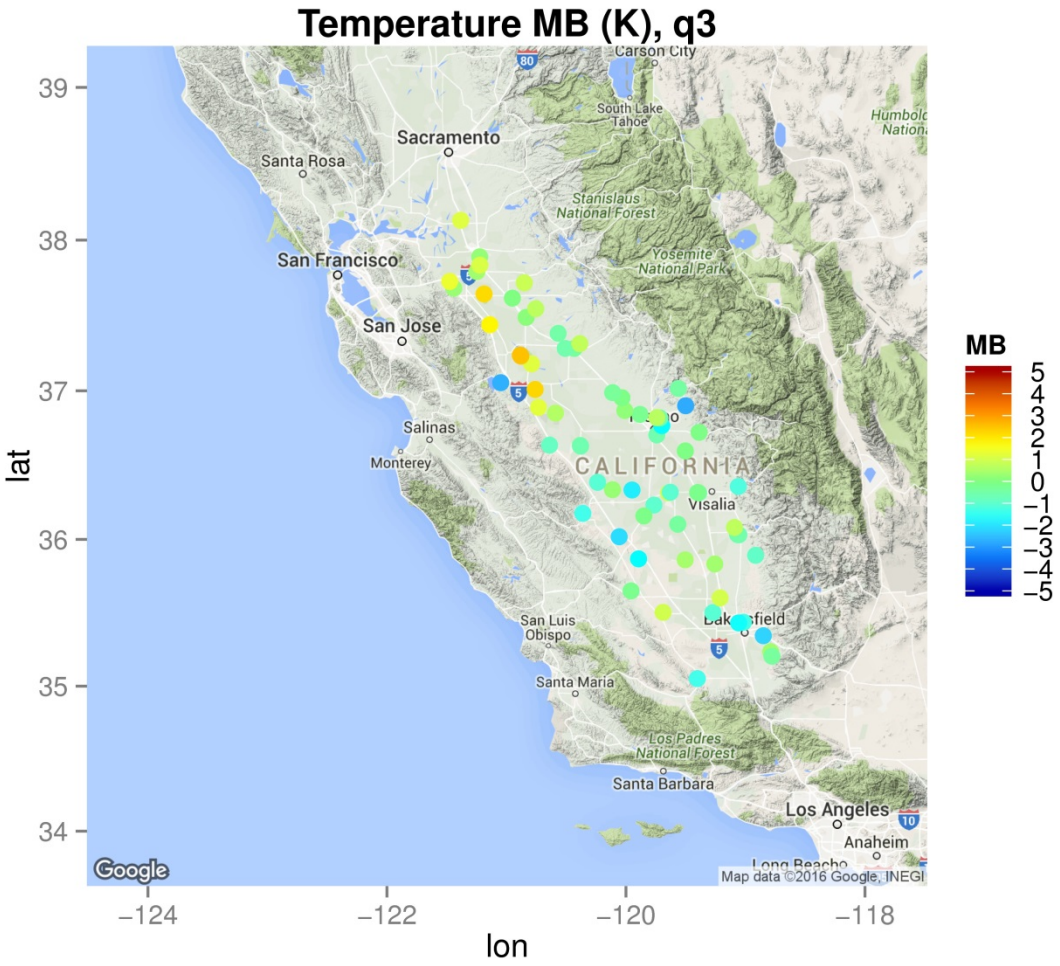


Figure S. 23 Hourly temperature mean bias in the third quarter of 2013

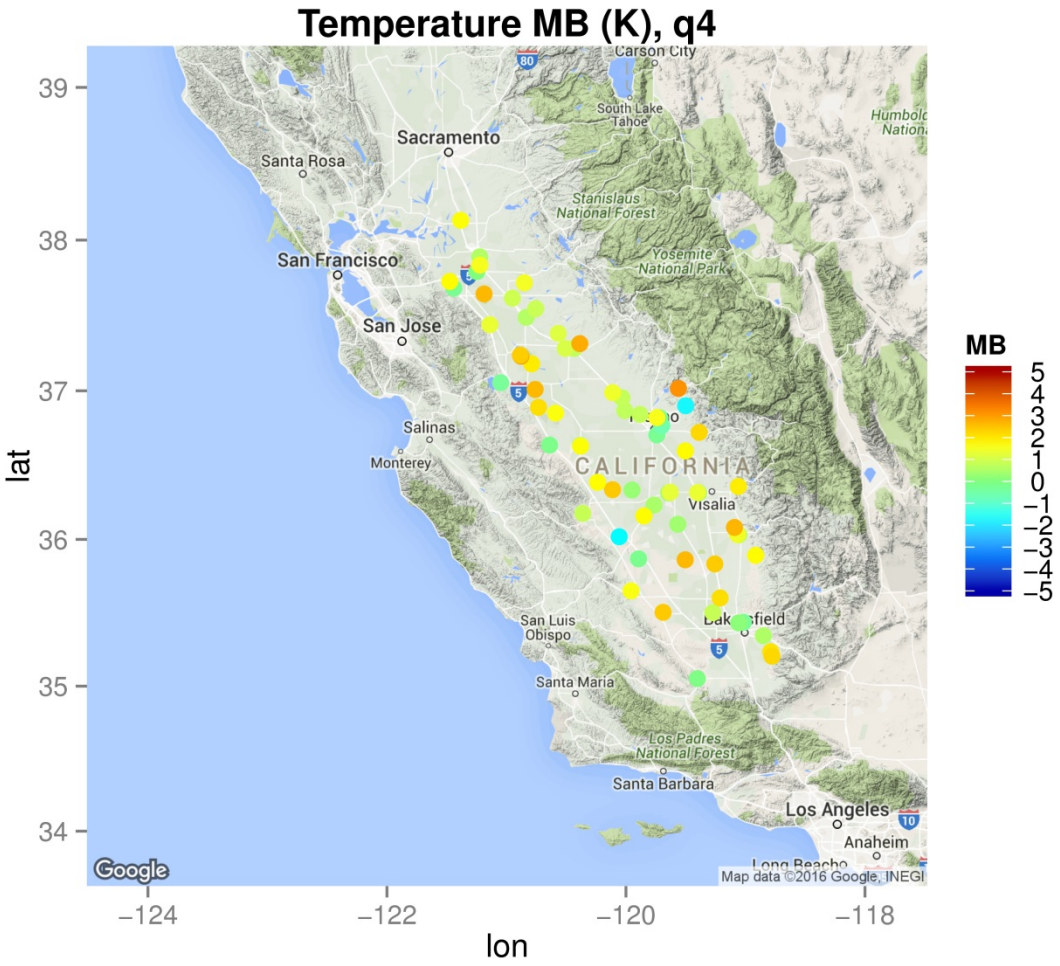


Figure S. 24 Hourly temperature mean bias in the fourth quarter of 2013

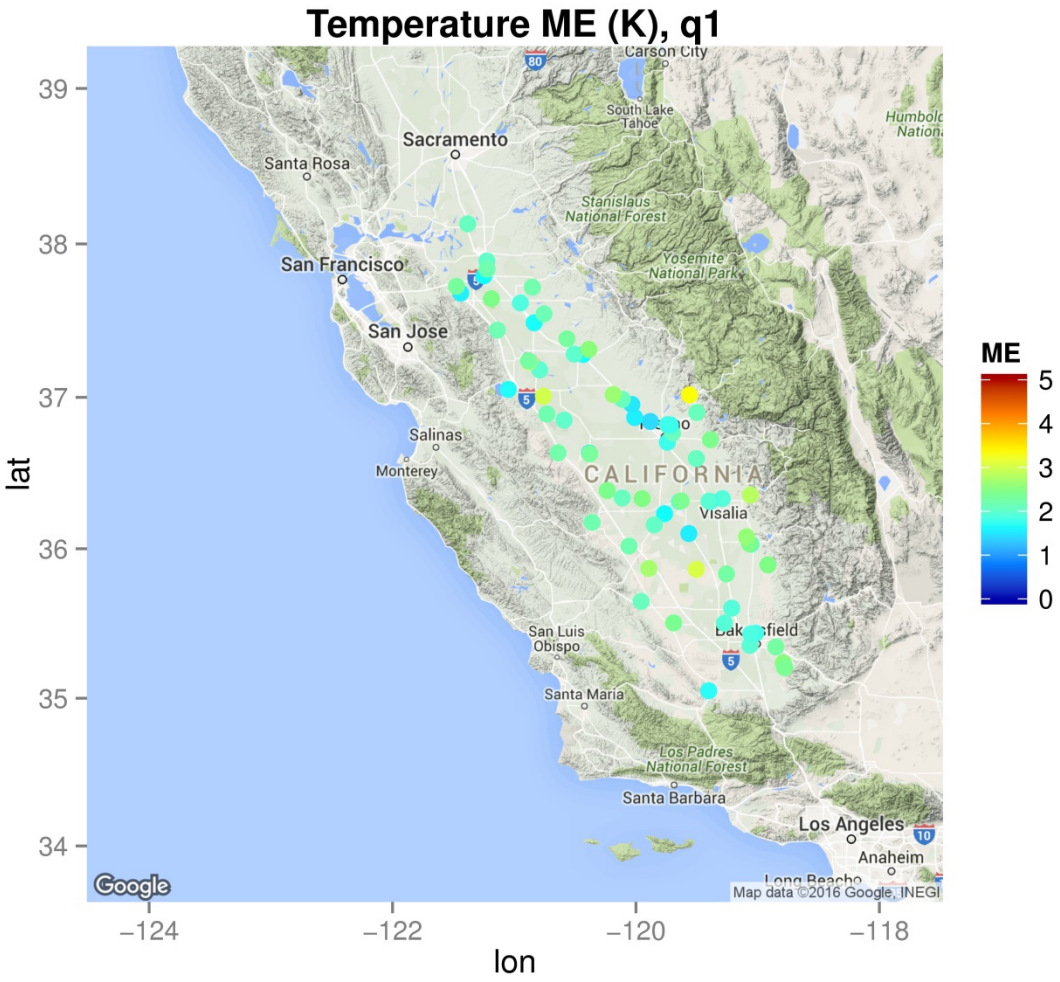


Figure S. 25 Hourly temperature mean error in the first quarter of 2013

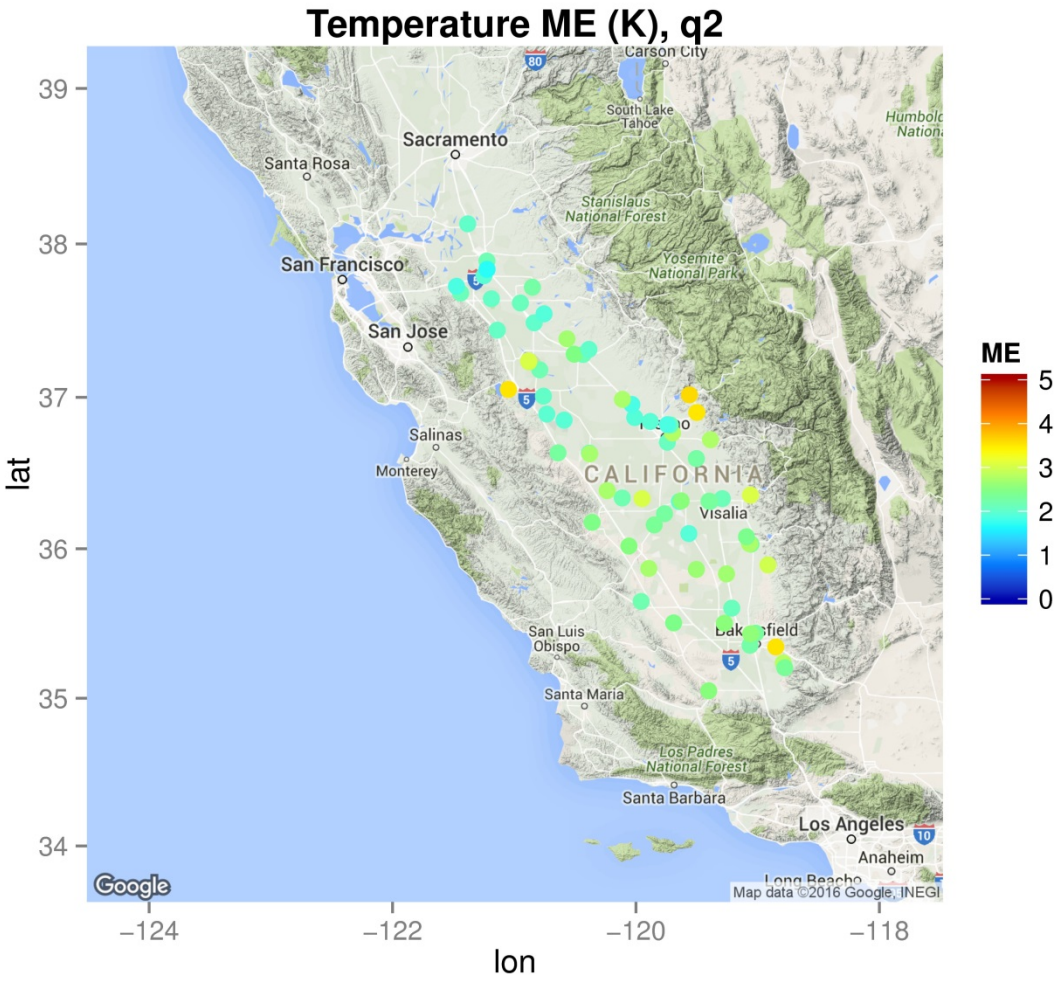


Figure S. 26 Hourly temperature mean error in the second quarter of 2013

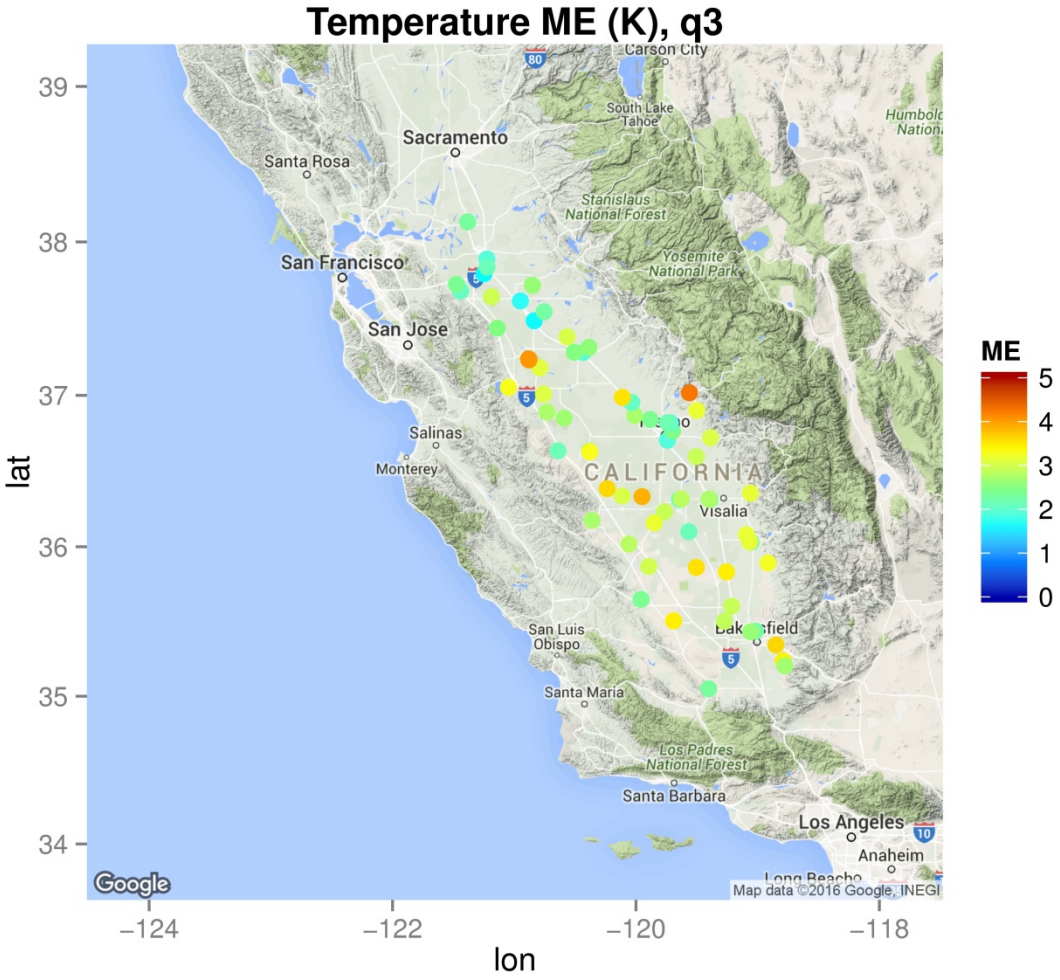


Figure S. 27 Hourly temperature mean error in the third quarter of 2013

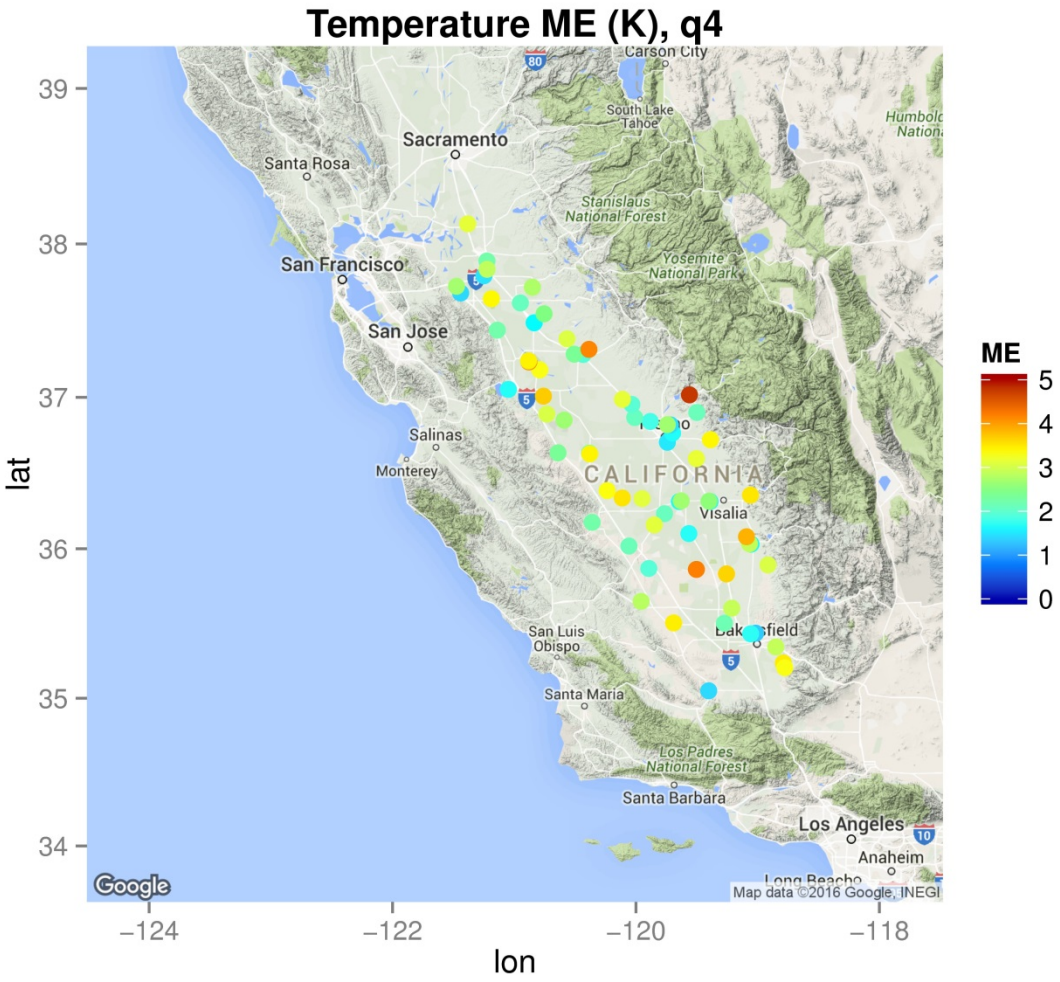


Figure S. 28 Hourly temperature mean error in the fourth quarter of 2013

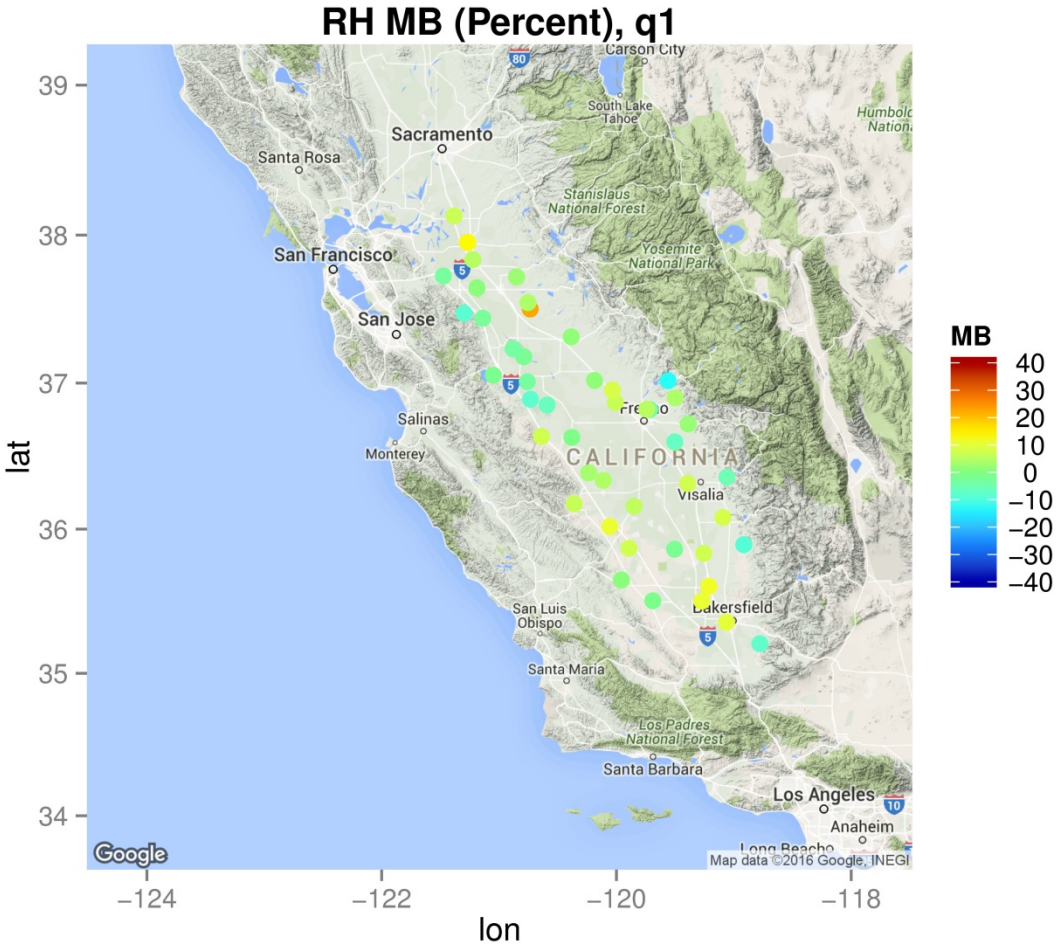


Figure S. 29 Hourly relative humidity mean bias in the first quarter of 2013

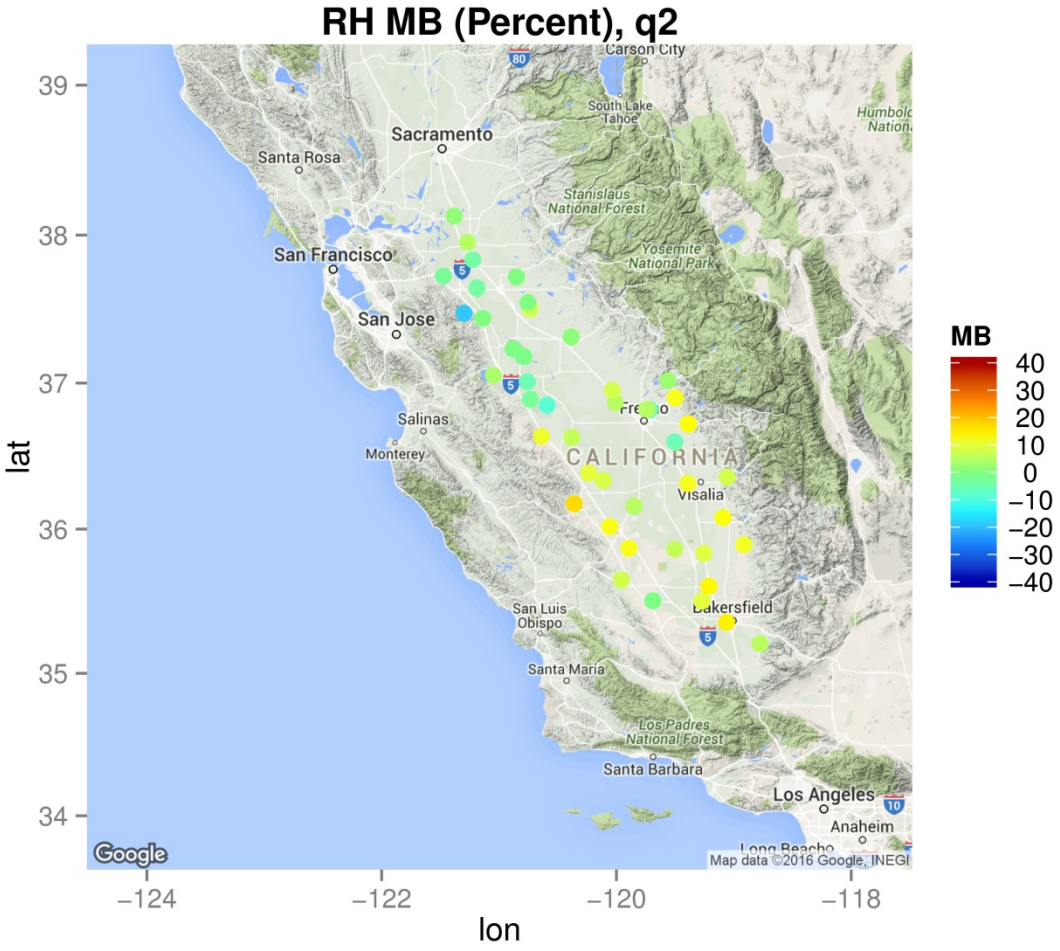


Figure S. 30 Hourly relative humidity mean bias in the second quarter of 2013

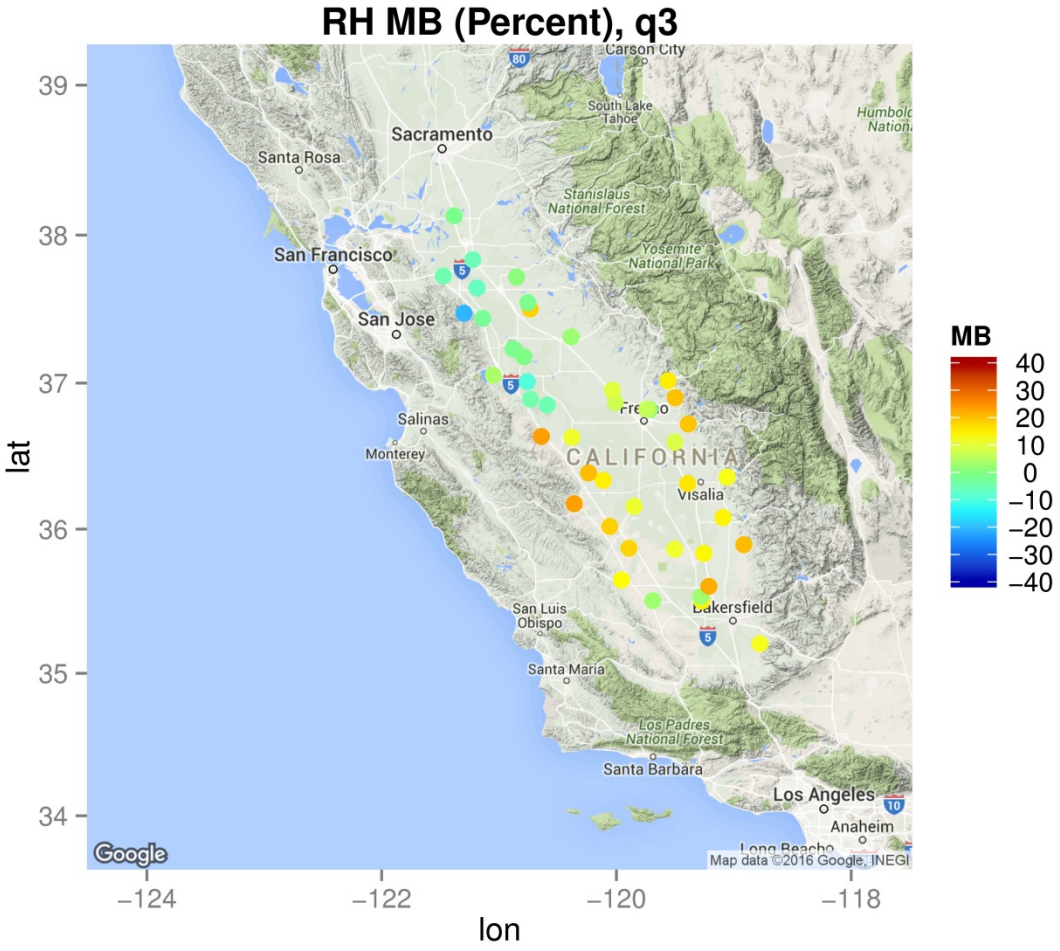


Figure S. 31 Hourly relative humidity mean bias in the third quarter of 2013

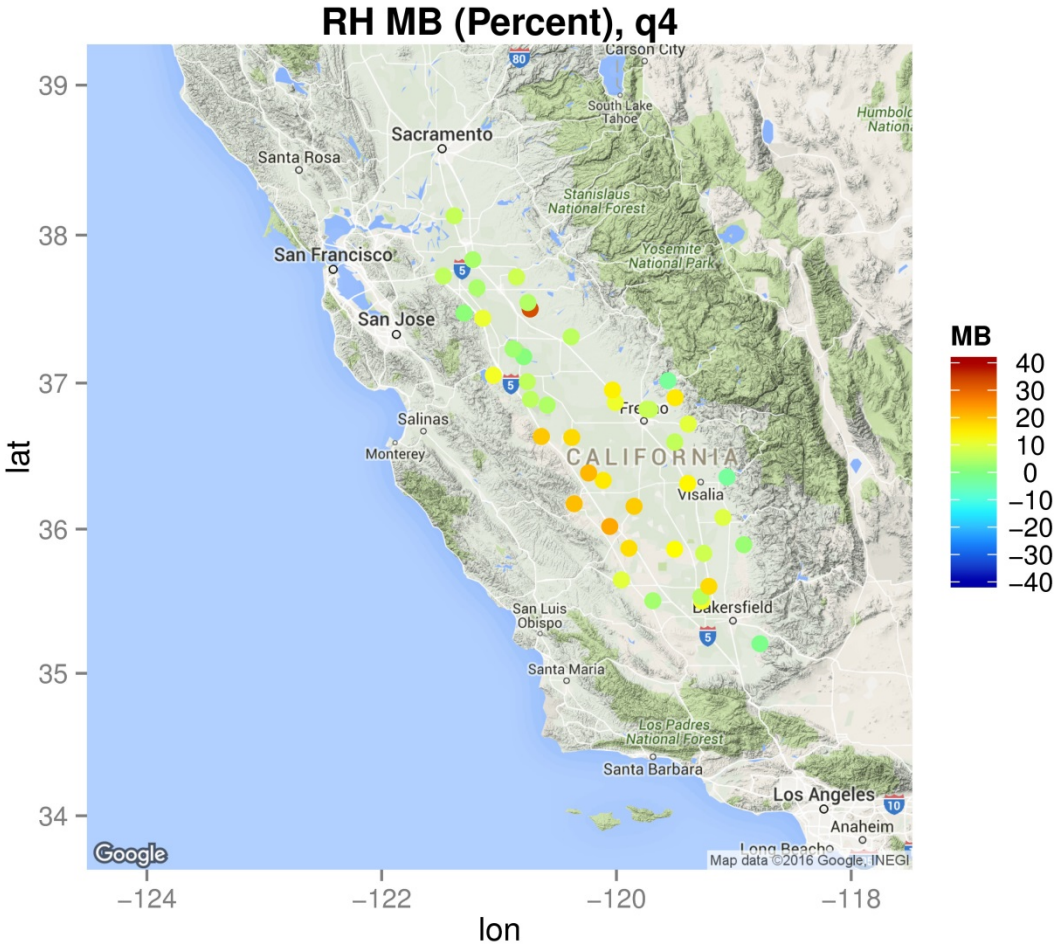


Figure S. 32 Hourly relative humidity mean bias in the fourth quarter of 2013

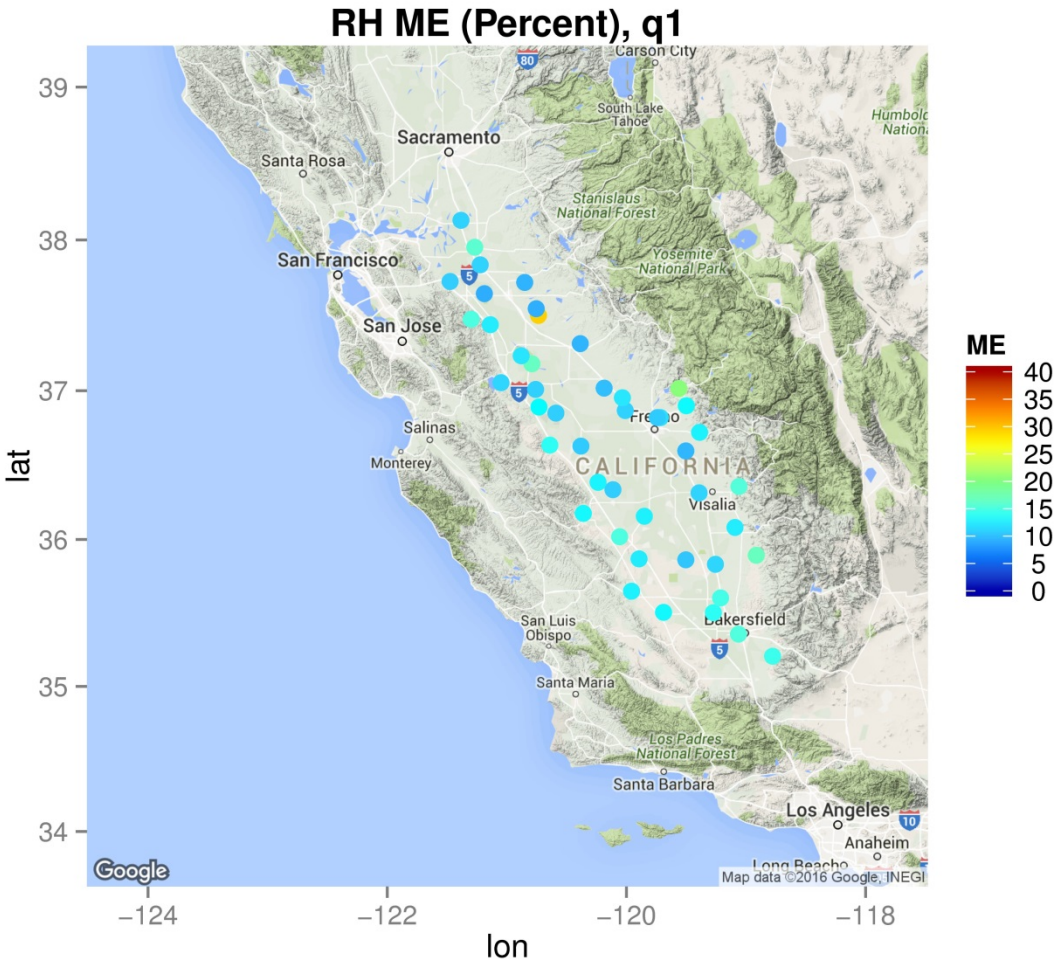


Figure S. 33 Hourly relative humidity mean error in the first quarter of 2013

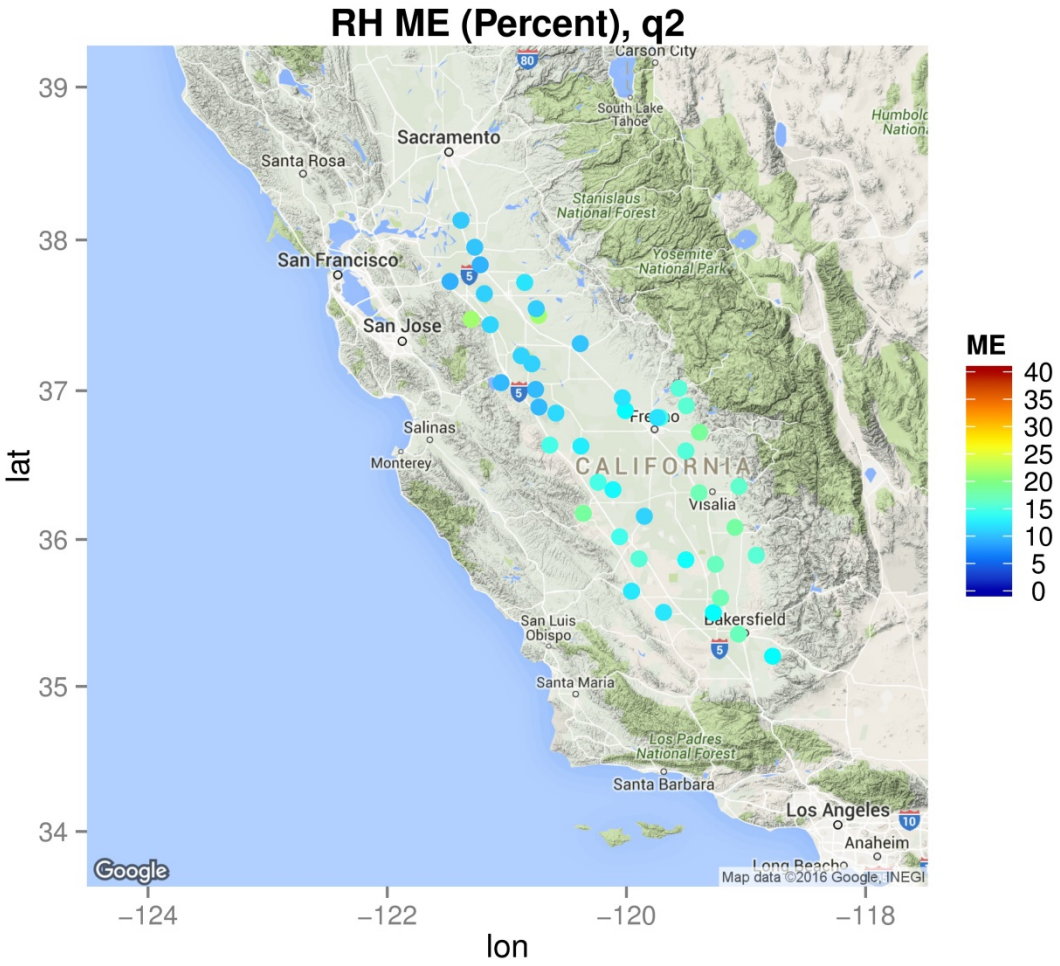


Figure S. 34 Hourly relative humidity mean error in the second quarter of 2013

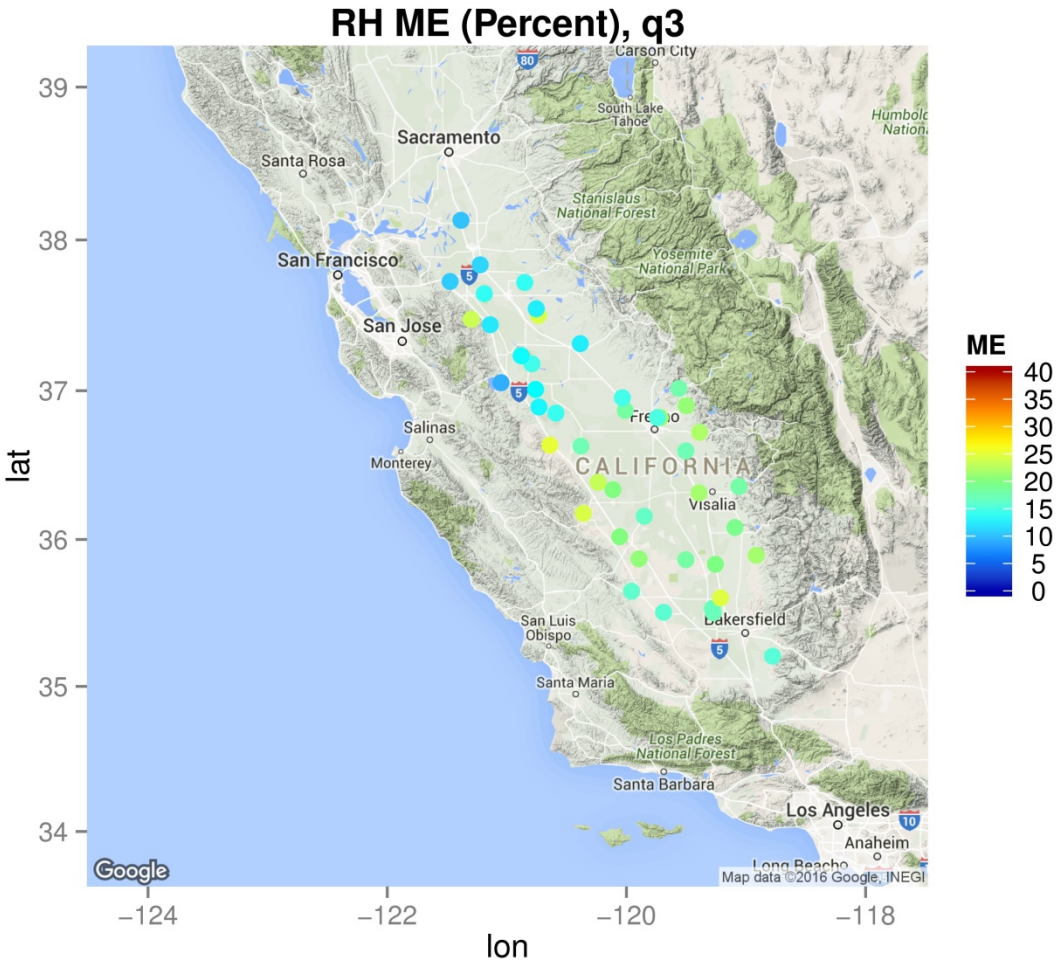


Figure S. 35 Hourly relative humidity mean error in the third quarter of 2013

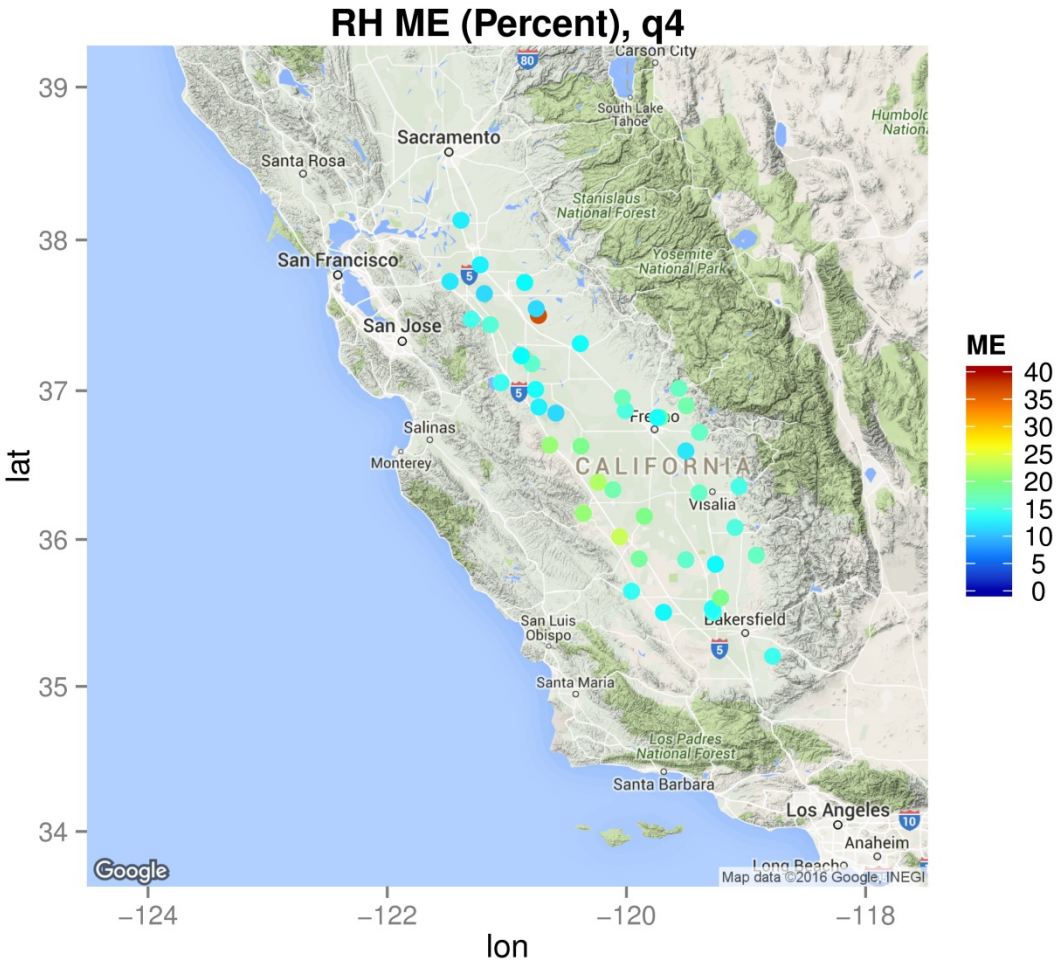


Figure S. 36 Hourly relative humidity mean error in the fourth quarter of 2013

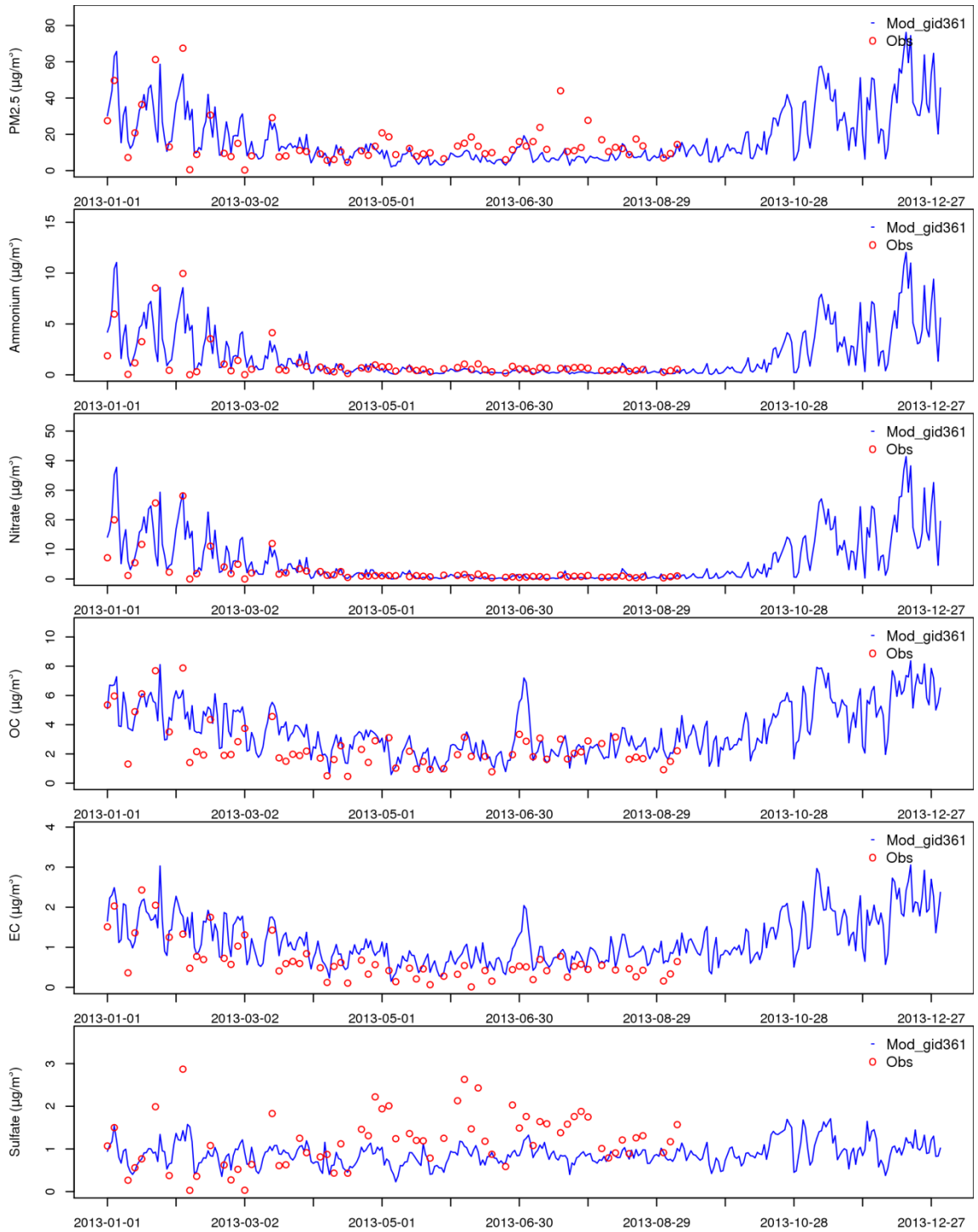


Figure S. 37 Comparison of time series of observed (from CSN measurement) and modeled $PM_{2.5}$ species at Bakersfield

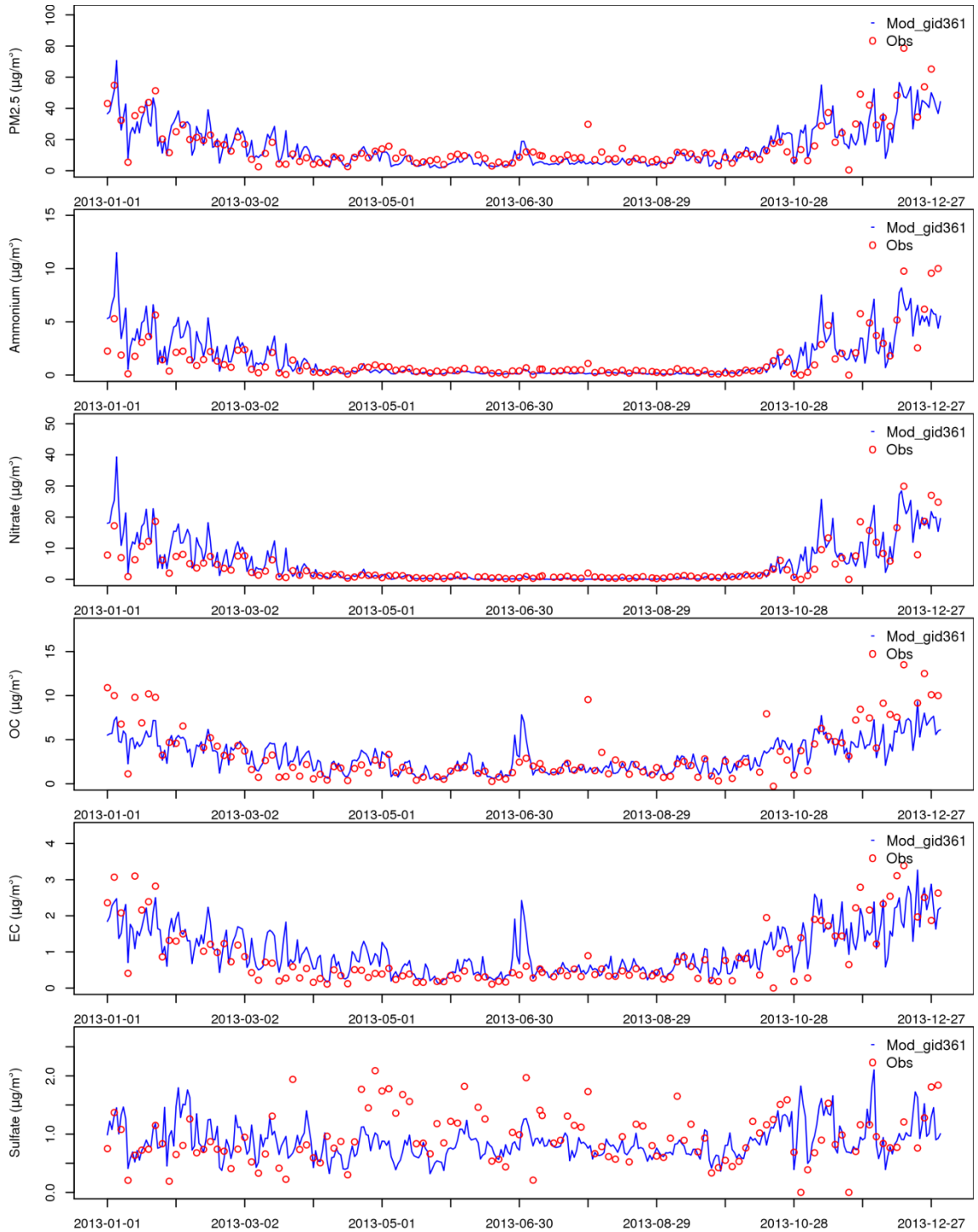


Figure S. 38 Comparison of time series of observed (from CSN measurement) and modeled $PM_{2.5}$ species at Fresno

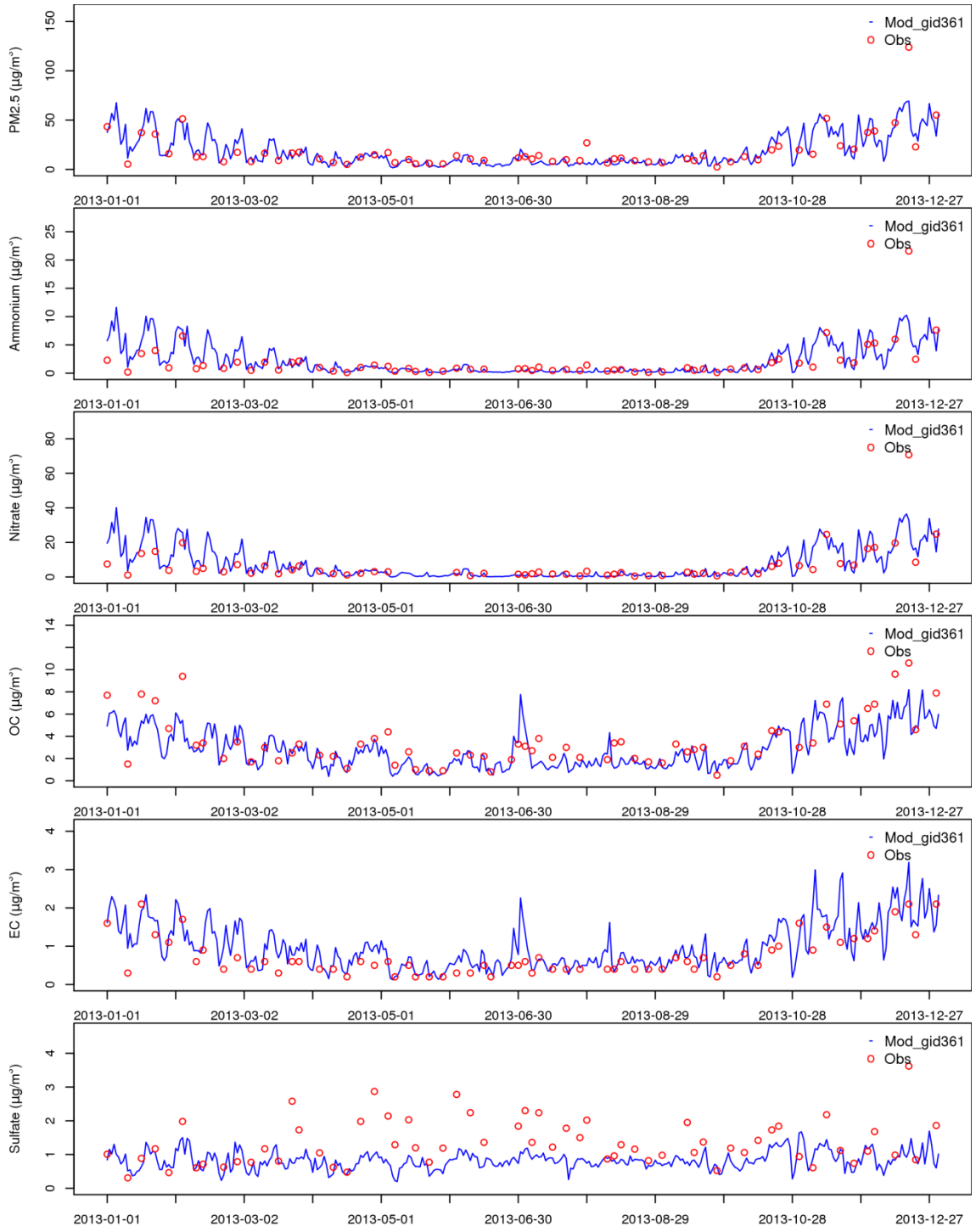


Figure S. 39 Comparison of time series of observed (from CSN measurement) and modeled $PM_{2.5}$ species at Visalia

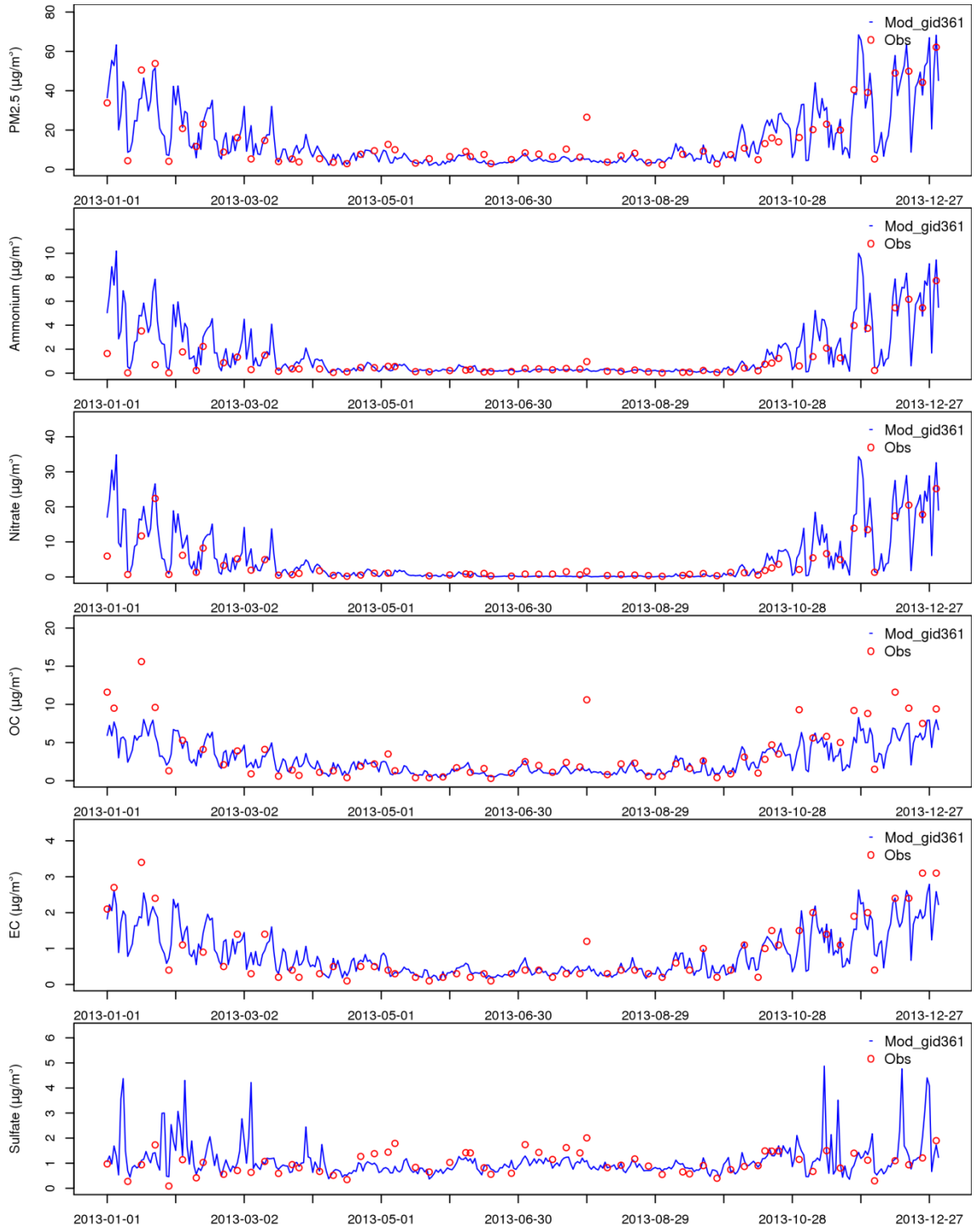


Figure S. 40 Comparison of time series of observed (from CSN measurement) and modeled $PM_{2.5}$ species at Modesto

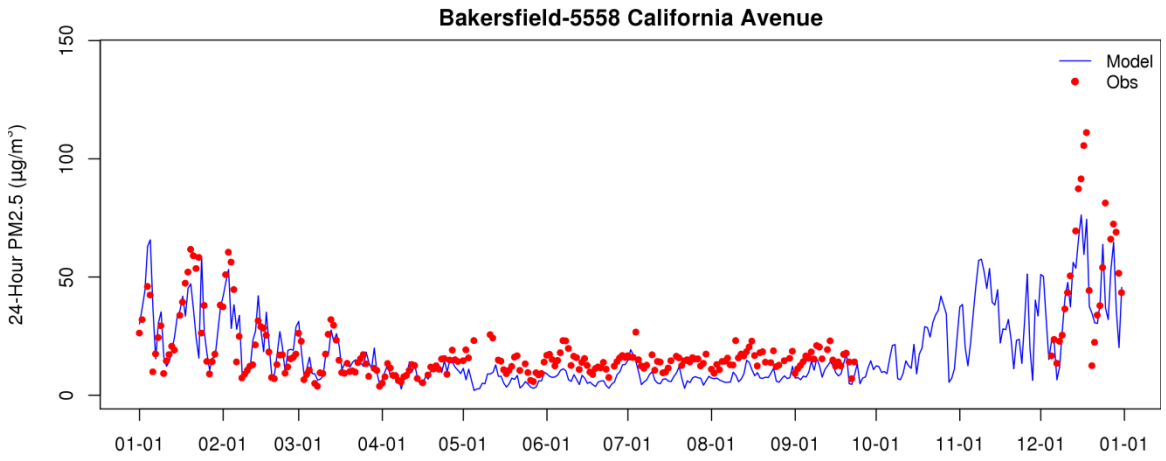


Figure S. 41 Observed and modeled 24-hour average $PM_{2.5}$ at Bakersfield – California Avenue.

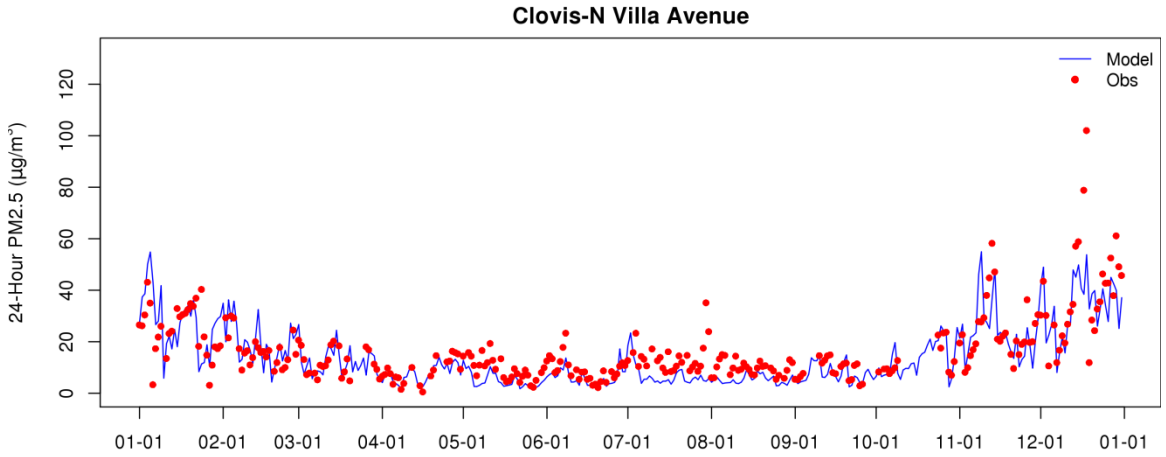


Figure S. 42 Observed and modeled 24-hour average $PM_{2.5}$ at Clovis – Villa Avenue

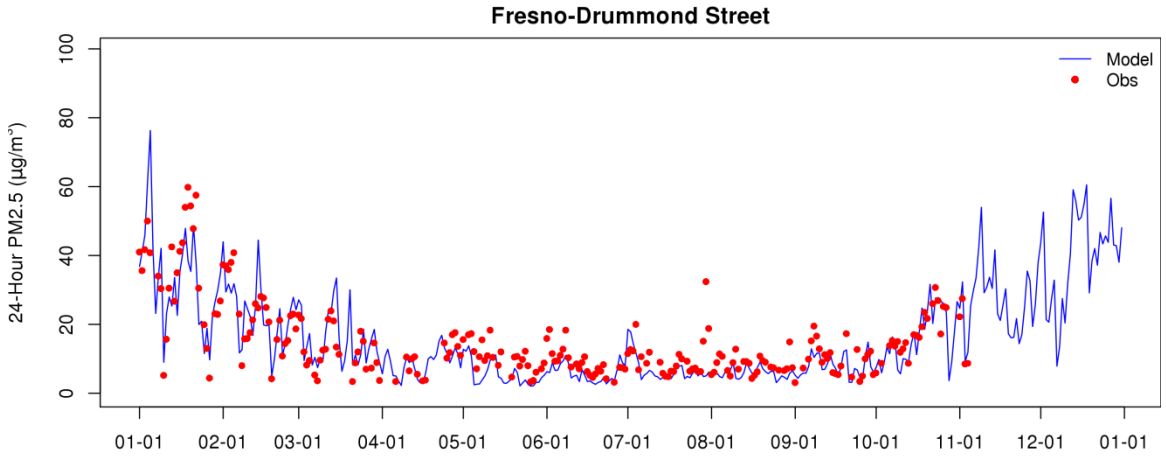


Figure S. 43 Observed and modeled 24-hour average $PM_{2.5}$ at Fresno – Drummond Street

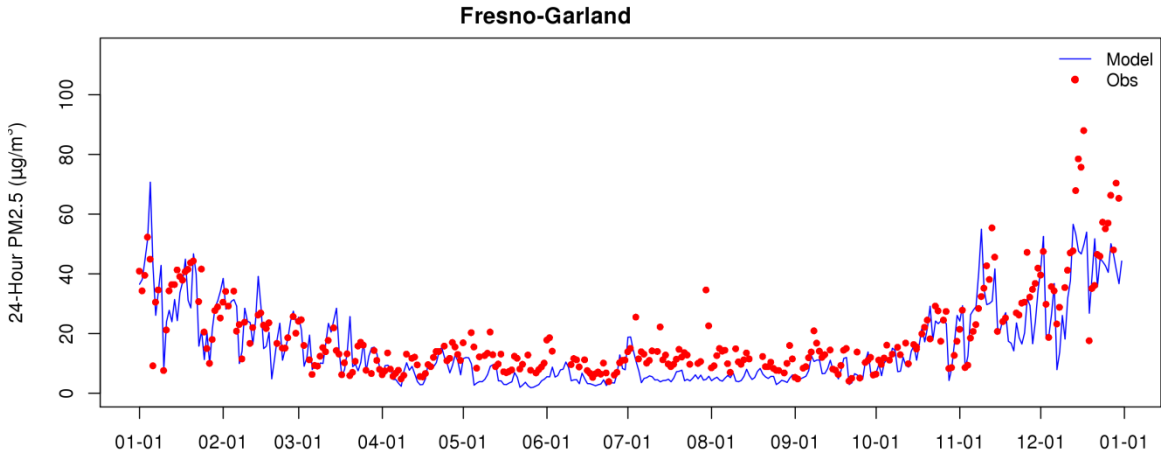


Figure S. 44 Observed and modeled 24-hour average $PM_{2.5}$ at Fresno – Garland

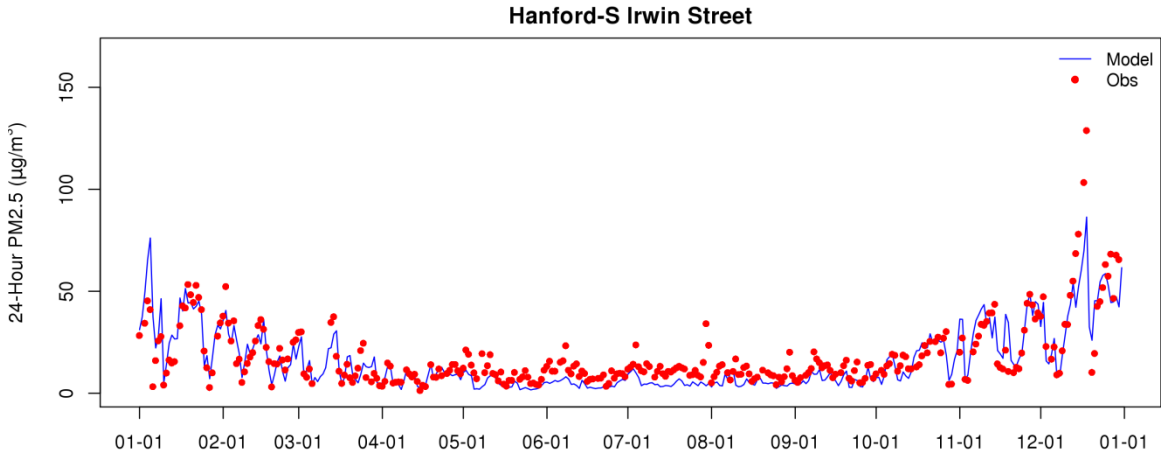


Figure S. 45 Observed and modeled 24-hour average $PM_{2.5}$ at Hanford – Irwin Street

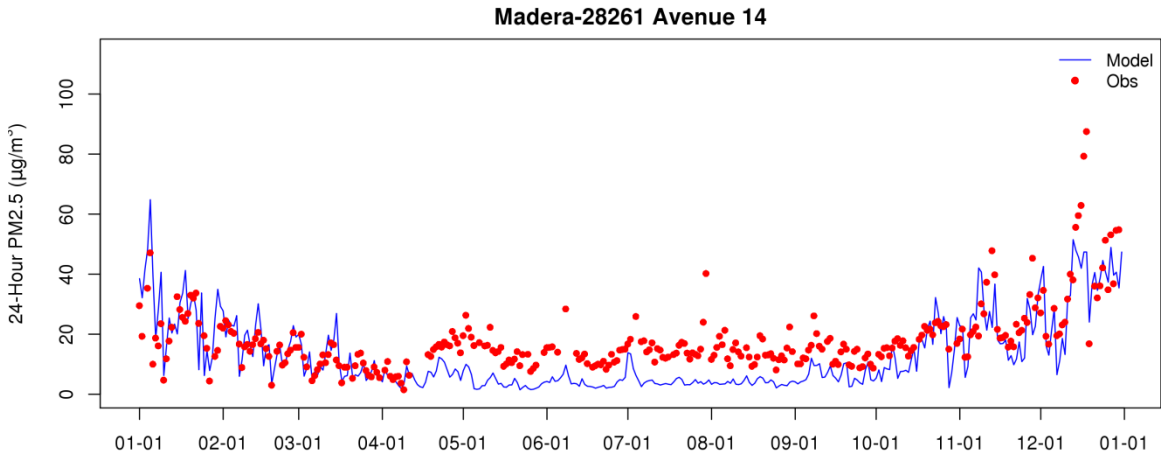


Figure S. 46 Observed and modeled 24-hour average $PM_{2.5}$ at Madera – Avenue 14

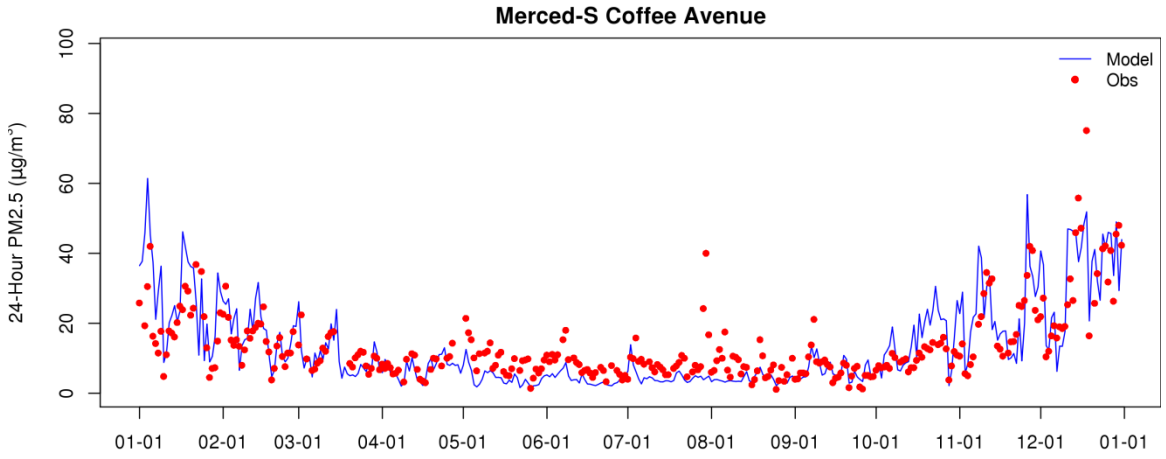


Figure S. 47 Observed and modeled 24-hour average $PM_{2.5}$ at Merced – S Coffee Avenue

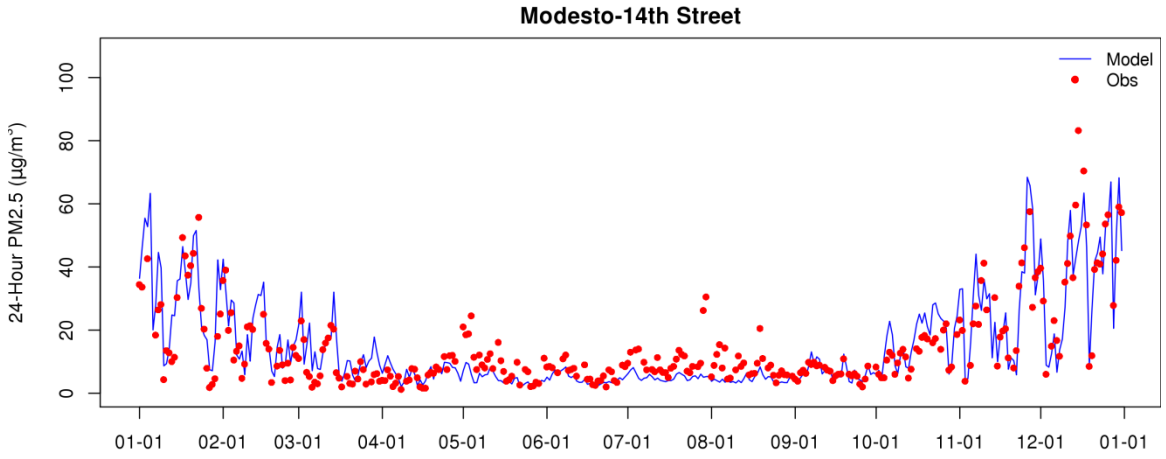


Figure S. 48 Observed and modeled 24-hour average $PM_{2.5}$ at Modesto – 14th Street

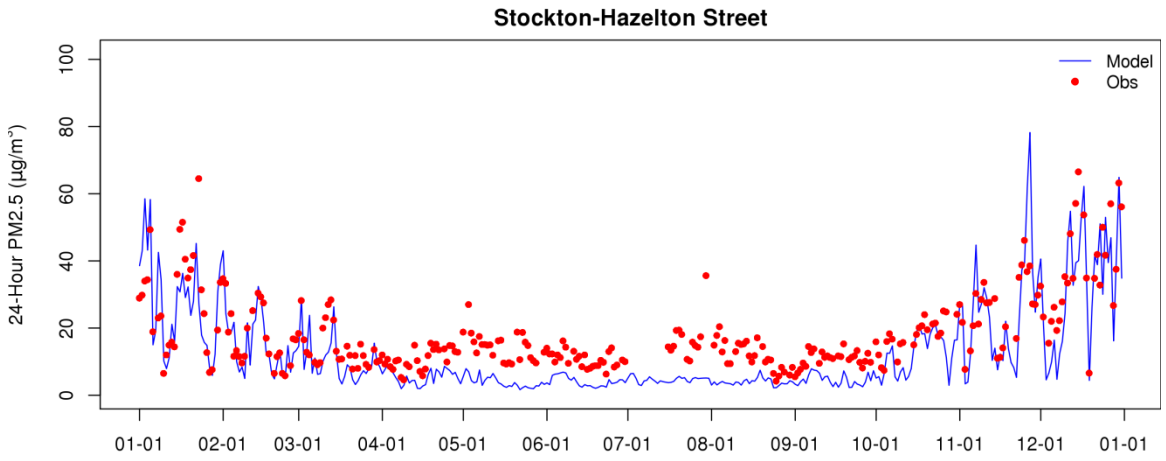


Figure S. 49 Observed and modeled 24-hour average $PM_{2.5}$ at Stockton – Hazelton Street

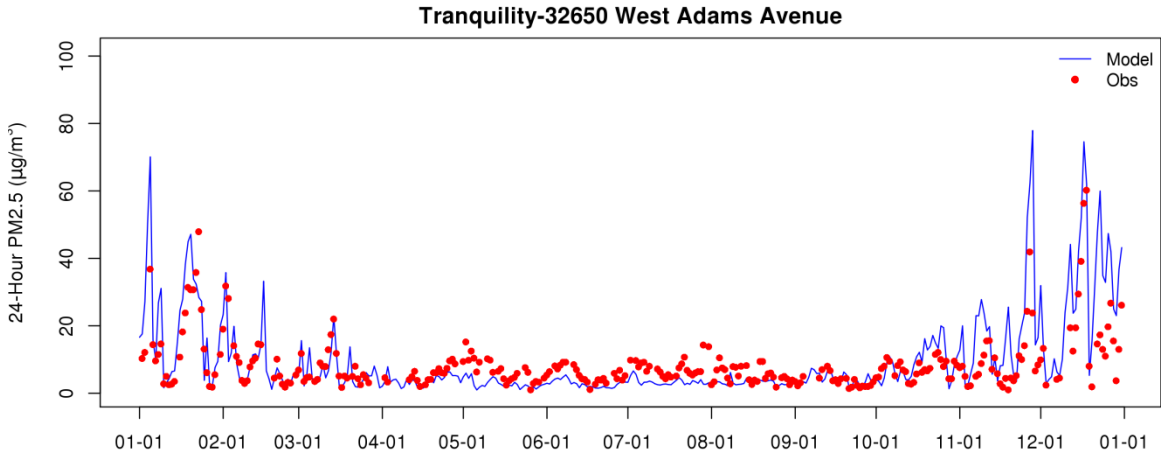


Figure S. 50 Observed and modeled 24-hour average $PM_{2.5}$ at Tranquility – West Adams Avenue

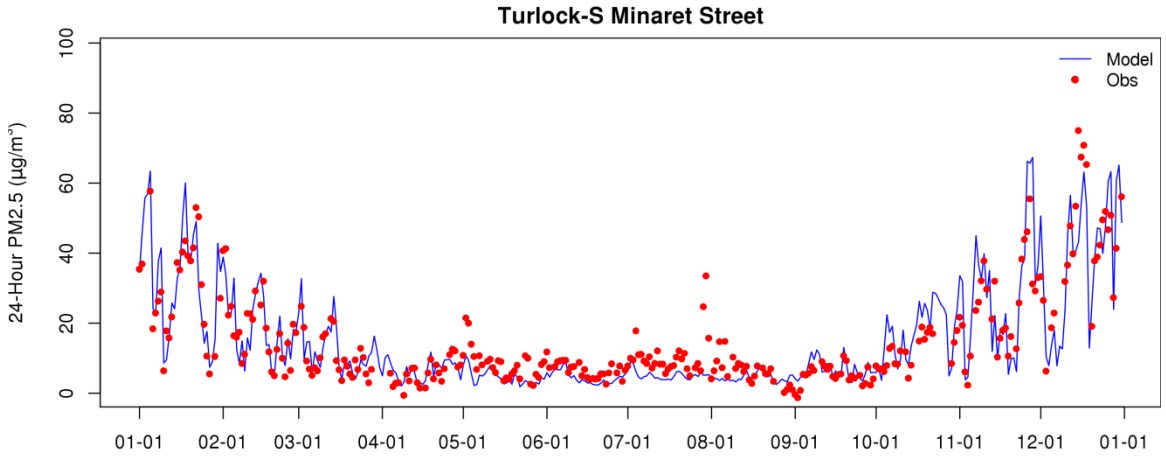


Figure S. 51 Observed and modeled 24-hour average $PM_{2.5}$ at Turlock – Minaret Street

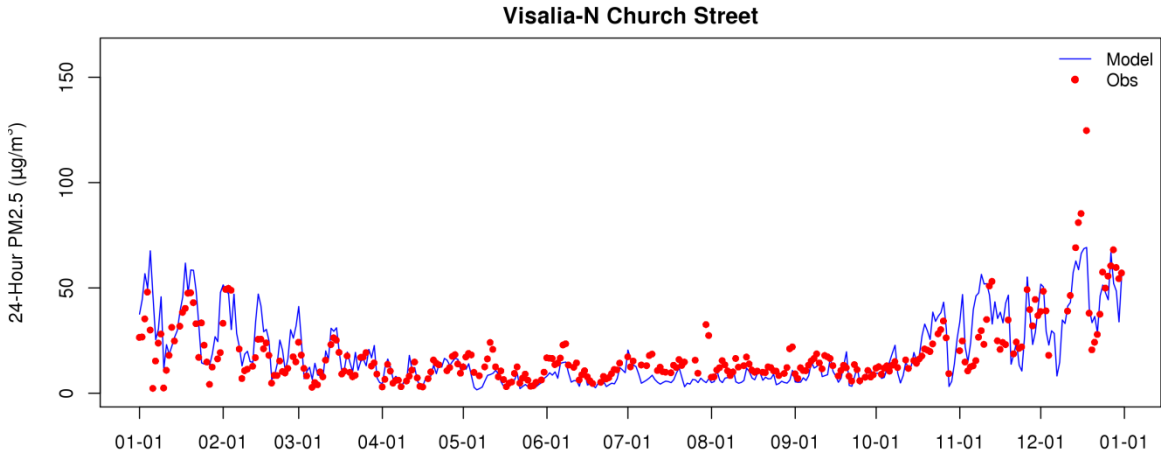


Figure S. 52 Observed and modeled 24-hour average $PM_{2.5}$ at Visalia – Church Street

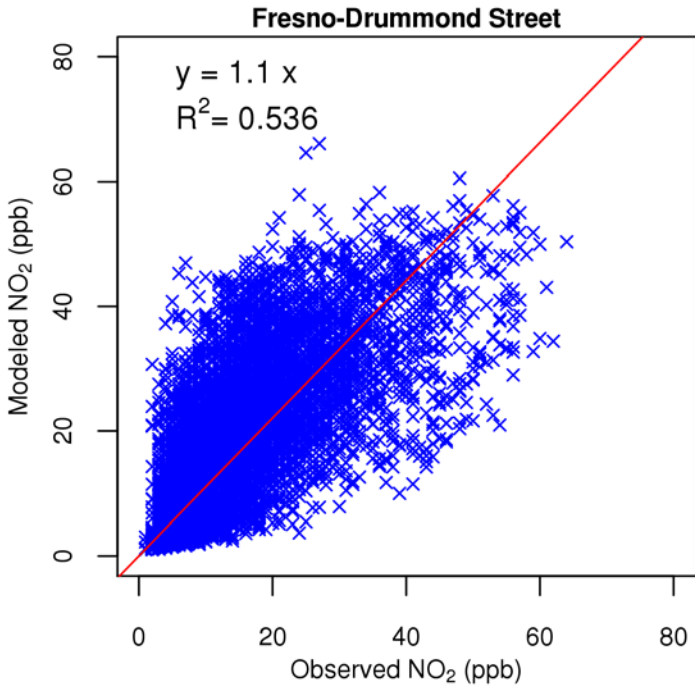


Figure S. 53 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Fresno – Drummond Street

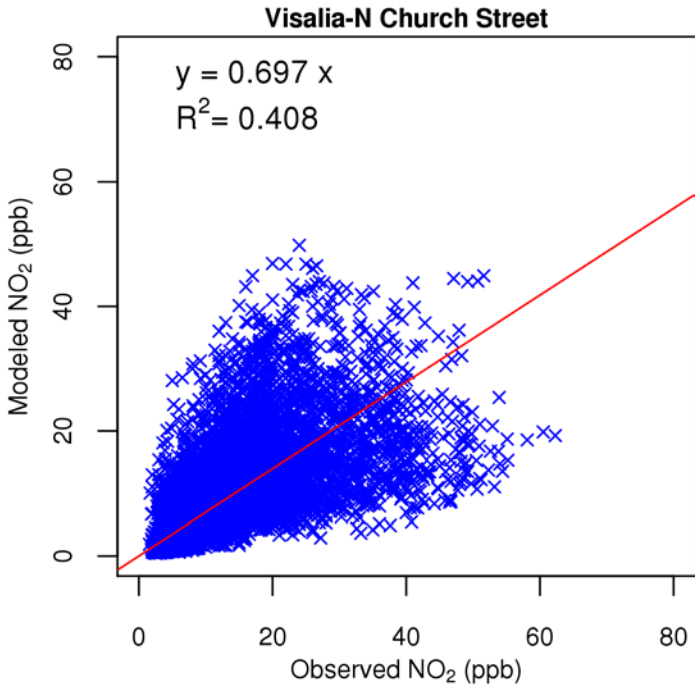


Figure S. 54 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Visalia

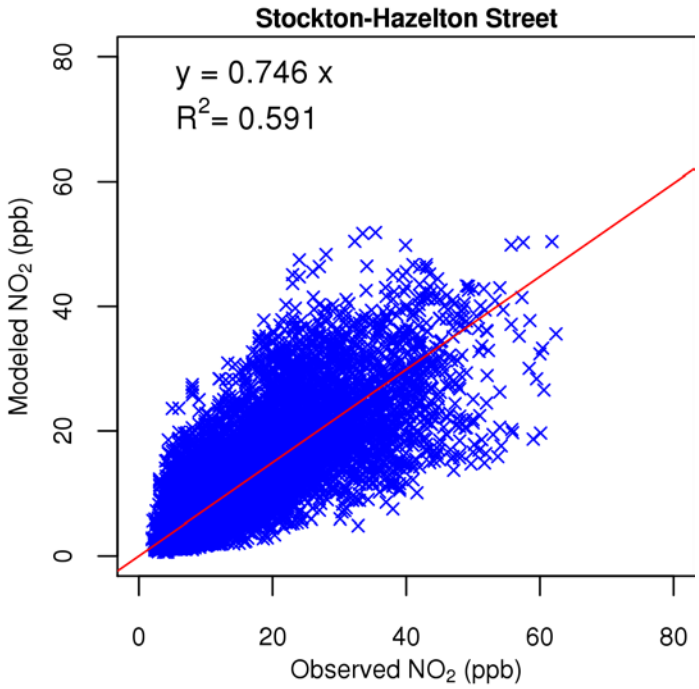


Figure S. 55 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Stockton

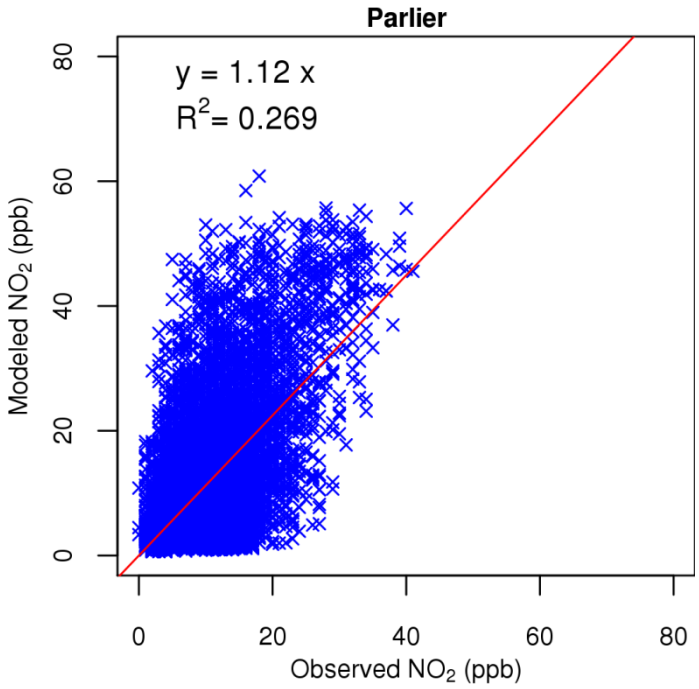


Figure S. 56 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Parlier

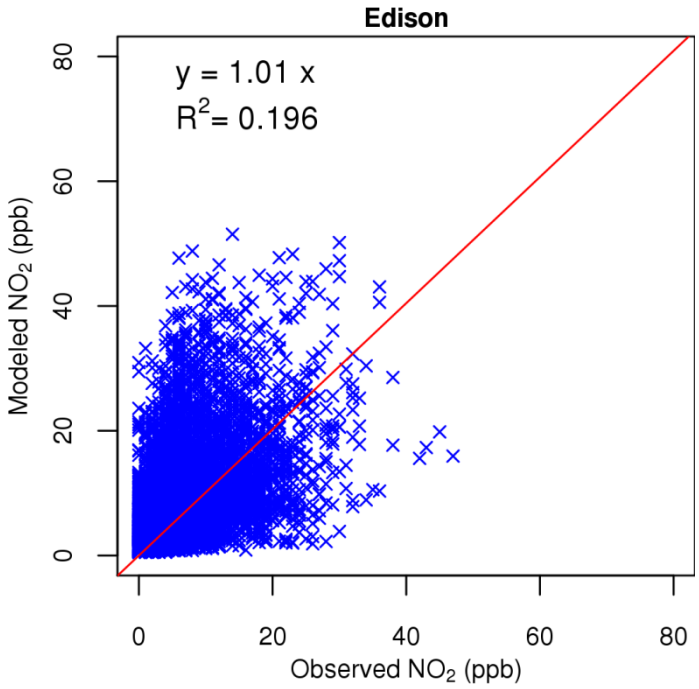


Figure S. 57 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Edison

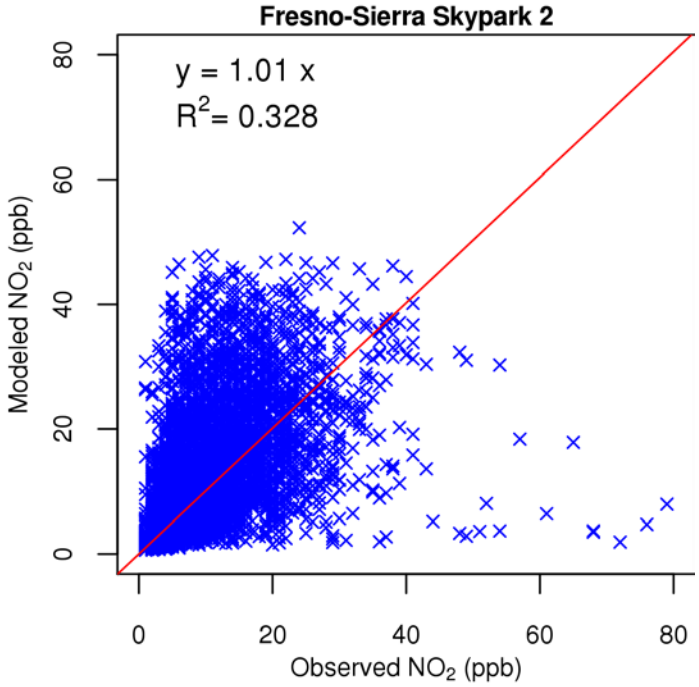


Figure S. 58 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Fresno – Sierra Sky Park

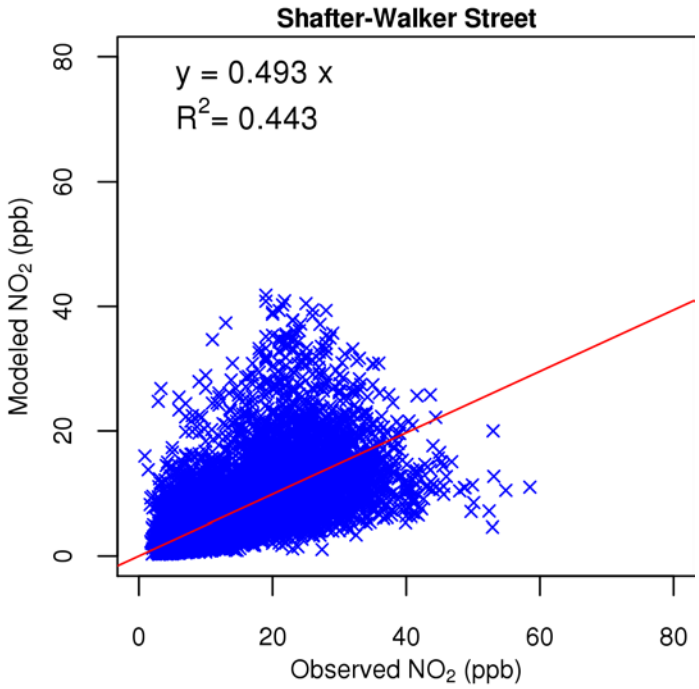


Figure S. 59 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Shafter

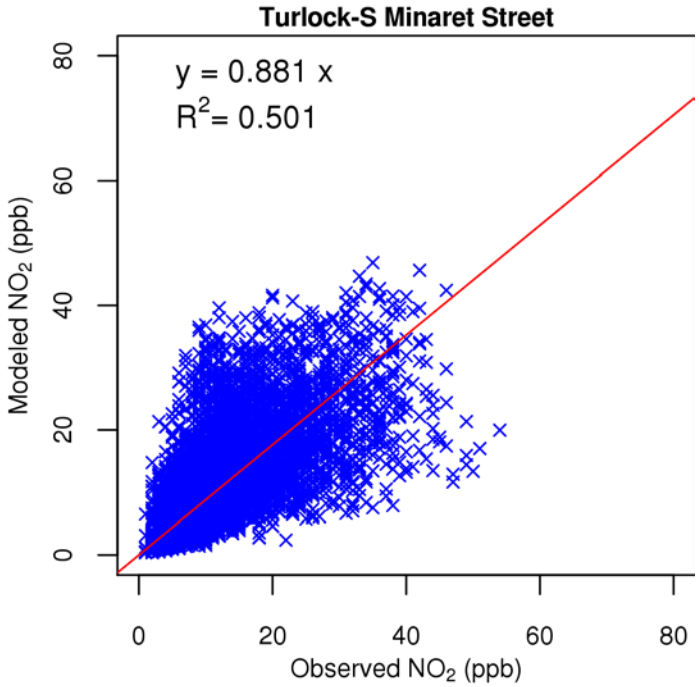
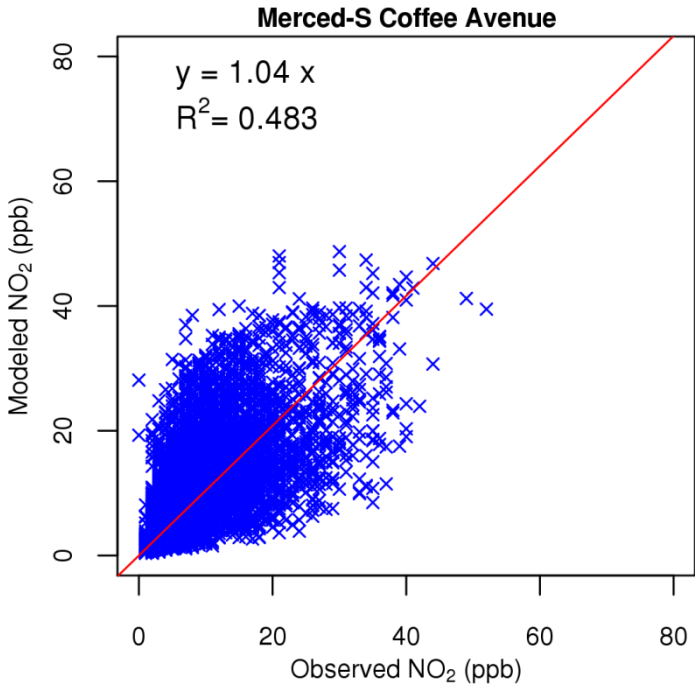


Figure S. 60 Scattering plot of observed and modeled 1-hour NO_2 mixing ratio at Turlock



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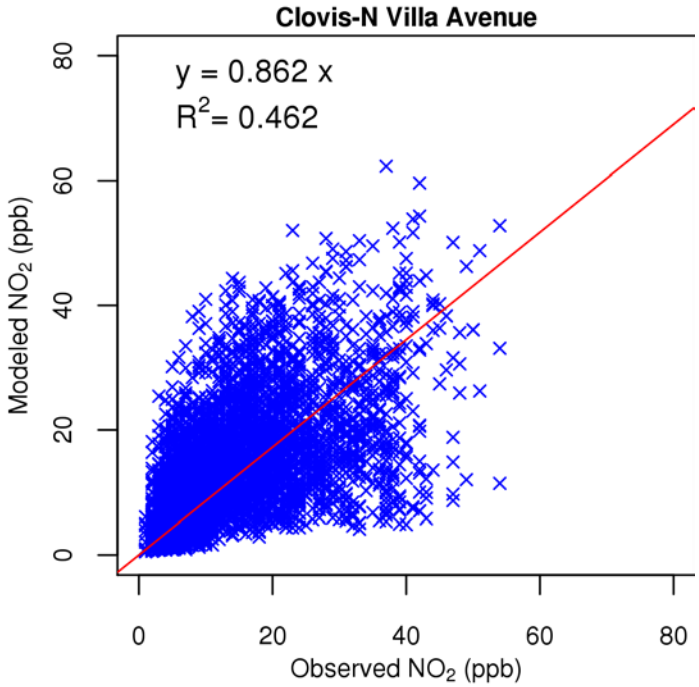

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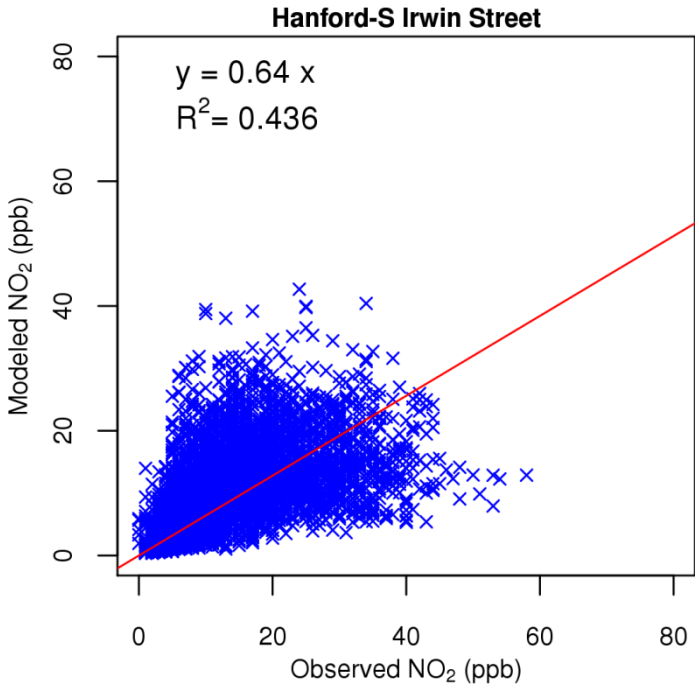

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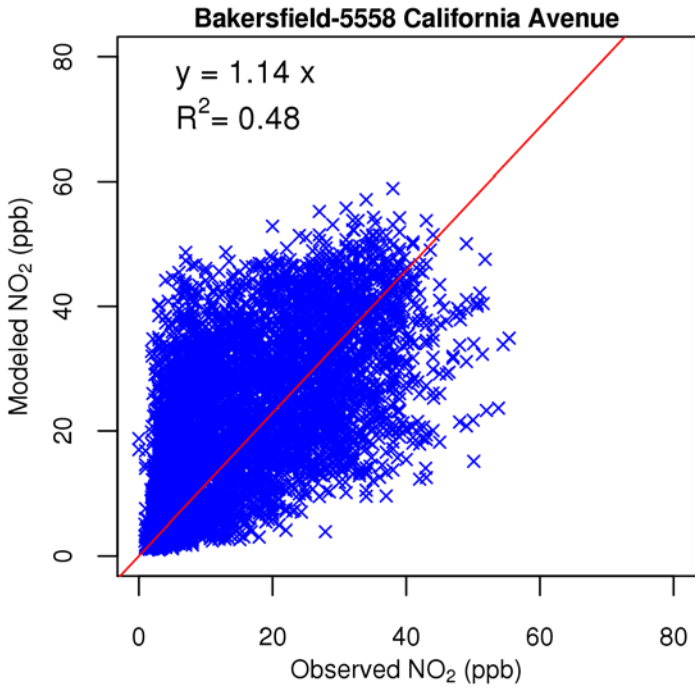

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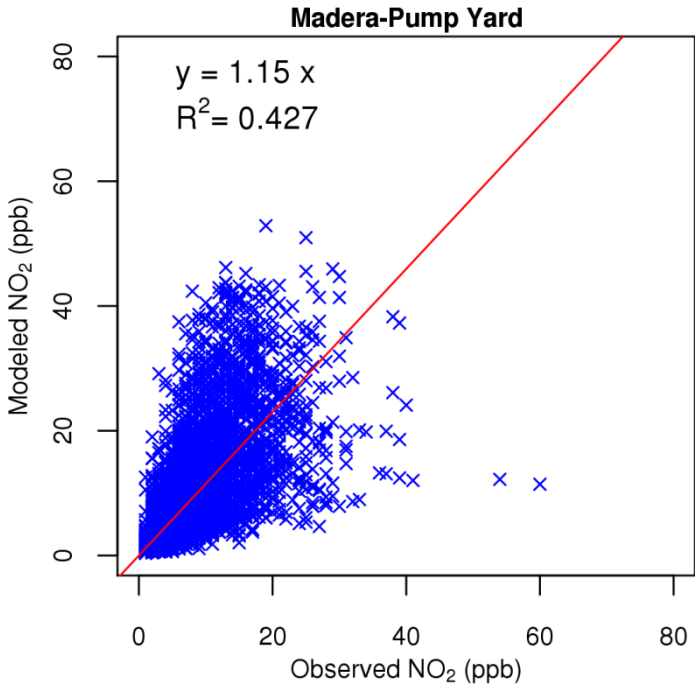

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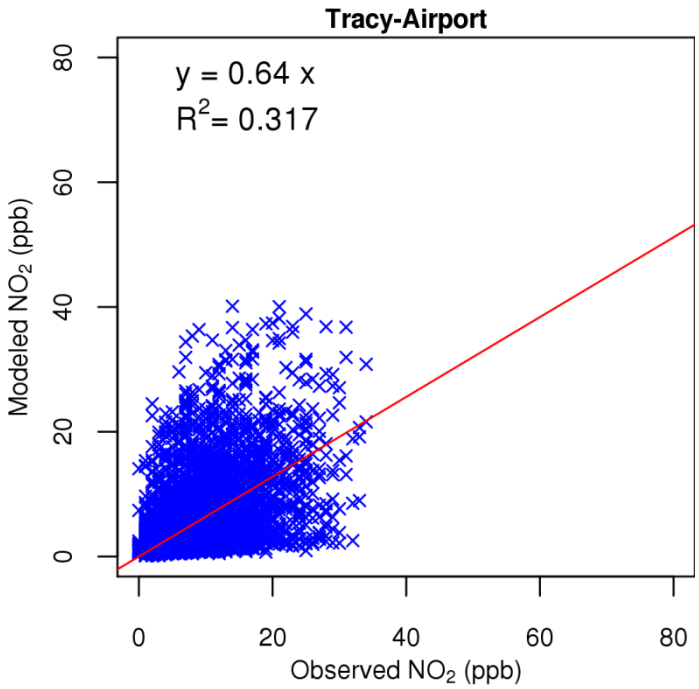

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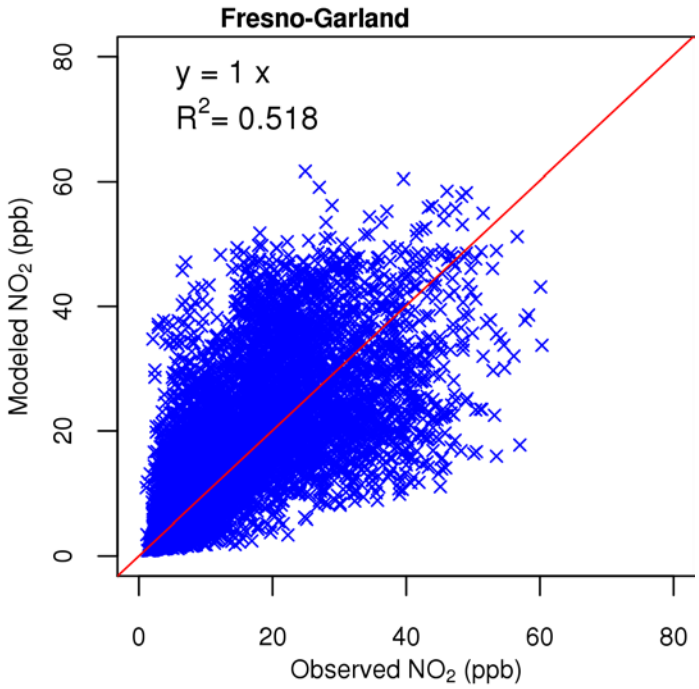

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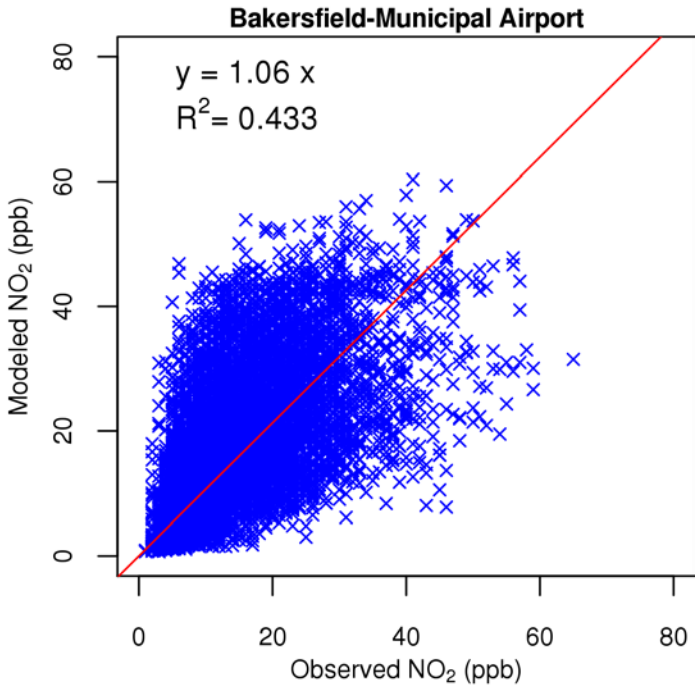

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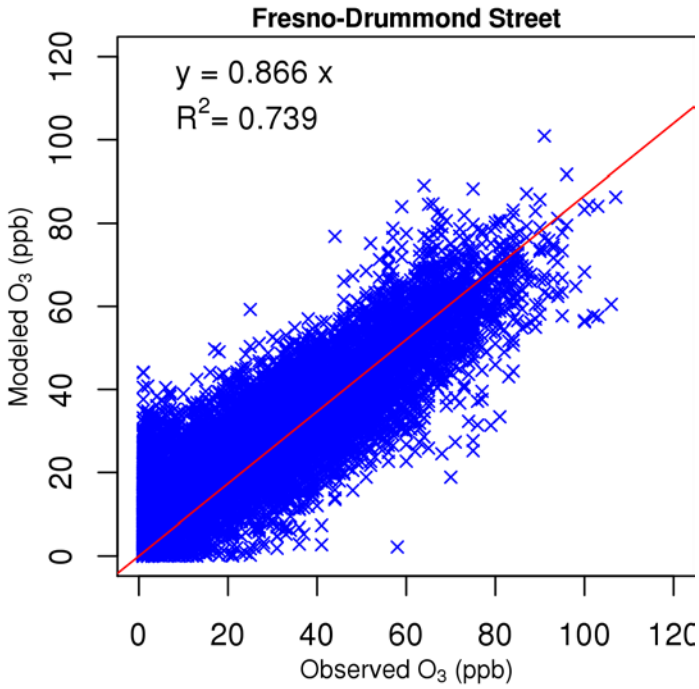

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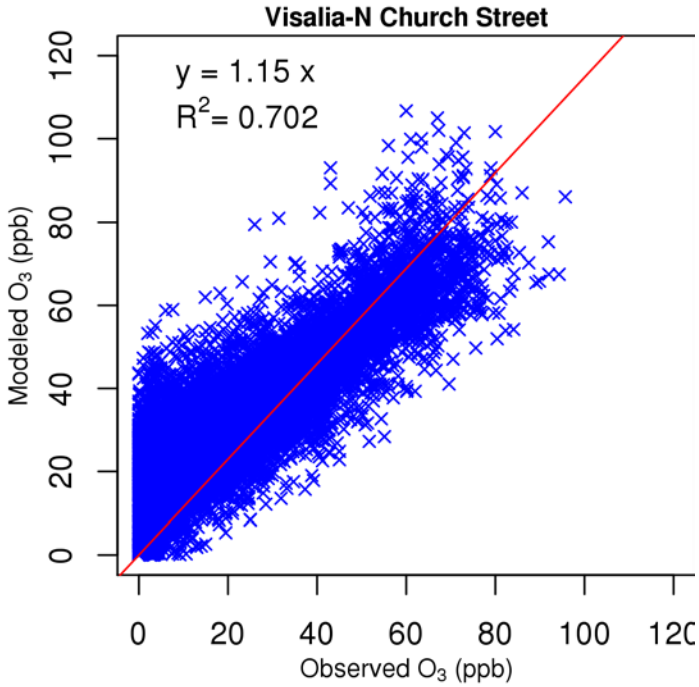

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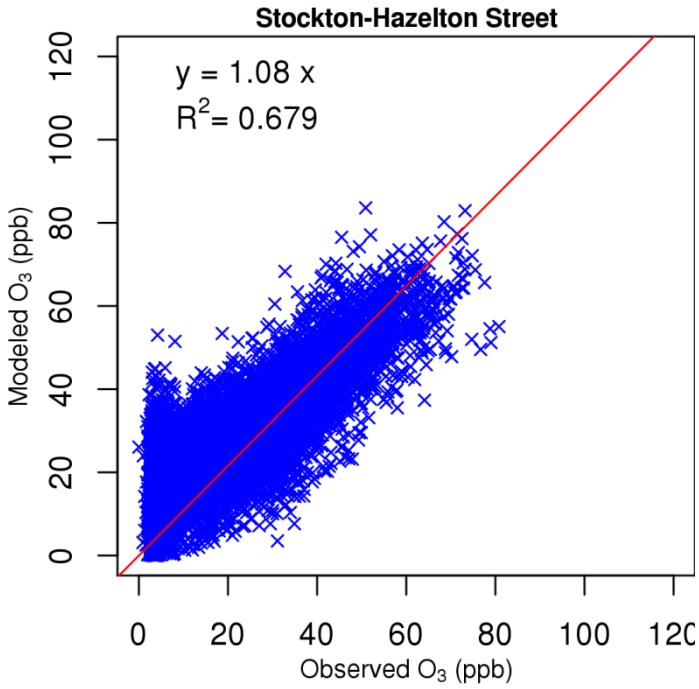

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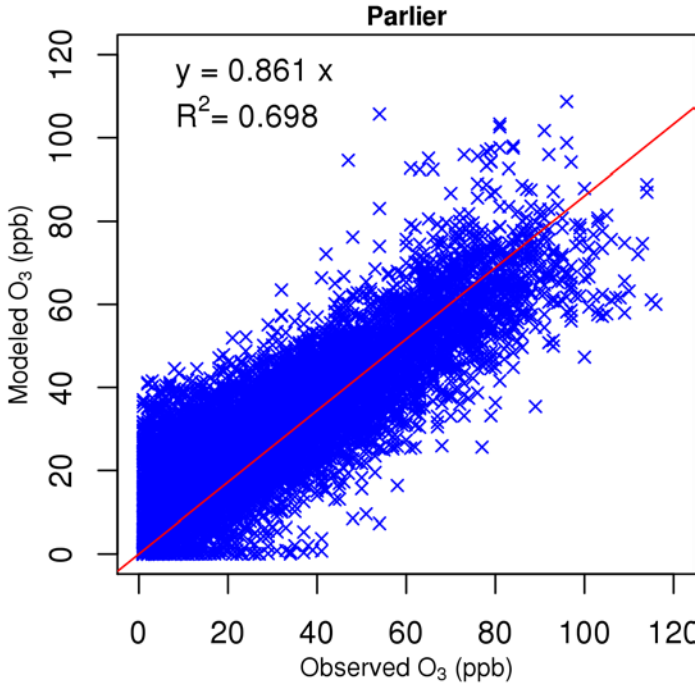

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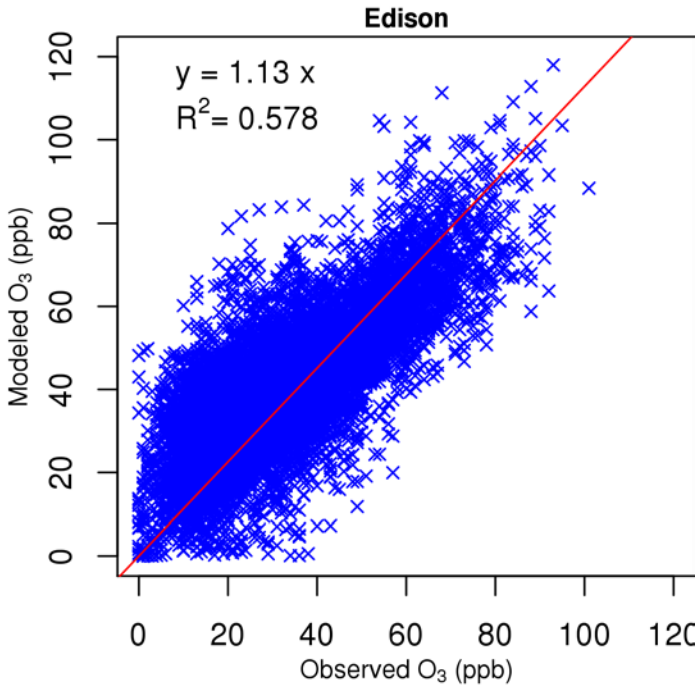

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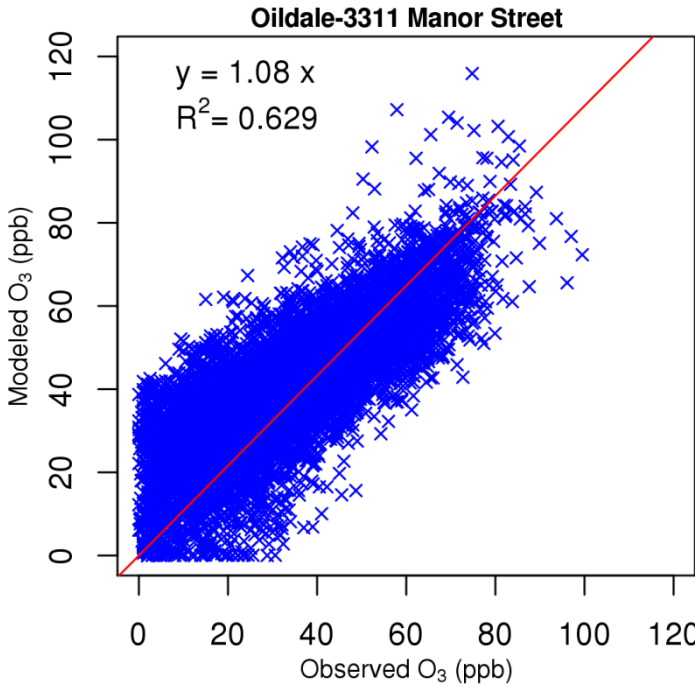

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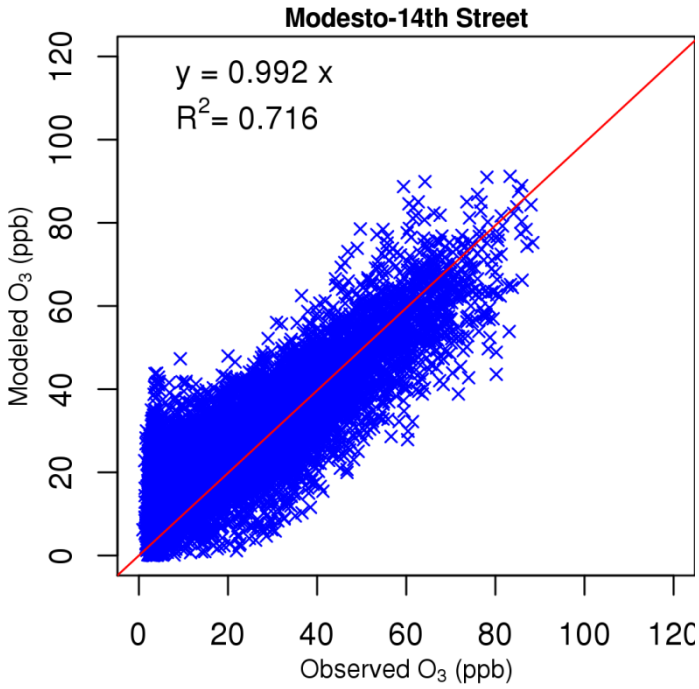

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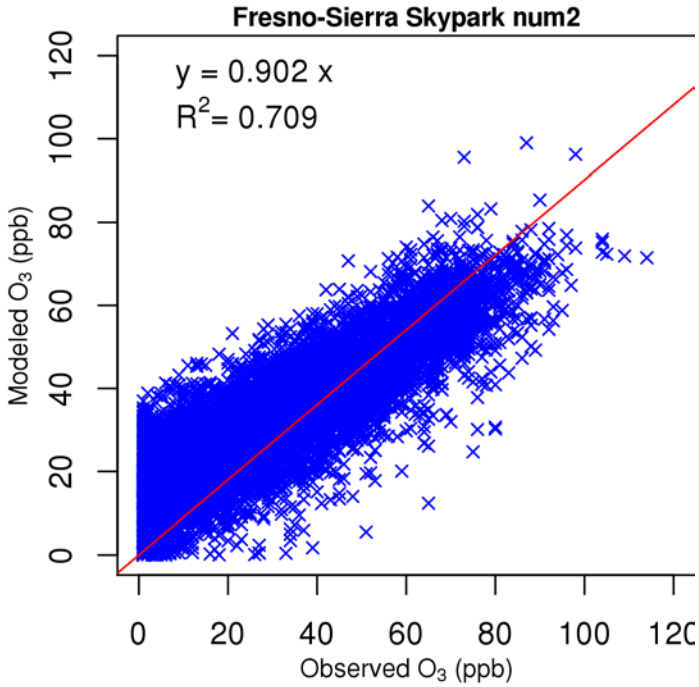

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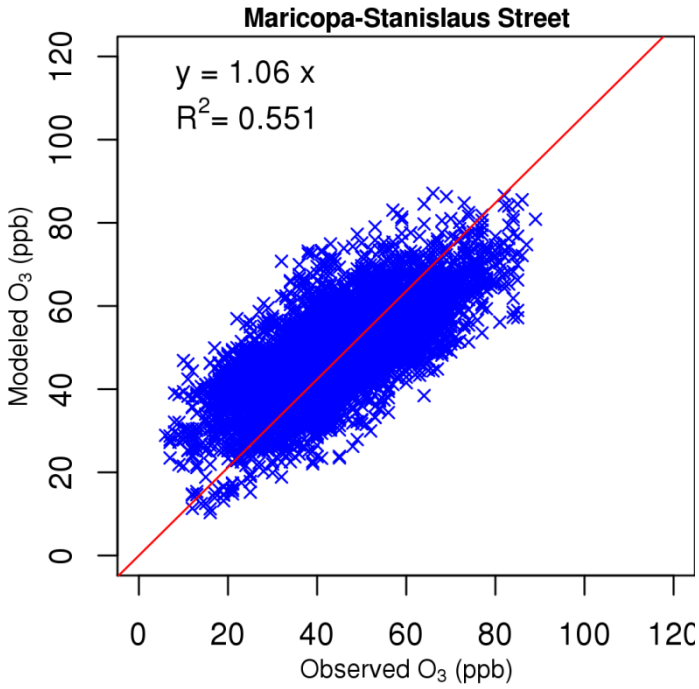

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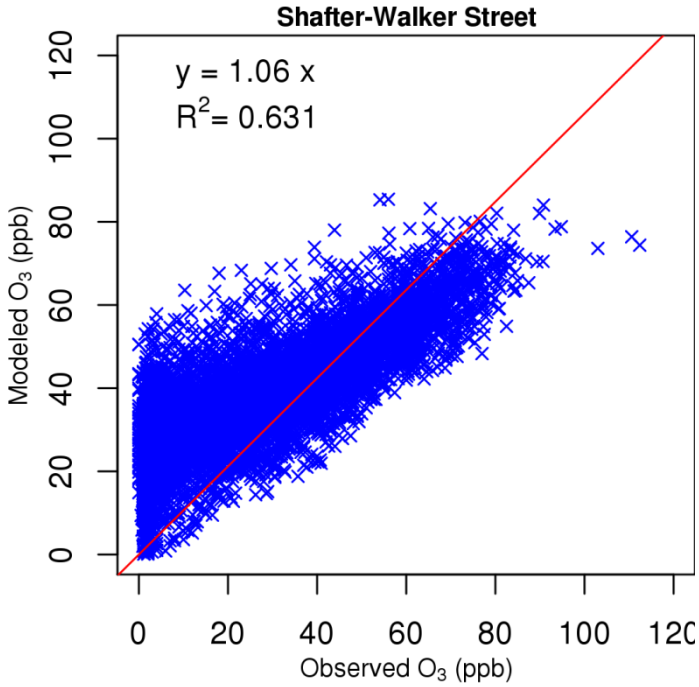

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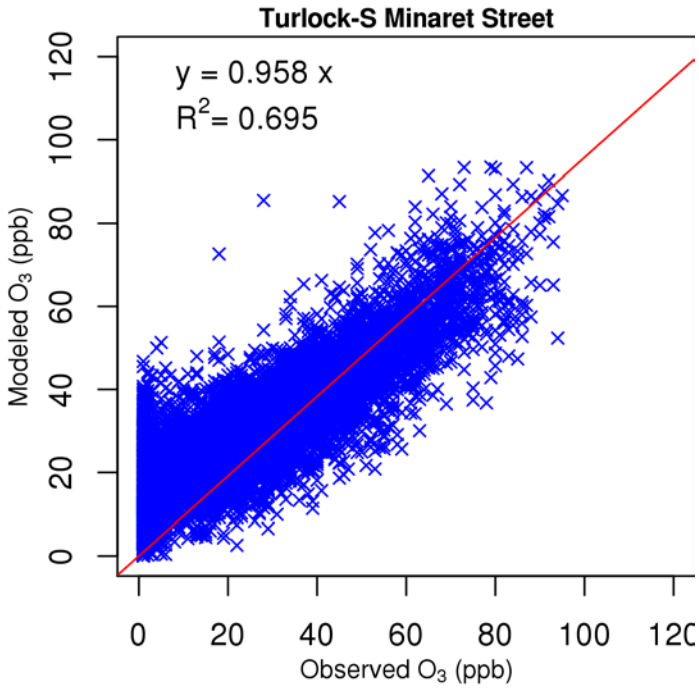

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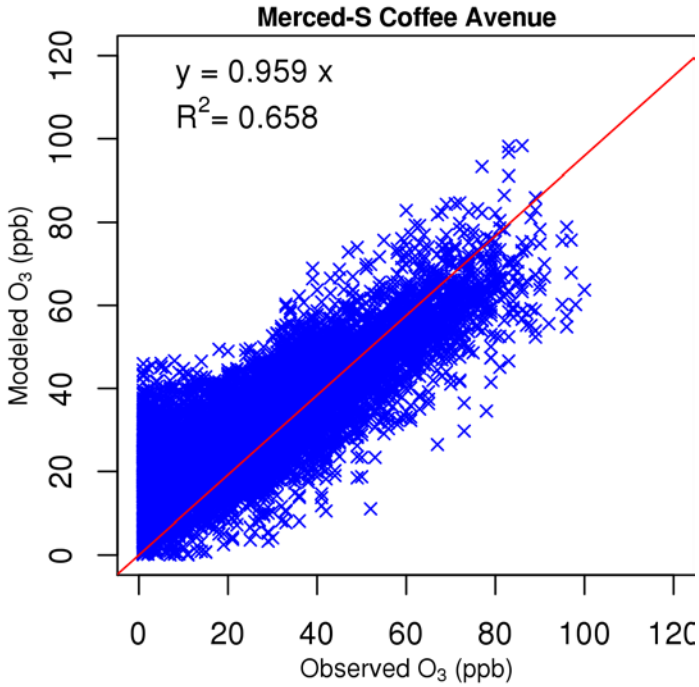

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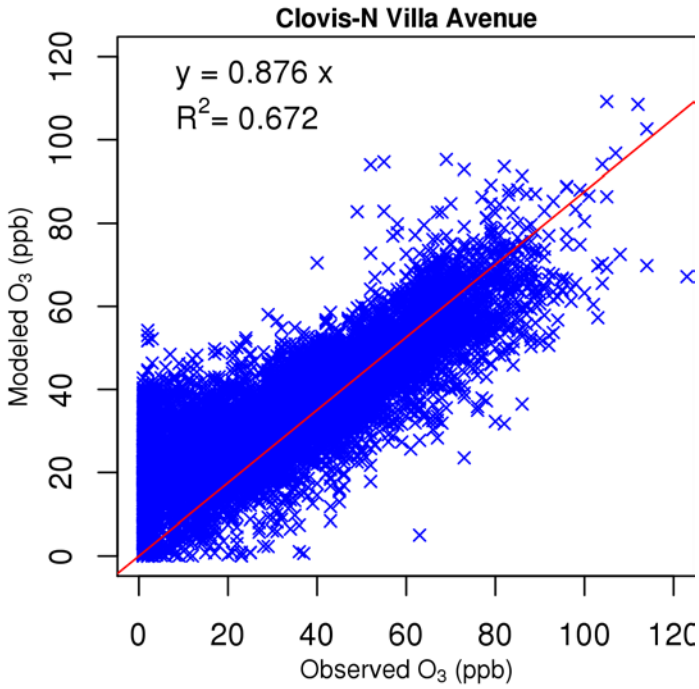

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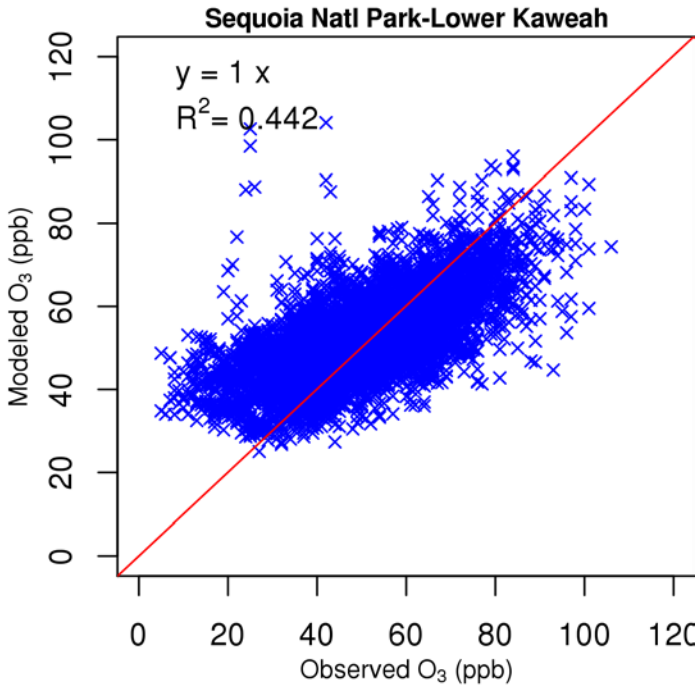

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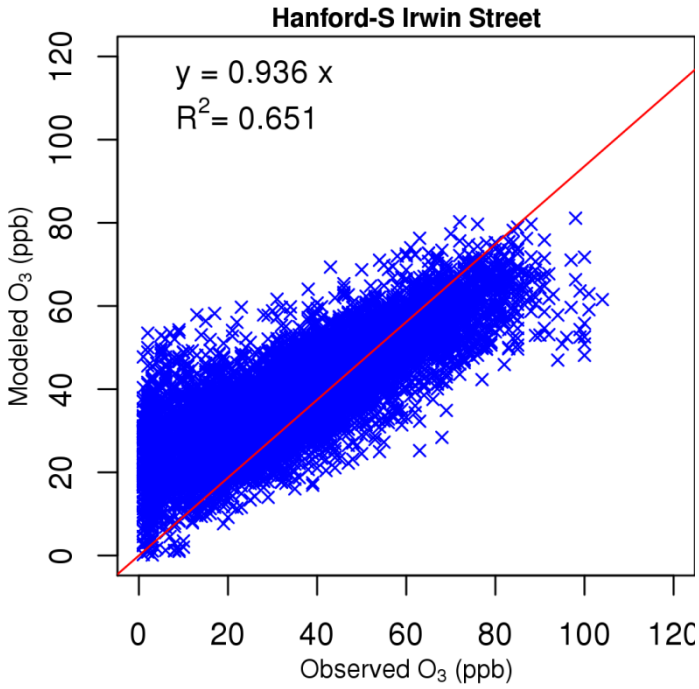

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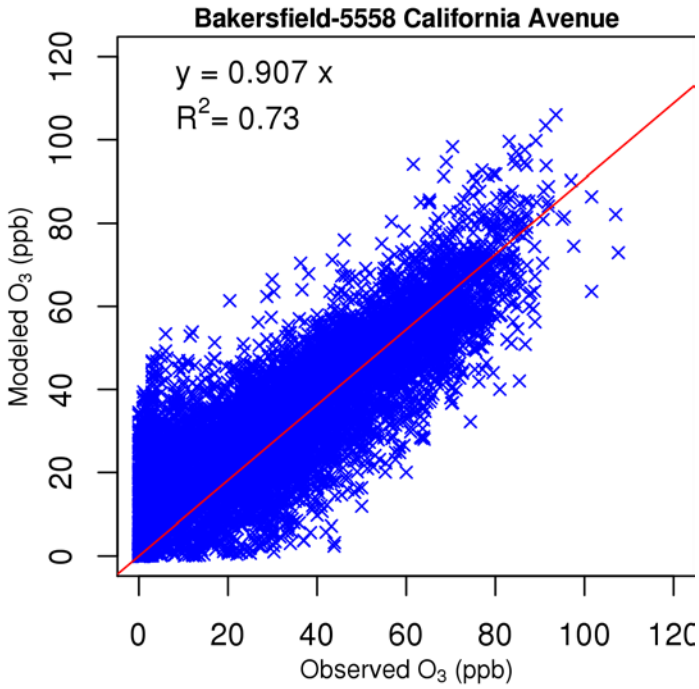

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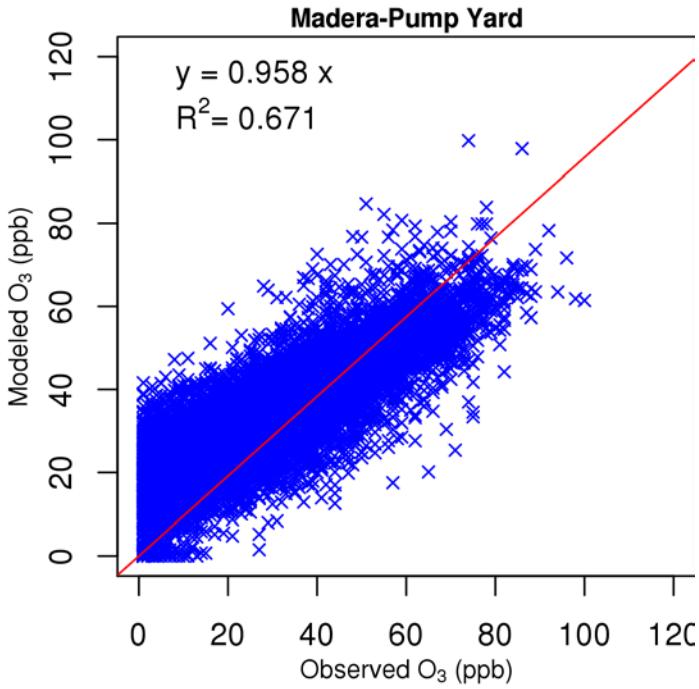

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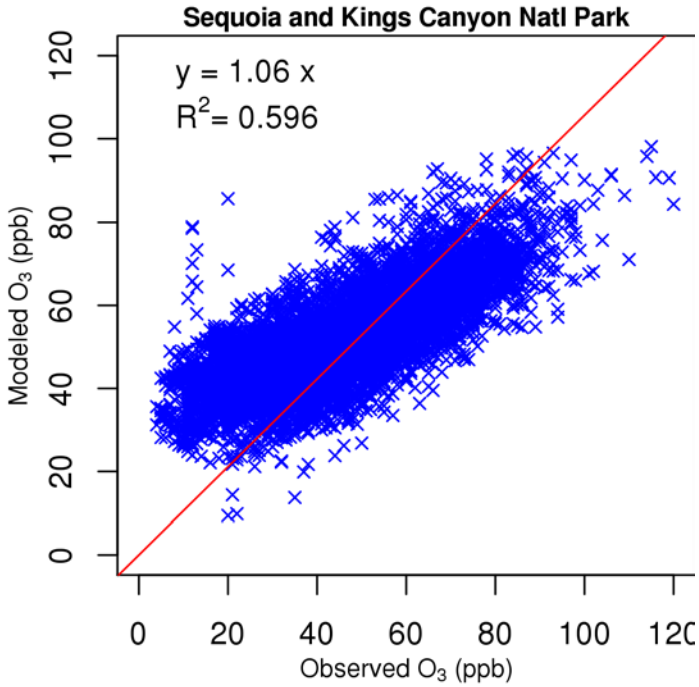

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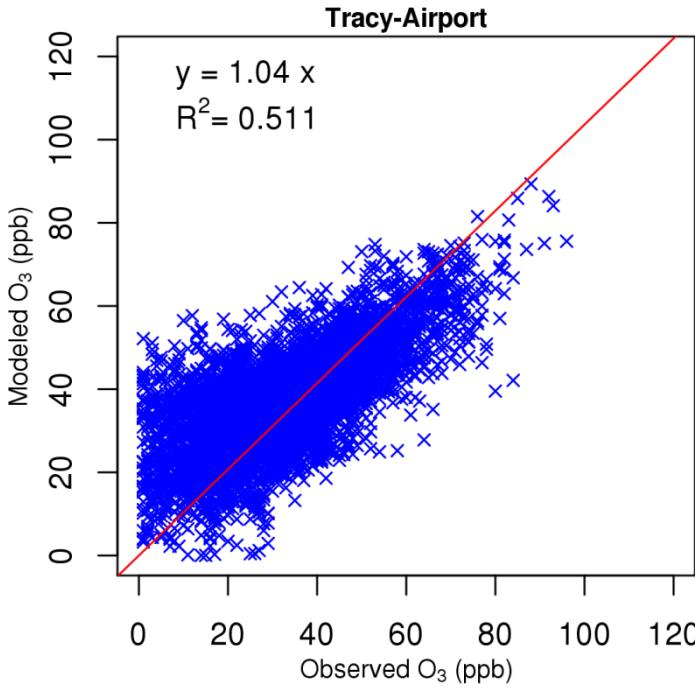

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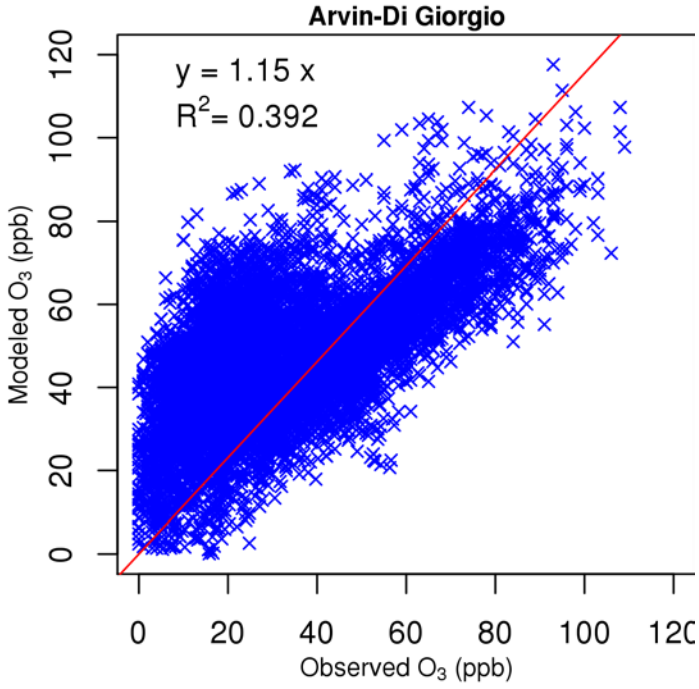

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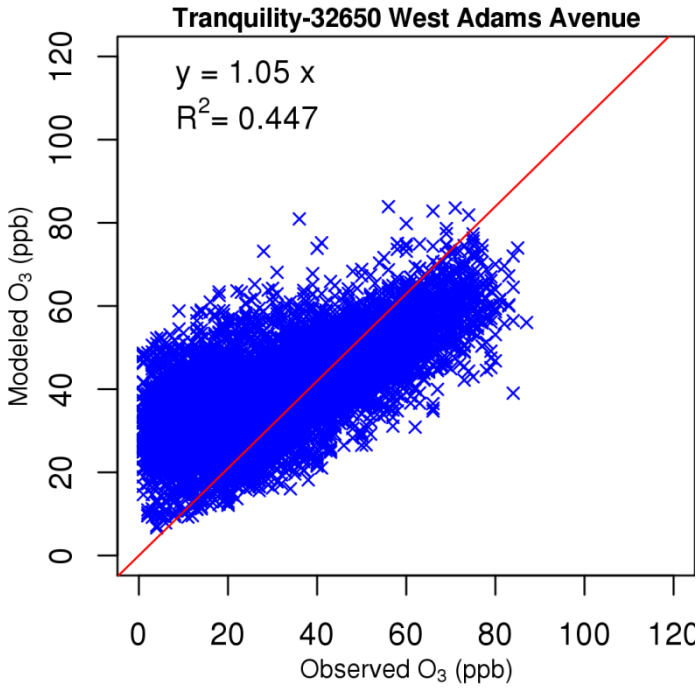

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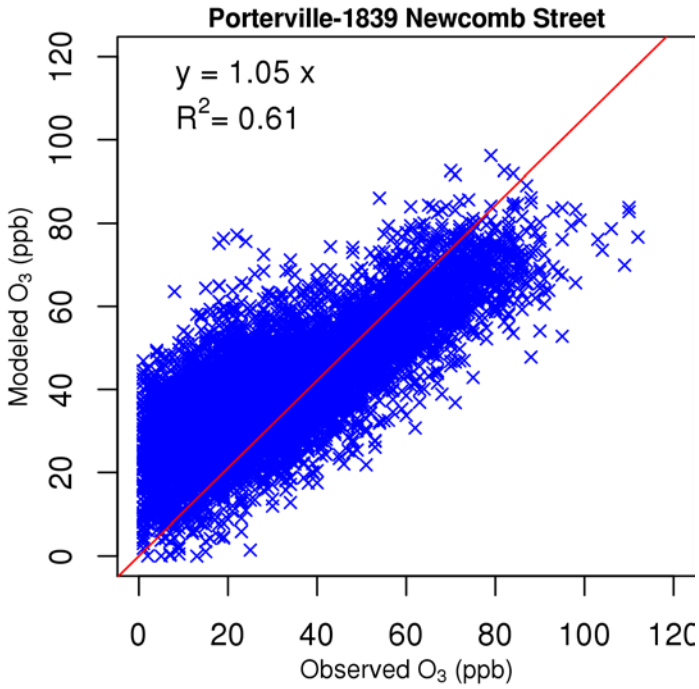

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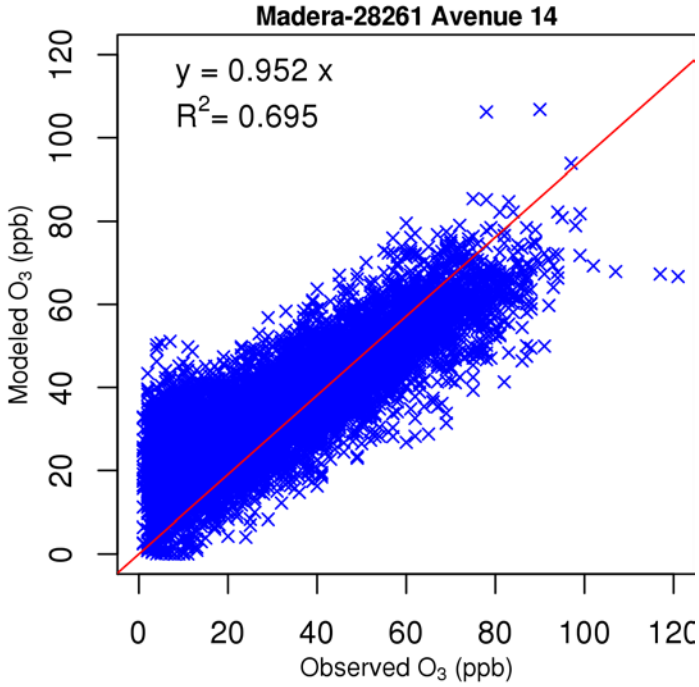

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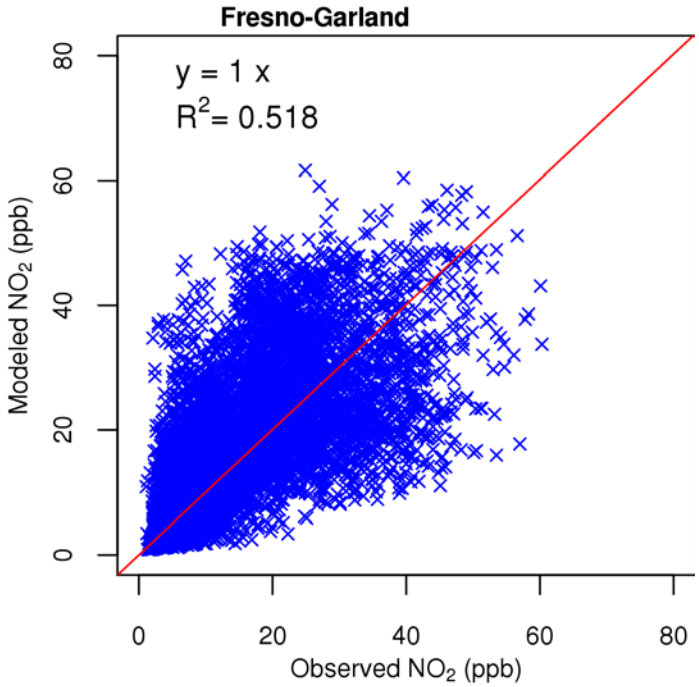

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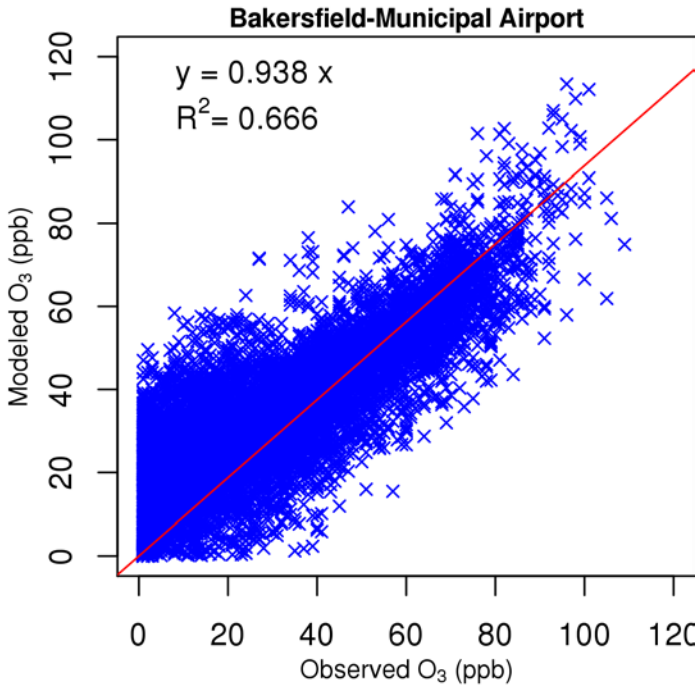

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PHOTOCHEMICAL MODELING PROTOCOL

Photochemical Modeling for the 8-Hour Ozone and Annual/24-hour $PM_{2.5}$ State Implementation Plans

Prepared by

California Air Resources Board

Prepared for

United States Environmental Protection Agency Region IX

July 26, 2016

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ACRONYMS

ARB – Air Resources Board

ARCTAS-CARB – California portion of the Arctic Research of the Composition of the Troposphere from Aircraft and Satellites conducted in 2008

BCs – Boundary Conditions

CalNex – Research at the Nexus of Air Quality and Climate Change conducted in 2010

CCOS - Central California Ozone Study

CMAQ Model – Community Multi-scale Air Quality Model

CIT – California Institute of Technology

CRPAQS – California Regional PM_{10}/$PM_{2.5}$ Air Quality Study

DISCOVER-AQ - Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality

DV – Design Value

FDDA – Four-Dimensional Data Assimilation

FEM – Federal Equivalence Monitors

FRM – Federal Reference Monitors

HNO_3 – Nitric Acid

ICs – Initial Conditions

IMPROVE – Interagency Monitoring of Protected Visual Environments

IMS-95 – Integrated Monitoring Study of 1995

LIDAR – Light Detection And Ranging

MDA – Maximum Daily Average

MM5 – Mesoscale Meteorological Model Version 5

MOZART – Model for Ozone and Related chemical Tracers

NARR - North American Regional Reanalysis

NCAR – National Center for Atmospheric Research

NCEP – National Centers for Environmental Prediction

NH_3 – Ammonia

NOAA - National Oceanic and Atmospheric Administration

NO_x – Oxides of nitrogen

OC – Organic Carbon

OFP - Ozone Forming Potential

PAMS – Photochemical Assessment Monitoring Stations

PAN – Peroxy Acetyl Nitrate

$PM_{2.5}$ – Particulate Matter with aerodynamic diameter less than 2.5 micrometers

PM_{10} – Particulate Matter with aerodynamic diameter less than 10 micrometers

RH – Relative Humidity

ROG – Reactive Organic Gases

RRF – Relative Response Factor

RSAC – Reactivity Scientific Advisory Committee

SANDWICH – Application of the Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous Material Balance Approach

SAPRC – Statewide Air Pollution Research Center

SARMAP – SJVAQS/AUSPEX Regional Modeling Adaptation Project

SCAQMD – South Coast Air Quality Management District

SIP – State Implementation Plan

SJV – San Joaquin Valley

SJVAB – San Joaquin Valley Air Basin (SJVAB)

SJVUAPCD – San Joaquin Valley Unified Air Pollution Control District

SJVAQS/AUSPEX – San Joaquin Valley Air Quality Study/Atmospheric Utilities Signatures Predictions and Experiments

SLAMS – State and Local Air Monitoring Stations

SMAQMD – Sacramento Metropolitan Air Quality Management District

SMAT – Application of the Speciated Modeled Attainment Test

SOA – Secondary Organic Aerosol

SO_x – Oxides of Sulfur

STN – Speciated Trend Network

UCD – University of California at Davis

U.S. EPA – United States Environmental Protection Agency

VOC – Volatile Organic Compounds

WRF Model – Weather and Research Forecast Model

1. INTRODUCTION

The purpose of this modeling protocol is to detail and formalize the procedures for conducting the photochemical modeling that forms the basis of the attainment demonstration for the 8-hour ozone and annual/24-hour $PM_{2.5}$ State Implementation Plans (SIPs) for California. The protocol is intended to communicate up front how the model attainment test will be performed. In addition, this protocol discusses analyses that are intended to help corroborate the findings of the model attainment test.

1.1 Modeling roles for the current SIP

The Clean Air Act (Act) establishes the planning requirements for all those areas that routinely exceed the health-based air quality standards. These nonattainment areas must adopt and implement a SIP that demonstrates how they will attain the standards by specified dates. Air quality modeling is an important technical component of the SIP, as it is used in combination with other technical information to project the attainment status of an area and to develop appropriate emission control strategies to achieve attainment.

ARB and local Air Districts will jointly develop the emission inventories, which are an integral part of the modeling. Working closely with the Districts, the ARB will perform the meteorological and air quality modeling. Districts will then develop and adopt their local air quality plan. Upon approval by the ARB, the SIP will be submitted to U.S.EPA for approval.

1.2 Stakeholder participation

Public participation constitutes an integral part of the SIP development. It is equally important in all technical aspects of SIP development, including the modeling. As the SIP is developed, the Air Districts and ARB will hold public workshops on the modeling and other SIP elements. Representatives from the private sector, environmental interest groups, academia, and the federal, state, and local public sectors are invited to attend and provide comments. In addition, Draft Plan documents will be available for public review and comment at various stages of plan development and at least 30 days before Plan consideration by the Districts' Governing Boards and subsequently by the ARB Board. These documents will include descriptions of the technical aspects of the SIP. Stakeholders have the choice to provide written and in-person comments at any of the Plan workshops and public Board hearings. The agencies take the comments into consideration when finalizing the Plan.

1.3 Involvement of external scientific/technical experts and their input on the photochemical modeling

During the development of the modeling protocol for the 2012 SJV 24-hour $PM_{2.5}$ SIP (SJVUAPCD, 2012), ARB and the San Joaquin Valley Air Pollution Control District (SJVAPCD) engaged a group of experts on prognostic meteorological modeling and photochemical/aerosol modeling to help prepare the modeling protocol document.

The structure of the technical expert group was as follows:

Conveners: John DaMassa – ARB
Samir Sheikh – SJVAPCD
Members: Scott Bohning – U.S. EPA Region 9
Ajith Kaduwela – ARB
James Kelly – U.S. EPA Office of Air Quality Planning and Standards
Michael Kleeman – University of California at Davis
Jonathan Pleim – U.S. EPA Office of Research and Development
Anthony Wexler – University of California at Davis

The technical consultant group provided technical consultations/guidance to the staff at ARB and SJVAPCD during the development of the protocol. Specifically, the group provided technical expertise on the following components of the protocol:

- Selection of the physics and chemistry options for the prognostic meteorological and photochemical air quality models
- Selection of methods to prepare initial and boundary conditions for the air quality model
- Performance evaluations of both prognostic meteorological and photochemical air quality models. This includes statistical, diagnostic, and phenomenological evaluations of simulated results.
- Selection of emissions profiles (size and speciation) for particulate-matter emissions.
- Methods to determine the limiting precursors for $PM_{2.5}$ formation.
- Application of the Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous Material Balance Approach (SANDWICH) with potential modifications.
- Application of the Speciated Modeled Attainment Test (SMAT).
- Selection of methodologies for the determination of $PM_{2.5}$ precursor equivalency ratios.
- Preparation of Technical Support Documents.

The current approach to regional air quality modeling has not changed significantly since the 2012 SJV 24-hour $PM_{2.5}$ SIP (SJVUAPCD, 2012), so the expertise provided on the above components to the protocol remain highly relevant. In addition, since regional air quality modeling simulates ozone chemistry and PM chemistry/formation simultaneously, there is generally no difference in how the models are configured and simulations conducted for ozone vs. PM. Therefore, development of this modeling protocol will rely heavily on the recommendations made by this group of technical experts, as well as recently published work in peer-review journals related to regional air quality modeling.

1.4 Schedule for completion of the Plan

Final area designations kick-off the three year SIP development process. For the first two years, efforts center on updates and improvements to the Plan's technical and scientific underpinnings. These include the development of emission inventories, selection of modeling periods, model selection, model input preparation, model performance evaluation and supplemental analyses. During the last year, modeling, further supplemental analyses and control strategy development proceed in an iterative manner and the public participation process gets under way. After thorough review the District Board and subsequently the ARB Board consider the Plan. The Plan is then submitted to U.S. EPA. Table 1-1 in the Appendix corresponding to the appropriate region/standard (e.g., SJV 0.075 ppm 8-hour ozone) summarizes the overall anticipated schedule for Plan completion.

2. DESCRIPTION OF THE CONCEPTUAL MODEL FOR THE NONATTAINMENT AREA

See Section 2 in the Appendix corresponding to the appropriate region/standard (e.g., SJV 0.075 ppm 8-hour ozone).

3. SELECTION OF MODELING PERIODS

3.1 Reference Year Selection and Justification

From an air quality and emissions perspective, ARB and the Districts have selected 2012 as the base year for design value calculation and for the modeled attainment test.

For the SJV, the $PM_{2.5}$ model attainment test will utilize 2013 instead of 2012. These baseline values will serve as the anchor point for estimating future year projected design values.

The selection of 2012/13 is based on the following four considerations:

- Most complete and up to date emissions inventory, which reduces the uncertainty associated with future emissions projections.
- Analysis of meteorological adjusted air quality trends to determine recent years with meteorology most conducive to ozone and $PM_{2.5}$ formation and buildup.
- Availability of research-grade wintertime field measurements in the Valley, which captured two significant pollution episodes during the DISCOVER-AQ field study (January-February 2013).
- The SJV $PM_{2.5}$ design values for year 2013 were some of the highest in recent years, making 2013 a conservative choice for attainment demonstration modeling.

Details and discussion on these analyses can be found in the Weight of Evidence Appendix.

3.2 Future Year Selection and Justification

The future year modeled is determined by the year for which attainment must be demonstrated. Table 3-1 lists the year in which attainment must be demonstrated for the various ozone and $PM_{2.5}$ standards and non-attainment regions in California.

Table 3-1. Future attainment year by non-attainment region and NAAQS. 0.08 ppm and 0.075 ppm refer to the 1997 and 2008 8-hour ozone standards, respectively. 15 ug/m^3 and 12 ug/m^3 refer to the 1997 and 2012 annual $PM_{2.5}$ standards, respectively. 35 ug/m^3 refers to the 2006 24-hour $PM_{2.5}$ standard, and 1-hr ozone refers to the revoked 1979 0.12 ppm 1-hour ozone standard.

Area	Year								
	2031	2026	2025	2024	2023	2021	2020	2019	2017
Southern California Modeling Domain									
South Coast	0.075 ppm	--	--	--	0.08 ppm	12 µg/m^3	--	--	--
Mojave/Coachella	--	0.075 ppm	--	--	--	--	--	--	0.08 ppm
Imperial County	--	--	--	--	--	12 µg/m^3	--	--	0.075 ppm
Ventura County	--	--	--	--	--	--	0.075 ppm	--	--
San Diego	--	--	--	--	--	--	--	--	0.075 ppm
Northern California Modeling Domain									
San Joaquin Valley	0.075 ppm	--	[1]12 µg/m^3	35 µg/m^3	--	[2]12 µg/m^3	15 µg/m^3	35 µg/m^3	1-hr ozone
Sacramento Metropolitan	--	0.075 ppm	--	--	--	--	--	--	--
Portola-Plumas County	--	--	--	--	--	12 µg/m^3	--	--	--
East Kern	--	--	--	--	--	--	--	--	0.075 ppm
W. Nevada County	--	--	--	--	--	--	--	--	0.075 ppm

[1] Serious classification attainment date

[2] Moderate classification attainment date

3.3 Justification for Seasonal/Annual Modeling Rather than Episodic Modeling

In the past, computational constraints restricted the time period modeled for a SIP attainment demonstration to a few episodes (e.g., 2007 SJV 8-hr ozone SIP (SJVUAPCD, 2007), 2007 SC 8-hr ozone SIP (SCAQMD, 2012) and 2009 Sacramento 8-hr ozone SIP (SMAQMD, 2012)). However, as computers have become faster and

large amounts of data storage have become readily accessible, there is no longer a need to restrict modeling periods to only a few episodes. In more recent years, SIP modeling in California has covered the entire ozone or peak $PM_{2.5}$ seasons (2012 SC 8-hour ozone and 24-hour $PM_{2.5}$ SIP (SCAQMD, 2012), 2012 SJV 24-hour $PM_{2.5}$ SIP (SJVUAPCD, 2012) and 2013 SJV 1-hr ozone SIP (SJVUAPCD,2013)), or an entire year in the case of annual $PM_{2.5}$ (2008 SJV annual $PM_{2.5}$ SIP (SJVUAPCD, 2008)) The same is true for other regulatory modeling platforms outside of California (Boylan and Russell, 2006; Morris et al., 2006; Rodriguez et al., 2009; Simon et al., 2012; Tesche et al., 2006; U.S. EPA, 2011a, b).

Recent ozone based studies, which focused on model performance evaluation for regulatory assessment, have recommended the use of modeling results covering the full synoptic cycles and full ozone seasons (Hogrefe et al., 2000; Vizuete et al., 2011). This enables a more complete assessment of ozone response to emission controls under a wide range of meteorological conditions. The same is true for modeling conducted for peak 24-hour $PM_{2.5}$. Consistent with the shift to seasonal or annual modeling in most regulatory modeling applications, modeling for the 8-hour ozone standard will cover the entire ozone season (May – September), modeling for the annual 24-hour $PM_{2.5}$ standard will be conducted for the entire year, and modeling for the 24-hour $PM_{2.5}$ standard will, at a minimum, cover the months in which peak 24-hour $PM_{2.5}$ occurs (e.g., October – March in the SJV) and will be conducted annually whenever possible.

4. DEVELOPMENT OF EMISSION INVENTORIES

For a detailed description of the emissions inventory, updates to the inventory, and how it was processed from the planning totals to a gridded inventory for modeling, see the Modeling Emissions Inventory Appendix.

5. MODELS AND INPUTS

5.1 Meteorological Model

Meteorological model selection is based on a need to accurately simulate the synoptic and mesoscale meteorological features observed during the selected modeling period. The main difficulties in accomplishing this are California's extremely complex terrain and its diverse climate. It is desirable that atmospheric modeling adequately represent essential meteorological fields such as wind flows, ambient temperature variation, evolution of the boundary layer, and atmospheric moisture content to properly characterize the meteorological component of photochemical modeling.

In the past, the ARB has applied prognostic, diagnostic, and hybrid models to prepare meteorological fields for photochemical modeling. There are various numerical models that are used by the scientific community to study the meteorological characteristics of an air pollution episode. For this SIP modeling platform, the Weather and Research Forecasting (WRF) model (Skaramock et al, 2005) will be used to develop the meteorological fields that drive the photochemical modeling. The U.S. EPA (2014) recommends the use of a well-supported grid-based mesoscale meteorological model for generating meteorological inputs. The WRF model is a community-based mesoscale prediction model, which represents the state-of-the-science and has a large community of model users and developers who frequently update the model as new science becomes available. In recent years, WRF has been applied in California to generate meteorological fields for numerous air quality studies (e.g., Angevine, et al., 2012; Baker et al., 2015; Ensberg et al., 2013; Fast et al., 2014; Hu et al., 2014a, 2014b; Huang et al., 2010; Kelly et al., 2014; Lu et al., 2012; Mahmud et al., 2010), and has been shown to reasonably reproduce the observed meteorology in California.

5.1.1 Meteorological Modeling Domain

The WRF meteorological modeling domain consists of three nested grids of 36 km, 12 km and 4 km uniform horizontal grid spacing (illustrated in Figure 5-1). The purpose of the coarse, 36 km grid (D01) is to provide synoptic-scale conditions to all three grids, while the 12 km grid (D02) is used to provide finer resolution data that feeds into the 4 km grid (D03). The D01 grid is centered at 37 ˚N and 120.5 ˚W and was chosen so that the inner two grids, D02 and D03, would nest inside of D03 and be sufficiently far away from the boundaries to minimize boundary influences. The D01 grid consists of 90 x 90 grid cells, while the D02 and D03 grids encompass 192 x 192 and 327 x 297 grid cells, respectively, with an origin at -696 km x -576 km (Lambert Conformal projection). WRF will be run for the three nested domains simultaneously with two-way feedback between the parent and the nest grids. The D01 and D02 grids are meant to resolve the larger scale synoptic weather systems, while the D03 grid is intended to resolve the finer details of the atmospheric conditions and will be used to drive the air quality model simulations. All three domains will utilize 30 vertical sigma layers (defined in Table 5-1), as well as the various physics options listed in Table 5-2 for each domain.
The initial and boundary conditions (IC/BCs) for WRF will be prepared based on 3-D North American Regional Reanalysis (NARR) data that are archived at the National Center for Atmospheric Research (NCAR). These data have a 32 km horizontal resolution. Boundary conditions to WRF are updated at 6-hour intervals for the 36 km grid (D01). In addition, surface and upper air observations obtained from NCAR will be used to further refine the analysis data that are used to generate the IC/BCs. Analysis

nudging will be employed in the outer 36km grid (D01) to ensure that the simulated meteorological fields are constrained and do not deviate from the observed meteorology.

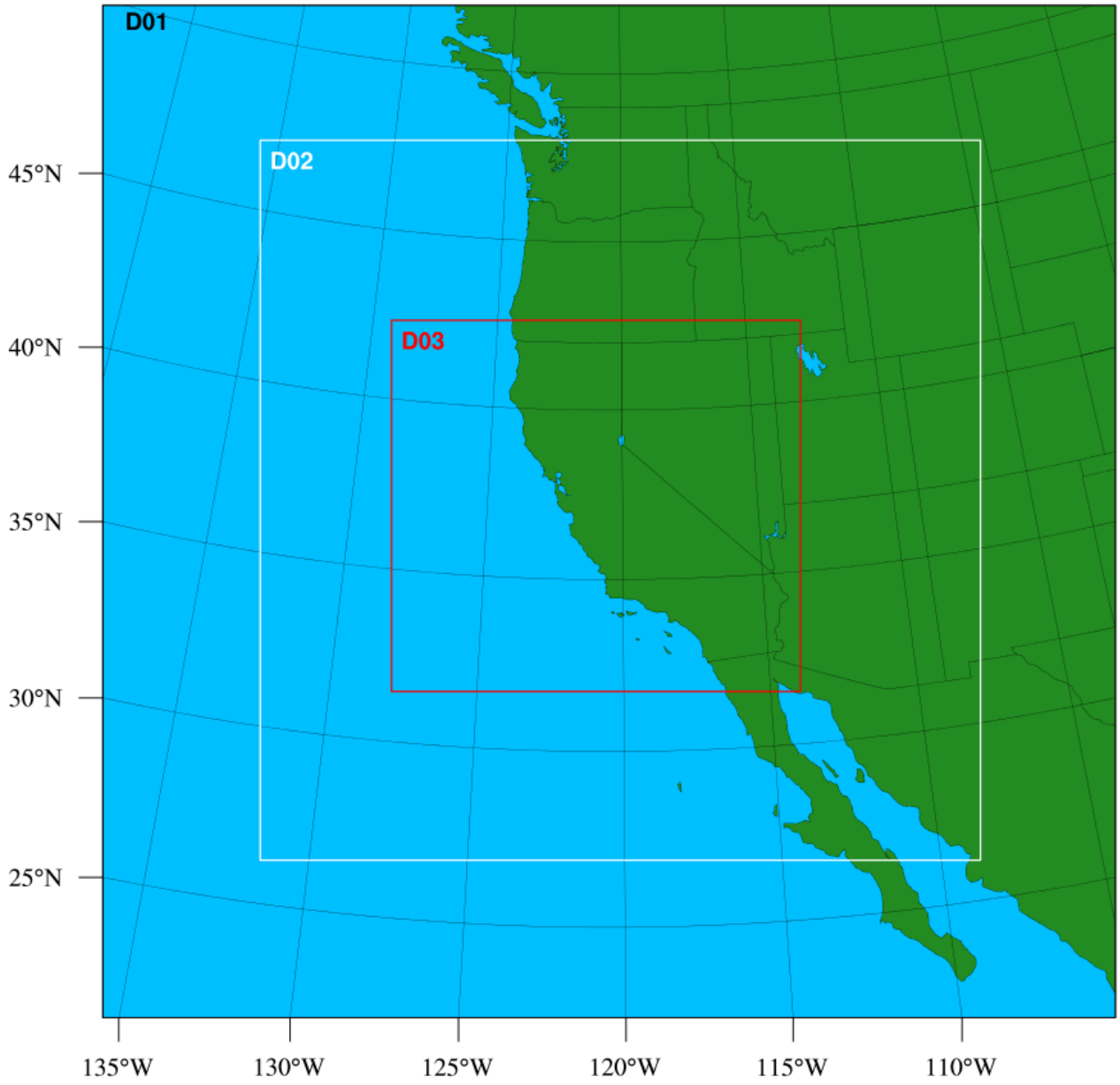

Figure 5-1. The three nested grids for the WRF model (D01 36km; D02 12km; and D03 4km).

Table 5-1. WRF vertical layer structure.

Layer Number	Height (m)	Layer Thickness (m)	Layer Number	Height (m)	Layer Thickness (m)
30	16082	1192	14	1859	334
29	14890	1134	13	1525	279
28	13756	1081	12	1246	233
27	12675	1032	11	1013	194
26	11643	996	10	819	162
25	10647	970	9	657	135
24	9677	959	8	522	113
23	8719	961	7	409	94
22	7757	978	6	315	79
21	6779	993	5	236	66
20	5786	967	4	170	55
19	4819	815	3	115	46
18	4004	685	2	69	38
17	3319	575	1	31	31
16	2744	482	0	0	0
15	2262	403			

Note: Shaded layers denote the subset of vertical layers to be used in the CMAQ photochemical model simulations. Further details on the CMAQ model configuration and settings can be found in subsequent sections.

Table 5-2. WRF Physics Options.

Physics Option	Domain		
	D01 (36 km)	D02 (12 km)	D03 (4 km)
Microphysics	WSM 6-class graupel scheme	WSM 6-class graupel scheme	WSM 6-class graupel scheme
Longwave radiation	RRTM	RRTM	RRTM
Shortwave radiation	Dudhia scheme	Dudhia scheme	Dudhia scheme
Surface layer	Revised MM5 Monin-Obukhov	Revised MM5 Monin-Obukhov	Revised MM5 Monin-Obukhov
Land surface	Pleim-Xiu LSM	Pleim-Xiu LSM	Pleim-Xiu LSM
Planetary Boundary Layer	YSU	YSU	YSU
Cumulus Parameterization	Kain-Fritsch scheme	Kain-Fritsch scheme	None

5.2 Photochemical Model

The U.S. EPA modeling guidance (U.S. EPA, 2014) requires several factors to be considered as criteria for choosing a qualifying air quality model to support the attainment demonstration. These criteria include: (1) It should have received a scientific peer review; (2) It should be appropriate for the specific application on a theoretical basis; (3) It should be used with databases which are available and adequate to support its application; (4) It should be shown to have performed well in past modeling applications; and (5). It should be applied consistently with an established protocol on methods and procedures (U.S. EPA, 2014). In addition, it should be well documented with a user's guide as well as technical descriptions. For the ozone modeled attainment test, a grid-based photochemical model is necessary to offer the best available representation of important atmospheric processes and the ability to analyze the impacts of proposed emission controls on ozone mixing ratios. In ARB's SIP modeling platform, the Community Multiscale Air Quality (CMAQ) Modeling System has been selected as the air quality model for use in attainment demonstrations of NAAQS for ozone and $PM_{2.5}$.

The CMAQ model, a state-of-the-science "one-atmosphere" modeling system developed by U.S. EPA, was designed for applications ranging from regulatory and policy analysis to investigating the atmospheric chemistry and physics that contribute to air pollution. CMAQ is a three-dimensional Eulerian modeling system that simulates ozone, particulate matter, toxic air pollutants, visibility, and acidic pollutant species throughout the troposphere (UNC, 2010). The model has undergone peer review every

few years and represents the state-of-the-science (Brown et al., 2011). The CMAQ model is regularly updated to incorporate new chemical and aerosol mechanisms, algorithms, and data as they become available in the scientific literature (e.g., Appel et al., 2013; Foley, et al., 2010; Pye and Pouliot, 2012;). In addition, the CMAQ model is well documented in terms of its underlying scientific algorithms as well as guidance on operational uses (e.g., Appel et al., 2013; Binkowski and Roselle, 2003; Byun and Ching, 1999; Byun and Schere, 2006; Carlton et al., 2010; Foley et al., 2010; Kelly, et al., 2010a; Pye and Pouliot, 2012; UNC, 2010).

The CMAQ model was the regional air quality model used for the 2008 SJV annual $PM_{2.5}$ SIP (SJVUAPCD, 2008), the 2012 SJV 24-hour $PM_{2.5}$ SIP (SJVUAPCD, 2012) and the 2013 SJV 1-hr ozone SIP (SJVUAPCD, 2013). A number of previous studies have also used the CMAQ model to study ozone and $PM_{2.5}$ formation in the SJV (e.g., Jin et al., 2008, 2010b; Kelly et al., 2010b; Liang and Kaduwela, 2005; Livingstone, et al., 2009; Pun et al, 2009; Tonse et al., 2008; Vijayaraghavan et al., 2006; Zhang et al., 2010). The CMAQ model has also been used for regulatory analysis for many of U.S. EPA's rules, such as the Clean Air Interstate Rule (U.S. EPA, 2005) and Light-duty and Heavy-duty Greenhouse Gas Emissions Standards (U.S. EPA, 2010, 2011a). There have been numerous applications of the CMAQ model within the U.S. and abroad (e.g., Appel, et al., 2007, 2008; Civerolo et al., 2010; Eder and Yu, 2006; Hogrefe et al., 2004; Lin et al., 2008, 2009; Marmur et al., 2006; O'Neill, et al., 2006; Philips and Finkelstein, 2006; Smyth et al., 2006; Sokhi et al., 2006; Tong et al., 2006; Wilczak et al., 2009; Zhang et al., 2004, 2006), which have shown it to be suitable as a regulatory and scientific tool for investigating air quality. Staff at the CARB has developed expertise in applying the CMAQ model, since it has been used at CARB for over a decade. In addition, technical support for the CMAQ model is readily available from the Community Modeling and Analysis System (CMAS) Center (http://www.cmascenter.org/) established by the U.S. EPA.

The version 5.0.2 of the CMAQ model released in May 2014, (http://www.airqualitymodeling.org/cmaqwiki/index.php?title=CMAQ_version_5.0.2_%28April_2014_release%29_Technical_Documentation), will be used in this SIP modeling platform. Compared to the previous version, CMAQv4.7.1, which was used for the 2012 SJV 24-hour $PM_{2.5}$ SIP (SJVUAPCD, 2012) and the 2013 SJV 1-hour ozone SIP (SJVUAPCD, 2013), CMAQ version 5 and above incorporated substantial new features and enhancements to topics such as gas-phase chemistry, aerosol algorithms, and structure of the numerical code (http://www.airqualitymodeling.org/cmaqwiki/index.php?title=CMAQ_version_5.0_%28February_2012_release%29_Technical_Documentation#RELEASE_NOTES_for_CMAQv5.0_-.C2.A0February_2012).

5.2.1 Photochemical Modeling Domain

Figure 5-2 shows the photochemical modeling domains used by ARB in this modeling platform. The larger domain (dashed black colored box), covering all of California, has a horizontal grid resolution of 12 km and extends from the Pacific Ocean in the west to Eastern Nevada in the east and runs from south of the U.S.-Mexico border in the south to north of the California-Oregon border in the north. The smaller 4 km Northern (green box) and Southern (red box) modeling domains are nested within the outer 12 km domain and utilized to better reflect the finer scale details of meteorology, topography, and emissions. Consistent with the WRF modeling, the 12 km and 4 km CMAQ domains are based on a Lambert Conformal Conic projection with reference longitude at -120.5°W, reference latitude at 37°N, and two standard parallels at 30°N and 60°N. The 30 vertical layers from WRF were mapped onto 18 vertical layers for CMAQ, extending from the surface to 100 mb such that the majority of the vertical layers fall within the planetary boundary layer. This vertical layer structure is based on the WRF sigma-pressure coordinates and the exact layer structure used can be found in Table 5-1. A third 4 km resolution modeling domain (blue box) is nested within the Northern California domain and covers the SJV air basin. This smaller SJV domain may be utilized for $PM_{2.5}$ modeling in the SJV if computational constraints (particularly for annual modeling) require the use of a smaller modeling domain. In prior work, modeling results from the smaller SJV domain were compared to results from the larger Northern California domain and no appreciable differences were noted, provided that both simulations utilized chemical boundary conditions derived from the same statewide 12 km simulation.

For the coarse portions of nested regional grids, the U.S. EPA guidance (U.S. EPA, 2014) suggests a grid cell size of 12 km if feasible but not larger than 36 km. For the fine scale portions of nested regional grids, it is desirable to use a grid cell size of ~4 km (U.S. EPA, 2014). Our selection of modeling domains and grid resolution is consistent with this recommendation. The U.S. EPA guidance (U.S. EPA, 2014) does not require a minimum number of vertical layers for an attainment demonstration, although typical applications of “one- atmosphere” models (with the model top at 50-100 mb) are anywhere from 14 to 35 vertical layers. In the ARB’s current SIP modeling platform, 18 vertical layers will be used in the CMAQ model. The vertical structure is based on the sigma-pressure coordinate, with the layers separated at 1.0, 0.9958, 0.9907, 0.9846, 0.9774, 0.9688, 0.9585, 0.9463, 0.9319, 0.9148, 0.8946, 0.8709, 0.8431, 0.8107, 0.7733, 0.6254, 0.293, 0.0788, and 0.0. As previously noted, this also ensures that the majority of the layers are in the planetary boundary layer.

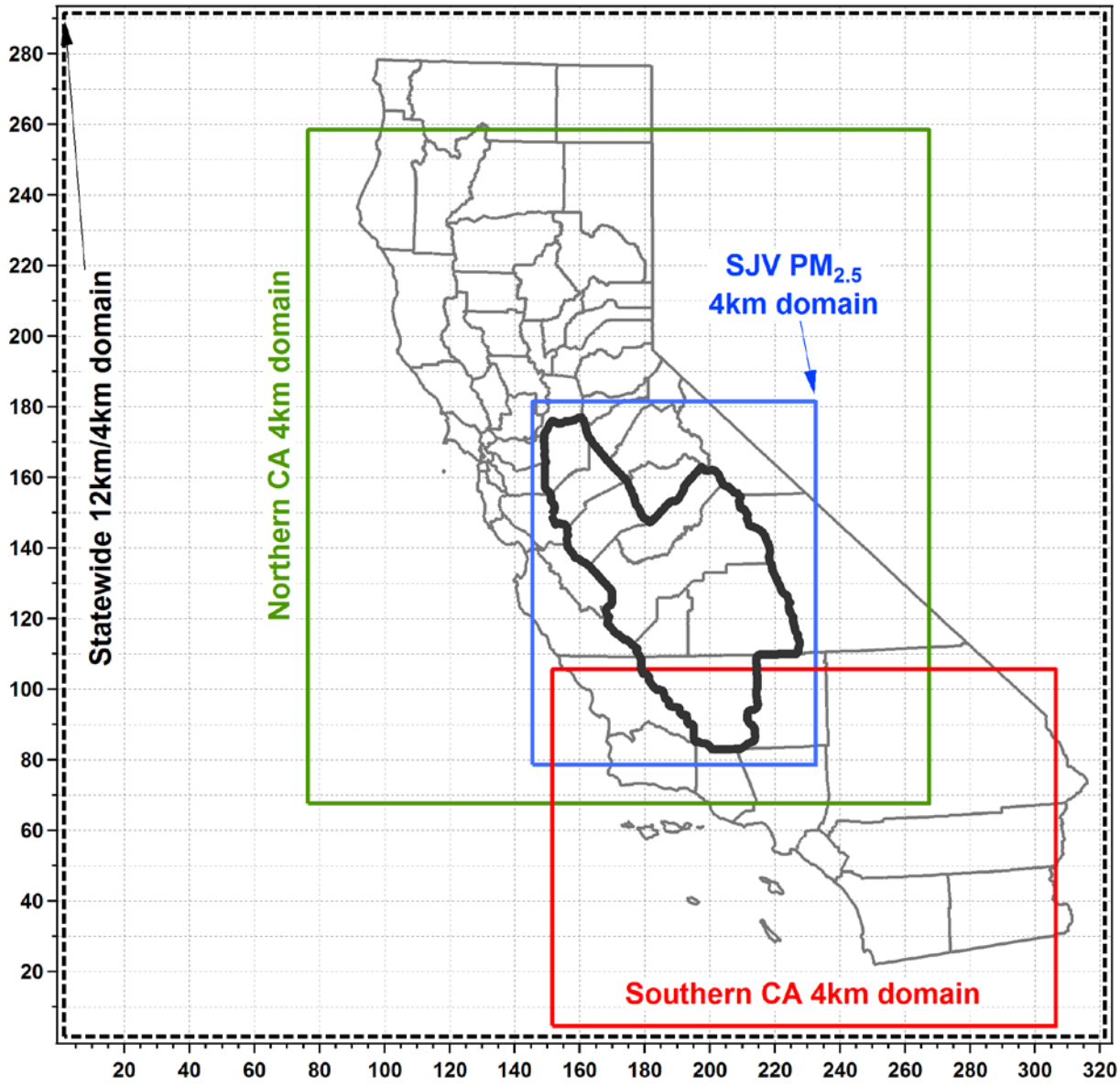

Figure 5-2. CMAQ modeling domains used in this SIP modeling platform. The outer domain (dashed black line) represents the extent of the California statewide domain (shown here with a 4 km horizontal resolution, but utilized in this modeling platform with a 12 km horizontal resolution). Nested higher resolution 4 km modeling domains are highlighted in green and red for Northern/Central California and Southern California, respectively. The smaller SJV $PM_{2.5}$ 4 km domain (colored in blue) is nested within the Northern California 4 km domain.

5.2.2 CMAQ Model Options

Table 5-3 shows the CMAQv5.0.2 configuration utilized in this modeling platform. The same configuration will be used in all simulations for both ozone and $PM_{2.5}$, and for all modeled years. The Intel FORTRAN compiler version 12 will be used to compile all source codes.

Table 5-3. CMAQ v5.0.2 configuration and settings.

Process	Scheme
Horizontal advection	Yamo (Yamartino scheme for mass-conserving advection)
Vertical advection	WRF-based scheme for mass-conserving advection
Horizontal diffusion	Multi-scale
Vertical diffusion	ACM2 (Asymmetric Convective Model version 2)
Gas-phase chemical mechanism	SAPRC07 gas-phase mechanism with version "C" toluene updates
Chemical solver	EBI (Euler Backward Iterative solver)
Aerosol module	Aero6 (the sixth-generation CMAQ aerosol mechanism with extensions for sea salt emissions and thermodynamics; includes a new formulation for secondary organic aerosol yields)
Cloud module	ACM_AE6 (ACM cloud processor that uses the ACM methodology to compute convective mixing with heterogeneous chemistry for AERO6)
Photolysis rate	phot_inline (calculate photolysis rates in-line using simulated aerosols and ozone)

5.2.3 Photochemical Mechanism

The SAPRC07 chemical mechanism will be utilized for all CMAQ simulations. SAPRC07, developed by Dr. William Carter at the University of California, Riverside, is a detailed mechanism describing the gas-phase reactions of volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) (Carter, 2010a, 2010b). It represents a complete update to the SAPRC99 mechanism, which has been used for previous ozone SIP plans in the SJV. The well-known SAPRC family of mechanisms have been used widely in California and the U.S. (e.g., Baker, et al., 2015; Cai et al., 2011; Chen et

al., 2014; Dennis et al., 2008; Ensberg, et al., 2013; Hakami, et al., 2004a, 2004b; Hu et al., 2012, 2014a, 2014b; Jackson, et al., 2006; Jin et al., 2008, 2010b; Kelly, et al., 2010b; Lane et al., 2008; Liang and Kaduwela, 2005; Livingstone et al., 2009; Lin et al., 2005; Napelenok, 2006; Pun et al., 2009; Tonse et al., 2008; Ying et al., 2008a, 2008b; Zhang et al., 2010; Zhang and Ying, 2011).

The SAPRC07 mechanism has been fully reviewed by four experts in the field through an ARB funded contract. These reviews can be found at http://www.arb.ca.gov/research/reactivity/rsac.htm. Dr. Derwent's (2010) review compared ozone impacts of 121 organic compounds calculated using SAPRC07 and the Master Chemical Mechanism (MCM) v 3.1 and concluded that the ozone impacts using the two mechanisms were consistent for most compounds. Dr. Azzi (2010) used SAPRC07 to simulate ozone formation from isoprene, toluene, m-xylene, and evaporated fuel in environmental chambers performed in Australia and found that SAPRC07 performed reasonably well for these data. Dr. Harley discussed implementing the SAPRC07 mechanism into 3-D air quality models and brought up the importance of the rate constant of NO_2 + OH. This rate constant in the SAPRC07 mechanism in CMAQv5.0.2 has been updated based on new research (Mollner et al., 2010). Dr. Stockwell (2009) compared individual reactions and rate constants in SAPRC07 to two other mechanisms (CB05 and RADM2) and concluded that SAPRC07 represented a state-of-the-science treatment of atmospheric chemistry.

5.2.4 Aerosol Module

The aerosol mechanism with extensions version 6 with aqueous-phase chemistry (AE6-AQ) will be utilized for all SIP modeling. When coupled with the SAPRC07 chemical mechanism, AE6-AQ simulates the formation and evaporation of aerosol and the evolution of the aerosol size distribution (Foley et al., 2010). AE6-AQ includes a comprehensive, yet computationally efficient, inorganic thermodynamic model ISORROPIA to simulate the physical state and chemical composition of inorganic atmospheric aerosols (Fountoukis and Nenes, 2007). AE6-AQ also features the addition of new $PM_{2.5}$ species, an improved secondary organic aerosol (SOA) formation module, as well as new treatment of atmospheric processing of primary organic aerosol (Appel et al., 2013; Carlton et al., 2010; Simon and Bhave, 2011). These updates to AE6-AQ in CMAQv5.0.2 continue to represent state-of-the-art treatment of aerosol processes in the atmosphere (Brown et al., 2011).

5.2.5 CMAQ Initial and Boundary Conditions (IC/BC) and Spin-Up period

Air quality model initial conditions define the mixing ratio (or concentration) of chemical and aerosol species within the modeling domain at the beginning of the model simulation. Boundary conditions define the chemical species mixing ratio (or concentration) within the air entering or leaving the modeling domain. This section discusses the initial and boundary conditions utilized in the ARB modeling system.

U.S. EPA guidance recommends using a model "spin-up" period by beginning a simulation 3-10 days prior to the period of interest (U.S. EPA, 2014). This "spin-up" period allows the initial conditions to be "washed out" of the system, so that the actual initial conditions have little to no impact on the modeling over the time period of interest, as well as giving sufficient time for the modeled species to come to chemical equilibrium. When conducting annual or seasonal modeling, it is computationally more efficient to simulate each month in parallel rather than the entire year or season sequentially. For each month, the CMAQ simulations will include a seven day spin-up period (i.e., the last seven days of the previous month) for the outer 12 km domain to ensure that the initial conditions are "washed out" of the system. Initial conditions at the beginning of the seven day spin-up period will be based on the default initial conditions that are included with the CMAQ release. The 4 km inner domain simulations will utilize a three day spin-up period, where the initial conditions will be based on output from the corresponding day of the 12 km domain simulation.

In recent years, the use of global chemical transport model (CTM) outputs as boundary conditions (BCs) in regional CTM applications has become increasingly common (Chen et al., 2008; Hogrefe et al., 2011; Lam and Fu, 2009; Lee et al., 2011; Lin et al., 2010), and has been shown to improve model performance in many cases (Appel et al., 2007; Borge et al., 2010; Tang et al., 2007, 2009; Tong and Mauzerall, 2006). The advantage of using global CTM model outputs as opposed to fixed climatological-average BCs is that the global CTM derived BCs capture spatial, diurnal, and seasonal variability, as well as provide a set of chemically consistent pollutant mixing ratios. In the ARB's SIP modeling system, the Model for Ozone And Related chemical Tracers (MOZART; Emmons et al., 2010) will be used to define the boundary conditions for the outer 12 km CMAQ domain, while boundary conditions for the 4 km domain will be derived from the 12 km output. MOZART is a comprehensive global model for simulating atmospheric composition including both gases and bulk aerosols (Emmons et al., 2010). It was developed by the National Center for Atmospheric Research (NCAR), the Max-Planck-Institute for Meteorology (in Germany), and the Geophysical Fluid Dynamics Laboratory (GFDL) of the National Oceanic and Atmospheric Administration (NOAA), and is widely

used in the scientific community. In addition to inorganic gases and VOCs, BCs were extracted for aerosol species including elemental carbon, organic matter, sulfate, soil and nitrate. MOZART has been extensively peer-reviewed and applied in a range of studies that utilize its output in defining BCs for regional modeling studies within California and other regions of the U.S. (e.g., Avise et al., 2008; Chen et al., 2008, 2009a, 2009b; Fast et al., 2014; Jathar et al., 2015).

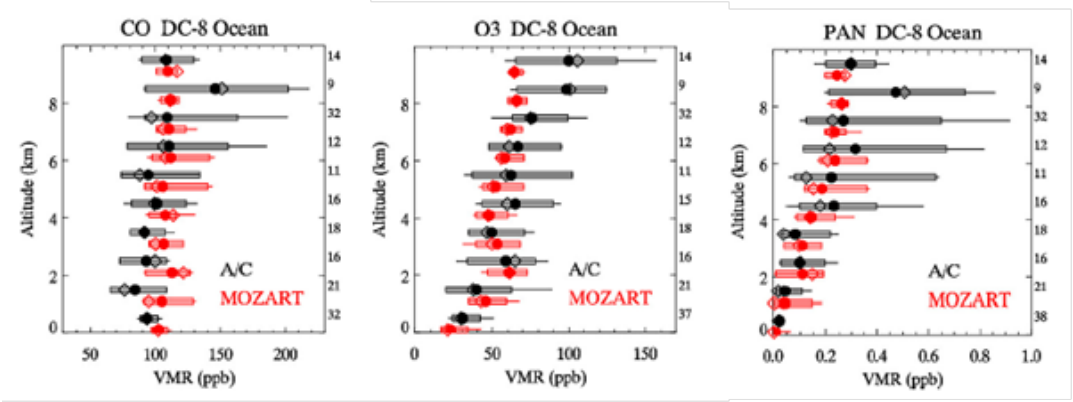

Figure 5-3. Comparison of MOZART (red) simulated CO (left), ozone (center), and PAN (right) to observations (black) along the DC-8 flight track. Shown are mean (filled symbol), median (open symbols), 10th and 90th percentiles (bars) and extremes (lines). The number of data points per 1-km wide altitude bin is shown next to the graphs. Adapted from Figure 2 in Pfister et al. (2011).

In particular, MOZART version 4 (MOZART-4) was recently used in a study characterizing summertime air masses entering California from the Pacific Ocean (Pfister et al., 2011). In their work, Pfister et al. (2011) compared MOZART-4 simulation results to measurements of CO, ozone, and PAN made off the California coast during the ARCTAS-CARB airborne field campaign (Jacob et al., 2010) and showed good agreement between the observations and model results (see Figure 5-3).
The specific MOZART simulations to be utilized in this modeling platform are the MOZART4-GEOS5 simulations by Louisa Emmons (NCAR) for the years 2012 and 2013, which are available for download at http://www.acom.ucar.edu/wrf-chem/mozart.shtml. These simulations are similar to those of Emmons et al. (2010), but with updated meteorological fields. Boundary condition data will be extracted from the MOZART-4 output and processed to CMAQ model ready format using the "mozart2camx" code developed by the Rambol-Environ Corporation (available at http://www.camx.com/download/support-software.aspx). The final BCs represent day-specific mixing ratios, which vary in both space (horizontal and vertical) and time (every six hours).

Per U.S. EPA guidance, the same MOZART derived BCs for the 12 km outer domain will be used for all simulations (e.g., Base Case, Reference, Future, and any sensitivity simulation).

5.3 Quality Assurance of Model Inputs

In developing the IC/BCs and Four Dimensional Data Assimilation (FDDA) datasets for WRF, quality control is performed on all associated meteorological data. Generally, all surface and upper air meteorological data are plotted in space and time to identify extreme values that are suspected to be "outliers". Data points are also compared to other, similar surrounding data points to determine whether there are any large relative discrepancies. If a scientifically plausible reason for the occurrence of suspected outliers is not known, the outlier data points are flagged as invalid and may not be used in the modeling analyses.

In addition, the model-ready emissions files used in CMAQ will be evaluated and compared against the planning inventory totals. Although deviations between the model-ready and planning inventories are expected due to temporal adjustments (e.g., month-of-year and day-of-week) and adjustments based on meteorology (e.g., evaporative emissions from motor vehicles and biogenic sources), any excessive deviation will be investigated to ensure the accuracy of the temporal and meteorology based adjustments. If determined to be scientifically implausible, then the adjustments which led to the deviation will be investigated and updated based on the best available science.

Similar to the quality control of the modeling emissions inventory, the chemical boundary conditions derived from the global CTM model will be evaluated to ensure that no errors were introduced during the processing of the data (e.g., during vertical interpolation of the global model data to the regional model vertical structure or mapping of the chemical species). Any possible errors will be evaluated and addressed if they are determined to be actual errors and not an artifact of the spatial and temporal dynamics inherent in the boundary conditions themselves.

6. METEOROLOGICAL MODEL PERFORMANCE

The complex interactions between the ocean-land interface, orographic induced flows from the mountain-valley topography, and the extreme temperature gradients between the ocean, delta region, valley floor, and mountain ranges surrounding the valley, make the SJV one of the most challenging areas in the country to simulate using prognostic meteorological models. Although there is a long history of prognostic meteorological model applications in California (e.g., Bao et al., 2008; Hu at al., 2010; Jackson et al., 2006; Jin et al., 2010a, 2010b; Livingstone et al., 2009; Michelson et al., 2010; Seaman, Stauffer, and Lario-Gibbs, 1995; Stauffer et al., 2000; Tanrikulu et al., 2000), there is no single model configuration that works equally well for all years and/or seasons, which makes evaluation of the simulated meteorological fields critical for ensuring that the fields reasonably reproduce the observed meteorology for any given time period.

6.1 Ambient Data Base and Quality of Data

Observed meteorological data used to evaluate the WRF model simulations will be obtained from the Air Quality and Meteorological Information System (AQMIS) database, which is a web-based source for real-time and official air quality and meteorological data (www.arb.ca.gov/airqualitytoday/). This database contains surface meteorological observations from 1969-2016, with the data through 2013 having been fully quality assured and deemed official. In addition ARB also has quality-assured upper-air meteorological data obtained using balloons, aircraft, and profilers.

6.2 Statistical Evaluation

Statistical analyses will be performed to evaluate how well the WRF model captured the overall structure of the observed atmosphere during the simulation period, using wind speed, wind direction, temperature, and humidity. The performance of the WRF model against observations will be evaluated using the METSTAT analysis tool (Emery et al, 2001) and supplemented using statistical software tools developed at ARB. The model output and observations will be processed, and data points at each observational site for wind speed, wind direction, temperature, and moisture data will be extracted. The following values will be calculated: Mean Obs, Mean Model, Mean Bias (MB), Mean (Gross) Error (ME/MGE), Normalized Mean Bias (NMB), Root Mean Squared error (RMSE), and the Index Of Agreement (IOA) when applicable. Additional statistical analysis may also be performed.

The mathematical expressions for these quantities are:

$$\mathrm{MB} = \frac{1}{\mathrm{N}}\sum_{1}^{\mathrm{N}}(\mathrm{Model} - \mathrm{Obs}) \tag{6-1}$$

$$\mathrm{ME} = \frac{1}{\mathrm{N}}\sum_{1}^{\mathrm{N}}\left|\mathrm{Model} - \mathrm{Obs}\right| \tag{6-2}$$

$$\mathrm{NMB} = \frac{\sum_{1}^{\mathrm{N}}(\mathrm{Model} - \mathrm{Obs})}{\sum_{1}^{\mathrm{N}}\mathrm{Obs}} \times 100\%, \tag{6-3}$$

$$\mathrm{RSME} = \sqrt{\frac{\sum_{1}^{\mathrm{N}}(\mathrm{Model} - \mathrm{Obs})^2}{\mathrm{N}}} \tag{6-4}$$

$$IOA = 1 - \frac{\sum_{1}^{N}(Model - Obs)^2}{\sum_{1}^{N}\left[(Model - Obs) + (Model + Obs)\right]^2}, \tag{6-5}$$

where, "*Model*" is the simulated values, "*Obs*" is the observed value, and *N* is the number of observations. These values will be tabulated and plotted for all monitoring sites within the air basin of interest, and summarized by subregion when there are distinct differences in the meteorology within the basin. Statistics may be compared to other prognostic model applications in California to place the current model performance within the context of previous studies. In addition to the statistics above, model performance may also be evaluated through metrics such as frequency distributions, time-series analysis, and wind-rose plots. Based on previous experience with meteorological simulations in California, it is expected that the analysis will show wind speed to be overestimated at some stations with a smaller difference at others. The diurnal variations of temperature and wind direction at most stations are likely to be captured reasonably well. However, the model will likely underestimate the larger magnitudes of temperature during the day and smaller magnitudes at night.

6.3 Phenomenological Evaluation

In addition to the statistical evaluation described above, a phenomenological based evaluation can provide additional insights as to the accuracy of the meteorological modeling. A phenomenological evaluation may include analysis such as determining the relationship between observed air quality and key meteorological parameters (e.g., conceptual model) and then evaluating whether the simulated meteorology and air quality is able to reproduce those relationships. Another possible approach would be to generate geopotential height charts at 500 and 850 mb using the simulated results and compare those to the standard geopotential height charts. This would reveal if the large-scale weather systems at those pressure levels were adequately simulated by the regional prognostic meteorology model. Another similar approach is to identify the larger-scale meteorological conditions associated with air quality events using the National Centers for Environmental Prediction (NCEP) Reanalysis dataset. These can then be visually compared to the simulated meteorological fields to determine whether those large-scale meteorological conditions were accurately simulated and whether the same relationships observed in the NCEP reanalysis are present in the simulated data.

7. PHOTOCHEMICAL MODEL PERFORMANCE

7.1 Ambient Data

Air quality observations are routinely made at state and local monitoring stations. Gas species and PM species are measured on various time scales (e.g., hourly, daily, weekly). The U.S. EPA guidance recommends model performance evaluations for the following gaseous pollutants: ozone (O_3), nitric acid (HNO_3), nitric oxide (NO), nitrogen dioxide (NO_2), peroxyacetyl nitrate (PAN), volatile organic compounds (VOCs), ammonia (NH_3), NO_y (sum of NO_x and other oxidized compounds), sulfur dioxide (SO_2), carbon monoxide (CO), and hydrogen peroxide (H2O2). The U.S. EPA recognizes that not all of these species are routinely measured (U.S. EPA, 2014) and therefore may not be available for evaluating every model application. Recognizing that $PM_{2.5}$ is a mixture, U.S. EPA recommends model performance evaluation for the following individual $PM_{2.5}$ species: sulfate (SO_4^{2-}), nitrate (NO_3^-), ammonium (NH_4^+), elemental carbon (EC), organic carbon (OC) or organic mass (OM), crustal, and sea salt constituent (U.S. EPA, 2014).

Table 7-1 lists the species for which routine measurements are generally available in 2012 and 2013. When quality assured data are available and appropriate for use, model performance for each species will be evaluated. Observational data will be

obtained from the Air Quality and Meteorological Information System (AQMIS), which is a web-based source for real-time and official air quality and meteorological data (www.arb.ca.gov/airqualitytoday/). This database contains surface air quality observations from 1980-2016, with the data through 2014 having been fully quality assured and deemed official.

Table 7-1. Monitored species used in evaluating model performance.

Species	Sampling frequency
O_3	1 hour
NO	1 hour
NO_2	1 hour
NO_x	1 hour
CO	1 hour
SO_2	1 hour
Selected VOCs from the PAMS measurement	3 hours (not every day)
$PM_{2.5}$ measured using FRM[1]	24 hours (daily to one in six days)
$PM_{2.5}$ measured using FEM	Continuously
$PM_{2.5}$ Speciation sites	24 hours (not every day)
Sulfate ion	24 hours (not every day)
Nitrate ion	24 hours (not every day)
Ammonium ion	24 hours (not every day)
Organic carbon	24 hours (not every day)
Elemental carbon	24 hours (not every day)
Sea salt constituents	24 hours (not every day)

[1] Direct comparison between modeled and FRM $PM_{2.5}$ may not be appropriate because of various positive and negative biases associated with FRM measurement procedures.

These species cover the majority of pollutants of interest for evaluating model performance as recommended by the U.S. EPA. Other species such as H_2O_2, HNO_3, NH_3, and PAN are not routinely measured. During the DISCOVER-AQ field campaign, which took place in January and February 2013 in the SJV, aircraft sampling provided daytime measurements for a number of species (including HNO_3, NH_3, PAN, alkyl nitrates, and selected VOC species) that are not routinely measured. Modeled concentrations will be compared to aircraft measurements for these species, except for the gaseous HNO_3 measurements, which were contaminated by particulate nitrate (Dr. Chris Cappa, personal communication).

7.2 Statistical Evaluation

As recommended by U.S. EPA, a number of statistical metrics will be used to evaluate model performance for ozone, speciated and total $PM_{2.5}$, as well as other precursor species. These metrics may include mean bias (MB), mean error (ME), mean fractional bias (MFB), mean fractional error (MFE), normalized mean bias (NMB), normalized mean error (NME), root mean square error (RMSE), correlation coefficient (R^2), mean normalized bias (MNB), and mean normalized gross error (MNGE). The formulae for estimating these metrics are given below.

$$\mathrm{MB} = \frac{1}{\mathrm{N}}\sum_{1}^{\mathrm{N}}(\mathrm{Model} - \mathrm{Obs}) \tag{7-1}$$

$$\mathrm{ME} = \frac{1}{\mathrm{N}}\sum_{1}^{\mathrm{N}}\left|\mathrm{Model} - \mathrm{Obs}\right| \tag{7-2}$$

$$\mathrm{MFB} = \frac{2}{\mathrm{N}}\sum_{1}^{\mathrm{N}}\left(\frac{\mathrm{Model} - \mathrm{Obs}}{\mathrm{Model} + \mathrm{Obs}}\right)\times 100\%, \tag{7-3}$$

$$\mathrm{MFE} = \frac{2}{\mathrm{N}}\sum_{1}^{\mathrm{N}}\left(\frac{\left|\mathrm{Model} - \mathrm{Obs}\right|}{\mathrm{Model} + \mathrm{Obs}}\right)\times 100\%, \tag{7-4}$$

$$NMB = \frac{\sum_{1}^{N}(Model - Obs)}{\sum_{1}^{N} Obs} \times 100\%, \quad (7\text{-}5)$$

$$NME = \frac{\sum_{1}^{N}|Model - Obs|}{\sum_{1}^{N} Obs} \times 100\%, \quad (7\text{-}6)$$

$$RSME = \sqrt{\frac{\sum_{1}^{N}(Model - Obs)^2}{N}} \quad (7\text{-}7)$$

$$R^2 = \left(\frac{\sum_{1}^{N}((Model - \overline{Model}) \times (Obs - \overline{Obs}))}{\sqrt{\sum_{1}^{N}(Model - \overline{Model})^2 \sum_{1}^{N}(Obs - \overline{Obs})^2}}\right)^2 \quad (7\text{-}8)$$

$$MNB = \frac{1}{N}\sum_{1}^{N}\left(\frac{Model - Obs}{Obs}\right) \times 100\%, \quad (7\text{-}9)$$

$$MNGE = \frac{1}{N}\sum_{1}^{N}\left(\frac{|Model - Obs|}{Obs}\right) \times 100\%. \quad (7\text{-}10)$$

where, "Model" is the simulated mixing ratio, "$\overline{Model}$" is the simulated mean mixing ratio, "Obs" is the observed value, "$\overline{Obs}$" is the mean observed value, and "N" is the number of observations.

In addition to the above statistics, various forms of graphics will also be created to visually examine and compare the model predictions to observations. These will include time-series plots comparing the predictions and observations, scatter plots for

comparing the magnitude of the simulated and observed mixing ratios, box plots to summarize the time series data across different regions and averaging times, as well as frequency distributions. For $PM_{2.5}$ the so called "bugle plots" of MFE and MFB from Boylan and Russell (2006) will also be generated. The plots described above will be created for paired observations and predictions over time scales dictated by the averaging frequencies of observations (i.e., hourly, daily, monthly, seasonally) for the species of interest. Together, they will provide a detailed view of model performance during different time periods, in different sub-regions, and over different concentrations and mixing ratio levels.

7.3 Comparison to Previous Modeling Studies

Previous U.S. EPA modeling guidance (U.S. EPA, 1991) utilized "bright line" criteria for the performance statistics that distinguished between adequate and inadequate model performance. In the latest modeling guidance from U.S. EPA (U.S EPA, 2014) it is now recommended that model performance be evaluated in the context of similar modeling studies to ensure that the model performance approximates the quality of those studies. The work of Simon et al. (2012) summarized photochemical model performance for studies published in the peer-reviewed literature between 2006 and 2012 and this work will form the basis for evaluating the modeling utilized in the attainment demonstration.

7.4 Diagnostic Evaluation

Diagnostic evaluations are useful for investigating whether the physical and chemical processes that control ozone and $PM_{2.5}$ formation are correctly represented in the modeling. These evaluations can take many forms, such as utilizing model probing tools like process analysis, which tracks and apportions ozone mixing ratios in the model to various chemical and physical processes, or source apportionment tools that utilize model tracers to attribute ozone formation to various emissions source sectors and/or geographic regions. Sensitivity studies (either "brute-force" or the numerical Direct Decoupled Method) can also provide useful information as to the response exhibited in the modeling to changes in various input parameters, such as changes to the emissions inventory or boundary conditions. Due to the nature of this type of analysis, diagnostic evaluations can be very resource intensive and the U.S. EPA modeling guidance acknowledges that air agencies may have limited resources and time to perform such analysis under the constraints of a typical SIP modeling application. To the extent possible, some level of diagnostic evaluation will be included in the model attainment demonstration for this SIP.

In addition to the above analysis, the 2013 DISCOVER-AQ field campaign in the SJV offers a unique dataset for additional diagnostic analysis that is not available in other areas, in particular, the use of indicator ratios in determining the sensitivity of secondary $PM_{2.5}$ to its limiting precursors. As an example, the ratio between free ammonia (total ammonia – 2 x sulfate) and total nitrate (gaseous + particulate) was proposed by Ansari and Pandis (1998) as an indicator of whether ammonium nitrate formation is limited by NO_x or ammonia emissions. The DISCOVER-AQ dataset will be utilized to the extent possible to investigate $PM_{2.5}$ precursor sensitivity in the SJV as well as analysis of upper measurements and detailed ground level AMS measurements (Young et al., 2016).

8. ATTAINMENT DEMONSTRATION

The U.S. EPA modeling guidance (U.S. EPA, 2014) outlines the approach for utilizing models to predict future attainment of the 0.075 ppm 8-hour ozone standard. Consistent with the previous modeling guidance (U.S. EPA, 2007) utilized in the most recent 8-hour ozone (2007), annual $PM_{2.5}$ (2008), and 24-hour $PM_{2.5}$ (2012) SIPs, the current guidance recommends utilizing modeling in a relative sense. A detailed description of how models are applied in the attainment demonstration for both ozone and $PM_{2.5}$, as prescribed by U.S. EPA modeling guidance, is provided below.

8.1 Base Year Design Values

The starting point for the attainment demonstration is with the observational based design value (DV), which is used to determine compliance with the standard at any given monitor. The DV for a specific monitor and year represents the three-year average of the annual 4^{th} highest 8-hour ozone mixing ratio, 98^{th} percentile of the 24-hour $PM_{2.5}$ concentration, or annual average $PM_{2.5}$ concentration, depending on the standard, observed at the monitor. For example, the 8-hr O_3 DV for 2012 is the average of the observed 4^{th} highest 8-hour ozone mixing ratio from 2010, 2011, and 2012.

The U.S. EPA recommends using an average of three DVs to better account for the year-to-year variability inherent in meteorology. Since 2012 has been chosen as the base year for projecting DVs to the future, site-specific DVs will be calculated for the three three-year periods ending in 2012, 2013, and 2014 and then these three DVs will be averaged. This average DV is called a weighted DV (in the context of this SIP, the weighted DV will also be referred to as the reference year DV or DV_R). Table 8-1 illustrates how the weighted DV is calculated.

Table 8-1. Illustrates the data from each year that are utilized in the Design Value calculation for that year (DV Year), and the yearly weighting of data for the weighted Design Value calculation (or DV_R). "obs" refers to the observed metric (8-hr O_3, 24-hour $PM_{2.5}$, or annual average $PM_{2.5}$).

DV Year	Years Averaged for the Design Value (4th highest observed 8-hr O_3, 98th percentile 24-hour $PM_{2.5}$, or annual average $PM_{2.5}$)				
2012	2010	2011	2012		
2013		2011	2012	2013	
2014			2012	2013	2014
Yearly Weightings for the Weighted Design Value Calculation					
2012-2014 Average	$\mathrm{DV_R} = \frac{\mathrm{obs_{2010}} + (2)\mathrm{obs_{2011}} + (3)\mathrm{obs_{2012}} + (2)\mathrm{obs_{2013}} + \mathrm{obs_{2014}}}{9}$				

8.2 Base, Reference, and Future Year Simulations

Projecting the weighted DVs to the future requires three photochemical model simulations as described below:

1. Base Year Simulation

The base year simulation for 2012 or 2013 is used to assess model performance (i.e., to ensure that the model is reasonably able to reproduce the observed ozone mixing ratios). Since this simulation will be used to assess model performance, it is essential to include as much day-specific detail as possible in the emissions inventory, including, but not limited to hourly adjustments to the motor vehicle and biogenic inventories based on observed local meteorological conditions, known wildfire and agricultural burning events, and exceptional events such as the Chevron refinery fire in 2012.

2. Reference Year Simulation

The reference year simulation is identical to the base year simulation, except that certain emissions events which are either random and/or cannot be projected to the future are removed from the emissions inventory. These include wildfires and events such as the 2012 Chevron refinery fire.

3. Future Year Simulation

The future year simulation is identical to the reference year simulation, except that the projected future year anthropogenic emission levels are used rather than the reference year emission levels. All other model inputs (e.g., meteorology, chemical boundary conditions, biogenic emissions, and calendar

for day-of-week specifications in the inventory) are the same as those used in the reference year simulation.

The base year simulation is solely used for evaluating model performance, while the reference and future year simulations are used to project the weighted DV to the future as described in subsequent sections of this document.

8.3 Relative Response Factors

As part of the model attainment demonstration, the fractional change in ozone or $PM_{2.5}$ between the model future year and model reference year are calculated for each monitor location. These ratios, called "relative response factors" or RRFs, are calculated based on the ratio of modeled future year ozone or $PM_{2.5}$ to the corresponding modeled reference year ozone or $PM_{2.5}$ (Equation 8-1).

$$RRF = \frac{\text{average } (O_3 \text{ or } PM_{2.5})_{\text{future}}}{\text{average } (O_3 \text{ or } PM_{2.5})_{\text{reference}}} \quad (8\text{-}1)$$

8.3.1 8-hour Ozone RRF

For 8-hour ozone, the modeled maximum daily average 8-hour (MDA8) ozone is used in calculating the RRF. These MDA8 ozone values are based on the maximum simulated ozone within a 3x3 array of cells surrounding the monitor (Figure 8-1). The future and base year ozone values used in RRF calculations are paired in space (i.e., using the future year MDA8 ozone value at the same grid cell where the MDA8 value for the reference? year is located within the 3x3 array of cells). The days used to calculate the average MDA8 for the reference and future years are inherently consistent, since the same meteorology is used to drive both simulations.

Not all modeled days are used to calculate the average MDA8 ozone from the reference and future year simulations. The form of the 8-hour ozone NAAQS is such that it is geared toward the days with the highest mixing ratios in any ozone season (i.e., the 4th highest MDA8 ozone). Therefore, the modeled days used in the RRF calculation should also reflect days with the highest ozone levels. As a result, the current U.S. EPA guidance (U.S. EPA, 2014) suggests using the top 10 modeled days when calculating the RRF. Since the relative sensitivity to emissions changes (in both the model and real world) can vary from day-to-day due to meteorology and emissions (e.g., temperature dependent emissions or day-of-week variability) using the top 10 days ensures that the

calculated RRF is robust and stable (i.e., not overly sensitive to any single day used in the calculation).

When choosing the top 10 days, the U.S. EPA recommends beginning with all days in which the simulated reference MDA8 is >= 60 ppb and then calculating RRFs based on the top 10 high ozone days. If there are fewer than 10 days with MDA8 ozone >= 60 ppb then all days >= 60 ppb are used in the RRF calculation, as long as there are at least 5 days used in the calculation. If there are fewer than 5 days >= 60 ppb, an RRF cannot be calculated for that monitor. To ensure that only modeled days which are consistent with the observed ozone levels are used in the RRF calculation, the modeled days are further restricted to days in which the reference MDA8 ozone is within ± 20% of the observed value at the monitor location.

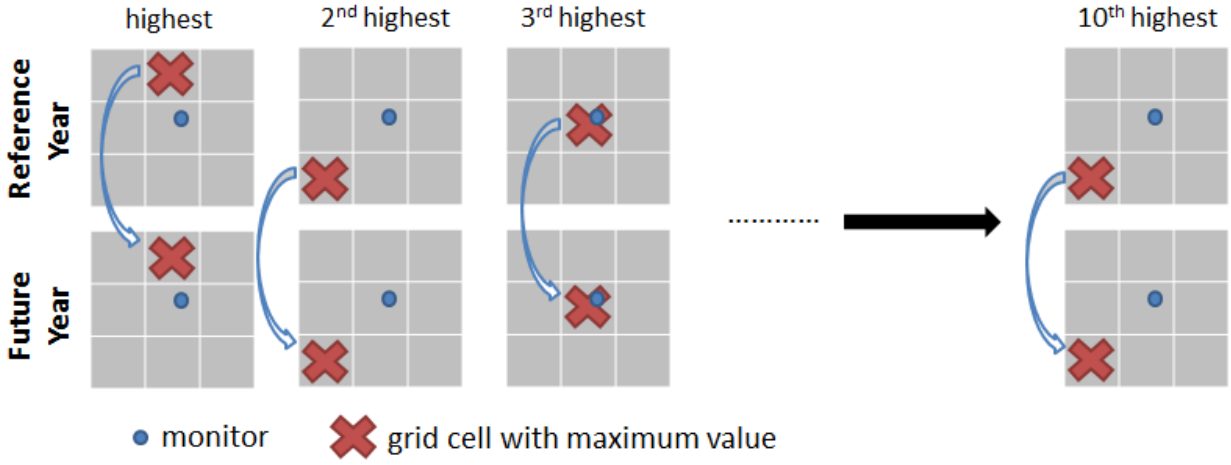

Figure 8-1. Example showing how the location of the MDA8 ozone for the top ten days in the reference and future years are chosen.

8.3.2 Annual and 24-hour $PM_{2.5}$ RRF

The U.S. EPA (2014) guidance requires RRFs for both the annual and 24-hour $PM_{2.5}$ attainment tests be calculated on a quarterly basis (January-March, April-June, July-September, and October-December) and for each $PM_{2.5}$ component (sulfate, nitrate, ammonium, organic carbon, elemental carbon, particle bound water, salt, and other primary inorganic components).

For annual $PM_{2.5}$, the quarterly RRFs are based on modeled quarterly mean concentrations for each component, where the concentrations are averaged over the 9 model grid cells within the 3x3 array of grid cells surrounding each monitor. For the 24-hour $PM_{2.5}$ attainment test, the quarterly RRFs are calculated based on the average for

each component over the top 10% of modeled days (or the top nine days per quarter) with the highest total 24-hour average $PM_{2.5}$ concentration. Peak $PM_{2.5}$ values are selected and averaged using the $PM_{2.5}$ concentration simulated at the single grid cell containing the monitoring site for calculating the 24-hour $PM_{2.5}$ RRF (as opposed to the 3x3 array average used in the annual $PM_{2.5}$ RRF calculation).

8.4 Future Year Design Value Calculation

8.4.1 8-hour Ozone

For 8-hour ozone, a future year DV at each monitor is calculated by multiplying the corresponding reference year DV by the site-specific RRF from Equation 8-1 (Equation 8-2).

$$DV_F = DV_R \times RRF \quad (8\text{-}2)$$

where,
DV_F = future year design value,
DV_R = reference year design value, and
RRF = the site specific RRF from Equation 8-1

The resulting future year DVs are then compared to the 8-hour ozone NAAQS to demonstrate whether attainment will be reached under the future emissions scenario utilized in the future year modeling. A monitor is considered to be in attainment of the 8-hour ozone standard if the estimated future design value does not exceed the level of the standard.

8.4.2 Annual and 24-hour $PM_{2.5}$

8.4.2.1 Sulfate, Adjusted Nitrate, Derived, Water, Inferred Carbonaceous Material Balance Approach (SANDWICH) and Potential Modifications

Federal Reference Method (FRM) $PM_{2.5}$ mass measurements provide the basis for the attainment/nonattainment designations. For this reason it is recommended that the FRM data be used to project future air quality and progress towards attainment. However, given the complex physicochemical nature of $PM_{2.5}$, it is necessary to consider individual $PM_{2.5}$ species as well. While the FRM measurements give the mass

of the bulk sample, a method for apportioning this bulk mass to individual $PM_{2.5}$ components is the first step towards determining the best emissions controls strategies to reach NAAQS levels in a timely manner.

The FRM measurement protocol finds its roots in the past epidemiological studies of health effects associated with $PM_{2.5}$ exposure. It is upon these studies that the NAAQS are based. The FRM protocol is sufficiently detailed so that results might be easily reproducible and involves the measurement of filter mass before and after sampling together with equilibrating at narrowly defined conditions. Filters are equilibrated for more than 24 hours at a standard relative humidity between 30 and 40% and temperature between 20 and 23 ºC. Due to the sampler construction and a lengthy filter equilibration period, FRM measurements are subjected to a number of known positive and negative artifacts. FRM measurements do not necessarily capture the $PM_{2.5}$ concentrations in the atmosphere and can differ substantially from what is measured by speciation monitors including the Speciation Trends Network (STN) monitors (see http://www.epa.gov/ttnamti1/specgen.html for more details). Nitrate and semi-volatile organic mass can be lost from the filter during the equilibration process, and particle bound water associated with hygroscopic species like sulfate provides a positive artifact. These differences present an area for careful consideration when one attempts to utilize speciated measurements to apportion the bulk FRM mass to individual species. Given that (1) attainment status is currently dependent upon FRM measurements and (2) concentrations of individual $PM_{2.5}$ species need to be considered in order to understand the nature of and efficient ways to ameliorate the $PM_{2.5}$ problem in a given region, a method has been developed to speciate bulk FRM $PM_{2.5}$ mass with known FRM limitations in mind. This method is referred to as the measured **S**ulfate, **A**djusted **N**itrate, **D**erived **W**ater, **I**nferred **C**arbonaceous material balance approach or "SANDWICH" (Frank, 2006). SANDWICH is based on speciated measurements from other (often co-located) samplers, such as those from STN, and the known sampling artifacts of the FRM. The approach strives to provide mass closure, reconciliation between speciated and bulk mass concentration measurements, and the basis for a connection between observations, modeled $PM_{2.5}$ concentrations, and the air quality standard (U.S. EPA, 2014).

The main steps in estimating the $PM_{2.5}$ composition are as follows:

(1) Calculate the nitrate retained on the FRM filter using hourly relative humidity and temperature together with the STN nitrate measurements,

The FRM does not retain all of the semi-volatile $PM_{2.5}$ mass, and at warmer temperatures, loss of particulate nitrate from filters has been commonly observed (Chow et al., 2005). In order to estimate how much nitrate is retained on the FRM filter,

simple thermodynamic equilibrium relations may be used. Necessary inputs include 24-hour average nitrate measurements and hourly temperature and relative humidity data. Frank (2006) suggests the following methodology for estimating retained nitrate. For each hour *i* of the day, calculate the dissociation constant, K_i from ambient temperature and relative humidity (RH).

For RH < 61%:

$$\ln(K_i) = 118.87 - (24084/T_i) - 6.025 \times \ln(T_i),$$

where, T_i is the hourly temperature in Kelvins and K_i is in nanobars.

For RH ≥ 61%, K_i is replaced by:

$$K_i' = [P_1 - P_2(1-a_i) + P_3(1-a_i)^2] \times (1-a_i)^{1.75} \times K_i,$$

where, a_i is "fractional" relative humidity and

$$\ln(P_1) = -135.94 + 8763/T_i + 19.12 \times \ln(T_i),$$
$$\ln(P_2) = -122.65 + 9969/T_i + 16.22 \times \ln(T_i),$$
$$\ln(P_3) = -182.61 + 13875/T_i + 24.46 \times \ln(T_i).$$

Using this information, calculate the nitrate retained on the filter as:

$$\text{Retained Nitrate} = \text{STN nitrate} - 745.7/T_R \times (\kappa - \gamma) \times \frac{1}{24} \sum_{i=1}^{24} \sqrt{K_i},$$

where, T_R is the daily average temperature for the sampled air volume in Kelvin, K_i is the dissociation constant for NH_4NO_3 at ambient temperature for hour i, and $(\kappa - \gamma)$ relates to the temperature rise of the filter and vapor depletion from the inlet surface and is assumed to have a value equal to one (Hering and Cass, 1999).

(2) Calculate quarterly averages for retained nitrate, sulfate, elemental carbon, sea salt, and ammonium,

(3) Calculate particle bound water using the concentrations of ammonium, sulfate, and nitrate, using an equilibrium model like the Aerosol Inorganic Model (AIM) or a polynomial equation derived from model output

Under the FRM filter equilibration conditions, hygroscopic aerosol will retain its particle bound water (PBW) and be included in the observed FRM $PM_{2.5}$ mass. PBW can be calculated using an equilibrium model like the Aerosol Inorganics Model (AIM). AIM requires the concentrations of ammonium, nitrate, sulfate, and estimated H^+ as inputs. In addition to inorganic concentrations, the equilibration conditions are also necessary model inputs. In this case, a temperature of 294.15 K and 35% RH is recommended. Alternatively, for simplification, a polynomial regression equation may be constructed by fitting the calculated water concentration from an equilibrium model and the concentrations of nitrate, ammonium, and sulfate. The AIM model will be used for more accurate calculation of PBW.

(4) Add 0.5 µg/m^3 as blank mass, and

(5) Calculate organic carbon mass (OCMmb) by difference, subtracting all inorganic species (including blank mass) from the $PM_{2.5}$ mass.

Other components that may be represented on the FRM filter include elemental carbon, crustal material, sea salt, and passively collected mass. Depending on location certain species may be neglected (e.g., sea salt for inland areas).

While carbonaceous aerosol may make up a large portion of airborne aerosol, speciated measurements of carbonaceous PM are considered highly uncertain. This is due to the large number of carbon compounds in the atmosphere and the measurement uncertainties associated with samplers of different configurations. In the SANDWICH approach, organic carbonaceous mass is calculated by difference. The sum of all nonorganic carbon components will be subtracted from the FRM $PM_{2.5}$ mass to estimate the mass of organic carbon.

After having calculated the species concentrations as outlined above, we will calculate the percentage contribution of each species to the measured FRM mass (minus the blank concentration of 0.5 µg/m^3) for each quarter of the years represented by the speciated data. Note that blank mass is kept constant at 0.5 µg/m^3 between the base and future years, and future year particle bound water needs to be calculated for the future year values of nitrate, ammonium, and sulfate.

8.4.2.2 Estimation of Species Concentrations at Federal Reference Method (FRM) Monitors that Lack Speciation Data

Speciation data from available STN (speciation) sites will be used to speciate the FRM mass for all FRM sites. For those sites not collocated with STN monitors, surrogate speciation sites will be determined based on proximity and evaluation of local emissions or based on similarity in speciation profiles if such data exists (e.g., such as the speciated data collected in the SJV during CRPAQS (Solomon and Magliano, 1998)).

8.4.2.3 Speciated Modeled Attainment Test (SMAT)

Following U.S. EPA modeling guidance (U.S. EPA, 2014), the model attainment test for the annual $PM_{2.5}$ standard will be performed with the following steps.

Step 1: For each year used in the design value calculation, determine the observed quarterly mean $PM_{2.5}$ and quarterly mean composition for each monitor by multiplying the monitored quarterly mean concentration of FRM derived $PM_{2.5}$ by the fractional composition of $PM_{2.5}$ species for each quarter.

Step 2: Calculate the component specific RRFs at each monitor for each quarter as described in section 8.3.2.

Step 3: Apply the component specific RRFs to the quarterly mean concentrations from Step 1 to obtain projected quarterly species estimates.

Step 4: Calculate future year annual average $PM_{2.5}$ estimates by summing the quarterly species estimates at each monitor and then compare to the annual $PM_{2.5}$ NAAQS. If the projected average annual arithmetic mean $PM_{2.5}$ concentration is ≤ the NAAQS, then the attainment test is passed.

For the 24-hour $PM_{2.5}$ standard, the attainment test is performed with the following steps (U.S. EPA, 2014):

Step 1: Determine the top eight days with the highest observed 24-hour $PM_{2.5}$ concentration (FRM sites) in each quarter and year used in the design value calculation (a total of 32 days per year), and calculate the 98^{th} percentile value for each year.

Step 2: Calculate quarterly ambient species fractions on "high" $PM_{2.5}$ days for each of the major $PM_{2.5}$ component species (i.e., sulfate, nitrate, ammonium, elemental carbon, organic carbon, particle bound water, salt, and blank mass). The "high" days are represented by the top 10% of days in each quarter. Depending on the sampling frequency, the number of days captured in the top 10% would range from three to nine. The species fractions of $PM_{2.5}$ are calculated using the "SANDWICH" approach which was described previously. These quarter-specific fractions along with the FRM $PM_{2.5}$ concentrations are then used to calculate species concentrations for each of the 32 days per year determined in Step 1.

Step 3: Apply the component and quarter specific RRF, described in Section 8.3.2, to observed daily species concentrations from Step 2 to obtain future year concentrations of sulfate, nitrate, elemental carbon, organic carbon, salt, and other primary $PM_{2.5}$.

Step 4: Calculate the future year concentrations for the remaining $PM_{2.5}$ components (i.e., ammonium, particle bound water, and blank mass). The future year ammonium is calculated based on the calculated future year sulfate and nitrate, using a constant value for the degree of neutralization of sulfate from the ambient data. The future year particle bound water is calculated from the AIM model.

Step 5: Sum the concentration of each of the species components to calculate the total $PM_{2.5}$ concentration for each of the 32 days per year and at each site. Sort the 32 days for each site and year, and calculate the 98^{th} percentile value corresponding to each year.

Step 6: Calculate the future design value at each site based on the 98^{th} percentile concentrations calculated in Step 5 and following the standard protocol for calculating design values (see Table 8-1). Compare the future-year 24-hour design values to the NAAQS. If the projected design value is ≤ the NAAQS, then the attainment test is passed.

8.4.2.4 Sensitivity Analyses

Model sensitivity analysis may be conducted if the model attainment demonstration does not show attainment of the applicable standard with the baseline future inventory, or for determining precursor sensitivities and inter-pollutant equivalency ratios. For both ozone and $PM_{2.5}$, the sensitivity analysis will involve domain wide fractional reductions of the appropriate anthropogenic precursor emissions using the future year baseline emissions scenario as a starting point. In the event that the model attainment demonstration does not show attainment for the applicable standard, it is important to know the precursor limitation to assess the level of emissions controls needed to attain the standard.

In order to identify what combinations of precursor emissions reductions is predicted to lead to attainment, a series of modeling sensitivity simulations with varying degrees of precursor reductions from anthropogenic sources are typically performed. These sensitivity simulations are identical to the baseline future year simulation discussed earlier except that domain-wide fractional reductions are applied to future year anthropogenic precursor emission levels and a new future year design value is calculated. The results of these sensitivity simulations are plotted on isopleth diagrams, which are also referred to as carrying capacity diagrams. The isopleths provide an estimate of the level of emissions needed to demonstrate attainment and thereby inform the development of a corresponding control strategy.

For ozone, this would likely entail reducing anthropogenic NO_x and VOC emissions in 25% increments including cross sensitivities (e.g., 0.75 x NO_x + 1.00 x VOC; 1.00 x NO_x + 0.75 x VOC; 0.75 x NO_x + 0.75 x VOC; 0.5 x NO_x + 1.00 x VOC; ….). Typically, a full set of sensitivities would include simulations for 25%, 50%, and 75% reduction in NO_x and VOC, along with the cross sensitivities (for a total of 16 simulations including the future base simulation). After design values are calculated for each new sensitivity simulation, an ozone isopleth (or carrying capacity diagram) as a function of NO_x and VOC emissions is generated and used to estimate the additional NO_x and VOC emission reductions needed to attain the standard. The approach for $PM_{2.5}$ is similar, except that additional precursor emissions must be considered. Typically, the precursors considered for $PM_{2.5}$ would include anthropogenic NO_x, SO_x, VOCs, NH_3, as well as direct $PM_{2.5}$ emissions (Chen et al., 2014). Cross sensitivities for generating $PM_{2.5}$ carrying capacity diagrams would be conducted with respect to NO_x, which would include the following precursor pairs: NO_x vs. primary $PM_{2.5}$, NO_x vs. VOC, NO_x vs. NH_3, and NO_x vs. SO_x.

In addition to the $PM_{2.5}$ carrying capacity simulations, precursor sensitivity modeling may be conducted for determining the significant precursors to $PM_{2.5}$ formation and for

developing inter-pollutant equivalency ratios. These simulations would follow a similar approach to the carrying capacity simulations described above, but would involve only a single sensitivity simulation for each precursor, where emissions of that precursor are reduced between 30% and 70% from the future base year. The "effectiveness" of reducing a given species can be quantified at each FRM monitor as the change in µg $PM_{2.5}$ (i.e., change in design value) per ton of precursor emissions (corresponding to the 15% change in emissions). Equivalency ratios between $PM_{2.5}$ precursors (i.e., NO_x, SO_x, VOCs, and NH_3) and primary $PM_{2.5}$ will be determined by dividing primary $PM_{2.5}$ effectiveness by the precursors' effectiveness.

8.5 Unmonitored Area Analysis

The unmonitored area analysis is used to ensure that there are no regions outside of the existing monitoring network that could exceed the NAAQS if a monitor was present at that location (U.S. EPA, 2014). The U.S. EPA recommends combining spatially interpolated design value fields with modeled gradients for the pollutant of interest (e.g. Ozone and $PM_{2.5}$) and grid-specific RRFs in order to generate gridded future year gradient adjusted design values. The spatial Interpolation of the observed design values is done only within the geographic region constrained by the monitoring network, since extrapolating to outside of the monitoring network is inherently uncertain. This analysis can be done using the Model Attainment Test Software (MATS) (Abt, 2014); however this software is not open source and comes as a precompiled software package. To maintain transparency and flexibility in the analysis, in-house R codes (https://www.r-project.org/) developed at ARB will be utilized in this analysis. The basic steps followed in the unmonitored area analysis for 8-hour ozone and annual/24-hour $PM_{2.5}$ are described below.

8.5.1 8-hour Ozone

In this section, the specific steps followed in 8-hr ozone unmonitored area analysis are described briefly:

Step 1: At each grid cell, the top-10 modeled maximum daily average 8-hour ozone mixing ratios from the reference year simulation will be averaged, and a gradient in this top-10 day average between each grid cell and grid cells which contain a monitor will be calculated.

Step 2: A single set of spatially interpolated 8-hr ozone DV fields will be generated based on the observed 5-year weighted base year 8-hr ozone DVs from the available monitors. The interpolation is done using normalized inverse

distance squared weightings for all monitors within a grid cell's Voronoi Region (calculated with the R tripack library; https://cran.r-project.org/web/packages/tripack/README), and adjusted based on the gradients between the grid cell and the corresponding monitor from Step 1.

Step 3: At each grid cell, the RRFs are calculated based on the reference- and future-year modeling following the same approach outlined in Section 8.3, except that the +/- 20% limitation on the simulated and observed maximum daily average 8-hour ozone is not applicable because observed data do not exist for grid cells in unmonitored areas.

Step 4: The future year gridded 8-hr ozone DVs are calculated by multiplying the gradient-adjusted interpolated 8-hr ozone DVs from Step 2 with the gridded RRFs from Step 3

Step 5: The future-year gridded 8-hr ozone DVs (from Step 4) are examined to determine if there are any peak values higher than those at the monitors, which could potentially cause violations of the applicable 8-hr ozone NAAQS.

8.5.2 Annual $PM_{2.5}$

The unmonitored area analysis for the annual $PM_{2.5}$ standard will include the following steps:

Step 1: At each grid cell, the quarterly average $PM_{2.5}$ (total and by species) will be calculated from the reference year simulation, and a gradient in these quarterly averages between each grid cell and grid cells which contain a monitor will be calculated.

Step 2: Interpolated spatial fields, based on the observed $PM_{2.5}$ (FRM) and each component species of $PM_{2.5}$, will be generated for each quarter using normalized inverse distance squared weightings for all monitors within a grid cell's Voronoi Region. The ambient interpolated spatial fields are then adjusted based on the gradients in predicted quarterly mean concentrations from Step 1.

Step 3: The component specific RRFs are calculated at each grid cell for each quarter as described in section 8.3.2.

Step 4: The quarterly mean concentrations from Step 2 are then multiplied by the corresponding component specific RRF (from Step 3) to obtain the corresponding projected quarterly species estimates.

Step 5: The future year annual average $PM_{2.5}$ estimates are calculated by summing the quarterly species estimates at each grid cell and then compared to the annual $PM_{2.5}$ NAAQS to determine compliance.

8.5.3 24-hour $PM_{2.5}$

The unmonitored area analysis for the 24-hour $PM_{2.5}$ standard will include the following steps:

Step 1: At each grid cell, the quarterly average of the top 10% of the modeled days for 24-hour $PM_{2.5}$ (total and by species for the same top 10% of days) will be calculated from the reference year simulation, and a gradient in these quarterly averages between each grid cell and grid cells which contain a monitor will be calculated.

Step 2: The top 8 days with observed high $PM_{2.5}$ (FRM) are identified for each quarter and for each of the five years (a total of 32 days per year), used in the base year DV calculation. The speciated $PM_{2.5}$ (FRM) values are then interpolated for each of the "high" $PM_{2.5}$ days (identified above) using normalized inverse distance squared weightings for all monitors within a grid cell's Voronoi Region. These ambient interpolated spatial fields are then adjusted based on the appropriate gradients in predicted concentrations from Step 1.

Step 3: The component specific RRFs are calculated at each grid cell for each quarter as described in section 8.3.2.

Step 4: The observed daily species concentrations from Step 2 are multiplied by the component and quarter specific RRF (from Step 3) to estimate the future year concentration of each $PM_{2.5}$ species using the method outlined in section 8.4.2.3

Step 5: The concentration of each of the component $PM_{2.5}$ species is summed to calculate the total $PM_{2.5}$ concentration for each of the 32 days per year (8 days per quarter) and at each grid cell. For each year, the 98^{th} percentile value is calculated by the sorting the 32 days for that particular year at each grid cell.

Step 6: The future design value at each grid cell is calculated based on the 98th percentile concentrations calculated in Step 5 and following the standard protocol for calculating design values (see Table 8-1). The future-year 24-hour design values are then compared to the 24-hour $PM_{2.5}$ NAAQS to determine compliance with that standard.

The R codes used in this analysis will be made available upon request.

8.6 Banded Relative Response Factors for Ozone

The "Band-RRF" approach expands upon the standard "Single-RRF" approach for 8-hour ozone to account for differences in model response to emissions controls at varying ozone levels. The most recent U.S. EPA modeling guidance (U. S. EPA, 2014) accounts for some of these differences by focusing on the top ten modeled days, but even the top ten days may contain a significant range of ozone mixing ratios. The Band-RRF approach accounts for these differences more explicitly by grouping the simulated ozone into bands of lower, medium, and higher ozone mixing ratios. Specifically, daily peak 8-hour ozone mixing ratios for all days meeting model performance criteria (+/- 20% with the observations) can be stratified into 5 ppb increments from 60 ppb upwards (bin size and mixing ratio range may vary under different applications). A separate RRF is calculated for each ozone band following a similar approach as the standard Single-RRF. A linear regression is then fit to the data resulting in an equation relating RRF to ozone band. Similar to the Single-RRF, this equation is unique to each monitor/location.

The top ten days for each monitor, based on observed 8-hour ozone, for each year that is utilized in the design value calculation (see Table 8-1) is then projected to the future using the appropriate RRF for the corresponding ozone band. The top ten future days for each year are then re-sorted, the fourth highest 8-hour ozone is selected, and the future year design value is calculated in a manner consistent with the base/reference year design value calculation. More detailed information on the Band-RRF approach can be found in Kulkarni et al. (2014) and the 2013 SJV 1-hour ozone SIP (SJVUAPCD, 2013).

9. PROCEDURAL REQUIREMENTS

9.1 How Modeling and other Analyses will be Archived, Documented, and Disseminated

The computational burden of modeling the entire state of California and its sub-regions requires a significant amount of computing power and large data storage requirements. For example, there are over half a million grid cells in total for each simulation based on the Northern CA domain (192 x 192 cells in the lateral direction and 18 vertical layers). The meteorological modeling system has roughly double the number of grid cells since it has 30 vertical layers. Archiving of all the inputs and outputs takes several terabytes (TB) of computer disk space (for comparison, one single-layer DVD can hold roughly 5 gigabytes (GB) of data, and it would require ~200 DVDs to hold one TB). Please note that this estimate is for simulated surface-level pollutant output only. If three-dimensional pollutant data are needed, it would add a few more TB to this total. Therefore, transferring the modeling inputs/outputs over the internet using file transfer protocol (FTP) is not practical.

Interested parties may send a request for model inputs/outputs to Mr. John DaMassa, Chief of the Modeling and Meteorology Branch at the following address.

John DaMassa, Chief
Modeling and Meteorology Branch
Air Quality Planning and Science Division
Air Resources Board
California Environmental Protection Agency
P.O. Box 2815
Sacramento, CA 95814, USA

The requesting party will need to send an external disk drive(s) to facilitate the data transfer. The requesting party should also specify what input/output files are requested so that ARB can determine the capacity of the external disk drive(s) that the requester should send.

9.2 Specific Deliverables to U.S. EPA

The following is a list of modeling-related documents that will be provided to the U.S. EPA.

- The modeling protocol

- Emissions preparation and results
- Meteorology
    - Preparation of model inputs
    - Model performance evaluation
- Air Quality
    - Preparation of model inputs
    - Model performance evaluation
- Documentation of corroborative and weight-of-evidence analyses
- Predicted future year Design Values
- Access to input data and simulation results

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APPENDIX: San Joaquin Valley 12 µg/m^3 Annual $PM_{2.5}$ (2016)

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ACRONYMS

ACHEX - Aerosol Characterization Experiment

ARCTAS - Arctic Research of the Composition of the Troposphere from Aircraft and Satellites

BEARPEX - Biosphere Effects on Aerosols and Photochemistry Experiment

CABERNET - California Airborne BVOC Emission Research in Natural Ecosystem Transects

CalNex - Research at the Nexus of Air Quality and Climate Change

CARB – California Air Resources Board

CARES - Carbonaceous Aerosols and Radiative Effects Study

CCOS - Central California Ozone Study

CIRPAS - Center for Interdisciplinary Remotely-Piloted Aircraft Studies

CRPAQS - California Regional PM_{10}/$PM_{2.5}$ Air Quality Study

CSN – Chemical Speciation Network

DISCOVER-AQ - Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality

FEM – Federal Equivalent Method

FRM – Federal Reference Method

IMPROVE - Interagency Monitoring of Protected Visual Environments

IMS - Integrated Monitoring Study

NASA – National Aeronautics and Space Administration

NOAA – National Oceanic and Atmospheric Administration

OC – Organic Carbon

OM – Organic Matter

PAMS - Photochemical Assessment Monitoring Stations

$PM_{2.5}$ – Particulate matter with aerodynamic diameter less than 2.5 µm

SJV - San Joaquin Valley

SJVAB - San Joaquin Valley Air Basin

SJVAPCD - San Joaquin Valley Air Pollution Control District

SJVAQS/AUSPEX - San Joaquin Valley Air Quality Study/Atmospheric Utilities Signatures Predictions and Experiments

SLAMS - State and Local Air Monitoring Stations

SOA – Secondary Organic Aerosol

SoCAB - Southern California Air Basin

U.S. EPA – United States Environmental Protection Agency

VOC – Volatile Organic Compounds

1. TIMELINE OF THE PLAN

Table 1-1. Timeline for Completion of the Plan

Timeline	Action
Late 2015/Early 2016	Emission Inventory Completed
Spring/Summer 2016	Modeling Completed
September 15, 2016	San Joaquin Valley Governing Board Hearing to consider the Draft Plan
October 20, 2016	ARB Board Hearing to consider the SJV Adopted Plan
October 15, 2016	Plan is due to U.S. EPA

2. DESCRIPTION OF THE CONCEPTUAL MODEL FOR THE NONATTAINMENT AREA

2.1 History of Field Studies in the Region

The San Joaquin Valley (SJV) air basin is perhaps the second most studied air basin in the world, in terms of the number of publications in peer-reviewed international scientific/technical journals and other major reports, with the Los Angeles air basin being the first. Major Field studies that have taken place in the SJV and surrounding areas are listed in Table 2-1.

The first major air quality study in the SJV, dubbed Project Lo-Jet, took place in 1970 and resulted in the identification of the Fresno Eddy (Lin and Jao, 1995 and references therein). The first Valley-wide study that formed the foundation for a SIP was the San Joaquin Valley Air Quality Study/Atmospheric Utilities Signatures Predictions and Experiments (SJVAQS/AUSPEX) study, also known as SARMAP (SJVAQS/AUSPEX Regional Modeling Adaptation Project). A 1-hour Extreme Ozone Attainment Demonstration Plan based on the SARMAP Study was submitted to the U.S. EPA in 2004 and was approved in 2010 (74 FR 33933; 75 FR 10420). The next major study was the Integrated Monitoring Study in 1995 (IMS-95), which was the pilot study for the subsequent California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS) in 2000 (Solomon and Magliano, 1998). IMS-95 formed the technical basis for the 2003 PM10 SIP which was approved by the U.S. EPA in 2006 (71 FR 63642). The area was re-designated as attainment in 2008 (73 FR 66759). The first annual field campaign in the SJV was CRPAQS, and embedded in it was the Central California Ozone Study (CCOS) that took place during the summer of 2000 (Fujita et al., 2001). CRPAQS was a component of the technical foundation for the 2008 annual $PM_{2.5}$ SIP which was approved by the U.S. EPA in 2011 (76 FR 41338; 76 FR 69896), and CCOS was part of the technical basis for the 2007 8-hour O_3 SIP (76 FR 57846). While CRPAQS is still highly relevant to the current annual 24-hour $PM_{2.5}$ SIP, there are additional, more recent studies with relevance to $PM_{2.5}$ formation in the Valley and surrounding regions: 1) ARCTAS-CARB 2008, 2) CalNex 2010, 3) CARES 2010, 4) BEARPEX 2007 & 2009, 5) CABERNET 2011, and 6) DISCOVER-AQ 2013. Each of these studies has contributed significantly to our understanding of various atmospheric processes in the Valley.

The ARCTAS-CARB aircraft field campaign was a joint research effort by NASA and CARB and took place from June 18 to 24, 2008. During the study, DC-8 aircraft performed two flights over southern California on June 18 and 24 with a focus on the Southern California Air Basin (SoCAB), one flight over northern California with a focus

on the San Joaquin Valley Air Basin (SJVAB) on June 20, and one flight off shore on June 22 to quantify the pollutant levels in air masses entering California from the Pacific Ocean. During the campaign, large wildfires occurred in California, particularly in the north. The DC-8 aircraft encountered many of the fire plumes, which allowed for the study of fire emissions and their chemical composition, as well as evaluation of the simulated fire impacts. The ARCTAS-CARB campaign provided a unique dataset for evaluating the impacts of wildfires on ozone levels through photochemical modeling studies and for evaluating the distribution of reactive nitrogen species in California (Huang et al., 2011; Cai et al., 2016).

The CalNex May-July 2010 field campaign was organized by NOAA (NOAA, 2014) and CARB. The focus of this field study included airborne measurements using the NOAA WP-3D aircraft and the Twin Otter Remote Sensing aircraft, and surface measurements using the R/V *Atlantis* mobile platform as well as two stationary ground supersites, one of which was located in Bakersfield. Analysis of the data collected during CalNex has shown that photochemical ozone production in the southern and central portions of the Valley is transitioning to a NO_x-limited chemistry regime, where further NO_x reductions are expected to lead to a more rapid reduction in ozone than what was observed over the past decade or more (Pusede and Cohen, 2012). Studies have also shown that there is evidence for an unidentified temperature-dependent VOC emissions source on the hottest days (Pusede and Cohen, 2012; Pusede et al., 2014) and large sources of hydrocarbon compounds from petroleum extraction/processing, dairy (and other cattle) operations, and agricultural crops in SJV (Gentner et al., 2014a,b). In addition, findings also suggest that NO_x emissions control nighttime secondary organic aerosol formation in Bakersfield, thus reductions in NOx emissions should reduce organic aerosol concentrations in Bakersfield and the surrounding region (Rollins et al., 2012).

The CARES field campaign took place in the central California region, to the northeast of Sacramento in June 2010. Comprehensive data sets of trace gases and aerosols were taken from the daily evolving Sacramento urban plume under relatively well-defined and regular meteorological conditions using multiple suites of ground-based and airborne instruments onboard the Gulfstream (G-1) research aircraft. The ground-based measurements were conducted at two sites: one within the Sacramento urban source area and the other in a downwind area about 70 km to the northeast in Cool, CA. A combination of measurement and model data during CARES (Fast et al., 2012) shows that emissions from the San Francisco Bay area transported by intrusions of marine air contributed a large fraction of the carbon monoxide in the vicinity of Sacramento. The study also showed that mountain venting processes contributed to aged pollutants aloft in the valley atmosphere which are then entrained into the growing boundary layer the following day. Although the CARES study did not take place within the SJV itself, it

remains relevant to the SJV for two reasons: 1) CARES took place within the delta region north of the SJV, which can influence air quality in the northern SJV (see Section 2.4), and 2) the improved scientific understanding of the interaction between urban emissions and downwind biogenic emissions gained during CARES is applicable to the SJV, which experiences a similar confluence of anthropogenic and biogenic emissions.

BEARPEX was conducted at the University of California's Blodgett Forest Research Station during June-July 2007 and September-October 2009. Blodgett Forest is located 65 miles northeast of Sacramento. The project was designed to study chemistry downwind of urban areas where there is high VOC reactivity (due to biogenic emissions sources) and low NO_x, to understand the full oxidation sequence and subsequent fate of biogenic VOC and the processes leading to formation and removal of biogenic secondary organic aerosol (SOA) and the associated chemical and optical properties of SOA. A study by Bouvier-Brown et al., (2009) suggests that reactive and semi-volatile compounds, especially sesquiterpenes, significantly impact the gas- and particle-phase chemistry of the atmosphere at Blodgett Forest. An analysis of absolute PANs mixing ratios by Lafranchi et al. (2009) reveals a missing PANs sink that can be resolved by increasing the peroxy acetyl radicals + RO2 rate constant by a factor of three. At the BEARPEX field site, the sum of the individual biogenically derived nitrates account for two-thirds of the organic nitrate, confirming the importance of biogenic nitrates to the NO_y budget (Beaver et al., 2012).

The CABERNET field campaign was conducted in June 2011 in California. The objectives were to develop and evaluate new approaches for regional scale measurements of biogenic VOC emissions, quantify the response of biogenic VOC emissions to land cover change, investigate the vertical transport of isoprene and oxidation products, and evaluate biogenic emission models. Isoprene fluxes were measured on board the Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) Twin Otter (http://www.cirpas.org/twinOtter.html) using the virtual disjunct eddy covariance method (Karl et al. 2013). Isoprene flux measurements from CABERNET have formed the basis for evaluating the biogenic emissions inventory used in California's SIP modeling (Misztal et al., 2016).

The DISCOVER-AQ (Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality) field campaign took place in the SJV from January 16th through mid-February 2013. The campaign was organized by NASA, with the primary goal of relating column observations (e.g., from satellites) to surface measurements of $PM_{2.5}$ and key trace gases such as O_3, NO_2, and formaldehyde. The campaign captured two elevated $PM_{2.5}$ episodes in the SJV when 24-hour $PM_{2.5}$ concentrations in Bakersfield exceeded 60 µg/m^3. During the campaign,

sampling by two aircrafts focused on agricultural and vehicle traffic emission sources from Bakersfield to Fresno. In addition to the aircraft measurements there were also intensive ground-based data collection in Fresno and Porterville. The field campaign provided unprecedented observations of $PM_{2.5}$ and its precursors with broad horizontal spatial coverage, at the surface as well as aloft, and also at a finer temporal resolution (i.e., minutes compared to daily or multiple hours in the past) than was previously available. The combination of highly resolved spatial and temporal measurements presented a unique opportunity to update the conceptual model for wintertime $PM_{2.5}$ formation in the SJV that was initially developed from CRPAQS field study. Pusede et al. (2016) analyzed the DISCOVER-AQ dataset and historical ammonium nitrate records in the SJV and concluded that NO_x emissions control in the valley in the past decade has substantially decreased nighttime ammonium nitrate formation in the nocturnal residual layer and continued reduction in NO_x emissions in the SJV will lead to fewer wintertime exceedances of the 24-hour $PM_{2.5}$ standard. This study lends support to the emissions control policies in the SJV that have historically focused on NO_x emissions.

Table 2-1. Major Field Studies in Central California and surrounding areas.

Year	Study	Significance
1970	Project Lo-Jet	Identified summertime low-level jet and Fresno eddy
1972	Aerosol Characterization Experiment (ACHEX)	First TSP chemical composition and size distributions
1979-1980	Inhalable Particulate Network	First long-term $PM_{2.5}$ and PM_{10} mass and elemental measurements in Bay Area, Five Points
1978	Central California Aerosol and Meteorological Study	Seasonal TSP elemental composition, seasonal transport patterns
1979-1982	Westside Operators	First TSP sulfate and nitrate compositions in western Kern County
1984	Southern SJV Ozone Study	First major characterization of O_3 and meteorology in Kern County
1986-1988	California Source Characterization Study	Quantified chemical composition of source emissions

1988-1989	Valley Air Quality Study	First spatially diverse, chemical characterized, annual and 24-hour $PM_{2.5}$ and PM_{10}
Summer 1990	San Joaquin Valley Air Quality Study/Atmospheric Utilities Signatures Predictions and Experiments (SJVAQS/AUSPEX) – Also known as SARMAP (SJVAQS/AUSPEX Regional Modeling Adaptation Project)	First central California regional study of O_3 and $PM_{2.5}$
July and August 1991	California Ozone Deposition Experiment	Measurements of dry deposition velocities of O_3 using the eddy correlation technique made over a cotton field and senescent grass near Fresno
Winter 1995	Integrated Monitoring Study (IMS-95, the CRPAQS Pilot Study)	First sub-regional winter study
December 1999 – February 2001	California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS) and Central California Ozone Study (CCOS)	First year-long, regional-scale effort to measure both O_3 and $PM_{2.5}$
December 1999 to present	Fresno Supersite	First multi-year experiment with advanced monitoring technology
July 2003	NASA high-resolution lidar flights	First high-resolution airborne lidar application in SJV in the summer
February 2007	U.S. EPA Advanced Monitoring Initiative	First high-resolution airborne lidar application in SJV in the winter
August-October 2007; June-July 2009	BEARPEX (Biosphere Effects on Aerosols and Photochemistry Experiment)	Research-grade measurements to study the interaction of the Sacramento urban plume with downwind biogenic emissions
June 2008	ARCTAS - CARB	First measurement of high-time resolution (1-10s) measurements of organics

		and free radicals in SJV
May-July 2010	CalNex 2010 (Research at the Nexus of Air Quality and Climate Change)	Expansion of ARCTAS-CARB type research-grade measurements to multi-platform and expanded geographical area including the ocean.
June 2010	CARES (Carbonaceous Aerosols and Radiative Effects Study)	Research-grade measurements of trace gases and aerosols within the Sacramento urban plume to investigate SOA formation
June 2011	CABERNET (California Airborne BVOC Emission Research in Natural Ecosystem Transects)	Provided the first ever airborne flux measurements of isoprene in California
January- February 2013	DISCOVER-AQ (Deriving Information of Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality)	Research-grade measurements of trace gases and aerosols during two $PM_{2.5}$ pollution episodes in the SJV

2.2 Description of the Ambient Monitoring Network

The San Joaquin Valley covers an area of 23,490 square miles and is home to approximately 4 million residents. The Valley is bordered on the west by the coastal mountain ranges and on the east by the Sierra Nevada range. These ranges converge at the southern end of the basin at the Tehachapi Mountains. The majority of the population is centered in the large urban areas of Bakersfield, Fresno, Modesto, and Stockton. The nonattainment area includes seven full counties (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare) and one partial county Kern (only the western portion of Kern County, which lies in the jurisdiction of the SJVAPCD, is included).

The Valley can be divided into three regions that are characterized by distinct geography, meteorology, and air quality: 1) northern SJV (San Joaquin, Stanislaus, and Merced counties), 2) central SJV (Madera, Fresno, and King counties), and 3) southern SJV (Tulare and Western Kern counties). A third of the Valley population lives in the

northern SJV. This lowland area is bordered by the Sacramento Valley and Delta lowland to the north, the central portion of the SJV to the south, and mountain ranges to the east and west. Because of the marine influence, which extends into this area through gaps in the coastal mountains to the west, the northern SJV experiences a more temperate climate than the rest of the Basin. These more moderate temperatures (cooler in the summer and warmer in the winter) and the predominant air flow patterns generally favor better air quality. Similar to the northern SJV, the central and southern SJV are also low lying areas, flanked by mountains on their west and east sides. The worst air quality within the Valley occurs in these two regions, where the population is primarily clustered around the Fresno and Bakersfield urban areas. In these regions the interaction between geography, climate, and a mix of natural (biogenic) and anthropogenic emissions pose significant challenges to air quality progress. The southern SJV represents the terminus of the Valley and is flanked by mountains on the south, as well. The surrounding mountains in both areas act as barriers to air flow, and combined with recirculation patterns and stable air to trap emissions and pollutants near the valley floor. The more extreme temperatures and stagnant conditions in these two regions lead to a build-up of $PM_{2.5}$ and ozone, and overall poorer air quality. In addition to the urban air quality problems, emissions and pollutants from these areas are transported downwind, resulting in poor air quality in downwind areas.

As discussed above, the Valley's diverse area includes several major metropolitan areas, vast expanses of agricultural land, industrial sources, and highways, all of which pose many issues to air quality. The San Joaquin Valley Air Pollution Control District (SJVAPCD or District), the California Air Resources Board (CARB), and the National Park Service work together and operate an extensive network of air quality monitors throughout the Valley to help improve and protect public health. The data collected from the Valley air monitoring network is used to generate daily air quality forecasts, issue health advisories as needed, support compliance with various ambient air quality standards and serves as the basis for developing long-term attainment strategies and tracking progress towards health-based air quality standards.

Figure 2-1 shows the spatial distribution of the $PM_{2.5}$, ozone, NO_x, and PAMS (Photochemical Assessment Monitoring Stations) monitors in the Valley (see Table 2-2 for longitude/latitude information for each monitor). The monitors are located throughout the Valley floor, at higher elevation locations, and within higher population density urban areas, and have been shown to sufficiently capture the highest ozone mixing ratios and the corresponding precursors under various weather conditions and in all major population centers. A detailed discussion about the monitoring network and its adequacy can be found in the Valley's 2015 Air Monitoring Network Plan (http://www.valleyair.org/aqinfo/Docs/2015-Air-Monitoring-Network-Plan.pdf) and 2014 California Infrastructure SIP (http://www.arb.ca.gov/planning/sip/infrasip/docs/i-sip.pdf).

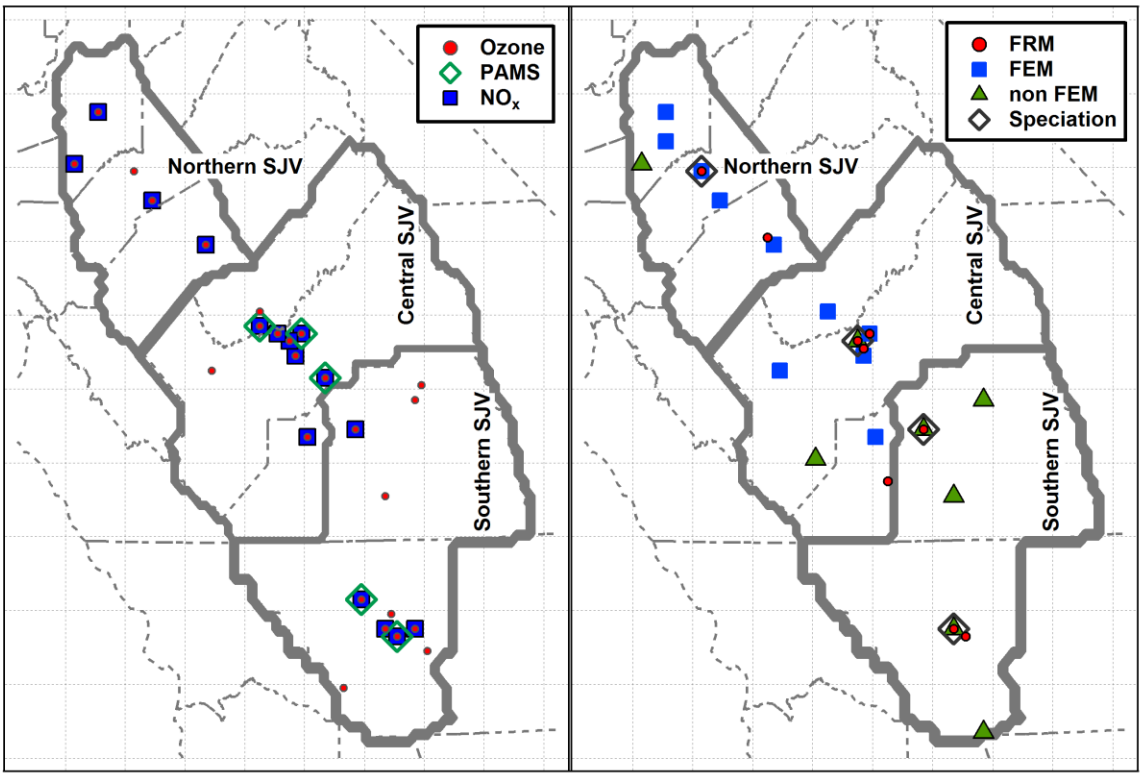

Figure 2-1. Map of the ambient monitoring network in the San Joaquin Valley.

Table 2-2. 2012-2015 San Joaquin Valley $PM_{2.5}$, ozone, NO_x, and PAMS Sites

Site ID (AQS/ARB)	Sub Region	Site	Particulate Matter				Gaseous			Location	
			FRM	FEM	non-FEM	Speciation	NO_x	Ozone	PAMS	Latitude	Longitude
Fresno County											
060195001 3026	Central SJV	Clovis-N Villa Avenue	X	X			X	X	X	36.8194	-119.7164
060190008 3009	Central SJV	Fresno-1st Street					X	X		36.7819	-119.7731
060190007 2013	Central SJV	Fresno-Drummond Street		X			X	X		36.7053	-119.7413
060190011 3781	Central SJV	Fresno-Garland	X		X	X	X	X		36.7853	-119.7742
060195025 3485	Central SJV	Fresno – Hamilton and Winery	X							36.7436	-119.7486
060190242 2844	Central SJV	Fresno-Sierra Skypark #2					X	X		36.8417	-119.8828
060192008 3768	Central SJV	Huron-16875 4th Street			X					36.1986	-120.1010
060194001 2114	Central SJV	Parlier					X	X	X	36.5974	-119.5039
060192009 3759	Central SJV	Tranquility-32650 West Adams Avenue		X				X		36.6342	-120.3823

Kern County										
060295002 3758	Southern SJV	Arvin-Di Giorgio					X		35.2367	-118.7894
060290016 3496	Southern SJV	Bakersfield-410 E Planz Road	X						35.3246	-118.9976
060290014 3146	Southern SJV	Bakersfield-5558 California Avenue	X	X	X	X	X		35.3567	-119.0628
060292012 3787	Southern SJV	Bakersfield-Municipal Airport				X	X	X	35.3313	-119.001
060290007 2312	Southern SJV	Edison				X	X		35.3458	-118.8506
060292009 3769	Southern SJV	Lebec-Beartrap Road		X					34.8415	-118.8605
060290008 2919	Southern SJV	Maricopa-Stanislaus Street					X		35.0514	-119.4028
060290232 2772	Southern SJV	Oildale-3311 Manor Street					X		35.4381	-119.0167
060296001 2981	Southern SJV	Shafter-Walker Street				X	X	X	35.5033	-119.2728
Kings County										
060310004 3194	Central SJV	Corcoran-Patterson Avenue	X						36.1022	-119.5658

060311004 3129	Central SJV	Hanford-S Irwin Street		X			X	X		36.3147	-119.6436
Madera County											
060392010 3771	Central SJV	Madera-28261 Avenue 14		X				X		36.9533	-120.0342
060390004 3211	Central SJV	Madera-Pump Yard					X	X	X	36.8672	-120.01
Merced County											
060470003 3022	Northern SJV	Merced-S Coffee Avenue		X			X	X		37.2817	-120.4336
060472510 3253	Northern SJV	Merced-2334 M Street	X							37.3092	-120.4806
San Joaquin County											
060772010 3772	Northern SJV	Manteca-530 Fishback Rd		X						37.7934	-121.2478
060771002 2094	Northern SJV	Stockton-Hazelton Street		X			X	X		37.9517	-121.2689
060773005 3696	Northern SJV	Tracy-Airport			X		X	X		37.6825	-121.4406
Stanislaus County											
060990005 2833	Northern SJV	Modesto-14th Street	X	X		X		X		37.6419	-120.9942
060990006 2996	Northern SJV	Turlock-S Minaret Street		X			X	X		37.4882	-120.8359

Tulare County									
061072010 3763	Southern SJV	Porterville -1839 Newcomb Street		X			X	36.0318	-119.055
061070009 3484	Southern SJV	Sequoia and Kings Canyon Natl Park		X			X	36.4911	-118.8342
061070002 3036	Southern SJV	Sequoia Natl Park-Lower Kaweah					X	36.564	-118.773
061072002 2032	Southern SJV	Visalia-N Church Street	X	X	X	X	X	36.3325	-119.2908

2.3 $PM_{2.5}$ Air Quality Trends

Tables 2-3 and 2-4 show the annual average $PM_{2.5}$ concentration and the annual $PM_{2.5}$ design values (i.e., 3-year average), from 1999 to 2013, for FRM and FEM sites in the SJV, respectively. Based on the 2013 design value, 13 out of the 16 FRM/FEM sites exceeded the annual $PM_{2.5}$ standard of 12 µg/m^3, with the Madera-city site having the highest design value at 18.1 µg/m^3. Figure 2-2 shows the trend in peak valley-wide annual average $PM_{2.5}$ concentration and 98th percentile of the 24-hour $PM_{2.5}$ concentration, as well as the approximate number of days above the 24-hour standard in the valley from 1999 to 2015. The extreme drought conditions experienced by much of California since 2012 coupled with persistent and strong high pressure systems over the SJV in recent winters, has led to elevated levels of $PM_{2.5}$ in the SJV that have not been seen in over a decade. This is clearly illustrated by the "U" shaped curve of the 98th percentile 24-hour $PM_{2.5}$ shown in Figure 2-2. Despite the recent increase in peak 24-hour $PM_{2.5}$ levels, the SJV has seen significant improvement in $PM_{2.5}$ concentrations over the last 15 years, with steady decreases in both annual average $PM_{2.5}$ and in the number of days above the 24-hour standard, which coincide with the large emission reductions experienced in the valley (Figure 2-3).

Table 2-3: Annual Average $PM_{2.5}$ ($\mu g/m^3$)

SJV Monitoring Site	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Stockton	19.7	15.5	13.9	16.7	13.6	13.2	12.5	13.1	12.9	14.4	11.3	11.0	11.3	12.4	17.7
Manteca													10.8	8.3	11.7
Modesto	24.9	18.7	15.6	18.7	14.5	13.6	13.9	14.8	15.0	16.0	13.0	12.3	14.7	11.9	14.3
Turlock											16.1	12.7	17.1	14.8	15.1
Merced-Coffee												16.3	15.6	11.0	13.3
Merced-M		16.7	14.5	18.7	15.7	15.2	14.1	14.8	15.2		13.6	11.2	10.4	9.5	13.5
Madera-City													20.4	16.0	17.8
Fresno-First	27.6		19.8	21.5	17.8	16.3	16.7	16.8	18.8	17.4	15.1	13.0	15.5		
Fresno-Garland														14.1	16.8
Fresno-Winery		18.4	18.6	21.3	17.8	17.0	16.9	17.6	16.8	16.5	14.6	13.4	15.4	12.7	15.9
Clovis	19.8	16.3	18.0	16.2	18.5	16.4	16.3	16.4	16.4	16.2	18.3	14.7	17.9	15.4	15.9
Tranquility												7.0	8.2	7.1	8.4
Corcoran		16.4	19.2	21.5	16.2	17.4	17.5	16.9	18.4	15.8	17.7	17.9			15.6
Hanford													18.0	14.8	18.2
Visalia	27.6	23.9	22.5	23.2	18.2	17.0	18.8	18.8	20.4	19.8	16.0	13.6	16.1	14.8	18.9
Bakersfield-Golden	26.2	22.6	21.8	24.1	19.6	18.2	19.1	18.6	19.9	17.9					
Bakersfield-California	27.4	22.5	21.2	22.7	17.1	18.9	18.0	18.7	22.0	21.9	19.0	14.2	16.2	13.0	20.0
Bakersfield-Planz		20.3	20.8	23.5	17.8	17.4	19.8	19.3	21.8	23.5	22.5	17.6	14.4	14.7	21.7

Table 2-4: Annual $PM_{2.5}$ Design Value (three year average, $\mu g/m^3$)

SJV Monitoring site	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Stockton	16.4	15.3	14.7	14.5	13.1	12.9	12.8	13.5	12.9.	12.2	11.2	11.6	13.8
Manteca													10.2
Modesto	19.7	17.7	16.2	15.6	14.0	14.1	14.6	15.3	14.7	13.8	13.3	12.9	13.6
Turlock											15.3	14.9	15.7
Merced-Coffee												14.3	13.3
Merced-M		16.6	16.3	16.5	15.0	14.7	14.7				11.7	10.4	11.1
Madera-City													18.1
Fresno-First			19.7	18.6	16.9	16.6	17.4	17.7	17.1	15.2	14.5		
Fresno-Garland													15.4
Fresno-Winery		19.4	19.2	18.7	17.2	17.2	17.1	17.0	16.0	14.9	14.5	13.9	14.7
Clovis	18.0	16.8	17.6	17.0	17.1	16.4	16.4	16.4	17.0	16.4	17.0	16.0	16.4
Tranquility												7.5	7.9
Corcoran		19.0	19.0	18.4	17.0	17.2	17.6	17.0	17.3	17.1			
Hanford												15.8	17.0
Visalia	24.7	23.2	21.3	19.5	18.0	18.2	19.3	19.7	18.8	16.5	15.2	14.8	16.6
Bakersfield-Golden	23.6	22.8	21.8	20.6	19.0	18.6	19.2	18.8					
Bakersfield-California	23.7	22.1	20.3	19.6	18.0	18.5	19.6	20.9	21.0	18.4	16.5	14.5	16.4
Bakersfield-Planz		21.5	20.7	19.6	18.4	18.9	20.3	21.5	22.6	21.2	18.2	15.6	16.9

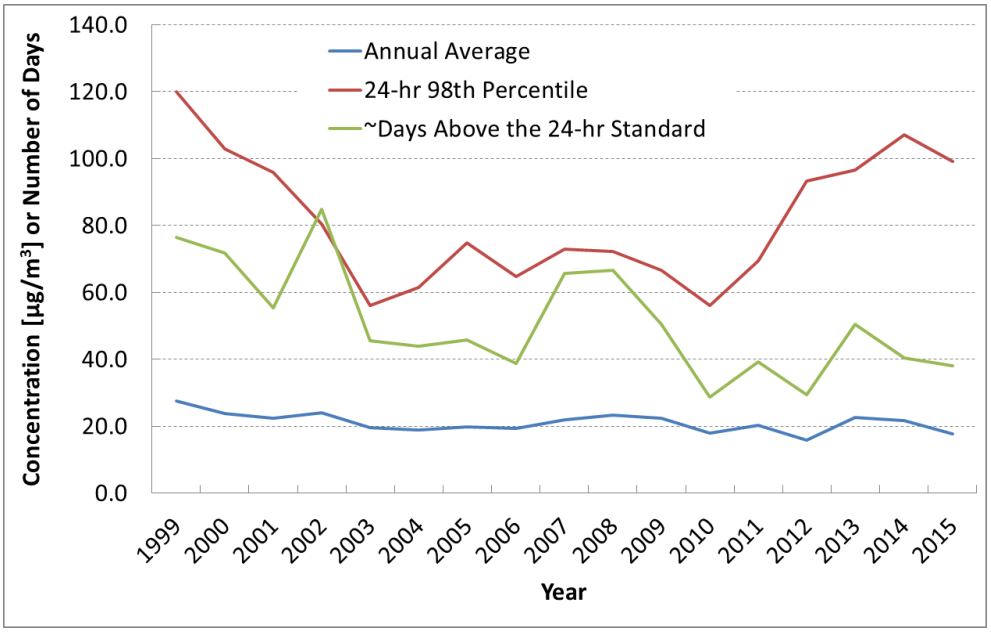

Figure 2-2. Trends in valley-wide annual average, 24-hour 98th percentile $PM_{2.5}$, and approximate number of days above the 24-hour standard (http://www.arb.ca.gov/adam/index.html).

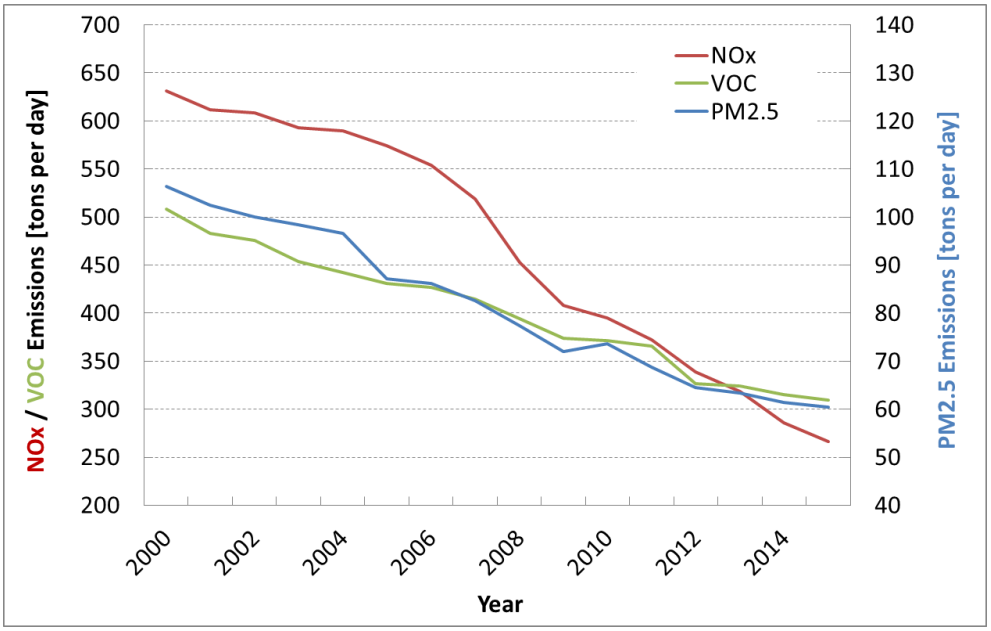

Figure 2-3. San Joaquin Valley trends in $PM_{2.5}$, NO_x, and VOC emissions.

2.4 Major $PM_{2.5}$ Components

Four monitoring sites collect $PM_{2.5}$ chemical composition data in the San Joaquin Valley: Bakersfield-California, Fresno-Garland, Modesto, and Visalia. The Bakersfield and Fresno speciation monitors are part of the national Chemical Speciation Network (CSN) while Modesto and Visalia are part of the State and Local Air Monitoring Stations (SLAMS) network. All four sites use SASS samplers (Spiral Aerosol Speciation Sampler, Met One, Grants Pass, OR.) for data collection. The CSN data are analyzed by the Research Triangle Institute and the SLAMS data are analyzed by ARB. In recent years, changes were made to the carbon sampling and analysis method. The collection method changed from the MetOne SASS to the URG3000N sampler, which is very similar to the IMPROVE module C sampler. The analytical method was changed from the NIOSH-like thermal optical transmittance method to IMPROVE_A thermal optical reflectance. At Bakersfield, Modesto, and Visalia these changes were implemented in May of 2007, and the Fresno site switched to the new carbon system in April of 2009.

Figure 2-4 illustrates the average of the 2011-2013 annual average $PM_{2.5}$ composition, as well as average of the top 10 percent of days at Bakersfield, Fresno, and Modesto over the same time period. Organic matter (OM) was calculated by multiplying measured OC by 1.5 according to the OM/OC ratio measured at Fresno (Ge et al., 2012). Ammonium nitrate is the largest contributor to $PM_{2.5}$ on annual basis, accounting for approximately 40% of the $PM_{2.5}$ mass. Its contribution is even higher on peak $PM_{2.5}$ days, accounting for 55-60% of $PM_{2.5}$ mass. Formation mechanisms for ammonium nitrate are discussed in Section 2.5. OM is the second most abundant component, constituting approximately 30% of the $PM_{2.5}$ mass on an annual basis. Activities such as residential wood combustion, cooking, biomass burning, and mobile sources contribute to OM levels in the atmosphere. In addition, OM can also be formed in the atmosphere from oxidation of VOCs. Ammonium sulfate contributes approximately 10% of the $PM_{2.5}$ on an annual basis. Its contribution is half that on peak days, at approximately 5%. Elemental carbon and crustal materials typically contribute less than 10% to $PM_{2.5}$ levels in these cities, except at Bakersfield, where crustal materials contributed more than 10% on an annual basis.

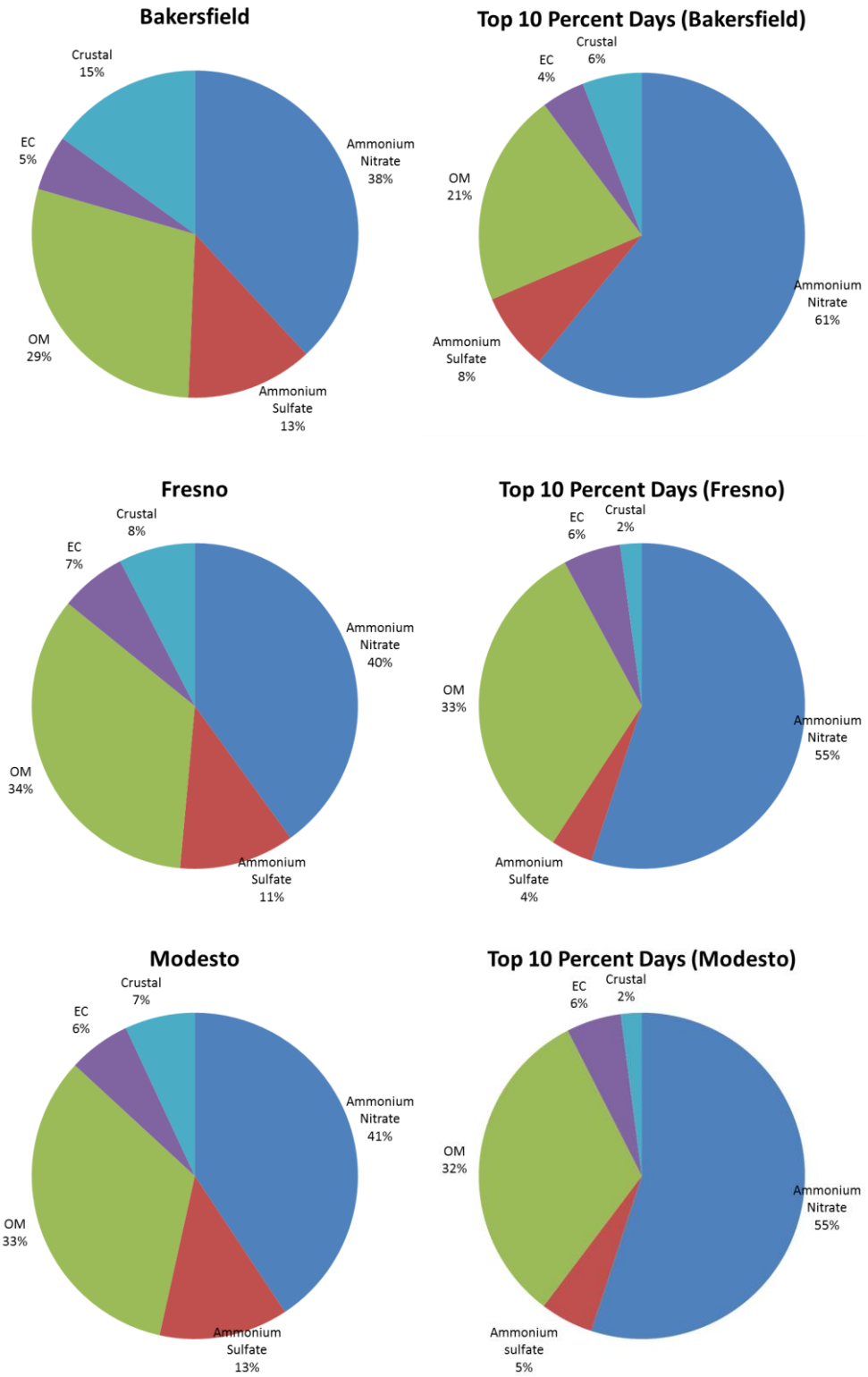

Figure 2-4. Three-year average (2011-2013) and average peak day (top 10 percent over the same three years) $PM_{2.5}$ composition at Bakersfield, Fresno, and Modesto.

2.5 Seasonality of $PM_{2.5}$ and Meteorological Conditions Leading to Elevated $PM_{2.5}$

$PM_{2.5}$ concentrations in the San Joaquin Valley exhibit a strong seasonal variability, with the highest concentrations occurring during the months of November through February. For example, Figure 2-5 represents the time series of 24-hour $PM_{2.5}$ concentrations at Bakersfield - California Avenue in 2013, which shows a vast majority of the elevated $PM_{2.5}$ episodes occurred in the first two and last two months of the year. The predominance of elevated $PM_{2.5}$ episodes during winter months results from a confluence of meteorological conditions conducive to the formation and buildup of $PM_{2.5}$, as well as wintertime sources of directly emitted $PM_{2.5}$.

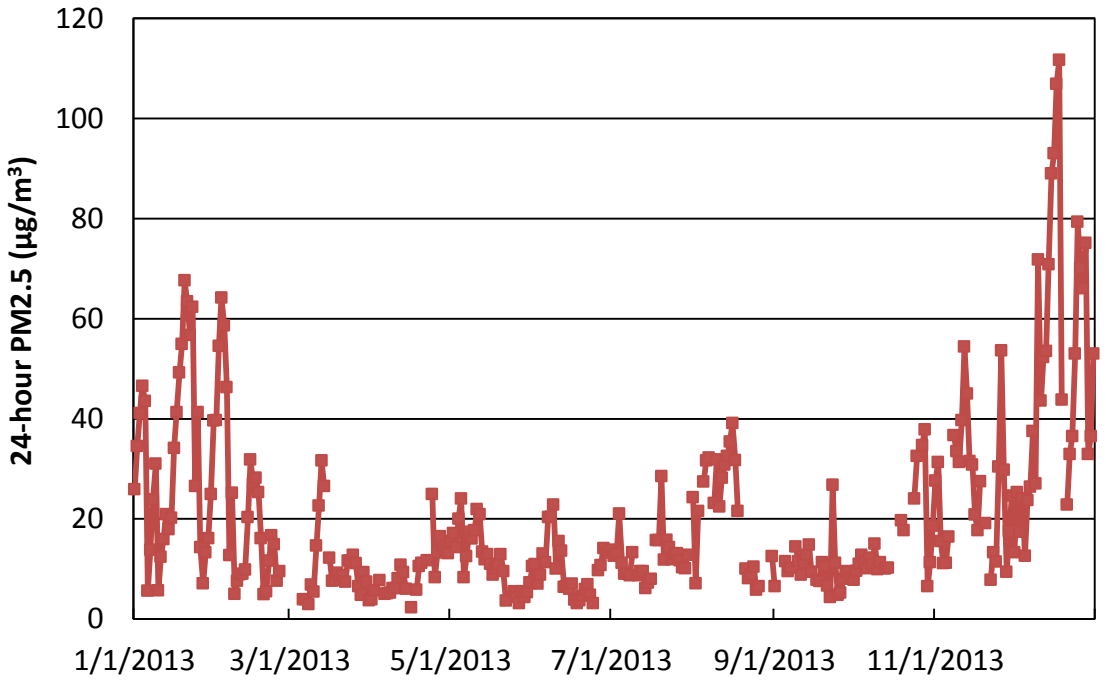

Figure 2-5. 24-hour $PM_{2.5}$ concentrations at Bakersfield- California Avenue in 2013.

High $PM_{2.5}$ concentrations typically build up during multiday episodes under stagnant winter weather when a high pressure system (the Great Basin High) reduces the ventilation in the Valley (Ferreria et al., 2005). These stagnation events, sandwiched between two weather systems, are characterized by low wind speeds, moderate temperatures, vertical atmospheric stability, and high relative humidity. This stable atmosphere prevents precursor gases and primary (or directly emitted) $PM_{2.5}$ released at the surface in the Valley from rapidly dispersing. The moderate temperatures and

high relative humidity also enhance the formation of secondary particulate matter, especially ammonium nitrate and sulfate. In contrast, hotter and drier weather conditions in summer favor the evaporation of semi-volatile species from particles. Greater mixing height in summer can also help the ventilation of air pollutants. As a result, summertime $PM_{2.5}$ concentrations in the SJV are typically much lower compared to wintertime.

Wintertime $PM_{2.5}$ episodes can last for many days. At the beginning of an episode, concentrations are low but increase daily because of both the accumulation of primary pollutants and formation of secondary pollutants (Watson et al, 2002). Concentrations continue to build until there is a change in the weather significant enough to wash out particles through rainfall or increased ventilation of the Valley. For example, the two main episodes captured during the CRPAQS field study (starting in late 1999) had up to 18 days with $PM_{2.5}$ concentrations exceeding 65 $\mu g/m^3$ (Turkiewicz et al., 2006). At the end of 2013 and the beginning of 2014, Bakersfield experienced 18 days with $PM_{2.5}$ concentrations greater than 35 $\mu g/m^3$. During such episodes, urban sites typically record elevated concentrations earlier than rural sites, and as a consequence, have a greater number of days with high concentrations. However, due to the buildup of $PM_{2.5}$ concentrations, rural sites can achieve concentrations with similar magnitude as urban sites by the end of an episode.

The elevated wintertime $PM_{2.5}$ concentrations observed during pollution episodes are the result of both directly emitted particulates (known as primary particulate matter) and particulate matter formed via chemical and physical processes in the atmosphere (known as secondary particulate matter). Ammonium nitrate, the dominant $PM_{2.5}$ component throughout the Valley, is formed in the atmosphere as a result of chemical reactions between precursor pollutants such as NO_x, VOC, and ammonia. Carbonaceous aerosol, the second most abundant component, is mostly directly emitted, and is the result of contributions from wood combustion (e.g., wood burning for heating), mobile sources, and cooking.

As shown in Figure 2-4, carbonaceous aerosols and ammonium nitrate together comprise approximately 80 percent of the $PM_{2.5}$ mass. In winter, most of the carbonaceous aerosol is emitted into the atmosphere as directly emitted particles, and its transport is much more limited compared to gaseous precursors of ammonium nitrate. Ammonium nitrate can be formed both at the surface and aloft and can be fairly uniform across urban and rural sites. The spatial homogeneity of ammonium nitrate is influenced by higher wind speeds aloft (which allow more efficient transport), and the diurnal variation in mixing heights (which allow entrainment of ammonium nitrate down to the surface).

Ammonium nitrate is also formed via both daytime and nighttime chemistry. The amount of ammonium nitrate produced will be limited by the relative abundance of its precursors in the atmosphere. In the San Joaquin Valley, the nighttime formation is considered to be the most important pathway (Lurmann et al., 2006). The nighttime pathway involves oxidation of NO_2, followed by reaction with ammonia to form ammonium nitrate. Since ammonia is abundant in the Valley in the winter, NO_x is considered to be the limiting precursor. In contrast, the daytime pathway also involves VOCs. Modeling studies that investigated winter episodes in the Valley estimated that reductions in VOC emissions have a small impact on nitrate concentrations only at very high $PM_{2.5}$ concentrations (Pun, et al., 2009). However, at current $PM_{2.5}$ levels the impact was very limited, and in some cases VOC reductions lead to an increase in $PM_{2.5}$ concentrations (Chen et al., 2014; Kleeman, et al., 2005).

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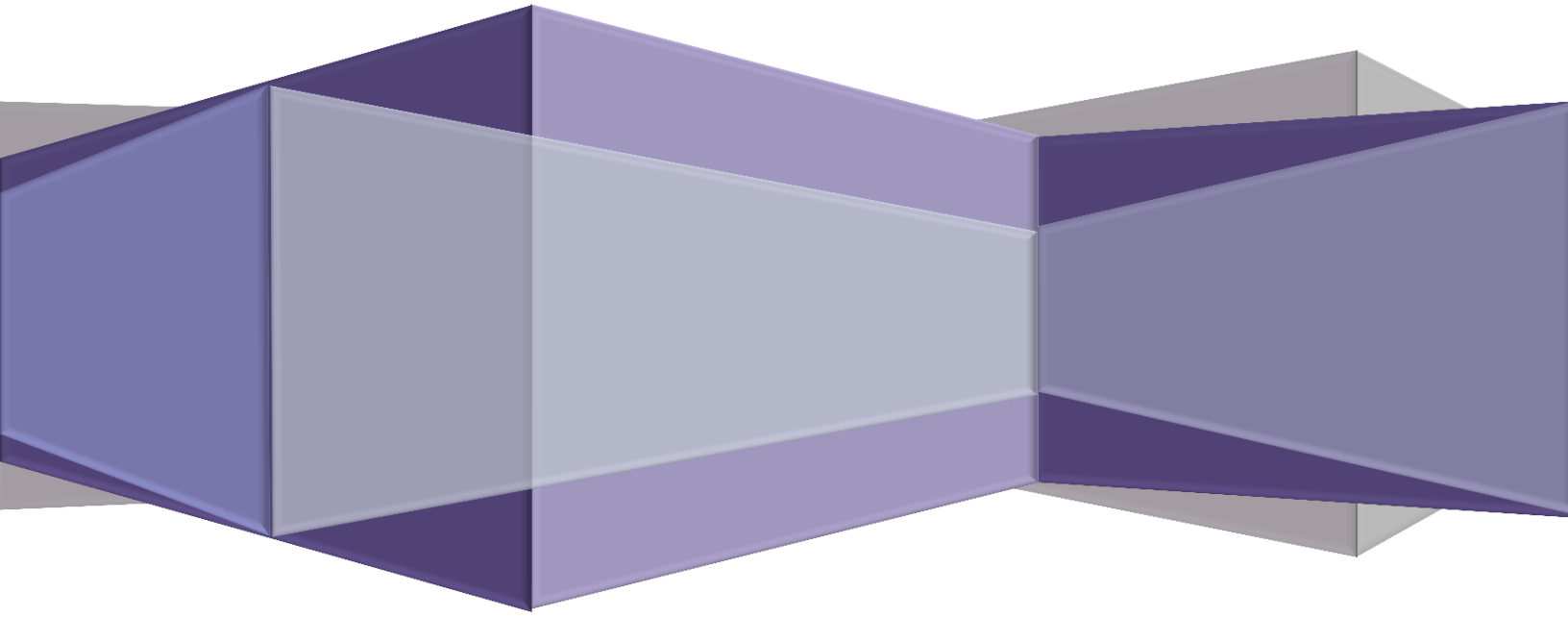
Appendix B

Emissions Inventory

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Appendix B: Emissions Inventory

B.1 INTRODUCTION

Emissions inventories are one of the fundamental building blocks in the development of an attainment plan. Emissions inventories serve as 1) a primary input to air quality modeling used in attainment demonstrations; 2) the emissions data used for developing control strategies; and 3) a means to track progress in meeting the emission reduction commitments. The inventories in this appendix are used to study and propose control measures, to track emissions for Reasonable Further Progress (RFP), to establish motor vehicle conformity budgets for transportation planning, and to assist in demonstrating attainment.

Emissions inventories are an estimate of the air pollution emissions that are actually released into the environment—they are not measurements of ambient concentrations. The following are examples of pollution sources by key sectors:

- Industrial or stationary point sources—power plants and oil refineries;
- Area-wide sources—consumer products and residential fuel combustion;
- On-road sources—passenger vehicles and heavy-duty trucks;
- Off-road mobile sources—aircraft, trains, ships, recreational boats, construction equipment and farm equipment; and
- Nonanthropogenic (natural) sources—biogenic (or vegetation), geogenic (petroleum seeps), and wildfires.

Emissions inventories are usually developed at various geographical resolutions encompassing district, air basin, and county levels. The inventories presented in this appendix are the emissions for the San Joaquin Valley Air Basin.

This appendix includes emissions for the San Joaquin Valley Air Basin for the years 2013 through 2022. The tables in this appendix include:

- Table B-1 Directly emitted PM2.5
- Table B-2 NOx
- Table B-3 SOx
- Table B-4 VOC
- Table B-5 Ammonia

Tables B-1 through B-5 are followed by an overview of emissions inventory calculations and revisions

B.2 EMISSIONS INVENTORY TABLES

Table B-1 Valley PM2.5 Emissions

SUMMARY CATEGORY NAME	PM2.5																			
	ANNUAL AVERAGE tons/day										WINTER AVERAGE tons/day									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
STATIONARY SOURCES																				
FUEL COMBUSTION																				
ELECTRIC UTILITIES	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
COGENERATION	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7
OIL AND GAS PRODUCTION (COMBUSTION)	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4
PETROLEUM REFINING (COMBUSTION)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MANUFACTURING AND INDUSTRIAL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
FOOD AND AGRICULTURAL PROCESSING	0.7	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SERVICE AND COMMERCIAL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL FUEL COMBUSTION**	**5.0**	**4.8**	**4.7**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.5**	**4.5**	**4.8**	**4.7**	**4.6**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.5**	**4.4**
WASTE DISPOSAL																				
SEWAGE TREATMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LANDFILLS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL WASTE DISPOSAL**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**
CLEANING AND SURFACE COATINGS																				
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COATINGS AND RELATED PROCESS SOLVENTS	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL CLEANING AND SURFACE COATINGS**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
PETROLEUM PRODUCTION AND MARKETING																				
OIL AND GAS PRODUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
INDUSTRIAL PROCESSES																				
CHEMICAL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
FOOD AND AGRICULTURE	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
MINERAL PROCESSES	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.7	1.7

PM2.5																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
METAL PROCESSES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
WOOD AND PAPER	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
GLASS AND RELATED PRODUCTS	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
*** TOTAL INDUSTRIAL PROCESSES**	**3.4**	**3.4**	**3.5**	**3.6**	**3.7**	**3.7**	**3.8**	**3.9**	**3.9**	**4.0**	**3.3**	**3.3**	**3.4**	**3.5**	**3.5**	**3.6**	**3.7**	**3.7**	**3.8**	**3.9**
**** TOTAL STATIONARY SOURCES**	**8.9**	**8.8**	**8.8**	**8.8**	**8.9**	**8.9**	**9.0**	**9.0**	**9.1**	**9.1**	**8.6**	**8.5**	**8.5**	**8.5**	**8.6**	**8.7**	**8.8**	**8.8**	**8.9**	**8.9**
AREA-WIDE SOURCES																				
SOLVENT EVAPORATION																				
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL SOLVENT EVAPORATION**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MISCELLANEOUS PROCESSES																				
RESIDENTIAL FUEL COMBUSTION	4.9	4.8	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	9.2	9.0	8.0	8.0	8.0	8.0	8.0	8.1	8.1	8.1
FARMING OPERATIONS	13.0	13.0	12.9	12.9	12.9	12.8	12.8	12.7	12.7	12.6	9.9	9.8	9.8	9.7	9.7	9.6	9.6	9.6	9.5	9.5
CONSTRUCTION AND DEMOLITION	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	1.5	1.6	1.4	1.4	1.5	1.6	1.6	1.7	1.7	1.7	1.4	1.4
PAVED ROAD DUST	4.8	4.9	4.9	5.0	5.1	5.2	5.3	5.4	5.4	5.5	4.5	4.5	4.6	4.7	4.8	4.8	4.9	5.0	5.1	5.2
UNPAVED ROAD DUST	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.4	3.4	3.4	3.4	3.4	3.4	3.3	3.3	3.3	3.3
FUGITIVE WINDBLOWN DUST	7.5	7.5	7.5	7.4	7.4	7.4	7.3	7.3	7.3	7.2	4.8	4.7	4.7	4.7	4.7	4.6	4.6	4.6	4.6	4.5
FIRES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MANAGED BURNING AND DISPOSAL	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
COOKING	3.6	3.6	3.7	3.8	3.8	3.9	3.9	4.0	4.1	4.1	3.6	3.6	3.7	3.8	3.8	3.9	3.9	4.0	4.1	4.1
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL MISCELLANEOUS PROCESSES**	**42.3**	**42.3**	**41.9**	**42.0**	**42.1**	**42.2**	**42.4**	**42.5**	**42.2**	**42.3**	**41.2**	**41.0**	**40.2**	**40.3**	**40.4**	**40.6**	**40.7**	**40.8**	**40.5**	**40.6**
**** TOTAL AREA-WIDE SOURCES**	**42.3**	**42.3**	**41.9**	**42.0**	**42.1**	**42.2**	**42.4**	**42.5**	**42.2**	**42.3**	**41.2**	**41.0**	**40.2**	**40.3**	**40.4**	**40.6**	**40.7**	**40.8**	**40.5**	**40.6**
MOBILE SOURCES																				
ON-ROAD MOTOR VEHICLES																				
LIGHT DUTY PASSENGER (LDA)	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3
LIGHT DUTY TRUCKS - 1 (LDT1)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT DUTY TRUCKS - 2 (LDT2)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
MEDIUM DUTY TRUCKS (MDV)	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.2

PM2.5																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	3.2	1.7	1.3	1.2	0.9	0.8	0.8	0.7	0.7	0.7	3.2	1.7	1.3	1.2	0.9	0.8	0.8	0.7	0.7	0.7
MOTORCYCLES (MCY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES GAS (SBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES DIESEL (SBD)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES GAS (OBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL OTHER BUSES DIESEL (OBD)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL ON-ROAD MOTOR VEHICLES**	**6.4**	**4.7**	**4.2**	**4.0**	**3.7**	**3.6**	**3.5**	**3.4**	**3.3**	**3.3**	**6.4**	**4.7**	**4.2**	**4.0**	**3.7**	**3.6**	**3.5**	**3.4**	**3.3**	**3.3**
OTHER MOBILE SOURCES																				
AIRCRAFT	1.2	1.2	1.2	1.2	1.2	1.2	1.7	1.7	1.7	1.7	1.2	1.2	1.2	1.2	1.2	1.2	1.7	1.7	1.7	1.7
TRAINS	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
OCEAN GOING VESSELS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMMERCIAL HARBOR CRAFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECREATIONAL BOATS	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
OFF-ROAD RECREATIONAL VEHICLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD EQUIPMENT	1.1	1.1	1.1	1.0	1.0	0.9	0.8	0.8	0.8	0.7	1.0	0.9	0.9	0.9	0.8	0.7	0.7	0.7	0.6	0.6
FARM EQUIPMENT	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.2	1.2
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL OTHER MOBILE SOURCES**	**5.8**	**5.7**	**5.5**	**5.4**	**5.2**	**5.1**	**5.3**	**5.2**	**5.0**	**4.8**	**4.5**	**4.4**	**4.3**	**4.2**	**4.0**	**3.9**	**4.2**	**4.1**	**4.0**	**3.9**
**** TOTAL MOBILE SOURCES**	**12.3**	**10.4**	**9.8**	**9.4**	**9.0**	**8.6**	**8.9**	**8.6**	**8.3**	**8.1**	**10.9**	**9.1**	**8.5**	**8.2**	**7.8**	**7.5**	**7.8**	**7.5**	**7.3**	**7.2**
GRAND TOTAL FOR SAN JOAQUIN VALLEY	**63.4**	**61.5**	**60.4**	**60.2**	**60.0**	**59.8**	**60.2**	**60.0**	**59.5**	**59.5**	**60.7**	**58.7**	**57.2**	**57.1**	**56.8**	**56.8**	**57.2**	**57.1**	**56.7**	**56.7**

Table B-2 Valley NOx Emissions

NOx																				
SUMMARY CATEGORY NAME	ANNUAL AVERAGE tons/day										WINTER AVERAGE tons/day									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
STATIONARY SOURCES																				
FUEL COMBUSTION																				
ELECTRIC UTILITIES	4.4	4.1	4.0	4.2	4.2	4.3	4.3	4.3	4.3	4.3	4.2	3.9	3.8	3.9	4.0	4.0	4.1	4.0	4.0	4.1
COGENERATION	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.0	2.1	1.5	1.5	1.6	1.7	1.7	1.8	1.9	1.9	1.9	1.9
OIL AND GAS PRODUCTION (COMBUSTION)	3.1	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.2	3.1	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.2
PETROLEUM REFINING (COMBUSTION)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MANUFACTURING AND INDUSTRIAL	5.2	5.2	5.2	5.2	5.1	5.2	5.2	5.2	5.2	5.3	5.3	5.3	5.3	5.2	5.2	5.3	5.3	5.3	5.3	5.3
FOOD AND AGRICULTURAL PROCESSING	11.5	11.2	8.0	6.0	5.6	5.4	5.2	5.0	4.8	4.6	7.9	7.7	5.6	4.3	4.0	3.8	3.7	3.6	3.4	3.3
SERVICE AND COMMERCIAL	4.6	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.8	4.9	4.9	4.9	4.9	5.0	5.1	5.2	5.2	5.2	5.2
OTHER (FUEL COMBUSTION)	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
*** TOTAL FUEL COMBUSTION**	**31.2**	**30.4**	**27.0**	**25.1**	**24.7**	**24.7**	**24.5**	**24.2**	**24.0**	**23.8**	**27.6**	**26.9**	**24.7**	**23.4**	**23.2**	**23.2**	**23.1**	**22.9**	**22.8**	**22.6**
WASTE DISPOSAL																				
SEWAGE TREATMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LANDFILLS	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL WASTE DISPOSAL**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
CLEANING AND SURFACE COATINGS																				
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
PETROLEUM PRODUCTION AND MARKETING																				
OIL AND GAS PRODUCTION	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
PETROLEUM REFINING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL PETROLEUM PRODUCTION AND MARKETING**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.3**
INDUSTRIAL PROCESSES																				
CHEMICAL	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
FOOD AND AGRICULTURE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MINERAL PROCESSES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
METAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

NOx																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	6.2	4.0	4.1	4.2	4.3	4.3	4.3	4.4	4.5	4.7	6.2	4.0	4.1	4.2	4.3	4.3	4.3	4.4	4.5	4.7
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL INDUSTRIAL PROCESSES**	**6.7**	**4.5**	**4.6**	**4.7**	**4.8**	**4.9**	**4.9**	**5.0**	**5.1**	**5.3**	**6.7**	**4.5**	**4.6**	**4.7**	**4.8**	**4.8**	**4.9**	**4.9**	**5.1**	**5.3**
**** TOTAL STATIONARY SOURCES**	**38.6**	**35.6**	**32.3**	**30.5**	**30.2**	**30.2**	**30.1**	**29.8**	**29.8**	**29.7**	**35.0**	**32.1**	**29.9**	**28.7**	**28.6**	**28.7**	**28.6**	**28.5**	**28.5**	**28.5**
AREA-WIDE SOURCES																				
SOLVENT EVAPORATION																				
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL SOLVENT EVAPORATION**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MISCELLANEOUS PROCESSES																				
RESIDENTIAL FUEL COMBUSTION	6.4	6.4	6.5	6.4	6.4	6.4	6.5	6.4	6.5	6.3	9.0	9.0	9.0	8.9	8.9	9.0	9.0	9.0	9.0	8.7
FARMING OPERATIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANAGED BURNING AND DISPOSAL	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
COOKING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL MISCELLANEOUS PROCESSES**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.0**	**11.5**	**11.6**	**11.5**	**11.5**	**11.4**	**11.5**	**11.5**	**11.5**	**11.5**	**11.2**
**** TOTAL AREA-WIDE SOURCES**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.1**	**8.0**	**11.5**	**11.6**	**11.5**	**11.5**	**11.4**	**11.5**	**11.5**	**11.5**	**11.5**	**11.2**
MOBILE SOURCES																				
ON-ROAD MOTOR VEHICLES																				
LIGHT DUTY PASSENGER (LDA)	9.6	8.6	7.7	6.9	6.1	5.5	4.9	4.5	4.1	3.8	10.5	9.4	8.4	7.5	6.7	6.0	5.4	4.9	4.5	4.2
LIGHT DUTY TRUCKS - 1 (LDT1)	2.8	2.5	2.1	1.8	1.5	1.3	1.1	1.0	0.9	0.8	3.1	2.7	2.3	2.0	1.7	1.4	1.2	1.1	0.9	0.8
LIGHT DUTY TRUCKS - 2 (LDT2)	7.0	6.3	5.6	4.9	4.3	3.8	3.3	2.9	2.6	2.4	7.7	6.9	6.1	5.4	4.7	4.1	3.6	3.2	2.9	2.6
MEDIUM DUTY TRUCKS (MDV)	10.0	9.2	8.4	7.6	6.8	6.1	5.3	4.7	4.1	3.5	11.0	10.1	9.2	8.3	7.5	6.6	5.9	5.2	4.5	3.9
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	3.2	2.9	2.7	2.5	2.3	2.1	1.9	1.8	1.6	1.5

NOx																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.2
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	11.0	10.3	9.6	8.9	8.1	7.5	6.8	6.1	5.5	4.9	11.2	10.5	9.8	9.0	8.3	7.6	6.9	6.2	5.6	5.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	2.8	2.6	2.3	2.1	1.9	1.7	1.5	1.3	1.1	1.0	2.8	2.6	2.4	2.1	1.9	1.7	1.5	1.3	1.2	1.0
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	18.2	16.4	14.0	13.0	11.8	11.1	10.2	8.3	6.5	6.4	18.5	16.6	14.2	13.2	12.0	11.2	10.3	8.4	6.6	6.5
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	110.1	89.4	81.9	76.7	70.1	66.1	64.4	61.5	57.2	52.5	111.8	90.8	83.1	77.8	71.0	66.9	65.2	62.3	57.8	53.1
MOTORCYCLES (MCY)	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9
HEAVY DUTY DIESEL URBAN BUSES (UB)	3.4	3.0	2.8	2.5	2.3	2.1	1.8	1.6	1.5	1.3	3.5	3.1	2.8	2.6	2.4	2.1	1.9	1.7	1.5	1.3
HEAVY DUTY GAS URBAN BUSES (UB)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
SCHOOL BUSES GAS (SBG)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES DIESEL (SBD)	1.1	1.0	1.0	1.0	1.0	0.9	0.8	0.8	0.7	0.7	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7
OTHER BUSES GAS (OBG)	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2
ALL OTHER BUSES DIESEL (OBD)	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2
MOTOR HOMES (MH)	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2
*** TOTAL ON-ROAD MOTOR VEHICLES**	**183.1**	**156.0**	**141.6**	**131.1**	**119.2**	**110.7**	**104.7**	**96.9**	**88.1**	**80.9**	**188.7**	**160.9**	**146.0**	**135.0**	**122.7**	**113.8**	**107.6**	**99.5**	**90.4**	**83.0**
OTHER MOBILE SOURCES																				
AIRCRAFT	2.5	2.5	2.5	2.5	2.5	2.5	4.6	4.6	4.6	4.6	2.4	2.4	2.4	2.4	2.4	2.4	4.5	4.5	4.5	4.5
TRAINS	13.4	13.8	14.0	14.1	14.0	13.8	13.5	13.2	12.9	12.6	13.4	13.8	14.0	14.1	14.0	13.8	13.5	13.2	12.9	12.6
OCEAN GOING VESSELS	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
COMMERCIAL HARBOR CRAFT	0.7	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
RECREATIONAL BOATS	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8
OFF-ROAD RECREATIONAL VEHICLES	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
OFF-ROAD EQUIPMENT	21.3	21.0	20.8	20.3	19.6	18.3	17.5	17.2	16.4	15.3	18.3	17.9	17.7	17.2	16.6	15.5	14.8	14.5	13.9	12.9
FARM EQUIPMENT	48.4	46.5	44.7	43.1	41.5	40.0	38.6	36.2	34.0	32.0	30.1	28.9	27.8	26.7	25.8	24.8	23.9	22.5	21.2	19.9
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL OTHER MOBILE SOURCES**	**88.3**	**86.4**	**84.5**	**82.4**	**80.0**	**76.9**	**76.4**	**73.5**	**70.2**	**66.7**	**66.2**	**65.0**	**63.8**	**62.3**	**60.6**	**58.3**	**58.5**	**56.4**	**54.2**	**51.6**
**** TOTAL MOBILE SOURCES**	**271.4**	**242.4**	**226.1**	**213.5**	**199.2**	**187.6**	**181.2**	**170.4**	**158.3**	**147.5**	**254.9**	**226.0**	**209.7**	**197.4**	**183.3**	**172.1**	**166.1**	**156.0**	**144.6**	**134.6**
GRAND TOTAL FOR SAN JOAQUIN VALLEY	**318.1**	**286.2**	**266.6**	**252.1**	**237.5**	**225.9**	**219.4**	**208.3**	**196.2**	**185.2**	**301.4**	**269.6**	**251.2**	**237.6**	**223.3**	**212.3**	**206.2**	**195.9**	**184.6**	**174.3**

Table B-3 Valley SOx Emissions

SOx																				
SUMMARY CATEGORY NAME	ANNUAL AVERAGE tons/day										WINTER AVERAGE tons/day									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
STATIONARY SOURCES																				
FUEL COMBUSTION																				
ELECTRIC UTILITIES	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
COGENERATION	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
OIL AND GAS PRODUCTION (COMBUSTION)	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2
PETROLEUM REFINING (COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANUFACTURING AND INDUSTRIAL	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
FOOD AND AGRICULTURAL PROCESSING	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SERVICE AND COMMERCIAL	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL FUEL COMBUSTION**	**2.9**	**2.3**	**2.3**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.9**	**2.3**	**2.3**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**
WASTE DISPOSAL																				
SEWAGE TREATMENT	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LANDFILLS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL WASTE DISPOSAL**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
CLEANING AND SURFACE COATINGS																				
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
PETROLEUM PRODUCTION AND MARKETING																				
OIL AND GAS PRODUCTION	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PETROLEUM REFINING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL PETROLEUM PRODUCTION AND MARKETING**	**0.5**	**0.5**	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.5**	**0.5**	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
INDUSTRIAL PROCESSES																				
CHEMICAL	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9
FOOD AND AGRICULTURE	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MINERAL PROCESSES	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
METAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	2.0	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.0	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1

SOx																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL INDUSTRIAL PROCESSES**	**3.6**	**3.5**	**3.6**	**3.6**	**3.7**	**3.7**	**3.8**	**3.8**	**3.9**	**4.0**	**3.4**	**3.2**	**3.3**	**3.3**	**3.4**	**3.4**	**3.5**	**3.5**	**3.6**	**3.7**
**** TOTAL STATIONARY SOURCES**	**7.2**	**6.5**	**6.5**	**6.6**	**6.6**	**6.7**	**6.8**	**6.8**	**6.9**	**7.0**	**6.9**	**6.2**	**6.2**	**6.3**	**6.3**	**6.4**	**6.5**	**6.5**	**6.6**	**6.7**
AREA-WIDE SOURCES																				
SOLVENT EVAPORATION																				
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL SOLVENT EVAPORATION**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MISCELLANEOUS PROCESSES																				
RESIDENTIAL FUEL COMBUSTION	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
FARMING OPERATIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANAGED BURNING AND DISPOSAL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
COOKING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL MISCELLANEOUS PROCESSES**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
**** TOTAL AREA-WIDE SOURCES**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
MOBILE SOURCES																				
ON-ROAD MOTOR VEHICLES																				
LIGHT DUTY PASSENGER (LDA)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
LIGHT DUTY TRUCKS - 1 (LDT1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT DUTY TRUCKS - 2 (LDT2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MEDIUM DUTY TRUCKS (MDV)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SOx																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MOTORCYCLES (MCY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES GAS (SBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES DIESEL (SBD)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES GAS (OBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL OTHER BUSES DIESEL (OBD)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL ON-ROAD MOTOR VEHICLES**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
OTHER MOBILE SOURCES																				
AIRCRAFT	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
TRAINS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCEAN GOING VESSELS	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
COMMERCIAL HARBOR CRAFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECREATIONAL BOATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD RECREATIONAL VEHICLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARM EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL OTHER MOBILE SOURCES**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**
**** TOTAL MOBILE SOURCES**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.9**	**0.9**	**0.9**	**0.9**
GRAND TOTAL FOR SAN JOAQUIN VALLEY	**8.4**	**7.7**	**7.7**	**7.8**	**7.8**	**7.9**	**8.0**	**8.1**	**8.2**	**8.2**	**8.3**	**7.5**	**7.6**	**7.6**	**7.7**	**7.8**	**7.8**	**7.9**	**8.0**	**8.1**

Table B-4 Valley Ammonia Emissions

AMMONIA																				
SUMMARY CATEGORY NAME	ANNUAL AVERAGE tons/day										WINTER AVERAGE tons/day									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
STATIONARY SOURCES																				
FUEL COMBUSTION																				
ELECTRIC UTILITIES	1.8	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7
COGENERATION	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
OIL AND GAS PRODUCTION (COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING (COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANUFACTURING AND INDUSTRIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FOOD AND AGRICULTURAL PROCESSING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SERVICE AND COMMERCIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL FUEL COMBUSTION**	**2.3**	**2.1**	**2.1**	**2.1**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.1**	**2.1**	**2.1**	**2.1**	**2.2**	**2.2**	**2.1**	**2.2**	**2.2**
WASTE DISPOSAL																				
SEWAGE TREATMENT	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7
LANDFILLS	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.8	9.9	10.1	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.8	9.9	10.1
*** TOTAL WASTE DISPOSAL**	**10.0**	**10.1**	**10.3**	**10.5**	**10.7**	**10.9**	**11.0**	**11.2**	**11.4**	**11.6**	**10.0**	**10.1**	**10.3**	**10.5**	**10.7**	**10.8**	**11.0**	**11.2**	**11.4**	**11.6**
CLEANING AND SURFACE COATINGS																				
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
PETROLEUM PRODUCTION AND MARKETING																				
OIL AND GAS PRODUCTION	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL PETROLEUM PRODUCTION AND MARKETING**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
INDUSTRIAL PROCESSES																				
CHEMICAL	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3

AMMONIA																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
FOOD AND AGRICULTURE	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MINERAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
METAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL INDUSTRIAL PROCESSES**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	**1.7**	**1.7**	**1.7**	**1.8**	**1.8**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**	**1.7**	**1.7**	**1.7**	**1.8**	**1.8**
**** TOTAL STATIONARY SOURCES**	**13.9**	**13.9**	**14.1**	**14.4**	**14.6**	**14.8**	**15.0**	**15.2**	**15.5**	**15.7**	**13.9**	**13.9**	**14.1**	**14.3**	**14.5**	**14.8**	**15.0**	**15.2**	**15.4**	**15.7**
AREA-WIDE SOURCES																				
SOLVENT EVAPORATION																				
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	117.6	116.9	116.3	115.7	115.0	114.4	113.8	113.1	112.5	111.8	97.9	97.3	96.8	96.2	95.6	95.1	94.5	94.0	93.4	92.8
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL SOLVENT EVAPORATION**	**117.6**	**116.9**	**116.3**	**115.7**	**115.0**	**114.4**	**113.8**	**113.1**	**112.5**	**111.8**	**97.9**	**97.3**	**96.8**	**96.2**	**95.6**	**95.1**	**94.5**	**94.0**	**93.4**	**92.8**
MISCELLANEOUS PROCESSES																				
RESIDENTIAL FUEL COMBUSTION	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
FARMING OPERATIONS	186.5	186.5	186.5	186.5	186.5	186.5	186.5	186.5	186.5	186.5	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANAGED BURNING AND DISPOSAL	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
COOKING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (MISCELLANEOUS PROCESSES)	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0
*** TOTAL MISCELLANEOUS PROCESSES**	**193.3**	**193.3**	**193.4**	**193.5**	**193.6**	**193.7**	**193.8**	**193.9**	**194.0**	**194.1**	**193.7**	**193.7**	**193.8**	**193.9**	**194.0**	**194.1**	**194.2**	**194.3**	**194.4**	**194.5**
**** TOTAL AREA-WIDE SOURCES**	**310.9**	**310.3**	**309.7**	**309.2**	**308.7**	**308.1**	**307.6**	**307.0**	**306.5**	**306.0**	**291.5**	**291.0**	**290.6**	**290.1**	**289.7**	**289.2**	**288.7**	**288.3**	**287.8**	**287.4**
MOBILE SOURCES																				
ON-ROAD MOTOR VEHICLES																				
LIGHT DUTY PASSENGER (LDA)	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
LIGHT DUTY TRUCKS - 1 (LDT1)	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT DUTY TRUCKS - 2 (LDT2)	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7

AMMONIA																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
MEDIUM DUTY TRUCKS (MDV)	1.3	1.2	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7	1.3	1.2	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
MOTORCYCLES (MCY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES GAS (SBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES DIESEL (SBD)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES GAS (OBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL OTHER BUSES DIESEL (OBD)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL ON-ROAD MOTOR VEHICLES**	**4.4**	**4.3**	**4.1**	**4.0**	**3.9**	**3.8**	**3.7**	**3.6**	**3.5**	**3.5**	**4.4**	**4.3**	**4.1**	**4.0**	**3.9**	**3.8**	**3.7**	**3.6**	**3.5**	**3.5**
OTHER MOBILE SOURCES																				
AIRCRAFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TRAINS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCEAN GOING VESSELS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMMERCIAL HARBOR CRAFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECREATIONAL BOATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD RECREATIONAL VEHICLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARM EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL OTHER MOBILE SOURCES**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
**** TOTAL MOBILE SOURCES**	**4.4**	**4.3**	**4.2**	**4.0**	**3.9**	**3.8**	**3.7**	**3.6**	**3.6**	**3.5**	**4.4**	**4.3**	**4.2**	**4.0**	**3.9**	**3.8**	**3.7**	**3.6**	**3.6**	**3.5**
GRAND TOTAL FOR SAN JOAQUIN VALLEY	**329.2**	**328.5**	**328.0**	**327.6**	**327.2**	**326.7**	**326.3**	**325.9**	**325.5**	**325.2**	**309.8**	**309.2**	**308.8**	**308.5**	**308.1**	**307.8**	**307.4**	**307.1**	**306.8**	**306.5**

Table B-5 Valley VOC Emissions

SUMMARY CATEGORY NAME	VOC																			
	ANNUAL AVERAGE tons/day										WINTER AVERAGE tons/day									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
STATIONARY SOURCES																				
FUEL COMBUSTION																				
ELECTRIC UTILITIES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
COGENERATION	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
OIL AND GAS PRODUCTION (COMBUSTION)	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9
PETROLEUM REFINING (COMBUSTION)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MANUFACTURING AND INDUSTRIAL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
FOOD AND AGRICULTURAL PROCESSING	1.0	1.0	0.9	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SERVICE AND COMMERCIAL	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL FUEL COMBUSTION**	**3.8**	**3.7**	**3.6**	**3.4**	**3.3**	**3.3**	**3.3**	**3.3**	**3.2**	**3.2**	**3.6**	**3.5**	**3.4**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.1**	**3.1**
WASTE DISPOSAL																				
SEWAGE TREATMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LANDFILLS	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.5	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
OTHER (WASTE DISPOSAL)	22.2	22.6	23.1	23.4	22.9	23.3	23.7	24.1	24.5	24.9	22.2	22.6	23.1	23.4	22.9	23.3	23.7	24.1	24.5	24.9
*** TOTAL WASTE DISPOSAL**	**23.9**	**24.3**	**24.8**	**25.2**	**24.7**	**25.1**	**25.5**	**25.9**	**26.4**	**26.8**	**23.9**	**24.3**	**24.8**	**25.2**	**24.7**	**25.1**	**25.5**	**25.9**	**26.4**	**26.8**
CLEANING AND SURFACE COATINGS																				
LAUNDERING	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DEGREASING	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.9
COATINGS AND RELATED PROCESS SOLVENTS	8.2	8.5	8.7	8.8	8.9	9.1	9.2	9.3	9.5	9.8	8.2	8.5	8.6	8.8	8.9	9.0	9.2	9.3	9.5	9.8
PRINTING	5.3	5.4	5.5	5.6	5.7	5.7	5.8	5.9	5.9	6.0	5.3	5.4	5.5	5.6	5.7	5.7	5.8	5.9	5.9	6.0
ADHESIVES AND SEALANTS	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7
OTHER (CLEANING AND SURFACE COATINGS)	6.6	6.8	6.9	7.0	7.1	7.1	7.2	7.3	7.5	7.6	6.6	6.8	6.9	7.0	7.1	7.1	7.2	7.3	7.5	7.6
*** TOTAL CLEANING AND SURFACE COATINGS**	**22.4**	**23.0**	**23.5**	**23.8**	**24.1**	**24.4**	**24.7**	**25.1**	**25.5**	**26.0**	**22.4**	**23.0**	**23.5**	**23.8**	**24.1**	**24.4**	**24.7**	**25.1**	**25.5**	**26.0**
PETROLEUM PRODUCTION AND MARKETING																				
OIL AND GAS PRODUCTION	12.6	12.3	12.0	11.7	11.5	11.2	11.0	10.7	10.5	10.3	12.6	12.3	12.0	11.7	11.5	11.2	11.0	10.7	10.5	10.3
PETROLEUM REFINING	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
PETROLEUM MARKETING	5.5	5.5	5.5	5.4	5.3	5.2	5.1	5.1	5.0	4.9	5.5	5.5	5.4	5.4	5.3	5.2	5.1	5.1	5.0	4.9
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL PETROLEUM PRODUCTION AND MARKETING**	**18.8**	**18.6**	**18.3**	**18.0**	**17.6**	**17.3**	**16.9**	**16.6**	**16.3**	**16.0**	**18.8**	**18.5**	**18.3**	**18.0**	**17.6**	**17.3**	**16.9**	**16.6**	**16.3**	**16.0**
INDUSTRIAL PROCESSES																				
CHEMICAL	4.9	4.9	5.0	5.1	5.1	5.2	5.3	5.4	5.5	5.7	4.9	4.9	5.0	5.0	5.1	5.2	5.3	5.4	5.5	5.6
FOOD AND AGRICULTURE	11.2	11.3	11.4	11.7	12.0	12.2	12.5	12.7	12.8	13.0	11.0	11.0	11.2	11.5	11.7	11.9	12.2	12.4	12.5	12.7
MINERAL PROCESSES	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
METAL PROCESSES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

VOC																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
*** TOTAL INDUSTRIAL PROCESSES**	**17.3**	**17.5**	**17.7**	**18.1**	**18.5**	**18.8**	**19.2**	**19.5**	**19.8**	**20.1**	**17.1**	**17.2**	**17.5**	**17.8**	**18.2**	**18.5**	**18.9**	**19.2**	**19.5**	**19.8**
**** TOTAL STATIONARY SOURCES**	**86.2**	**87.1**	**87.8**	**88.5**	**88.3**	**88.9**	**89.6**	**90.4**	**91.3**	**92.2**	**85.7**	**86.6**	**87.3**	**88.0**	**87.8**	**88.4**	**89.2**	**89.9**	**90.8**	**91.8**
AREA-WIDE SOURCES																				
SOLVENT EVAPORATION																				
CONSUMER PRODUCTS	20.4	20.5	20.8	21.1	21.4	21.7	22.0	22.3	22.6	22.9	20.4	20.5	20.8	21.1	21.4	21.7	22.0	22.3	22.6	22.9
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	9.0	9.1	9.2	9.3	9.4	9.6	9.7	9.9	10.0	10.2	7.8	7.8	7.9	8.0	8.1	8.2	8.4	8.5	8.6	8.8
PESTICIDES/FERTILIZERS	19.5	17.8	16.7	16.7	16.6	16.5	16.4	16.4	16.3	16.2	19.4	18.9	16.7	16.6	16.6	16.5	16.4	16.3	16.3	16.2
ASPHALT PAVING / ROOFING	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2
*** TOTAL SOLVENT EVAPORATION**	**49.8**	**48.3**	**47.7**	**48.1**	**48.5**	**48.9**	**49.3**	**49.7**	**50.1**	**50.5**	**48.5**	**48.1**	**46.4**	**46.8**	**47.2**	**47.5**	**47.9**	**48.3**	**48.7**	**49.1**
MISCELLANEOUS PROCESSES																				
RESIDENTIAL FUEL COMBUSTION	5.4	5.3	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	10.4	10.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1
FARMING OPERATIONS	96.0	96.0	96.0	96.0	96.0	96.0	96.0	96.0	96.0	96.0	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MANAGED BURNING AND DISPOSAL	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
COOKING	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL MISCELLANEOUS PROCESSES**	**104.7**	**104.5**	**104.0**	**104.0**	**104.0**	**104.1**	**104.1**	**104.1**	**104.1**	**104.1**	**110.6**	**110.4**	**109.4**	**109.4**	**109.4**	**109.4**	**109.4**	**109.4**	**109.4**	**109.4**
**** TOTAL AREA-WIDE SOURCES**	**154.5**	**152.9**	**151.7**	**152.1**	**152.5**	**152.9**	**153.4**	**153.8**	**154.2**	**154.6**	**159.1**	**158.5**	**155.8**	**156.2**	**156.6**	**157.0**	**157.4**	**157.7**	**158.1**	**158.5**
MOBILE SOURCES																				
ON-ROAD MOTOR VEHICLES																				
LIGHT DUTY PASSENGER (LDA)	13.6	12.0	10.6	9.4	8.3	7.4	6.7	6.2	5.8	5.5	13.6	11.9	10.5	9.2	8.1	7.2	6.5	6.1	5.7	5.4
LIGHT DUTY TRUCKS - 1 (LDT1)	5.0	4.4	3.9	3.4	2.9	2.6	2.3	2.0	1.8	1.7	5.3	4.7	4.1	3.6	3.1	2.7	2.4	2.1	1.9	1.7
LIGHT DUTY TRUCKS - 2 (LDT2)	7.3	6.7	6.0	5.5	4.9	4.4	4.1	3.8	3.6	3.4	7.7	7.0	6.3	5.7	5.1	4.6	4.2	3.9	3.7	3.5
MEDIUM DUTY TRUCKS (MDV)	7.8	7.5	7.2	6.8	6.4	6.1	5.7	5.3	4.9	4.5	8.2	7.9	7.5	7.1	6.6	6.3	5.8	5.4	5.0	4.6
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	2.5	2.3	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1

VOC																				
SUMMARY CATEGORY NAME	**ANNUAL AVERAGE tons/day**										**WINTER AVERAGE tons/day**									
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	1.5	1.3	1.0	0.9	0.8	0.7	0.6	0.4	0.2	0.2	1.5	1.3	1.0	0.9	0.8	0.7	0.6	0.4	0.2	0.2
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	6.8	3.8	3.2	2.9	2.3	2.1	2.1	2.0	1.9	1.8	6.8	3.8	3.2	2.9	2.3	2.1	2.1	2.0	1.9	1.8
MOTORCYCLES (MCY)	3.3	3.2	3.1	3.0	2.9	2.9	2.9	2.9	2.8	2.8	3.3	3.2	3.1	3.0	2.9	2.9	2.8	2.8	2.8	2.7
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
HEAVY DUTY GAS URBAN BUSES (UB)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
SCHOOL BUSES GAS (SBG)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES DIESEL (SBD)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES GAS (OBG)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL OTHER BUSES DIESEL (OBD)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*** TOTAL ON-ROAD MOTOR VEHICLES**	**49.8**	**42.9**	**38.6**	**35.1**	**31.6**	**28.9**	**26.8**	**24.9**	**23.3**	**22.0**	**51.1**	**44.0**	**39.5**	**35.8**	**32.1**	**29.3**	**27.1**	**25.1**	**23.5**	**22.2**
OTHER MOBILE SOURCES																				
AIRCRAFT	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9	3.9	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9	3.9	3.9
TRAINS	0.8	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.8	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6
OCEAN GOING VESSELS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMMERCIAL HARBOR CRAFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECREATIONAL BOATS	7.8	7.4	7.1	6.7	6.4	6.1	5.8	5.5	5.2	4.9	4.7	4.4	4.2	4.0	3.8	3.6	3.4	3.3	3.1	2.9
OFF-ROAD RECREATIONAL VEHICLES	2.6	2.5	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.5	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.1	2.1
OFF-ROAD EQUIPMENT	9.1	8.9	8.6	8.3	8.1	7.8	7.7	7.6	7.6	7.5	8.8	8.5	8.3	7.9	7.7	7.5	7.3	7.2	7.2	7.1
FARM EQUIPMENT	8.8	8.4	8.0	7.6	7.2	6.8	6.5	6.2	5.9	5.6	6.1	5.8	5.5	5.2	4.9	4.6	4.4	4.2	4.0	3.8
FUEL STORAGE AND HANDLING	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.6	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2
*** TOTAL OTHER MOBILE SOURCES**	**33.9**	**32.6**	**31.4**	**30.3**	**29.3**	**28.2**	**28.2**	**27.4**	**26.7**	**26.0**	**27.5**	**26.4**	**25.5**	**24.6**	**23.8**	**23.0**	**23.2**	**22.6**	**22.1**	**21.5**
**** TOTAL MOBILE SOURCES**	**83.7**	**75.5**	**70.1**	**65.4**	**60.8**	**57.2**	**55.0**	**52.3**	**50.0**	**48.0**	**78.6**	**70.4**	**65.0**	**60.4**	**55.9**	**52.3**	**50.3**	**47.7**	**45.6**	**43.7**
GRAND TOTAL FOR SAN JOAQUIN VALLEY	**324.4**	**315.5**	**309.6**	**306.0**	**301.6**	**299.0**	**298.0**	**296.4**	**295.4**	**294.8**	**323.4**	**315.5**	**308.2**	**304.6**	**300.3**	**297.7**	**296.9**	**295.4**	**294.6**	**294.1**

B.3 EMISSIONS INVENTORY SUMMARY AND METHODOLOGY

[PROVIDED BY CALIFORNIA AIR RESOURCES BOARD]

Emissions inventories are one of the fundamental building blocks in the development of a State Implementation Plan[1] (SIP or Plan). In simple terms, an emissions inventory is a systematic listing of the sources of air pollution along with the amount of pollution emitted from each source or category over a given time period. This document presents a summary of the data sources, along with revisions and improvements made to the emissions inventory included in the 2016 San Joaquin Valley Plan for the 2012 Annual PM2.5 Standard.

The California Air Resources Board (ARB) and San Joaquin Valley Unified Air Pollution Control District (District) have developed a comprehensive, accurate, and current emissions inventory consistent with the requirements set forth in Section 182(a)(1) of the federal Clean Air Act. ARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emission reports for point sources, and that estimates for mobile and area-wide sources are based on the most recent models and methodologies. Staff also reviewed the growth profiles for point and areawide source categories, and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts.

Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and areawide sources such as consumer products and paint. They are fundamental components of an air quality plan, and serve critical functions such as:

1) the primary input to air quality modeling used in attainment demonstrations;
2) the emissions data used for developing control strategies; and
3) a means to track progress in meeting the emission reduction commitments.

The United States Environmental Protection Agency (U.S. EPA) regulations require that the emissions inventory contain emissions data for directly emitted PM2.5 and its precursors: oxides of nitrogen (NOx), sulfur oxides (SOx), volatile organic compounds (VOC), and ammonia (NH3). The inventory included in this plan substitutes VOC with reactive organic gases (ROG), which in general represent a slightly broader group of compounds than those in U.S. EPA's list of VOCs.

[1] Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements; Final Rule. 81 Fed. Reg. 164, pp. 58010-58162. (2016, August 24). (to be codified at 40 CFR Parts 50, 51, and 93). https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

Agency Responsibilities

ARB and District staff worked jointly to develop the emissions inventory for the San Joaquin Valley PM2.5 Nonattainment Area. The District worked closely with operators of major stationary facilities in their jurisdiction to develop the point source emission estimates. ARB staff developed the emission inventory for mobile sources, both on-road and off-road. The District and ARB shared responsibility for developing estimates for the nonpoint (areawide) sources such as paved road dust and agricultural burning. ARB worked with several State and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), the California Energy Commission (CEC), and municipal planning organizations (MPOs) to assemble activity information necessary to develop the mobile and area-wide source emission estimates.

Inventory Base Year

The base year inventory forms the basis for all future year projections and also establishes the emission levels against which progress in emission reductions will be measured. U.S. EPA regulations establish that the base year inventory should be preferably consistent with the triennial reporting schedule required under the Air Emissions Reporting Requirements (AERR) rule. However, U.S. EPA allows a different year to be selected if justified by the State. ARB worked with the local air districts to determine the base year that should be used across the State. Since the South Coast Air Quality Management District typically aligns their base year inventory with the data collection period for their Multiple Air Toxics Exposure Study, which was last conducted in 2012, ARB selected 2012 as the base year to maintain consistency across the various plans being developed in the State. [The base year and reference year modeling for this *2016 PM2.5 Plan* is 2013, a projected base year based on the initial 2012 inventory data.]

Forecasted Inventories

In addition to a base year inventory, U.S. EPA regulations also require future year inventory projections for specific milestone years. Forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emission reductions due to adopted control measures. ARB develops emission forecasts by applying growth and control profiles to the base year inventory.

Growth profiles for point and areawide sources are derived from surrogates such as economic activity, fuel usage, population, housing units, etc., that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or in some cases, from econometric models. Control profiles, which account for emission reductions resulting from adopted rules and regulations, are derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for mobile source emissions are generated by models that predict activity rates and vehicle fleet turnover by vehicle model year. As with stationary sources, the mobile source models include control algorithms that account for all adopted regulatory actions.

Temporal Resolution

Planning inventories typically include annual as well as seasonal (summer and winter) emission estimates. Annual emission inventories represent the total emissions over an entire year (tons per year), or the daily emissions produced on an average day (tons per day). Seasonal inventories account for temporal activity variations throughout the year, as determined by category-specific temporal profiles. Since PM2.5 concentrations tend to be highest during the winter months, the emission inventory used in the Plan is based on the winter season (November through April).

Geographical Scope

The inventories presented in this Plan include emissions for the seven full counties (Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare) and the portion of Kern County that comprise the San Joaquin Valley Air Basin.

Quality Assurance and Quality Control

ARB has established a quality assurance and quality control (QA/QC) process involving ARB and District staff to ensure the integrity and accuracy of the emissions inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). ARB inventory staff works with District staff, who are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Area-wide source emission estimates are reviewed by ARB and District staff before their inclusion in the emission inventory. Additionally, CEIDARS is designed with automatic system checks to prevent errors such as double counting of emission sources. The system also makes various reports available to assist staff in their efforts to identify and reconcile anomalous emissions.

Future year emissions are estimated using the California Emission Projection Analysis Model (CEPAM). Growth and control factors are reviewed for each category and year along with the resulting emission projections. Year to year trends are compared to similar and past datasets to ensure general consistency. Emissions for specific categories are checked to confirm they reflect the anticipated effects of applicable control measures. Mobile categories are verified with mobile source staff for consistency with the on-road and off-road emission models.

A summary of the information supporting the San Joaquin Valley PM2.5 Nonattainment Area SIP emissions inventory is presented in the sections below.

Point Sources

The emissions inventory reflects actual emissions from industrial point sources reported to the District by the facility operators through calendar year 2012, in accordance with the requirements set forth in U.S. EPA's AERR rule. The data elements in the 2012 baseline inventory are consistent with the data elements required by the AERR rule. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations.

The point source categories that occur in the PM2.5 nonattainment area are listed in Table B-6.

Table B- 6 Point Source Categories

Source Category	Subcategory
Fuel Combustion	Electric Utilities Cogeneration Oil and Gas Production (Combustion) Petroleum Refining (Combustion) Manufacturing and Industrial Food and Agricultural Processing Service and Commercial Other (Fuel Combustion)
Waste Disposal	Sewage Treatment Landfills Incinerators Soil Remediation Other (Waste Disposal)
Cleaning and Surface Coatings	Laundering Degreasing Coatings and Related Process Solvents Printing Adhesives and Sealants Other (Cleaning and Surface Coatings)
Petroleum Production and Marketing	Oil and Gas Production Petroleum Refining Petroleum Marketing Other (Petroleum Production and Marketing)

Table B-7 Point Source Categories

Source Category	Subcategory
Industrial Processes	Chemical
	Food and Agriculture
	Mineral Processes
	Metal Processes
	Wood and Paper
	Glass and Related Products
	Electronics
	Other (Industrial Processes)

The point source inventory also includes emissions from stationary area sources, which are categories such as internal combustion engines and gasoline dispensing facilities that are not inventoried individually, but are estimated as a group and reported as a single source category. The District's methodologies encompassing over sixty individual stationary area source subcategories are available at: http://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/EmissionsMethods.htm

While emission estimates for most stationary area sources are provided by the District, the estimates for the following categories were developed by ARB:

Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 ARB methodology derived from the OFFROAD model. Additional information on this methodology is available at: http://www.arb.ca.gov/ei/areasrc/FULLPDF/FULL1-2.pdf

Agricultural Irrigation Pumps

Emissions from agricultural irrigation pumps are estimated from a model developed by ARB staff. Air districts with significant irrigated agricultural acreage provided estimates of the population and emissions from stationary and mobile diesel-fueled agricultural irrigation pumps. These data were reconciled with equipment population estimates from the 2003 US Department of Agriculture Farm and Ranch Irrigation Survey (FRIS). The inventory also reflects the number of pumps that have been replaced to date under the Carl Moyer Program. Emissions are forecasted using irrigated cropland acreage trends. Additional information on this methodology is available at: http://www.arb.ca.gov/regact/agen06/attach2.pdf

Laundering

This category includes emissions from perchloroethylene (perc) dry cleaning establishments. The emission estimates are based on a 2002 ARB methodology that used nationwide perc consumption rates allocated to the county level based on population and an emission factor of 10.125 pounds per gallon used. Emissions were grown from the original estimates to 2012 using population growth trends from the California Department of Finance. Additional information on this methodology is available at:
http://www.arb.ca.gov/ei/areasrc/onehtm/one3-1.htm

Degreasing

This category includes emissions from the use of solvents in degreasing operations in the manufacturing and maintenance industries. The emission estimates from this source category are based on a 1996 study by E.H. Pechan and Associates, Inc. (Pechan) titled, "Solvent Cleaning/Degreasing Source Category Emission Inventory." To estimate degreasing emissions, Pechan collected activity data by surveying solvent users in two major groups: manufacturing and maintenance. Emissions were estimated for 32 equipment and solvent pairs. For the manufacturer's survey, the emission factor for pure solvents is the density of the particular solvent. The emission factor for solvent blends is the density of the solvent multiplied by the total organic gas (TOG) content of the solvent. Exhaust controls were taken into account if used. For the maintenance survey, the emission factors are the density of the solvent with no exhaust controls. The 1993 emissions estimates were grown to 2012 based on manufacturing output data developed by Pechan. Additional information on this methodology is available at:
http://www.arb.ca.gov/ei/areasrc/onehtm/one3-2.htm

Oil and Gas Production

ARB staff updated the emission inventory for oil and natural gas production, which included the revision of emission estimates and the addition of emission categories that previously were not estimated. The revised emissions were calculated with a software tool developed by U.S. EPA that generates county-level emissions for upstream oil and gas activity. This tool uses 2011 as the base year, with activity data taken from the California Division of Oil, Gas, and Geothermal Resources (DOGGR) and an industry database, and default emission factors provided in an associated report. Staff incorporated data from ARB's 2007 Oil and Gas Industry Survey (e.g., typical component counts) and feedback from individual air districts (e.g., minimum controls required to operate in a certain district, with associated control factors) to improve these parameters and further adjust the tool's output. Emissions estimates for 2012 and other years were forecasted using the historical trend in statewide oil production from DOGGR, which assumes a 2.2 percent annual decline.

Gasoline Dispensing Facilities

ARB staff developed an updated methodology to estimate emissions from fuel transfer and storage operations at gasoline dispensing facilities (GDFs). The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The

updated methodology uses emission factors developed by ARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based the 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from ARB's on-road mobile sources model (EMFAC). Additional information on this category is available at:
http://www.arb.ca.gov/ei/areasrc/arbpetprodmarkpm.htm

Areawide Sources

Areawide sources are categories such as consumer products, fireplaces, and prescribed burning (see Table B-8) for which emissions occur over a wide geographic area. Emissions for these categories are estimated by both ARB and the local air districts using various models and methodologies.

Table B-8 Areawide Sources

Source Category	Subcategory
Solvent Evaporation	Consumer Products
	Architectural Coatings and Related Solvents
	Pesticides/Fertilizers
	Asphalt Paving and Roofing
Miscellaneous Processes	Residential Fuel Combustion
	Farming Operations
	Construction and Demolition
	Paved Road Dust
	Unpaved Road Dust
	Fugitive Windblown Dust
	Fires
	Managed Burning and Disposal
	Cooking

A summary of the areawide methodologies is presented below:

Consumer Products

The consumer products category reflects the three most recent surveys conducted by ARB staff for the years 2003, 2006, and 2008. Together these surveys collected updated product information and ingredient information for approximately 350 product categories. Based on the survey data, ARB staff determined the total product sales and total VOC emissions for the various product categories. The growth trend for most consumer product subcategories is based on the latest DOF human population growth

projections, except for aerosol coatings. Staff determined that a no-growth profile would be more appropriate for aerosol coatings based on survey data that show relatively flat sales of these products over the last decade. Additional information on ARB's consumer products surveys is available at: http://www.arb.ca.gov/consprod/survey/survey.htm.

Architectural Coatings

The architectural coatings category reflects emission estimates based on the comprehensive survey for the 2004 calendar year. The emission estimates include benefits of the 2003 and 2007 ARB Suggested Control Measures. These emissions are grown based on the growth in housing units. Additional information about ARB's architectural coatings program is available at: http://www.arb.ca.gov/coatings/arch/arch.htm

Pesticides

The Department of Pesticide Regulation (DPR) develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticides Use Report, which provides updated information from 1990 to the most current data year available. The inventory includes estimates through the 2012 calendar year. Emission forecasts for years 2013 and beyond are based on the average of the most recent five years.

Asphalt Paving/Roofing

Asphalt paving and asphalt roofing emissions were estimated using methodologies developed by the District. VOC emissions are estimated based on tons of paving applied in 2008 or the amount of asphalt used for roofing in 2007, and a default emission factor for each type of asphalt operation. The growth profile for asphalt paving is based on construction employment from the REMI forecasting model. No growth is assumed for asphalt roofing, as the industry has been moving toward the use of more advanced alternative materials. The inventory reflects the emission reductions from District Rule 4641. The District methodologies are available at: http://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/AsphaltPaving2008.pdf, and http://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/AsphaltRoofing2007.pdf

Residential Wood Combustion

The residential wood combustion methodology uses fuel consumption data from various surveys, including newer sales data for manufactured logs, and emission factors from U.S. EPA's National Emission Inventory. The fireplace wood consumption rate for 2008 and previous years is based on a 1997 firewood usage survey sponsored by the District. To reflect the episodic wood burning curtailment requirements in District Rule 4901 that became fully effective in 2009, the fireplace wood consumption rate for 2009 and subsequent years is based on the values suggested in a report by U.S. EPA staff and others entitled "A Recommended Procedure for Compiling Emission Inventory

National, Regional and County Level Activity Data for the Residential Wood Combustion Source Category." Staff assumed no growth for this category because of limits in new construction and the stringency of the District's rule. Additional information on this methodology is available at:
http://www.arb.ca.gov/ei/areasrc/arbmiscprocresfuelcom.htm

Residential Natural Gas Combustion

The inventory for residential natural gas combustion emissions is based on 2006 data provided by the District. Emissions are estimated based on the percentages of total natural gas consumed by various residential uses (space heating, water heating, cooking, other) obtained from the California Energy Commission (CEC), and U.S. EPA AP-42 emission factors. Emissions were grown from 2006 using CEC projections of natural gas consumption. The water heating inventory reflects the emission reductions from District Rule 4902. The District's methodology is available at:
http://www.valleyair.org/Air_Quality_Plans/EmissionsMethods/MethodForms/Current/ResidentialNG2006.pdf

Farming Operations – Land Preparation and Harvesting

Emissions for land preparation and harvesting operations were estimated using ARB methodologies that reflect the 2012 harvested acreage and crop mix from the National Agricultural Statistics Service (NASS). NASS data are based on reports compiled by the Agricultural Commissioner for each county. The growth profile for these categories is based on a linear regression analysis of the 2000-2009 farm acreage estimates from the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP), which results in a slight decline of about 0.3 percent per year. The inventory also reflects the emission reductions from District Rule 4550. Additional information on ARB's methodologies is available at:
http://www.arb.ca.gov/ei/areasrc/arbmiscprocfarmops.htm

Farming Operations – Livestock Husbandry

Emission estimates for dairy, feedlot, and range cattle reflect livestock population data from the U.S. Department of Agriculture's (USDA) 2012 Census of Agriculture, and emission factors for dairy support cattle provided by District staff. The emission estimates for other livestock categories are based on the USDA 2007 Census of Agriculture. Dairy emissions growth assumptions were set to no-growth based on an analysis of the SJV historical dairy cow population, which shows a relatively flat profile since 2007. Other livestock categories reflect a no-growth assumption based on an earlier analysis that found no significant growth. The emissions reflect updated District control profiles to account for control requirements, including VOC controls from District Rule 4570. Additional information on this methodology is available at:
http://www.arb.ca.gov/ei/areasrc/arbmiscproclivestock.htm

Construction and Demolition

Dust emissions from building and road construction operations are based on methodologies developed by ARB. Both methodologies employ disturbed acreage as the activity data and apply emission factors developed by Midwest Research Institute.

The emission estimates were grown to 2012 based on REMI forecasting models for construction activity and employment. Road construction growth also includes estimates of annual road lane-miles constructed, based on forecasts by local transportation planning agencies. The inventory reflects the emission reductions from District Regulation VIII. The methodologies are available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocconstdem.htm

Paved Road Dust

Paved road dust emissions were estimated using an ARB methodology consistent with the current U.S. EPA method (AP-42). The 2012 emission estimates are based on vehicle miles traveled (VMT) data from the local MPOs, California-specific silt loading values, updated VMT distribution (travel fractions) for various paved road categories, and a county specific rain adjustment. Emissions were grown using VMT projections from EMFAC2014. The inventory also reflects the emission reductions from District Rules 803 and 805. Additional information is available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocpaverddst.htm

Unpaved Road Dust – Farm Roads

The unpaved farm road dust estimates are based on the 2012 harvested acreage data from NASS, crop specific VMT factors, and an emission factor of 2.00 lbs PM10/VMT based on California test data. Growth for this category is based on linear regression analyses of the 2000-2009 farmland acreage. In addition, the inventory reflects the emission reductions from District Rule 806. Additional information on this methodology is available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm

Unpaved Road Dust – Nonfarm Roads

Emissions from unpaved nonfarm roads were estimated from 2008 unpaved road data collected from the California Statewide Local Streets and Roads Needs Assessment, the California Department of Transportation, and local agencies. Dust emissions were calculated using an emission factor derived from tests conducted by the University of California, Davis, and the Desert Research Institute. Staff assumed no growth for this category based on the assumption that existing unpaved roads tend to get paved as vehicle traffic on them increases, which counteracts any additional emissions from new unpaved roads. Additional information on this methodology is available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm

Windblown Dust

Emissions for this source category were estimated based on ARB's 1997 methodology. The methodology uses 1993 agricultural land acreage and unpaved road mileage along with a California-specific wind erosion equation that incorporates local attributes such as climate, soil, and vegetative cover. Agricultural land windblown dust emissions were grown based on a linear regression analysis of the 2000-2009 FMMP data. Windblown dust emissions from unpaved roads reflect a no-growth assumption. Additional information on this methodology is available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm

Fires

Emissions from structural and automobile fires were estimated using ARB's March 1999 methodology. Structural fire emissions estimates are based on rates of structural and content material loss per fire, average combustible content, and an emission factor per ton of material burned. Automobile fire emissions are based the number of vehicle fires per year and a composite emission factor from US EPA's AP-42 (April 1973). Structural fire emissions were grown based on the growth in occupied households, and automobile fire emissions were grown based on population projections from the California Department of Finance. ARB's methodology is available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocfires.htm

Managed Burning & Disposal

The managed burning and disposal category is based on emissions data reported by District staff for 2012. Emissions are calculated using crop specific emission factors and fuel loadings. The agricultural burning emissions were grown based on linear regression analyses of the 2000-2009 farmland acreage. Staff used a no-growth assumption for forest management emissions based on analyses of District reported data that don't show a discernible trend. No-growth was also used for weed abatement, as the emission levels for this category have been fairly stable since 2005. ARB's methodology for managed burning is available at: http://www.arb.ca.gov/ei/see/see.htm

Commercial Cooking

The commercial cooking inventory is based on emissions data reported by the District for 2008. The emissions estimates were developed from the number of restaurants, the number and types of cooking equipment, the food type, and emission factors from U.S. EPA's 2002 National Emissions Inventory. The growth profile reflects the latest population projections provided by the California Department of Finance (DOF). The inventory also reflects the emission reductions from District Rule 4692. Additional information on the District's methodology is available at: http://www.arb.ca.gov/ei/areasrc/districtmeth/sjvalley/CommercialCooking2006.pdf

Ammonia Emissions

Ammonia emissions from miscellaneous domestic processes (human respiration and perspiration, smoking, pets, untreated human waste, etc.) were grown from a 2005 ARB estimate using DOF population projections. Ammonia emissions for other categories such as residential wood combustion, livestock husbandry, managed burning, on-road motor vehicles, were estimated as part of the methodologies for those specific area source categories.

Point and Areawide Source Emissions Forecasting

Emission forecasts (2013 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented in Table B-9 below.

Table B-9 Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Electric Utilities	Natural Gas	CEC Integrated Energy Policy Report (IEPR 2013)
	Other Fuels	Annual Energy Outlook 2011(AEO 2011): Energy consumption forecasts
Cogeneration	Natural Gas	IEPR 2013
	Other Fuels	AEO 2011
Oil and Gas Production (Combustion)	All	DOGGR statewide total oil production (2.2% annual decline)
Petroleum Refining	All	No growth – facilities operating at capacity
Manufacturing & Industrial	Natural Gas	IEPR 2013
	Other Fuels	AEO 2011
Food & Agricultural Processing	Ag Irrigation Pumps	Farmland acreage
	Other	IEPR 2013 & AEO 2011
Service & Commercial	Natural Gas	IEPR 2013
	Other Fuels	AEO 2011
Other (Fuel Combustion)	I.C. Reciprocating Engines	Cal. Department of Finance (DOF) population projections
	Other	AEO 2011
Sewage Treatment	All	Regional Economic Models, Inc. (REMI) industry-specific outputs
Landfills	Stationary Aggregated (SA) Sources	DOF population projections
	Point Sources	REMI industry-specific outputs
Incinerators	All	REMI industry-specific outputs
Soil Remediation	All	REMI industry-specific outputs
Other (Waste Disposal)	SA Sources	DOF Population projections
Other (Waste Disposal)	Point Sources	REMI industry-specific outputs
Laundering	SA Sources	DOF Population projections
	Point Sources	REMI industry-specific outputs
Degreasing	All	REMI industry-specific outputs

Source Category	Subcategory	Growth Surrogate
Coatings & Related Process Solvents	All	REMI industry-specific outputs
Printing	All	REMI industry-specific outputs
Adhesives & Sealants	All	REMI industry-specific outputs
Other (Cleaning & Surface Coatings)	All	REMI industry-specific outputs
Oil & Gas Production	All	DOGGR statewide total oil production (2.2% annual decline)
Petroleum Marketing	Gasoline Dispensing Facilities	Gasoline consumption projections (EMFAC2014)
	Natural Gas Transmission Losses	DOGGR and CEC natural gas consumption
	Point Sources	REMI industry-specific outputs
Other (Petroleum Production & Marketing)	All	REMI industry-specific outputs
Chemical	All	REMI chemical manufacturing output
Food & Agriculture	All	REMI food manufacturing output
Mineral Processes	Cement Concrete Manufacturing & Fabrication	REMI cement and concrete products manufacturing output
	Cement (Portland & Others) Manufacturing	AEO 2011
	Other	REMI non-metallic mineral product manufacturing output
Metal Processes	All	REMI industry-specific outputs
Wood & Paper	All	REMI wood product and paper manufacturing output
Glass & Related Products	Flat Glass	Construction equipment curve, capped at pre-recession levels
	Container Glass	No growth
Other (Industrial Processes)	All	REMI manufacturing Output
Consumer Products	Consumer Products	Population projections
	Aerosol Coatings	No growth
Architectural Coatings & Thinners	All	Household projections
Pesticides & Fertilizers	Agricultural Pesticides	Farmland acreage
	Structural Pesticides	Housing expenditures
Asphalt Paving	Asphalt Paving	Construction employment
Asphalt Roofing	Asphalt Roofing	No growth
Residential Fuel Combustion	Wood Stoves and Fireplaces	No growth
	Others	Natural gas consumption

Source Category	Subcategory	Growth Surrogate
Farming Operations	Land Preparation and Harvest	Farmland acreage
Farming Operations	Livestock	No growth
Construction and Demolition	Building Construction Dust	Construction employment
	Road Construction Dust	MPO road construction data
Paved Road Dust	All	Vehicle miles traveled (VMT)
Unpaved Road Dust	U.S. Forest & Park Service Roads	No growth
	Farm Roads	Farmland acreage
	City & County Roads	No growth
Fugitive Windblown Dust	Dust from Agricultural or Pasture Lands	Farmland acreage
	Dust from Unpaved Roads	No growth
Fires	Structural Fires	Household projections
	Automobile Fires	Population projections
Managed Burning & Disposal	Ag Burning - Prunings or Field Crops	Farmland acreage
	Forest Management	No Growth
	Weed Abatement	No Growth
Cooking	All	Population projections

Control Profiles

The emissions inventory reflects emission reductions from point and areawide sources subject to District rules. The local rules reflected in the inventory are listed in Table B-10 below.

Table B-10 District Rules Included in the SIP Inventory

Rule No.	Rule Title	Source Categories Impacted
4103	Open Burning	Agricultural burning
4204	Cotton Gins	Agricultural crop processing losses - Cotton ginning facilities
4305	Boilers, Process Heaters, and Steam Generators	Fuel combustion - Boilers, Process Heaters, and Steam Generators
4306	Boilers, Process Heaters, and Steam Generators	Fuel combustion - Boilers, Process Heaters, and Steam Generators

Rule No.	Rule Title	Source Categories Impacted
4307	Boilers, Process Heaters, and Steam Generators	Fuel combustion - Boilers, Process Heaters, and Steam Generators
4308	Boilers, Process Heaters, and Steam Generators	Fuel combustion - Boilers, Process Heaters, and Steam Generators
4309	Dryers, Dehydrators, and Ovens	Laundering; manufacturing & industrial; service & commercial
4320	Boilers, Process Heaters, and Steam Generators - Advanced Options for Emission Reduction	Fuel combustion - Boilers, Process Heaters, and Steam Generators
4352	Solid Fuel Fired Boilers, Steam Generators and Process Heaters	Fuel combustion - Boilers, Process Heaters, and Steam Generators
4354	Glass Melting Furnaces	Glass and related processes
4401	Steam-Enhanced Crude Oil Production Well Vents	Oil and gas production
4402	Crude Oil Production Sumps	Oil and gas production
4404	Heavy Oil Test Station - Kern County	Oil and gas production
4408	Glycol Dehydration Systems	Oil and gas production
4409	Components at Gas/Oil Production Facilities	Oil and gas production
4453	Refinery Vacuum Producing Devices or Systems	Petroleum refining
4455	Components at Refineries & Chemical Plants	Petroleum refining
4550	Conservation Management Practices	Agricultural operations, dust, and managed burning
4565	Biosolids, Animal Manure, and Poultry Litter Operations	Composting operations
4566	Organic Material Composting Operations	Composting operations
4570	Confined Animal Facilities	Livestock operations
4601	Architectural Coatings	Architectural coatings
4602	Motor Vehicle and Mobile Equipment Coating Operations	Coating and related processes
4603	Surface Coating of Metal Parts and Products	Coating and related processes
4604	Can and Coil Coating Operations	Coating and related processes
4605	Aerospace Assembly and Component Coating Operations	Coating and related processes
4606	Wood Coating Operations	Coating and related processes
4607	Graphic Arts	Coating and related processes; printing
4610	Glass Coating Operations	Coating and related processes
4612	Automotive Coatings	Coating and related processes

Rule No.	Rule Title	Source Categories Impacted
4621	Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants	Petroleum marketing
4622	Gas Transfer into Vehicle Storage Tanks	Petroleum marketing
4623	Storage of Organic Liquids	Oil and gas production; petroleum refining; petroleum marketing
4624	Organic Liquid Loading	Petroleum marketing
4625	Wastewater Separators	Petroleum refining - Wastewater treatment
4641	Cutback, Slow Cure, and Emulsified Asphalt Paving and Maintenance Operations	Asphalt paving & roofing
4642	Solid Waste Disposal Sites	Landfills; waste disposal
4651	Volatile Organic Compound Emissions from Decontaminated Soil	Waste disposal - Soil remediation
4653	Adhesives and Sealants	Adhesives & sealants
4661	Organic Solvents	Coatings and related process solvents; cleaning and surface coatings
4662	Organic Solvent Degreasing Operations	Degreasing; thinning and cleanup solvent uses
4663	Organic Solvent Cleaning, Storage and Disposal	Degreasing; thinning and cleanup solvent uses; cleaning & surface coating
4672	Petroleum Solvent Dry Cleaners	Laundering
4681	Rubber Tire Manufacturing	Chemical - Rubber and rubber products manufacturing
4682	Polystyrene	Chemical - Plastic and plastic products manufacturing
4684	Polyester Resin Operations	Chemical - Plastic and plastic products manufacturing
4691	Vegetable Oil Processing Operations	Food and agriculture
4692	Commercial Charbroiling	Cooking
4693	Bakery Ovens	Food and agriculture
4701	Internal Combustion Engines (Phase 1)	Fuel combustion
4702	Internal Combustion Engines (Phase 2)	Fuel combustion
4703	Stationary Gas Turbines	Fuel combustion
4901	Wood Burning Fireplaces and Wood Burning Heaters	Residential wood combustion
4902	Residual Water Heaters	Residential fuel combustion - Water heating

Rule No.	Rule Title	Source Categories Impacted
REG VIII	Regulation VIII -- PM Control for Fugitive Dust	Construction and demolition; paved and unpaved road dust; fugitive windblown dust; mineral processes

On-Road Mobile Sources

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using ARB's EMFAC2014 model. The on-road emissions were calculated by applying EMFAC2014 emission factors to the transportation activity data provided by the local MPOs from their 2014 adopted Regional Transportation Plan.

EMFAC2014 includes data on California's car and truck fleets and travel activity. Light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2012 California Department of Motor Vehicles data. The model also reflects the emissions benefits of ARB's recent rulemakings such as the Pavley Standards and Advanced Clean Cars Program, and includes the emissions benefits of ARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2014 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2012 Department of Motor Vehicles (DMV) registration data along with updates to mileage accrual using Smog Check data. Updates to heavy-duty trucks include model year specific emission factors based on new test data, and population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state trucks.

Additional information and documentation on the EMFAC2014 model is available at: http://www.arb.ca.gov/msei/categories.htm#emfac2014

Off-Road Mobile Sources

Emissions from off-road sources were estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models were developed to support recent regulations, including in-use off-road equipment, ocean-going vessels and others. The sections below summarize the updates made to specific off-road categories.

Oil and Gas Wells: Workover Rigs, Drill Rigs and Support Equipment Allocation

The allocation of drill and work-over rigs and support equipment (such as pumps) for oil and gas wells was updated within the SJV Air Basin to reflect the physical location of wells instead of the registration location. This allocation was done at the county level, where the number of wells within a county in the SJV Air Basin was used to determine that county's share of emissions from specified equipment. The physical location and

count of wells was updated using Division of Oil, Gas and Geothermal Resources (DOGGR) Well Finder data, from September, 2013, supplied to ARB by the District. (DOGGR data are available at: http://www.conservation.ca.gov/dog/Pages/Wellfinder.aspx)

Ocean-Going Vessels (OGV)

Staff updated the OGV activity growth rates and NOx emission calculations in September 2013. These updates reflect more recently available long-term economic forecasts and historical data from 2006 to 2012. ARB staff updated the long-term growth factors for container ships, auto ships, tankers, and cruise ships. Additional information is available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Cargo Handling Equipment

The emissions inventory for the Cargo Handling Equipment category has been updated to reflect new information on equipment population, activity, recessionary impacts on growth, and engine load. The new information includes regulatory reporting data which provide an accounting of all the cargo handling equipment in the State including their model year, horsepower and activity. Additional information is available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Pleasure Craft and Recreational Vehicles

A new model was developed in 2011 to estimate emissions from pleasure craft and recreational vehicles. In both cases, population, activity, and emission factors were re-assessed using new surveys, registration information, and emissions testing. Additional information is available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

In-Use Off-Road Equipment

ARB developed this model in 2010 to support the analysis for amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation. Staff updated the underlying activity forecast to reflect more recent economic forecast data, which suggests a slower rate of recovery through 2024 than previously anticipated. Additional information is available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Locomotives

In 2014, ARB developed a revised inventory for line-haul locomotive activity in California. The new model is based primarily on activity data reported to ARB by the major rail lines for calendar year 2011. To estimate emissions, ARB used duty cycle, fuel consumption and activity data reported by the rail lines. Activity is forecasted for individual train types and is consistent with ARB's ocean-going vessel and truck growth rates. Fuel efficiency improvements are projected to follow Federal Railroad Association projections and turnover assumptions are consistent with U.S. EPA projections. Additional information is available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Transport Refrigeration Units (TRU)

This model reflects updates to activity, population, growth and turn-over data, and emission factors developed to support the 2011 amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units. Additional information is available at:
http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Fuel Storage and Handling

Emissions for fuel storage and handling were estimated using the OFFROAD2007 model. Additional information is available at:
http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Diesel Agricultural Equipment

The inventory for agricultural diesel equipment (such as tractors, harvesters, combines, sprayers and others) was revised based on a 2008 survey of thousands of farmers, custom operators, and first processors. The survey data, along with information from the 2007 USDA Farm Census, was used to revise almost every aspect of the agricultural inventory, including population, activity, age distribution, fuel use, and allocation. This updated inventory replaces general information on farm equipment in the United States with one specific to California farms and practices. The updated inventory was compared against other available data sources such as Board of Equalization fuel reports, USDA tractor populations and age, and Eastern Research Group tractor ages and activity, to ensure the results were reasonable and compared well against outside data sources. Agricultural growth rates through 2050 were developed through a contract with URS Corp and UC Davis, in cooperation with the SJV agricultural community. Additional information is available at:
http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Mobile Source Forecasting

The table below summarizes the data and methods used to forecast future-year mobile source emissions by broad source category groupings.

Table B-11 Growth Surrogates for Mobile Sources

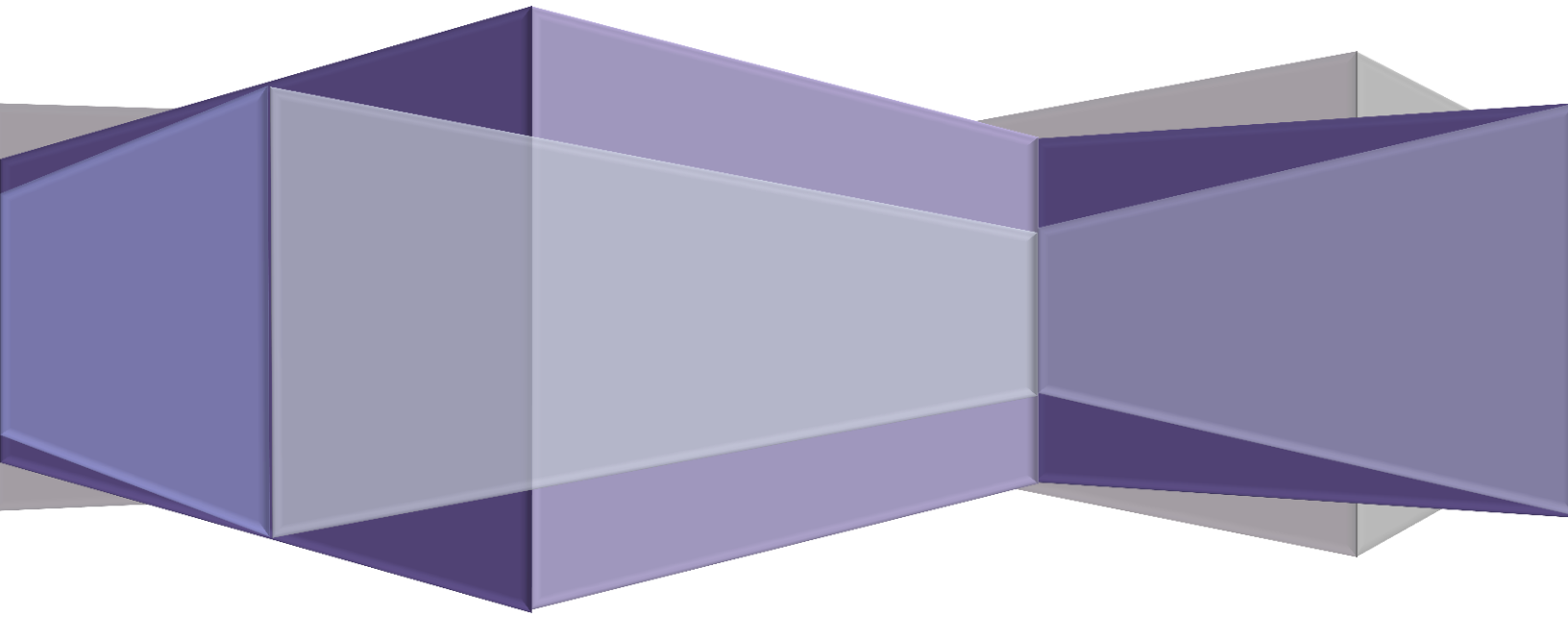
Category	Growth Methodology
On-Road Sources	
All	Match total VMT projections provided by Municipal Planning Organizations
Off-Road Gasoline Fueled Equipment	
Lawn & Garden	Household growth projection

Category	Growth Methodology
Off-Road Equipment	Employment growth projection
Recreational Boats	Housing starts (short-term) and human population growth (long-term)
Recreational Vehicles	Housing starts (short-term) and human population growth (long-term)
Off-Road Diesel-Fueled Equipment	
Commercial Harbor Craft	Growth rates provided by District, except for tugs and fishing vessels. Fishing fleet growth rates were adjusted to reflect a decline in fish landings. Assumed no growth for tugboats.
Construction and Mining	California construction employment data from U.S. Bureau of Labor Statistics
Farm Equipment	2011 study of forecasted growth by URS Corp, with SJV Advisory Committee funding.
Industrial Equipment	California construction employment data from Bureau of Labor Statistics
Oil Drilling	California oil and gas extraction gross domestic product from the U.S. Bureau of Economic analysis, oil company diesel fuel use published by the U.S. Energy Information Administration, California rotary rig counts from Baker Hughes, and California oil and gas extraction employment from the U.S. Bureau of Labor Statistics
Ocean-Going Vessels	Projected commodity tonnage in the Freight Analysis Framework (FAF) Model developed by the Federal Highway Administration
Trains (line haul)	International/premium train growth tied to OGV forecast; Domestic train growth tied truck growth
Transport Refrigeration Units	Projection of historical Truck/Trailer TRU sales from ACT Research, adjusted for recession.

Appendix C

SIP Creditable Incentive-Based Emission Reductions

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Appendix C: SIP Creditable Incentive-Based Emission Reductions

The Clean Air Act (CAA) explicitly provides for the use of economic incentives as one tool for states to use to achieve attainment of the NAAQS. In light of the increasing incremental cost associated with further stationary and mobile source emission reductions and the difficulty of identifying such additional sources of emission reductions in many areas, EPA encourages innovative approaches to reducing emissions though economic incentive programs, including "voluntary" and "emerging" measures.[1]

When a state relies upon an economic incentive program, EPA evaluates the programmatic elements of the measure to determine whether the resulting emission reductions are quantifiable, surplus, enforceable and permanent. In this *2016 PM2.5 Plan* the District is claiming 3.0 tons per day of incentive based emission reductions that will be credited for contingency in 2019. The projects identified in Table C-1 are Heavy-Duty Off-Road Engine Vehicle Replacements administered following 2011 Moyer Guidelines. As such, the discussion in this appendix, for purposes of this plan will focus on the 2011 Moyer Guidelines.

C.1 EPA PROGRAM REQUIREMENTS

According to EPA guidelines, there are four necessary elements to demonstrate the integrity of incentive programs that are to be credited as achieving emission reductions towards a SIP – the reductions from these programs must be enforceable, quantifiable, surplus, and permanent.[2] These integrity elements are defined below.

Enforceable: Emission reductions and/or required actions are enforceable if they are independently verifiable and practically enforceable consistent with EPA guidance; program violations are defined; those liable can be identified; the state or EPA may apply penalties and secure corrective action where applicable; citizens have access to all emissions-related information obtained from participating sources.

Quantifiable: To show that emission reductions from these incentive programs are quantifiable, the emission reductions must be measured in a reliable manner that can be replicated.

Surplus: Emission reductions are surplus when they are not otherwise required by or assumed in a SIP-related program (e.g., an attainment or reasonable further progress

[1] 1997 VMEP; 2004 Emerging and Voluntary Measures Guidance; 2014 Diesel Retrofits Guidance; and "Guidance on Incorporating Bundled Measures in a State Implementation Plan," August 16, 2005

[2] See "Guidance on Incorporating Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIPs)," October 24, 1997, at pages 6-7; "Improving Air Quality with Economic Incentive Programs," January 2001 at Section 4.1; "Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)," September 2004 at pages 3-4; and "Diesel Retrofits: Quantifying and Using Their Emission Benefits in SIPs and Conformity," February 2014 at pages 27-29.

plan or a transportation conformity demonstration), any other adopted state/local air quality program, a consent decree, or a federal rule designed to reduce criteria pollutant or precursor emissions. Also, emission reductions are "surplus" only for the remaining useful life of the vehicle, engine or equipment being replaced.

Permanent: Emission reductions from incentive programs are permanent if the State and EPA can ensure that emission reductions occur for as long as they are relied upon in the SIP, and no longer than the remaining useful life of the vehicle, engine or equipment being replaced.

C.2 DEMONSTRATION THAT INCENTIVE BASED EMISSION REDUCTIONS MEASURES MEET EPA REQUIREMENTS

The Carl Moyer Program is a grant program that funds the incremental cost of cleaner-than-required engines and equipment. Adopted in 1999 by ARB, this program was created through a public process and provides incentives to help obtain early or extra emission reductions, especially from emission sources in environmental justice communities and areas disproportionately impacted by air pollution with a primary objective of obtaining cost-effective and surplus emission reductions.

The Carl Moyer Program has been successfully implemented through the cooperative efforts of ARB and air districts in California. As directed by the California Health and Safety Code, ARB's role is to oversee the Carl Moyer Program by managing program funds, developing and maintaining guidelines, and determining cost-effectiveness methodologies. Air districts use the Carl Moyer Program Guidelines to select, fund, and monitor projects in their jurisdiction by providing grants to public and private entities.

The Carl Moyer Program guidelines include robust administrative requirements to ensure that emission reductions are enforceable and are achieved throughout the life of a project. The District has used the Carl Moyer Program Guidelines to develop the practices that are currently in place to ensure all EPA integrity principles of Surplus, Quantifiable, Enforceable, and Permanent are met. The following is a summary of how the Carl Moyer Program Guidelines meet each SIP-creditability criterion:

Surplus

The Carl Moyer Program Guidelines ensure that projects are surplus to regulations by only allowing projects to be selected that are not required by any federal, state, or local regulation, memorandum of agreement/understanding with a regulatory agency, settlement agreement, mitigation requirement, or other legal mandate. For example, the guidelines have accounted for each adopted regulation to determine the compliance dates of any affected engines and emission benefits claimed by each regulation have been determined. Minimum project lives are established in each component to ensure that the program does not fund actions taken to comply with regulatory deadlines. The minimum project life requirement also ensures the overall cost effectiveness of the program and that the emission reductions are real for the life of the project.

In some cases, a split project life methodology is utilized to properly account for all possible emission reductions while still ensuring that the emission reductions being claimed are surplus. In the case of split project life calculations, the first calculation captures the surplus between the baseline (tier 1 or tier 2) technology and a new tier 4 for the length of time until the rule compliance deadline. The second calculation captures the surplus from tier 4 (compliance requirement baseline) to electric for the remainder of the project life. Projects that are subject to the split life calculation methodology typically have a total project life of ten (10) years.

The District has utilized a split project life for tier 1 and tier 2 diesel agricultural irrigation pumps being replaced with new electric motors. These diesel engines are required by the District's Rule 4702 to upgrade to a tier 4 diesel engine by 12/31/2013. The project life is split between the surplus time for Rule 4702 (baseline to tier 4) and the remainder of the allowable 10 years for the reduced technology to the electric motor (tier 4 to electric).

The summary below provides more detail about how the 2011 Carl Moyer Program Guidelines ensure that the SIP-creditability integrity principle of "Surplus" is fulfilled:

- *Requirement that emission reductions generated by incentive programs are not required by other regulation*
    - (Moyer Guidelines Chapter 2, Project Criteria A, H, I, MM).
- *Protocols for quantifying maximum project life and maximum emission reductions which account for upcoming regulatory deadlines for a given source category*
    - (Moyer Guidelines Chapter 2, Project Criteria B, I and MM).
- *Assurance that baseline equipment was in use*
    - (Moyer Guidelines Chapter 3, Section Z.6(B) and AA.2.).
- *Assurance that new/upgraded equipment is not already accounted for in future-year inventories underlying a SIP attainment demonstration by natural fleet turnover, finite equipment life or incentives*
    - The definition of surplus in the Moyer guidelines requires that the emission reductions achieved are above and beyond those required under existing regulations that are incorporated into a SIP. As part of the SIP development process, ARB reviews the Moyer project mix to ensure that the amount of emission reductions credited to the program are not included in the future year inventories specific to each individual attainment demonstration.
- *Procedures that ensure that old equipment was used in the geographic area of interest*
    - (Moyer Guidelines, Chapter 2, Section S and Chapter 3, Section Z.6.(B)).

Quantifiable

The District evaluates the potential emission reductions that would be achieved by replacing the old equipment with the new equipment using the established calculation methodologies and emissions factors in the program guidelines. The calculation methodology, including calculation formulas, assumptions, emission factors and sample

calculations are part of the Carl Moyer Program Guidelines and have been approved through a public process. To ensure that real, quantifiable emission reductions are achieved over the life of a project, the program guidelines require that emission control technologies be certified or verified by ARB (certification or verification by the EPA or International Maritime Organization may be allowed for some source categories for which ARB does not have a certification or verification program). The summary below provides more detail about how the 2011 Carl Moyer Program Guidelines ensure that the SIP-creditability integrity principle of "Quantifiable" is fulfilled:

- *Emissions data needed to calculate emission reductions must be publicly available, current, and accurate. This should include appropriate emission factors, load factors, and other conversion factors.*
    - Moyer Guidelines, Appendix D (Publicly Available) and Chapter 1, Section E.7 (Allows ARB Executive Officer to modify the Guidelines under a public process, to keep them effective and up-to-date.)
- *Guidelines include necessary formulas and instructions to calculate emission reductions based on above data, and explicit instructions to ensure appropriate data are used in calculations*
    - Moyer Guidelines, Appendix C (contains formulas and instructions)
    - Moyer Guidelines, Supplemental document, "Sample Calculations" (contains formulas and instructions)
    - Moyer Guidelines, Appendix C, Section B.5, and Supplemental document, "Sample Calculations" (contains explicit instructions regarding inputs)
- *Requirement to provide activity data sufficient to determine actual emission reductions*
    - Moyer Guidelines, Chapter 3, Section Z.6.(B)
- *Requirement to demonstrate the percentage of emission reductions that occur in the geographic area of interest, and that emission reductions are therefore SIP creditable*
    - Moyer Guidelines, Section S.
    - Moyer Guidelines, Section Z.6.(B)
- *Requirement to periodically audit completed projects to verify emission reduction projections are fulfilled*
    - Moyer Guidelines Chapter 2, Sections Z.10.
    - Moyer Guidelines Chapter 3, Sections EE.

Enforceable

Emission reductions and other required actions are enforceable if: they are independently verifiable; program violations and those liable are defined; information needed to determine emission reductions is available to the public; and they are practicably enforceable in accordance with other EPA guidance on practicable enforceability. The summary below provides more detail about how the 2011 Carl Moyer Program Guidelines ensure that the SIP-creditability integrity principle of "Enforceable" is fulfilled:

- *Require Grantees to provide all necessary recordkeeping and reporting needed to verify emission reductions*
    - Moyer Guidelines, Chapter 3, Section Z.9 and DD
- *Require inspections to ensure incentive program information is consistent with actual operating equipment*
    - Moyer Guidelines Chapter 3, Sections AA and BB.
- *Identify liable parties and liability associated with contract noncompliance*
    - Moyer Guidelines Chapter 3, Section Z.11.

Permanent

To ensure that the SIP-creditable emission reductions are permanent, actions such as pre-inspections and post-inspections of the new equipment and verification that the baseline equipment has been destroyed through the required process as described in the program guidelines are performed. The summary below provides more detail about how the 2011 Carl Moyer Program Guidelines ensure that the SIP-creditability integrity principle of "Permanent" is fulfilled:

- *Data needed to determine and track location of activity*
    - Moyer Guidelines, Chapter 3, Section DD
- *Provisions for ensuring that the project was completed, including the verification of disposition of baseline equipment.*
    - Moyer Guidelines Chapter 3, Sections AA and BB

C.3 IDENTIFICATION OF INCENTIVE BASED PROJECTS

The following table identifies the specific incentive grant programs expected to provide the requisite emission reductions for purposes of this *2016 PM2.5 Plan*.

Table C-1 Carl Moyer Heavy-Duty Vehicle Replacement (2011 Moyer Guidelines)

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-7664-A	1	Off-Road Equipment	07/29/2011	10	0.19
C-8278-A	1	Off-Road Equipment	08/15/2011	10	2.71
C-8508-A	1	Off-Road Equipment	08/17/2011	10	0.54
C-8493-A	1	Off-Road Equipment	08/17/2011	10	0.50
C-8504-A	1	Off-Road Equipment	08/17/2011	10	0.50
C-8507-A	1	Off-Road Equipment	08/17/2011	10	0.50
C-8511-A	1	Off-Road Equipment	08/17/2011	10	0.44
C-8542-A	1	Off-Road Equipment	08/17/2011	10	0.04
C-8541-A	1	Off-Road Equipment	08/17/2011	10	0.03
C-7477-A	1	Off-Road Equipment	08/19/2011	10	0.74
C-7478-A	1	Off-Road Equipment	08/19/2011	10	0.44
C-7782-A	1	Off-Road Equipment	08/23/2011	10	0.61
C-7783-A	1	Off-Road Equipment	08/23/2011	10	0.61

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-7784-A	1	Off-Road Equipment	08/23/2011	10	0.58
C-7786-A	1	Off-Road Equipment	08/23/2011	10	0.55
C-7780-A	1	Off-Road Equipment	08/23/2011	10	0.39
C-7785-A	1	Off-Road Equipment	08/23/2011	10	0.24
C-8677-A	1	Off-Road Equipment	08/23/2011	10	0.14
C-8291-A	1	Off-Road Equipment	08/24/2011	10	1.84
C-7768-A	1	Off-Road Equipment	08/24/2011	10	1.47
C-8560-A	1	Off-Road Equipment	08/30/2011	10	0.84
C-7506-A	1	Off-Road Equipment	08/30/2011	10	0.35
C-7250-A	1	Off-Road Equipment	08/30/2011	10	0.15
C-7879-A	1	Off-Road Equipment	08/31/2011	10	1.86
C-7146-A	1	Off-Road Equipment	08/31/2011	10	1.69
C-8836-A	1	Off-Road Equipment	08/31/2011	10	0.77
C-8077-A	2	Off-Road Equipment	09/01/2011	10	0.23
C-7149-A	1	Off-Road Equipment	09/02/2011	10	1.79
C-7113-A	1	Off-Road Equipment	09/07/2011	10	0.56
C-8127-A	1	Off-Road Equipment	09/13/2011	10	0.07
C-8129-A	1	Off-Road Equipment	09/13/2011	10	0.07
C-8131-A	1	Off-Road Equipment	09/13/2011	10	0.07
C-7860-A	1	Off-Road Equipment	09/20/2011	10	1.06
C-7849-A	1	Off-Road Equipment	09/20/2011	10	0.77
C-7840-A	1	Off-Road Equipment	09/20/2011	10	0.65
C-7852-A	1	Off-Road Equipment	09/20/2011	10	0.65
C-7843-A	1	Off-Road Equipment	09/20/2011	10	0.54
C-7861-A	1	Off-Road Equipment	09/20/2011	10	0.48
C-7850-A	1	Off-Road Equipment	09/20/2011	10	0.42
C-7863-A	1	Off-Road Equipment	09/20/2011	10	0.42
C-7848-A	1	Off-Road Equipment	09/20/2011	10	0.41
C-7844-A	1	Off-Road Equipment	09/20/2011	10	0.39
C-7851-A	1	Off-Road Equipment	09/20/2011	10	0.34
C-7853-A	1	Off-Road Equipment	09/20/2011	10	0.26
C-7846-A	1	Off-Road Equipment	09/20/2011	10	0.12
C-7718-A	1	Off-Road Equipment	09/21/2011	10	0.69
C-7772-A	1	Off-Road Equipment	09/23/2011	10	1.08
C-8107-A	1	Off-Road Equipment	09/26/2011	10	1.59
C-8768-A	1	Off-Road Equipment	09/26/2011	10	0.51
C-8952-A	1	Off-Road Equipment	09/26/2011	10	0.37
C-8510-A	1	Off-Road Equipment	09/28/2011	10	0.50
C-7862-A	1	Off-Road Equipment	09/29/2011	10	0.08
C-8213-A	1	Off-Road Equipment	09/29/2011	10	0.01
C-8214-A	1	Off-Road Equipment	09/29/2011	10	0.01
C-8216-A	1	Off-Road Equipment	09/29/2011	10	0.01
C-8617-A	1	Off-Road Equipment	09/29/2011	10	0.01
C-8147-A	1	Off-Road Equipment	10/04/2011	10	0.25
C-7503-A	1	Off-Road Equipment	10/06/2011	10	1.82
C-7502-A	1	Off-Road Equipment	10/06/2011	10	1.43
C-8550-A	1	Off-Road Equipment	10/13/2011	10	0.80

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8557-A	1	Off-Road Equipment	10/13/2011	10	0.70
C-8564-A	1	Off-Road Equipment	10/17/2011	10	0.04
C-8566-A	1	Off-Road Equipment	10/17/2011	10	0.04
C-8568-A	1	Off-Road Equipment	10/17/2011	10	0.04
C-7473-A	1	Off-Road Equipment	10/19/2011	10	0.89
C-8279-A	1	Off-Road Equipment	10/20/2011	10	3.22
C-7662-A	1	Off-Road Equipment	10/24/2011	10	0.35
C-7918-A	1	Off-Road Equipment	10/25/2011	10	0.82
C-8551-A	1	Off-Road Equipment	10/25/2011	10	0.74
C-8531-A	1	Off-Road Equipment	10/25/2011	10	0.70
C-8317-A	1	Off-Road Equipment	10/27/2011	10	1.03
C-7661-A	1	Off-Road Equipment	10/28/2011	10	0.35
C-7472-A	1	Off-Road Equipment	10/31/2011	10	1.96
C-7291-A	1	Off-Road Equipment	10/31/2011	10	0.88
C-7293-A	1	Off-Road Equipment	10/31/2011	10	0.64
C-7504-A	1	Off-Road Equipment	11/09/2011	10	3.14
C-7501-A	1	Off-Road Equipment	11/09/2011	10	2.88
C-7465-A	1	Off-Road Equipment	11/09/2011	10	2.83
C-7466-A	1	Off-Road Equipment	11/09/2011	10	2.67
C-7470-A	1	Off-Road Equipment	11/09/2011	10	1.92
C-7467-A	1	Off-Road Equipment	11/09/2011	10	1.48
C-7657-A	1	Off-Road Equipment	11/09/2011	10	1.41
C-7658-A	1	Off-Road Equipment	11/09/2011	10	0.71
C-8300-A	1	Off-Road Equipment	11/10/2011	10	0.82
C-8302-A	1	Off-Road Equipment	11/10/2011	10	0.57
C-8308-A	1	Off-Road Equipment	11/10/2011	10	0.57
C-8310-A	1	Off-Road Equipment	11/10/2011	10	0.57
C-8311-A	1	Off-Road Equipment	11/10/2011	10	0.57
C-8503-A	1	Off-Road Equipment	11/10/2011	10	0.31
C-8313-A	1	Off-Road Equipment	11/10/2011	10	0.11
C-8780-A	1	Off-Road Equipment	11/11/2011	10	0.69
C-8781-A	1	Off-Road Equipment	11/11/2011	10	0.46
C-8468-A	1	Off-Road Equipment	11/17/2011	10	3.61
C-8274-A	1	Off-Road Equipment	11/17/2011	10	0.26
C-8418-A	1	Off-Road Equipment	11/18/2011	10	0.19
C-8623-A	1	Off-Road Equipment	11/22/2011	10	0.98
C-7372-A	1	Off-Road Equipment	11/22/2011	10	0.86
C-8693-A	1	Off-Road Equipment	11/22/2011	10	0.84
C-8691-A	1	Off-Road Equipment	11/22/2011	10	0.78
C-8383-A	1	Off-Road Equipment	11/22/2011	10	0.75
C-8697-A	1	Off-Road Equipment	11/22/2011	10	0.54
C-8681-A	1	Off-Road Equipment	11/22/2011	10	0.44
C-8683-A	1	Off-Road Equipment	11/22/2011	10	0.44
C-8687-A	1	Off-Road Equipment	11/22/2011	10	0.44
C-8694-A	1	Off-Road Equipment	11/22/2011	10	0.44
C-8674-A	1	Off-Road Equipment	11/22/2011	10	0.43
C-8695-A	1	Off-Road Equipment	11/22/2011	10	0.43

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-7563-A	1	Off-Road Equipment	11/25/2011	10	1.41
C-7564-A	1	Off-Road Equipment	11/25/2011	10	1.41
C-7404-A	1	Off-Road Equipment	11/29/2011	10	2.45
C-8133-A	1	Off-Road Equipment	11/29/2011	10	1.28
C-7876-A	1	Off-Road Equipment	11/30/2011	10	3.75
C-8283-A	1	Off-Road Equipment	11/30/2011	10	0.44
C-8155-A	1	Off-Road Equipment	12/01/2011	10	1.43
C-7890-A	1	Off-Road Equipment	12/01/2011	10	0.17
C-8137-A	1	Off-Road Equipment	12/02/2011	10	0.88
C-8462-A	1	Off-Road Equipment	12/05/2011	10	0.64
C-8576-A	1	Off-Road Equipment	12/06/2011	10	2.20
C-7507-A	1	Off-Road Equipment	12/06/2011	10	1.22
C-8574-A	1	Off-Road Equipment	12/06/2011	10	1.13
C-8370-A	1	Off-Road Equipment	12/06/2011	10	0.61
C-8624-A	1	Off-Road Equipment	12/09/2011	10	0.76
C-8055-A	1	Off-Road Equipment	12/09/2011	10	0.55
C-8052-A	1	Off-Road Equipment	12/09/2011	10	0.24
C-8282-A	1	Off-Road Equipment	12/13/2011	10	3.01
C-7461-A	1	Off-Road Equipment	12/13/2011	10	2.70
C-8287-A	1	Off-Road Equipment	12/13/2011	10	1.97
C-7659-A	1	Off-Road Equipment	12/13/2011	10	1.47
C-8285-A	1	Off-Road Equipment	12/13/2011	10	1.25
C-7720-A	1	Off-Road Equipment	12/13/2011	10	1.24
C-8292-A	1	Off-Road Equipment	12/13/2011	10	0.79
C-8160-A	1	Off-Road Equipment	12/14/2011	10	4.89
C-8158-A	1	Off-Road Equipment	12/14/2011	10	3.79
C-8783-A	1	Off-Road Equipment	12/14/2011	10	1.99
C-8336-A	1	Off-Road Equipment	12/14/2011	10	0.04
C-8349-A	1	Off-Road Equipment	12/14/2011	10	0.04
C-7239-A	1	Off-Road Equipment	12/16/2011	10	1.22
C-8662-A	1	Off-Road Equipment	12/19/2011	10	0.89
C-8527-A	1	Off-Road Equipment	12/19/2011	10	0.43
C-8244-A	1	Off-Road Equipment	12/19/2011	10	0.04
C-8445-A	1	Off-Road Equipment	12/20/2011	10	0.66
C-7743-A	1	Off-Road Equipment	12/20/2011	10	0.66
C-7646-A	1	Off-Road Equipment	12/21/2011	10	0.46
C-8420-A	2	Off-Road Equipment	12/21/2011	10	0.34
C-8741-A	1	Off-Road Equipment	12/21/2011	10	0.08
C-8112-A	1	Off-Road Equipment	12/21/2011	10	0.06
C-8114-A	1	Off-Road Equipment	12/21/2011	10	0.06
C-8690-A	1	Off-Road Equipment	12/27/2011	10	3.07
C-8853-A	1	Off-Road Equipment	12/27/2011	10	0.71
C-8355-A	1	Off-Road Equipment	12/27/2011	10	0.41
C-8219-A	1	Off-Road Equipment	12/27/2011	10	0.03
C-8221-A	1	Off-Road Equipment	12/27/2011	10	0.03
C-8222-A	1	Off-Road Equipment	12/27/2011	10	0.03
C-8500-A	1	Off-Road Equipment	12/28/2011	10	0.65

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8339-A	1	Off-Road Equipment	12/28/2011	10	0.54
C-8954-A	1	Off-Road Equipment	12/28/2011	10	0.50
C-8498-A	1	Off-Road Equipment	12/28/2011	10	0.45
C-8750-A	1	Off-Road Equipment	12/29/2011	10	1.18
C-8745-A	1	Off-Road Equipment	12/29/2011	10	1.01
C-8437-A	1	Off-Road Equipment	12/29/2011	10	0.87
C-8433-A	1	Off-Road Equipment	12/29/2011	10	0.59
C-8276-A	1	Off-Road Equipment	12/29/2011	10	0.57
C-8416-A	1	Off-Road Equipment	12/29/2011	10	0.34
C-8430-A	1	Off-Road Equipment	12/29/2011	10	0.34
C-9037-A	1	Off-Road Equipment	12/29/2011	10	0.03
C-8743-A	1	Off-Road Equipment	12/29/2011	10	0.03
C-7830-A	1	Off-Road Equipment	12/30/2011	10	3.64
C-8634-A	1	Off-Road Equipment	12/30/2011	10	0.88
C-8103-A	1	Off-Road Equipment	12/30/2011	10	0.70
C-7383-A	1	Off-Road Equipment	12/30/2011	10	0.68
C-8156-A	1	Off-Road Equipment	12/30/2011	10	0.62
C-8391-A	1	Off-Road Equipment	12/30/2011	10	0.29
C-8157-A	1	Off-Road Equipment	12/31/2011	10	0.38
C-9041-A	1	Off-Road Equipment	01/03/2012	10	0.41
C-8079-A	1	Off-Road Equipment	01/04/2012	10	1.08
C-7558-A	1	Off-Road Equipment	01/04/2012	10	0.60
C-7845-A	1	Off-Road Equipment	01/06/2012	10	1.39
C-8472-A	1	Off-Road Equipment	01/06/2012	10	1.09
C-7847-A	1	Off-Road Equipment	01/06/2012	10	1.03
C-7839-A	1	Off-Road Equipment	01/06/2012	10	0.52
C-7841-A	1	Off-Road Equipment	01/06/2012	10	0.46
C-7842-A	1	Off-Road Equipment	01/06/2012	10	0.14
C-8118-A	1	Off-Road Equipment	01/09/2012	10	1.02
C-8116-A	1	Off-Road Equipment	01/09/2012	10	1.02
C-7150-A	1	Off-Road Equipment	01/10/2012	10	1.74
C-7430-A	1	Off-Road Equipment	01/10/2012	10	1.22
C-8115-A	1	Off-Road Equipment	01/12/2012	10	0.96
C-8108-A	1	Off-Road Equipment	01/12/2012	10	0.96
C-8099-A	1	Off-Road Equipment	01/12/2012	10	0.61
C-8570-A	1	Off-Road Equipment	01/13/2012	10	1.17
C-8273-A	1	Off-Road Equipment	01/13/2012	10	0.68
C-8747-A	1	Off-Road Equipment	01/13/2012	10	0.42
C-7462-A	1	Off-Road Equipment	01/18/2012	10	2.14
C-7464-A	1	Off-Road Equipment	01/18/2012	10	1.76
C-7660-A	1	Off-Road Equipment	01/18/2012	10	1.28
C-7463-A	1	Off-Road Equipment	01/18/2012	10	1.26
C-7468-A	1	Off-Road Equipment	01/18/2012	10	1.07
C-8611-A	1	Off-Road Equipment	01/18/2012	10	1.00
C-8610-A	1	Off-Road Equipment	01/18/2012	10	0.53
C-8139-A	1	Off-Road Equipment	01/18/2012	10	0.48
C-8509-A	1	Off-Road Equipment	01/19/2012	10	0.43

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8122-A	1	Off-Road Equipment	01/19/2012	10	0.24
C-7896-A	1	Off-Road Equipment	01/20/2012	10	0.65
C-7409-A	1	Off-Road Equipment	01/23/2012	10	1.52
C-8340-A	1	Off-Road Equipment	01/23/2012	10	0.74
C-7469-A	1	Off-Road Equipment	01/23/2012	10	0.68
C-8290-A	1	Off-Road Equipment	01/24/2012	10	0.51
C-8756-A	1	Off-Road Equipment	01/24/2012	10	0.48
C-8446-A	1	Off-Road Equipment	01/25/2012	10	0.75
C-8449-A	1	Off-Road Equipment	01/25/2012	10	0.65
C-8448-A	1	Off-Road Equipment	01/25/2012	10	0.57
C-8444-A	1	Off-Road Equipment	01/25/2012	10	0.39
C-8442-A	1	Off-Road Equipment	01/25/2012	10	0.19
C-8440-A	1	Off-Road Equipment	01/25/2012	10	0.15
C-8201-A	1	Off-Road Equipment	01/27/2012	10	0.54
C-8392-A	1	Off-Road Equipment	01/27/2012	10	0.20
C-7797-A	1	Off-Road Equipment	01/28/2012	10	1.04
C-8051-A	1	Off-Road Equipment	01/30/2012	10	1.00
C-8350-A	1	Off-Road Equipment	01/30/2012	10	0.34
C-8329-A	1	Off-Road Equipment	02/01/2012	10	0.97
C-8723-A	1	Off-Road Equipment	02/02/2012	10	0.91
C-8047-A	1	Off-Road Equipment	02/02/2012	10	0.73
C-8548-A	1	Off-Road Equipment	02/02/2012	10	0.19
C-8335-A	1	Off-Road Equipment	02/06/2012	10	0.65
C-8332-A	1	Off-Road Equipment	02/06/2012	10	0.25
C-7767-A	1	Off-Road Equipment	02/07/2012	10	1.37
C-8348-A	1	Off-Road Equipment	02/07/2012	10	1.12
C-8271-A	1	Off-Road Equipment	02/07/2012	10	0.94
C-8275-A	1	Off-Road Equipment	02/07/2012	10	0.94
C-8343-A	1	Off-Road Equipment	02/07/2012	10	0.85
C-8022-A	1	Off-Road Equipment	02/07/2012	10	0.61
C-7812-A	1	Off-Road Equipment	02/08/2012	10	1.14
C-8457-A	1	Off-Road Equipment	02/09/2012	10	1.54
C-8864-A	1	Off-Road Equipment	02/09/2012	10	0.60
C-7698-A	1	Off-Road Equipment	02/09/2012	10	0.52
C-7407-A	1	Off-Road Equipment	02/10/2012	10	1.40
C-7475-A	1	Off-Road Equipment	02/10/2012	10	0.80
C-8187-A	1	Off-Road Equipment	02/10/2012	10	0.06
C-8196-A	1	Off-Road Equipment	02/10/2012	10	0.05
C-7476-A	1	Off-Road Equipment	02/13/2012	10	1.36
C-7479-A	1	Off-Road Equipment	02/13/2012	10	1.36
C-7408-A	1	Off-Road Equipment	02/13/2012	10	1.10
C-7474-A	1	Off-Road Equipment	02/13/2012	10	1.10
C-7406-A	1	Off-Road Equipment	02/13/2012	10	1.05
C-8739-A	1	Off-Road Equipment	02/13/2012	10	0.47
C-4565-A	1	Off-Road Equipment	02/14/2012	10	0.78
C-8866-A	1	Off-Road Equipment	02/14/2012	10	0.67
C-8117-A	1	Off-Road Equipment	02/15/2012	10	0.99

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8669-A	1	Off-Road Equipment	02/15/2012	10	0.90
C-8111-A	1	Off-Road Equipment	02/15/2012	10	0.71
C-8644-A	1	Off-Road Equipment	02/17/2012	10	0.89
C-8406-A	1	Off-Road Equipment	02/17/2012	10	0.43
C-8661-A	1	Off-Road Equipment	02/20/2012	10	0.79
C-7187-A	1	Off-Road Equipment	02/22/2012	10	0.37
C-8633-A	1	Off-Road Equipment	02/23/2012	10	1.20
C-8636-A	1	Off-Road Equipment	02/23/2012	10	1.20
C-8703-A	1	Off-Road Equipment	02/24/2012	10	0.18
C-8914-A	1	Off-Road Equipment	02/27/2012	10	0.75
C-8393-A	1	Off-Road Equipment	02/27/2012	10	0.26
C-8917-A	1	Off-Road Equipment	02/27/2012	10	0.18
C-8996-A	1	Off-Road Equipment	02/29/2012	10	1.00
C-7286-A	1	Off-Road Equipment	02/29/2012	10	0.51
C-8619-A	1	Off-Road Equipment	02/29/2012	10	0.39
C-8845-A	1	Off-Road Equipment	03/01/2012	10	2.62
C-8496-A	1	Off-Road Equipment	03/01/2012	10	1.41
C-8484-A	1	Off-Road Equipment	03/01/2012	10	1.11
C-7526-A	1	Off-Road Equipment	03/01/2012	10	0.77
C-7883-A	1	Off-Road Equipment	03/05/2012	10	1.12
C-7866-A	1	Off-Road Equipment	03/05/2012	10	0.45
C-7875-A	1	Off-Road Equipment	03/05/2012	10	0.39
C-7872-A	1	Off-Road Equipment	03/05/2012	10	0.37
C-7880-A	1	Off-Road Equipment	03/05/2012	10	0.08
C-8582-A	1	Off-Road Equipment	03/06/2012	10	0.77
C-7885-A	1	Off-Road Equipment	03/07/2012	10	0.85
C-8586-A	1	Off-Road Equipment	03/08/2012	10	3.29
C-8715-A	1	Off-Road Equipment	03/08/2012	10	0.85
C-7737-A	1	Off-Road Equipment	03/08/2012	10	0.31
C-8453-A	1	Off-Road Equipment	03/09/2012	10	3.61
C-8699-A	1	Off-Road Equipment	03/09/2012	10	0.36
C-7747-A	1	Off-Road Equipment	03/10/2012	10	0.64
C-8419-A	1	Off-Road Equipment	03/12/2012	10	0.37
C-8043-A	1	Off-Road Equipment	03/13/2012	10	0.03
C-8042-A	1	Off-Road Equipment	03/13/2012	10	0.01
C-8986-A	1	Off-Road Equipment	03/15/2012	10	1.08
C-8304-A	1	Off-Road Equipment	03/15/2012	10	0.78
C-7290-A	1	Off-Road Equipment	03/16/2012	10	0.92
C-7289-A	1	Off-Road Equipment	03/16/2012	10	0.86
C-8774-A	1	Off-Road Equipment	03/19/2012	10	2.35
C-8210-A	1	Off-Road Equipment	03/19/2012	10	0.14
C-7744-A	1	Off-Road Equipment	03/20/2012	10	1.02
C-7745-A	1	Off-Road Equipment	03/20/2012	10	0.73
C-8315-A	1	Off-Road Equipment	03/20/2012	10	0.71
C-7746-A	1	Off-Road Equipment	03/20/2012	10	0.65
C-8318-A	1	Off-Road Equipment	03/20/2012	10	0.64
C-7799-A	1	Off-Road Equipment	03/21/2012	10	0.75

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-7541-A	1	Off-Road Equipment	03/22/2012	10	0.38
C-7539-A	1	Off-Road Equipment	03/22/2012	10	0.32
C-7540-A	1	Off-Road Equipment	03/22/2012	10	0.32
C-8371-A	1	Off-Road Equipment	03/26/2012	10	1.19
C-8289-A	1	Off-Road Equipment	03/27/2012	10	0.59
C-8293-A	1	Off-Road Equipment	03/27/2012	10	0.58
C-8671-A	1	Off-Road Equipment	03/28/2012	10	5.13
C-8202-A	1	Off-Road Equipment	03/29/2012	10	0.74
C-8204-A	1	Off-Road Equipment	03/29/2012	10	0.61
C-7247-A	1	Off-Road Equipment	03/30/2012	10	1.45
C-8988-A	1	Off-Road Equipment	03/30/2012	10	0.41
C-8945-A	1	Off-Road Equipment	03/30/2012	10	0.36
C-8785-A	1	Off-Road Equipment	03/30/2012	10	0.35
C-7172-A	1	Off-Road Equipment	03/31/2012	10	0.61
C-8675-A	1	Off-Road Equipment	04/05/2012	10	1.70
C-8441-A	1	Off-Road Equipment	04/06/2012	10	0.38
C-8520-A	1	Off-Road Equipment	04/09/2012	10	0.65
C-7828-A	1	Off-Road Equipment	04/09/2012	10	0.47
C-7508-A	1	Off-Road Equipment	04/09/2012	10	0.08
C-8374-A	1	Off-Road Equipment	04/12/2012	10	1.38
C-8788-A	1	Off-Road Equipment	04/12/2012	10	0.52
C-7917-A	1	Off-Road Equipment	04/12/2012	10	0.37
C-8790-A	1	Off-Road Equipment	04/12/2012	10	0.11
C-8556-A	1	Off-Road Equipment	04/16/2012	10	1.69
C-7381-A	1	Off-Road Equipment	04/16/2012	10	1.05
C-8775-A	1	Off-Road Equipment	04/16/2012	10	0.82
C-8567-A	1	Off-Road Equipment	04/16/2012	10	0.79
C-7449-A	1	Off-Road Equipment	04/17/2012	10	0.43
C-8109-A	1	Off-Road Equipment	04/18/2012	10	1.04
C-8817-A	1	Off-Road Equipment	04/20/2012	10	0.74
C-8823-A	1	Off-Road Equipment	04/20/2012	10	0.57
C-8819-A	1	Off-Road Equipment	04/20/2012	10	0.42
C-8820-A	1	Off-Road Equipment	04/20/2012	10	0.42
C-8821-A	1	Off-Road Equipment	04/20/2012	10	0.42
C-4907-A	1	Off-Road Equipment	04/21/2012	10	0.62
C-8680-A	1	Off-Road Equipment	04/23/2012	10	1.09
C-8553-A	1	Off-Road Equipment	04/23/2012	10	0.83
C-8208-A	2	Off-Road Equipment	04/23/2012	10	0.22
C-7554-A	1	Off-Road Equipment	04/24/2012	10	0.43
C-7722-A	1	Off-Road Equipment	04/24/2012	10	0.01
C-7724-A	1	Off-Road Equipment	04/24/2012	10	0.01
C-7725-A	1	Off-Road Equipment	04/24/2012	10	0.01
C-7726-A	1	Off-Road Equipment	04/24/2012	10	0.01
C-7728-A	1	Off-Road Equipment	04/24/2012	10	0.01
C-7734-A	1	Off-Road Equipment	04/24/2012	10	0.01
C-7730-A	1	Off-Road Equipment	04/24/2012	10	0.00
C-7731-A	1	Off-Road Equipment	04/24/2012	10	0.00

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-7733-A	1	Off-Road Equipment	04/24/2012	10	0.00
C-7721-A	1	Off-Road Equipment	04/24/2012	10	0.00
C-8432-A	1	Off-Road Equipment	04/25/2012	10	0.44
C-8717-A	1	Off-Road Equipment	04/27/2012	10	0.62
C-8718-A	1	Off-Road Equipment	04/27/2012	10	0.60
C-8093-A	1	Off-Road Equipment	04/30/2012	10	0.82
C-8048-A	1	Off-Road Equipment	04/30/2012	10	0.75
C-8104-A	1	Off-Road Equipment	04/30/2012	10	0.72
C-8119-A	1	Off-Road Equipment	04/30/2012	10	0.43
C-8178-A	1	Off-Road Equipment	05/01/2012	10	0.87
C-8584-A	1	Off-Road Equipment	05/01/2012	10	0.59
C-7271-A	1	Off-Road Equipment	05/03/2012	10	0.29
C-8670-A	1	Off-Road Equipment	05/09/2012	10	0.59
C-8924-A	1	Off-Road Equipment	05/11/2012	10	0.25
C-8593-A	1	Off-Road Equipment	05/14/2012	10	0.75
C-8218-A	1	Off-Road Equipment	05/15/2012	10	0.29
C-7147-A	1	Off-Road Equipment	05/16/2012	10	2.39
C-7159-A	1	Off-Road Equipment	05/16/2012	10	2.09
C-8587-A	1	Off-Road Equipment	05/16/2012	10	1.11
C-7151-A	1	Off-Road Equipment	05/16/2012	10	0.91
C-8757-A	1	Off-Road Equipment	05/17/2012	10	0.66
C-8787-A	1	Off-Road Equipment	05/17/2012	10	0.53
C-7699-A	1	Off-Road Equipment	05/17/2012	10	0.40
C-8394-A	1	Off-Road Equipment	05/18/2012	10	0.32
C-8389-A	1	Off-Road Equipment	05/18/2012	10	0.11
C-8390-A	1	Off-Road Equipment	05/18/2012	10	0.11
C-8431-A	1	Off-Road Equipment	05/18/2012	10	0.11
C-7583-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7584-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7585-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7587-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7590-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7600-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7603-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7602-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7594-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7597-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7604-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7605-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7606-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7631-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-7633-A	1	Off-Road Equipment	05/21/2012	10	0.01
C-8368-A	1	Off-Road Equipment	05/25/2012	10	0.28
C-8831-A	1	Off-Road Equipment	05/27/2012	10	0.95
C-8711-A	1	Off-Road Equipment	05/28/2012	10	0.08
C-8324-A	1	Off-Road Equipment	05/29/2012	10	0.35
C-8215-A	1	Off-Road Equipment	05/30/2012	10	0.78

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8478-A	1	Off-Road Equipment	05/30/2012	10	0.22
C-8486-A	1	Off-Road Equipment	05/30/2012	10	0.17
C-8488-A	1	Off-Road Equipment	05/30/2012	10	0.15
C-8490-A	1	Off-Road Equipment	05/30/2012	10	0.13
C-8435-A	1	Off-Road Equipment	05/30/2012	10	0.11
C-8502-A	1	Off-Road Equipment	05/30/2012	10	0.06
C-8479-A	1	Off-Road Equipment	05/30/2012	10	0.01
C-8482-A	1	Off-Road Equipment	05/30/2012	10	0.01
C-8477-A	1	Off-Road Equipment	05/30/2012	10	0.01
C-8480-A	1	Off-Road Equipment	05/30/2012	10	0.01
C-8050-A	1	Off-Road Equipment	05/31/2012	10	1.37
C-7895-A	1	Off-Road Equipment	05/31/2012	10	0.91
C-8053-A	1	Off-Road Equipment	05/31/2012	10	0.89
C-8054-A	1	Off-Road Equipment	05/31/2012	10	0.89
C-7898-A	1	Off-Road Equipment	05/31/2012	10	0.83
C-7480-A	1	Off-Road Equipment	05/31/2012	10	0.51
C-8948-A	1	Off-Road Equipment	05/31/2012	10	0.49
C-8673-A	1	Off-Road Equipment	06/05/2012	10	0.32
C-8436-A	2	Off-Road Equipment	06/07/2012	10	0.46
C-7612-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7625-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7629-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7630-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7634-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7636-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7638-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7607-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7608-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7609-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7610-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7611-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7613-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7614-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7615-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7616-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7618-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7620-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7623-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7624-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7626-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7627-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7628-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7632-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7635-A	1	Off-Road Equipment	06/07/2012	10	0.01
C-7243-A	1	Off-Road Equipment	06/11/2012	10	2.37
C-8501-A	1	Off-Road Equipment	06/11/2012	10	0.27
C-8483-A	1	Off-Road Equipment	06/11/2012	10	0.24

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8491-A	1	Off-Road Equipment	06/11/2012	10	0.22
C-8485-A	1	Off-Road Equipment	06/11/2012	10	0.22
C-8494-A	1	Off-Road Equipment	06/11/2012	10	0.19
C-8495-A	1	Off-Road Equipment	06/11/2012	10	0.06
C-8572-A	1	Off-Road Equipment	06/12/2012	10	0.26
C-8585-A	1	Off-Road Equipment	06/14/2012	10	0.85
C-8692-A	1	Off-Road Equipment	06/15/2012	10	1.16
C-7864-A	1	Off-Road Equipment	06/18/2012	10	1.02
C-7141-A	1	Off-Road Equipment	06/18/2012	10	0.46
C-8950-A	1	Off-Road Equipment	06/19/2012	10	0.90
C-8198-A	1	Off-Road Equipment	06/19/2012	10	0.35
C-8805-A	1	Off-Road Equipment	06/19/2012	10	0.13
C-8184-A	1	Off-Road Equipment	06/20/2012	10	0.59
C-8258-A	1	Off-Road Equipment	06/20/2012	10	0.36
C-8265-A	1	Off-Road Equipment	06/20/2012	10	0.26
C-8260-A	1	Off-Road Equipment	06/20/2012	10	0.20
C-8262-A	1	Off-Road Equipment	06/20/2012	10	0.19
C-8270-A	1	Off-Road Equipment	06/20/2012	10	0.16
C-8268-A	1	Off-Road Equipment	06/20/2012	10	0.15
C-8263-A	1	Off-Road Equipment	06/20/2012	10	0.08
C-8267-A	1	Off-Road Equipment	06/20/2012	10	0.07
C-8571-A	1	Off-Road Equipment	06/21/2012	10	0.68
C-8626-A	1	Off-Road Equipment	06/22/2012	10	0.63
C-8540-A	1	Off-Road Equipment	06/26/2012	10	0.41
C-8639-A	1	Off-Road Equipment	06/26/2012	10	0.29
C-8710-A	1	Off-Road Equipment	06/27/2012	10	0.15
C-8973-A	1	Off-Road Equipment	06/28/2012	10	1.57
C-8946-A	1	Off-Road Equipment	06/28/2012	10	1.40
C-8428-A	1	Off-Road Equipment	06/28/2012	10	0.56
C-8412-A	1	Off-Road Equipment	06/29/2012	10	0.37
C-8145-A	1	Off-Road Equipment	06/29/2012	10	0.07
C-8121-A	1	Off-Road Equipment	06/30/2012	10	2.64
C-7854-A	1	Off-Road Equipment	07/02/2012	10	0.81
C-8522-A	1	Off-Road Equipment	07/03/2012	10	0.30
C-8696-A	1	Off-Road Equipment	07/06/2012	10	0.85
C-8607-A	1	Off-Road Equipment	07/06/2012	10	0.80
C-7859-A	1	Off-Road Equipment	07/06/2012	10	0.47
C-7858-A	1	Off-Road Equipment	07/06/2012	10	0.38
C-8908-A	1	Off-Road Equipment	07/08/2012	10	2.21
C-8590-A	1	Off-Road Equipment	07/09/2012	10	0.82
C-7889-A	1	Off-Road Equipment	07/13/2012	10	0.91
C-7892-A	1	Off-Road Equipment	07/13/2012	10	0.65
C-7838-A	1	Off-Road Equipment	07/17/2012	10	1.26
C-7765-A	1	Off-Road Equipment	07/17/2012	10	0.31
C-8135-A	1	Off-Road Equipment	07/17/2012	10	0.28
C-7771-A	1	Off-Road Equipment	07/17/2012	10	0.19
C-8132-A	1	Off-Road Equipment	07/17/2012	10	0.18

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8126-A	1	Off-Road Equipment	07/17/2012	10	0.15
C-8180-A	1	Off-Road Equipment	07/18/2012	10	0.73
C-8577-A	1	Off-Road Equipment	07/18/2012	10	0.64
C-8555-A	1	Off-Road Equipment	07/19/2012	10	0.11
C-8217-A	1	Off-Road Equipment	07/20/2012	10	0.21
C-8749-A	1	Off-Road Equipment	07/23/2012	10	0.65
C-8253-A	1	Off-Road Equipment	07/24/2012	10	0.03
C-8254-A	1	Off-Road Equipment	07/24/2012	10	0.03
C-8461-A	1	Off-Road Equipment	07/25/2012	10	0.37
C-7528-A	1	Off-Road Equipment	07/25/2012	10	0.34
C-8608-A	1	Off-Road Equipment	07/27/2012	10	0.27
C-8235-A	1	Off-Road Equipment	07/31/2012	10	0.49
C-8742-A	1	Off-Road Equipment	08/01/2012	10	0.32
C-8596-A	1	Off-Road Equipment	08/03/2012	10	1.21
C-8860-A	1	Off-Road Equipment	08/03/2012	10	0.44
C-8725-A	1	Off-Road Equipment	08/03/2012	10	0.11
C-8327-A	1	Off-Road Equipment	08/08/2012	10	0.41
C-8518-A	1	Off-Road Equipment	08/08/2012	10	0.07
C-8618-A	1	Off-Road Equipment	08/10/2012	10	0.27
C-8620-A	1	Off-Road Equipment	08/10/2012	10	0.27
C-8832-A	1	Off-Road Equipment	08/11/2012	10	4.43
C-7439-A	1	Off-Road Equipment	08/16/2012	10	0.16
C-8766-A	1	Off-Road Equipment	08/17/2012	10	0.53
C-8146-A	1	Off-Road Equipment	08/20/2012	10	0.52
C-8861-A	1	Off-Road Equipment	08/20/2012	10	0.37
C-7735-A	1	Off-Road Equipment	08/21/2012	10	1.22
C-8068-A	1	Off-Road Equipment	08/21/2012	10	0.50
C-8207-A	1	Off-Road Equipment	08/21/2012	10	0.42
C-8814-A	1	Off-Road Equipment	08/21/2012	10	0.37
C-7719-A	1	Off-Road Equipment	08/21/2012	10	0.30
C-7446-A	1	Off-Road Equipment	08/22/2012	10	0.37
C-7454-A	1	Off-Road Equipment	08/22/2012	10	0.25
C-7891-A	1	Off-Road Equipment	08/23/2012	10	1.27
C-8041-A	1	Off-Road Equipment	08/25/2012	10	0.61
C-7925-A	1	Off-Road Equipment	08/27/2012	10	0.74
C-8748-A	1	Off-Road Equipment	08/27/2012	10	0.39
C-8746-A	1	Off-Road Equipment	08/27/2012	10	0.18
C-7167-A	1	Off-Road Equipment	08/28/2012	10	1.29
C-7164-A	1	Off-Road Equipment	08/28/2012	10	1.12
C-7809-A	1	Off-Road Equipment	08/29/2012	10	0.67
C-8874-A	1	Off-Road Equipment	08/29/2012	10	0.24
C-5689-A	1	Off-Road Equipment	08/29/2012	10	0.04
C-8375-A	1	Off-Road Equipment	08/30/2012	10	0.48
C-8603-A	1	Off-Road Equipment	08/31/2012	10	1.32
C-8815-A	1	Off-Road Equipment	08/31/2012	10	1.21
C-7921-A	1	Off-Road Equipment	08/31/2012	10	0.67
C-7385-A	1	Off-Road Equipment	08/31/2012	10	0.57

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8834-A	1	Off-Road Equipment	08/31/2012	10	0.39
C-8652-A	1	Off-Road Equipment	08/31/2012	10	0.22
C-8209-A	1	Off-Road Equipment	09/04/2012	10	0.35
C-7498-A	1	Off-Road Equipment	09/05/2012	10	0.38
C-8255-A	1	Off-Road Equipment	09/05/2012	10	0.02
C-8256-A	1	Off-Road Equipment	09/05/2012	10	0.02
C-8257-A	1	Off-Road Equipment	09/05/2012	10	0.02
C-8721-A	1	Off-Road Equipment	09/06/2012	10	0.73
C-7576-A	1	Off-Road Equipment	09/06/2012	10	0.56
C-7639-A	1	Off-Road Equipment	09/07/2012	10	0.01
C-7913-A	1	Off-Road Equipment	09/10/2012	10	0.76
C-8143-A	1	Off-Road Equipment	09/11/2012	10	0.29
C-8600-A	1	Off-Road Equipment	09/12/2012	10	0.46
C-8360-A	1	Off-Road Equipment	09/13/2012	10	1.41
C-8592-A	1	Off-Road Equipment	09/13/2012	10	1.23
C-8975-A	1	Off-Road Equipment	09/13/2012	10	0.45
C-7505-A	1	Off-Road Equipment	09/13/2012	10	0.30
C-8142-A	1	Off-Road Equipment	09/13/2012	10	0.11
C-9145-A	1	Off-Road Equipment	09/14/2012	10	0.49
C-8848-A	1	Off-Road Equipment	09/18/2012	10	0.21
C-7882-A	1	Off-Road Equipment	09/19/2012	10	1.50
C-7923-A	1	Off-Road Equipment	09/20/2012	10	0.25
C-8910-A	1	Off-Road Equipment	09/20/2012	10	0.10
C-7837-A	1	Off-Road Equipment	09/21/2012	10	0.37
C-8705-A	1	Off-Road Equipment	09/25/2012	10	1.55
C-8447-A	1	Off-Road Equipment	09/25/2012	10	0.55
C-8455-A	1	Off-Road Equipment	09/25/2012	10	0.55
C-7581-A	1	Off-Road Equipment	09/25/2012	10	0.31
C-8125-A	1	Off-Road Equipment	09/25/2012	10	0.19
C-8060-A	1	Off-Road Equipment	09/27/2012	10	1.74
C-8200-A	1	Off-Road Equipment	09/27/2012	10	0.50
C-8179-A	1	Off-Road Equipment	09/27/2012	10	0.37
C-7577-A	1	Off-Road Equipment	09/27/2012	10	0.30
C-8128-A	1	Off-Road Equipment	09/27/2012	10	0.28
C-8130-A	1	Off-Road Equipment	09/27/2012	10	0.19
C-7481-A	1	Off-Road Equipment	09/27/2012	10	0.02
C-8867-A	1	Off-Road Equipment	09/28/2012	10	1.01
C-8930-A	1	Off-Road Equipment	10/02/2012	10	0.86
C-8164-A	1	Off-Road Equipment	10/03/2012	10	0.91
C-7818-A	1	Off-Road Equipment	10/04/2012	10	0.38
C-8983-A	1	Off-Road Equipment	10/04/2012	10	0.32
C-7857-A	1	Off-Road Equipment	10/04/2012	10	0.28
C-8148-A	1	Off-Road Equipment	10/10/2012	10	0.79
C-8168-A	1	Off-Road Equipment	10/11/2012	10	1.40
C-7645-A	1	Off-Road Equipment	10/15/2012	10	0.41
C-7640-A	1	Off-Road Equipment	10/16/2012	10	1.01
C-7877-A	1	Off-Road Equipment	10/18/2012	10	0.37

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8597-A	1	Off-Road Equipment	10/19/2012	10	4.09
C-8676-A	1	Off-Road Equipment	10/19/2012	10	1.05
C-7440-A	1	Off-Road Equipment	10/19/2012	10	0.69
C-8778-A	1	Off-Road Equipment	10/22/2012	10	0.24
C-7960-A	1	Off-Road Equipment	10/23/2012	10	0.35
C-8581-A	1	Off-Road Equipment	10/23/2012	10	0.25
C-8423-A	1	Off-Road Equipment	10/24/2012	10	0.42
C-8225-A	1	Off-Road Equipment	10/24/2012	10	0.28
C-8226-A	1	Off-Road Equipment	10/24/2012	10	0.28
C-8424-A	1	Off-Road Equipment	10/24/2012	10	0.24
C-8647-A	1	Off-Road Equipment	10/25/2012	10	1.90
C-8288-A	1	Off-Road Equipment	10/26/2012	10	0.36
C-7884-A	1	Off-Road Equipment	10/31/2012	10	2.67
C-7387-A	1	Off-Road Equipment	10/31/2012	10	1.10
C-7801-A	1	Off-Road Equipment	10/31/2012	10	0.86
C-7560-A	1	Off-Road Equipment	10/31/2012	10	0.54
C-7495-A	1	Off-Road Equipment	11/05/2012	10	1.30
C-7484-A	1	Off-Road Equipment	11/05/2012	10	0.78
C-7800-A	1	Off-Road Equipment	11/05/2012	10	0.70
C-7769-A	1	Off-Road Equipment	11/05/2012	10	0.25
C-6811-A	1	Off-Road Equipment	11/08/2012	10	0.52
C-6817-A	1	Off-Road Equipment	11/08/2012	10	0.35
C-8229-A	1	Off-Road Equipment	11/13/2012	10	0.42
C-8237-A	1	Off-Road Equipment	11/13/2012	10	0.39
C-8243-A	1	Off-Road Equipment	11/14/2012	10	0.20
C-7444-A	1	Off-Road Equipment	11/14/2012	10	0.19
C-7431-A	1	Off-Road Equipment	11/14/2012	10	0.16
C-7888-A	1	Off-Road Equipment	11/15/2012	10	1.15
C-7796-A	1	Off-Road Equipment	11/15/2012	10	0.73
C-8011-A	1	Off-Road Equipment	11/16/2012	10	0.79
C-8686-A	1	Off-Road Equipment	11/16/2012	10	0.02
C-9038-A	1	Off-Road Equipment	11/20/2012	10	0.22
C-8519-A	1	Off-Road Equipment	11/25/2012	10	0.87
C-8120-A	1	Off-Road Equipment	11/26/2012	10	0.29
C-7451-A	1	Off-Road Equipment	11/28/2012	10	0.42
C-7251-A	1	Off-Road Equipment	11/28/2012	10	0.06
C-7855-A	1	Off-Road Equipment	11/29/2012	10	0.68
C-8211-A	1	Off-Road Equipment	11/29/2012	10	0.57
C-8811-A	1	Off-Road Equipment	11/30/2012	10	0.27
C-8084-A	1	Off-Road Equipment	11/30/2012	10	0.23
C-8004-A	1	Off-Road Equipment	11/30/2012	10	0.07
C-4688-A	1	Off-Road Equipment	12/03/2012	10	0.16
C-8882-A	1	Off-Road Equipment	12/04/2012	10	1.67
C-8010-A	1	Off-Road Equipment	12/04/2012	10	0.14
C-8012-A	1	Off-Road Equipment	12/04/2012	10	0.13
C-4564-A	1	Off-Road Equipment	12/10/2012	10	0.67
C-8999-A	1	Off-Road Equipment	12/12/2012	10	0.66

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8979-A	1	Off-Road Equipment	12/13/2012	10	0.80
C-8466-A	1	Off-Road Equipment	12/14/2012	10	0.65
C-7190-A	1	Off-Road Equipment	12/14/2012	10	0.60
C-8598-A	1	Off-Road Equipment	12/14/2012	10	0.46
C-8395-A	1	Off-Road Equipment	12/17/2012	10	0.29
C-8153-A	1	Off-Road Equipment	12/18/2012	10	0.31
C-8682-A	1	Off-Road Equipment	12/18/2012	10	0.06
C-8840-A	1	Off-Road Equipment	12/19/2012	10	1.00
C-8376-A	1	Off-Road Equipment	12/19/2012	10	0.93
C-7691-A	1	Off-Road Equipment	12/19/2012	10	0.18
C-7382-A	1	Off-Road Equipment	12/20/2012	10	0.35
C-8627-A	2	Off-Road Equipment	12/21/2012	10	0.46
C-8876-A	1	Off-Road Equipment	12/21/2012	10	0.39
C-7936-A	1	Off-Road Equipment	12/24/2012	10	0.93
C-8231-A	1	Off-Road Equipment	12/26/2012	10	0.46
C-7998-A	1	Off-Road Equipment	12/26/2012	10	0.35
C-7994-A	1	Off-Road Equipment	12/26/2012	10	0.21
C-7989-A	1	Off-Road Equipment	12/26/2012	10	0.16
C-7984-A	1	Off-Road Equipment	12/26/2012	10	0.12
C-8000-A	1	Off-Road Equipment	12/26/2012	10	0.06
C-8169-A	1	Off-Road Equipment	12/26/2012	10	0.06
C-9031-A	1	Off-Road Equipment	12/27/2012	10	1.52
C-7438-A	1	Off-Road Equipment	12/27/2012	10	1.32
C-7437-A	1	Off-Road Equipment	12/27/2012	10	0.86
C-8167-A	1	Off-Road Equipment	12/27/2012	10	0.56
C-8351-A	1	Off-Road Equipment	12/27/2012	10	0.29
C-8425-A	1	Off-Road Equipment	12/27/2012	10	0.29
C-8341-A	1	Off-Road Equipment	12/27/2012	10	0.26
C-8136-A	1	Off-Road Equipment	12/27/2012	10	0.24
C-7434-A	1	Off-Road Equipment	12/27/2012	10	0.19
C-8123-A	1	Off-Road Equipment	12/28/2012	10	1.75
C-7738-A	1	Off-Road Equipment	12/28/2012	10	0.39
C-8513-A	1	Off-Road Equipment	12/28/2012	10	0.24
C-8852-A	1	Off-Road Equipment	12/28/2012	10	0.21
C-7894-A	1	Off-Road Equipment	12/28/2012	10	0.07
C-7937-A	1	Off-Road Equipment	12/28/2012	10	0.06
C-7740-A	1	Off-Road Equipment	12/31/2012	10	0.71
C-8842-A	1	Off-Road Equipment	01/03/2013	10	0.41
C-8166-A	1	Off-Road Equipment	01/07/2013	10	0.75
C-8301-A	1	Off-Road Equipment	01/08/2013	10	2.09
C-8295-A	1	Off-Road Equipment	01/08/2013	10	1.89
C-8966-A	1	Off-Road Equipment	01/09/2013	10	0.37
C-7912-A	1	Off-Road Equipment	01/15/2013	10	0.38
C-7557-A	1	Off-Road Equipment	01/16/2013	10	0.20
C-8344-A	1	Off-Road Equipment	01/18/2013	10	0.42
C-7500-A	1	Off-Road Equipment	01/22/2013	10	0.43
C-8369-A	1	Off-Road Equipment	01/23/2013	10	0.44

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-4789-A	1	Off-Road Equipment	01/28/2013	10	0.45
C-8878-A	1	Off-Road Equipment	01/29/2013	10	0.15
C-8664-A	1	Off-Road Equipment	01/31/2013	10	0.15
C-8464-A	1	Off-Road Equipment	03/20/2013	10	1.46
C-21232-A	1	Off-Road Equipment	05/10/2013	10	0.62
C-8220-A	1	Off-Road Equipment	05/10/2013	10	0.44
C-8206-A	1	Off-Road Equipment	05/10/2013	10	0.34
C-21225-A	1	Off-Road Equipment	05/10/2013	10	0.21
C-21600-A	1	Off-Road Equipment	05/13/2013	10	0.46
C-21153-A	1	Off-Road Equipment	05/15/2013	10	0.83
C-21152-A	1	Off-Road Equipment	05/15/2013	10	0.42
C-21813-A	1	Off-Road Equipment	05/15/2013	10	0.26
C-22248-A	1	Off-Road Equipment	05/15/2013	10	0.04
C-22246-A	1	Off-Road Equipment	05/15/2013	10	0.03
C-21659-A	1	Off-Road Equipment	05/16/2013	10	0.89
C-21299-A	1	Off-Road Equipment	05/16/2013	10	0.16
C-21848-A	1	Off-Road Equipment	05/17/2013	10	0.29
C-21842-A	1	Off-Road Equipment	05/17/2013	10	0.28
C-21308-A	1	Off-Road Equipment	05/17/2013	10	0.07
C-21478-A	1	Off-Road Equipment	05/17/2013	10	0.05
C-21285-A	1	Off-Road Equipment	05/20/2013	10	1.34
C-21129-A	1	Off-Road Equipment	05/20/2013	10	0.87
C-23528-A	1	Off-Road Equipment	05/20/2013	10	0.70
C-23531-A	1	Off-Road Equipment	05/20/2013	10	0.70
C-21306-A	1	Off-Road Equipment	05/20/2013	10	0.69
C-21305-A	1	Off-Road Equipment	05/20/2013	10	0.30
C-21605-A	1	Off-Road Equipment	05/20/2013	10	0.05
C-21610-A	1	Off-Road Equipment	05/20/2013	10	0.05
C-21608-A	1	Off-Road Equipment	05/20/2013	10	0.05
C-21640-A	1	Off-Road Equipment	05/20/2013	10	0.05
C-21563-A	1	Off-Road Equipment	05/20/2013	10	0.01
C-22794-A	1	Off-Road Equipment	05/21/2013	10	2.39
C-7499-A	1	Off-Road Equipment	05/21/2013	10	0.44
C-8314-A	1	Off-Road Equipment	05/21/2013	10	0.06
C-21574-A	1	Off-Road Equipment	05/22/2013	10	0.70
C-21459-A	1	Off-Road Equipment	05/22/2013	10	0.52
C-7433-A	1	Off-Road Equipment	05/22/2013	10	0.37
C-21578-A	1	Off-Road Equipment	05/22/2013	10	0.21
C-8709-A	1	Off-Road Equipment	05/23/2013	10	0.54
C-8149-A	1	Off-Road Equipment	05/23/2013	10	0.05
C-22501-A	1	Off-Road Equipment	05/24/2013	10	1.06
C-22500-A	1	Off-Road Equipment	05/24/2013	10	0.95
C-9004-A	1	Off-Road Equipment	05/24/2013	10	0.79
C-21273-A	1	Off-Road Equipment	05/24/2013	10	0.40
C-21819-A	1	Off-Road Equipment	05/24/2013	10	0.14
C-21377-A	1	Off-Road Equipment	05/24/2013	10	0.03
C-22440-A	1	Off-Road Equipment	05/28/2013	10	0.84

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8769-A	1	Off-Road Equipment	05/28/2013	10	0.75
C-21250-A	1	Off-Road Equipment	05/28/2013	10	0.23
C-21151-A	1	Off-Road Equipment	05/29/2013	10	0.45
C-21818-A	1	Off-Road Equipment	05/29/2013	10	0.15
C-21903-A	1	Off-Road Equipment	05/29/2013	10	0.15
C-21598-A	1	Off-Road Equipment	05/30/2013	10	0.93
C-21704-A	1	Off-Road Equipment	05/30/2013	10	0.37
C-21214-A	1	Off-Road Equipment	05/30/2013	10	0.31
C-21702-A	1	Off-Road Equipment	05/30/2013	10	0.27
C-21597-A	1	Off-Road Equipment	05/30/2013	10	0.12
C-21321-A	1	Off-Road Equipment	05/31/2013	10	1.43
C-21364-A	1	Off-Road Equipment	05/31/2013	10	0.79
C-21602-A	1	Off-Road Equipment	05/31/2013	10	0.75
C-21316-A	1	Off-Road Equipment	05/31/2013	10	0.70
C-21581-A	1	Off-Road Equipment	05/31/2013	10	0.41
C-8450-A	1	Off-Road Equipment	05/31/2013	10	0.31
C-21585-A	1	Off-Road Equipment	05/31/2013	10	0.31
C-21583-A	1	Off-Road Equipment	05/31/2013	10	0.29
C-21519-A	1	Off-Road Equipment	05/31/2013	10	0.07
C-21993-A	1	Off-Road Equipment	05/31/2013	10	0.01
C-21389-A	1	Off-Road Equipment	06/03/2013	10	0.63
C-21388-A	1	Off-Road Equipment	06/03/2013	10	0.56
C-21346-A	1	Off-Road Equipment	06/03/2013	10	0.49
C-21337-A	1	Off-Road Equipment	06/03/2013	10	0.27
C-22626-A	1	Off-Road Equipment	06/04/2013	10	1.98
C-22092-A	1	Off-Road Equipment	06/04/2013	10	0.28
C-22076-A	1	Off-Road Equipment	06/04/2013	10	0.18
C-8499-A	1	Off-Road Equipment	06/04/2013	10	0.01
C-8497-A	1	Off-Road Equipment	06/04/2013	10	0.01
C-21677-A	1	Off-Road Equipment	06/07/2013	10	0.98
C-21830-A	1	Off-Road Equipment	06/07/2013	10	0.74
C-21828-A	1	Off-Road Equipment	06/07/2013	10	0.60
C-21460-A	1	Off-Road Equipment	06/07/2013	10	0.20
C-21821-A	1	Off-Road Equipment	06/10/2013	10	1.15
C-21822-A	1	Off-Road Equipment	06/10/2013	10	1.00
C-24096-A	1	Off-Road Equipment	06/10/2013	10	0.47
C-21625-A	1	Off-Road Equipment	06/11/2013	10	0.30
C-22325-A	1	Off-Road Equipment	06/12/2013	10	0.45
C-21380-A	1	Off-Road Equipment	06/12/2013	10	0.21
C-21404-A	1	Off-Road Equipment	06/12/2013	10	0.12
C-21298-A	1	Off-Road Equipment	06/13/2013	10	1.68
C-7886-A	1	Off-Road Equipment	06/14/2013	10	1.57
C-21466-A	1	Off-Road Equipment	06/14/2013	10	0.34
C-21465-A	1	Off-Road Equipment	06/14/2013	10	0.21
C-21472-A	1	Off-Road Equipment	06/17/2013	10	1.07
C-21470-A	1	Off-Road Equipment	06/17/2013	10	0.73
C-21471-A	1	Off-Road Equipment	06/17/2013	10	0.58

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-21473-A	1	Off-Road Equipment	06/17/2013	10	0.26
C-8530-A	1	Off-Road Equipment	06/17/2013	10	0.26
C-21322-A	1	Off-Road Equipment	06/18/2013	10	0.81
C-21976-A	1	Off-Road Equipment	06/18/2013	10	0.02
C-21973-A	1	Off-Road Equipment	06/19/2013	10	1.07
C-8058-A	1	Off-Road Equipment	06/20/2013	10	0.69
C-8059-A	1	Off-Road Equipment	06/20/2013	10	0.67
C-21384-A	1	Off-Road Equipment	06/20/2013	10	0.44
C-21385-A	1	Off-Road Equipment	06/20/2013	10	0.44
C-21357-A	1	Off-Road Equipment	06/20/2013	10	0.34
C-21354-A	1	Off-Road Equipment	06/20/2013	10	0.23
C-21383-A	1	Off-Road Equipment	06/20/2013	10	0.19
C-21829-A	1	Off-Road Equipment	06/20/2013	10	0.14
C-21398-A	1	Off-Road Equipment	06/21/2013	10	1.08
C-21392-A	1	Off-Road Equipment	06/24/2013	10	1.54
C-23448-A	1	Off-Road Equipment	06/24/2013	10	0.59
C-21999-A	1	Off-Road Equipment	06/24/2013	10	0.52
C-21757-A	1	Off-Road Equipment	06/24/2013	10	0.12
C-23647-A	1	Off-Road Equipment	06/25/2013	10	0.08
C-22165-A	1	Off-Road Equipment	06/26/2013	10	0.24
C-22269-A	1	Off-Road Equipment	06/26/2013	10	0.16
C-21365-A	1	Off-Road Equipment	06/26/2013	10	0.04
C-21764-A	1	Off-Road Equipment	06/27/2013	10	0.35
C-8795-A	1	Off-Road Equipment	06/27/2013	10	0.21
C-22579-A	1	Off-Road Equipment	06/27/2013	10	0.01
C-22326-A	1	Off-Road Equipment	06/28/2013	10	0.44
C-21723-A	1	Off-Road Equipment	06/28/2013	10	0.15
C-21379-A	1	Off-Road Equipment	06/29/2013	10	2.79
C-23194-A	1	Off-Road Equipment	06/29/2013	10	0.68
C-21186-A	1	Off-Road Equipment	07/01/2013	10	0.02
C-21187-A	1	Off-Road Equipment	07/01/2013	10	0.02
C-21181-A	1	Off-Road Equipment	07/01/2013	10	0.01
C-21184-A	1	Off-Road Equipment	07/01/2013	10	0.01
C-8427-A	1	Off-Road Equipment	07/02/2013	10	2.19
C-21480-A	1	Off-Road Equipment	07/02/2013	10	0.11
C-21396-A	1	Off-Road Equipment	07/03/2013	10	0.02
C-21327-A	1	Off-Road Equipment	07/05/2013	10	1.22
C-21317-A	1	Off-Road Equipment	07/05/2013	10	0.49
C-21390-A	1	Off-Road Equipment	07/05/2013	10	0.37
C-21240-A	1	Off-Road Equipment	07/05/2013	10	0.32
C-21176-A	1	Off-Road Equipment	07/08/2013	10	0.25
C-21175-A	1	Off-Road Equipment	07/08/2013	10	0.24
C-21584-A	1	Off-Road Equipment	07/09/2013	10	0.74
C-8429-A	1	Off-Road Equipment	07/10/2013	10	1.99
C-21259-A	1	Off-Road Equipment	07/10/2013	10	0.25
C-21268-A	1	Off-Road Equipment	07/10/2013	10	0.24
C-21289-A	1	Off-Road Equipment	07/10/2013	10	0.19

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-7555-A	1	Off-Road Equipment	07/10/2013	10	0.18
C-7559-A	1	Off-Road Equipment	07/10/2013	10	0.17
C-21256-A	1	Off-Road Equipment	07/10/2013	10	0.13
C-21399-A	1	Off-Road Equipment	07/10/2013	10	0.10
C-22710-A	1	Off-Road Equipment	07/10/2013	10	0.06
C-8195-A	1	Off-Road Equipment	07/11/2013	10	1.74
C-22429-A	1	Off-Road Equipment	07/11/2013	10	0.71
C-21910-A	1	Off-Road Equipment	07/11/2013	10	0.41
C-21523-A	1	Off-Road Equipment	07/12/2013	10	0.54
C-21567-A	1	Off-Road Equipment	07/12/2013	10	0.08
C-22064-A	1	Off-Road Equipment	07/13/2013	10	0.04
C-8535-A	1	Off-Road Equipment	07/15/2013	10	0.24
C-21562-A	1	Off-Road Equipment	07/16/2013	10	0.09
C-21330-A	1	Off-Road Equipment	07/17/2013	10	0.98
C-22507-A	1	Off-Road Equipment	07/17/2013	10	0.22
C-22502-A	1	Off-Road Equipment	07/17/2013	10	0.12
C-22505-A	1	Off-Road Equipment	07/17/2013	10	0.12
C-22506-A	1	Off-Road Equipment	07/17/2013	10	0.12
C-21263-A	1	Off-Road Equipment	07/18/2013	10	1.09
C-21333-A	1	Off-Road Equipment	07/18/2013	10	0.86
C-21886-A	1	Off-Road Equipment	07/19/2013	10	1.46
C-21278-A	1	Off-Road Equipment	07/19/2013	10	1.41
C-21279-A	1	Off-Road Equipment	07/19/2013	10	1.32
C-21277-A	1	Off-Road Equipment	07/19/2013	10	1.31
C-21280-A	1	Off-Road Equipment	07/19/2013	10	1.11
C-21302-A	1	Off-Road Equipment	07/19/2013	10	0.45
C-22162-A	1	Off-Road Equipment	07/19/2013	10	0.29
C-21570-A	1	Off-Road Equipment	07/19/2013	10	0.23
C-21239-A	1	Off-Road Equipment	07/20/2013	10	1.17
C-21243-A	1	Off-Road Equipment	07/20/2013	10	0.74
C-22835-A	1	Off-Road Equipment	07/22/2013	10	0.19
C-21507-A	1	Off-Road Equipment	07/23/2013	10	0.87
C-21924-A	1	Off-Road Equipment	07/23/2013	10	0.58
C-21373-A	1	Off-Road Equipment	07/23/2013	10	0.57
C-21977-A	1	Off-Road Equipment	07/23/2013	10	0.05
C-21990-A	1	Off-Road Equipment	07/23/2013	10	0.03
C-21981-A	1	Off-Road Equipment	07/23/2013	10	0.02
C-21851-A	1	Off-Road Equipment	07/24/2013	10	0.34
C-21720-A	1	Off-Road Equipment	07/25/2013	10	1.10
C-22074-A	1	Off-Road Equipment	07/26/2013	10	1.20
C-21711-A	1	Off-Road Equipment	07/26/2013	10	0.82
C-22075-A	1	Off-Road Equipment	07/26/2013	10	0.75
C-21435-A	1	Off-Road Equipment	07/26/2013	10	0.55
C-21712-A	1	Off-Road Equipment	07/26/2013	10	0.32
C-22508-A	1	Off-Road Equipment	07/29/2013	10	0.76
C-22531-A	1	Off-Road Equipment	07/29/2013	10	0.11
C-21761-A	1	Off-Road Equipment	07/30/2013	10	1.17

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-23554-A	1	Off-Road Equipment	07/30/2013	10	1.15
C-8536-A	1	Off-Road Equipment	07/30/2013	10	0.20
C-22329-A	1	Off-Road Equipment	07/30/2013	10	0.02
C-22330-A	1	Off-Road Equipment	07/30/2013	10	0.02
C-21386-A	1	Off-Road Equipment	07/31/2013	10	0.76
C-21743-A	2	Off-Road Equipment	07/31/2013	10	0.73
C-21387-A	1	Off-Road Equipment	07/31/2013	10	0.69
C-21328-A	1	Off-Road Equipment	07/31/2013	10	0.41
C-21391-A	1	Off-Road Equipment	07/31/2013	10	0.37
C-21475-A	1	Off-Road Equipment	07/31/2013	10	0.30
C-23547-A	1	Off-Road Equipment	08/01/2013	10	1.15
C-21820-A	1	Off-Road Equipment	08/02/2013	10	2.16
C-21850-A	1	Off-Road Equipment	08/02/2013	10	0.67
C-8266-A	1	Off-Road Equipment	08/02/2013	10	0.21
C-21157-A	1	Off-Road Equipment	08/07/2013	10	1.46
C-21282-A	1	Off-Road Equipment	08/07/2013	10	1.26
C-21836-A	1	Off-Road Equipment	08/07/2013	10	0.14
C-21448-A	1	Off-Road Equipment	08/08/2013	10	1.43
C-22327-A	1	Off-Road Equipment	08/08/2013	10	0.43
C-21673-A	1	Off-Road Equipment	08/09/2013	10	2.10
C-22281-A	1	Off-Road Equipment	08/09/2013	10	1.00
C-22289-A	1	Off-Road Equipment	08/09/2013	10	1.00
C-22282-A	1	Off-Road Equipment	08/09/2013	10	0.80
C-8459-A	1	Off-Road Equipment	08/09/2013	10	0.68
C-21434-A	1	Off-Road Equipment	08/09/2013	10	0.55
C-21432-A	1	Off-Road Equipment	08/09/2013	10	0.46
C-21433-A	1	Off-Road Equipment	08/09/2013	10	0.46
C-8331-A	1	Off-Road Equipment	08/09/2013	10	0.35
C-8338-A	1	Off-Road Equipment	08/09/2013	10	0.35
C-8426-A	1	Off-Road Equipment	08/09/2013	10	0.35
C-21564-A	1	Off-Road Equipment	08/09/2013	10	0.33
C-8347-A	1	Off-Road Equipment	08/09/2013	10	0.30
C-22663-A	1	Off-Road Equipment	08/09/2013	10	0.26
C-21467-A	1	Off-Road Equipment	08/13/2013	10	1.66
C-21361-A	1	Off-Road Equipment	08/13/2013	10	0.48
C-21917-A	1	Off-Road Equipment	08/13/2013	10	0.29
C-21173-A	1	Off-Road Equipment	08/14/2013	10	3.90
C-22279-A	1	Off-Road Equipment	08/14/2013	10	0.25
C-22265-A	1	Off-Road Equipment	08/14/2013	10	0.11
C-21657-A	1	Off-Road Equipment	08/16/2013	10	1.84
C-24856-A	1	Off-Road Equipment	08/16/2013	10	0.74
C-22186-A	1	Off-Road Equipment	08/16/2013	10	0.07
C-21925-A	1	Off-Road Equipment	08/19/2013	10	0.88
C-22746-A	2	Off-Road Equipment	08/19/2013	10	0.47
C-22313-A	1	Off-Road Equipment	08/19/2013	10	0.36
C-22349-A	1	Off-Road Equipment	08/19/2013	10	0.20
C-21185-A	1	Off-Road Equipment	08/19/2013	10	0.10

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-23749-A	2	Off-Road Equipment	08/21/2013	10	0.11
C-21978-A	1	Off-Road Equipment	08/22/2013	10	2.14
C-21180-A	1	Off-Road Equipment	08/22/2013	10	0.28
C-21697-A	1	Off-Road Equipment	08/22/2013	10	0.14
C-21875-A	1	Off-Road Equipment	08/23/2013	10	1.62
C-22263-A	1	Off-Road Equipment	08/23/2013	10	0.53
C-21565-A	1	Off-Road Equipment	08/23/2013	10	0.45
C-22130-A	1	Off-Road Equipment	08/23/2013	10	0.45
C-22140-A	1	Off-Road Equipment	08/23/2013	10	0.34
C-22264-A	1	Off-Road Equipment	08/23/2013	10	0.21
C-21297-A	1	Off-Road Equipment	08/23/2013	10	0.15
C-23530-A	1	Off-Road Equipment	08/26/2013	10	0.58
C-21878-A	1	Off-Road Equipment	08/26/2013	10	0.42
C-22272-A	1	Off-Road Equipment	08/26/2013	10	0.08
C-22278-A	1	Off-Road Equipment	08/26/2013	10	0.05
C-21370-A	1	Off-Road Equipment	08/27/2013	10	0.62
C-22437-A	1	Off-Road Equipment	08/28/2013	10	0.67
C-22219-A	1	Off-Road Equipment	08/28/2013	10	0.09
C-21694-A	1	Off-Road Equipment	08/28/2013	10	0.05
C-21409-A	1	Off-Road Equipment	08/29/2013	10	3.12
C-21363-A	1	Off-Road Equipment	08/29/2013	10	0.94
C-23653-A	1	Off-Road Equipment	08/29/2013	10	0.24
C-22530-A	1	Off-Road Equipment	08/29/2013	10	0.16
C-22820-A	1	Off-Road Equipment	08/30/2013	10	1.23
C-21591-A	1	Off-Road Equipment	08/30/2013	10	0.69
C-21188-A	1	Off-Road Equipment	08/30/2013	10	0.31
C-21284-A	1	Off-Road Equipment	09/01/2013	10	1.15
C-22625-A	1	Off-Road Equipment	09/04/2013	10	0.32
C-21613-A	1	Off-Road Equipment	09/04/2013	10	0.17
C-23364-A	1	Off-Road Equipment	09/04/2013	10	0.07
C-21260-A	1	Off-Road Equipment	09/05/2013	10	0.43
C-21344-A	1	Off-Road Equipment	09/06/2013	10	1.63
C-23490-A	1	Off-Road Equipment	09/06/2013	10	0.63
C-21397-A	1	Off-Road Equipment	09/09/2013	10	1.41
C-21261-A	1	Off-Road Equipment	09/09/2013	10	0.87
C-21237-A	1	Off-Road Equipment	09/09/2013	10	0.78
C-21253-A	1	Off-Road Equipment	09/09/2013	10	0.58
C-21255-A	1	Off-Road Equipment	09/09/2013	10	0.54
C-21349-A	1	Off-Road Equipment	09/09/2013	10	0.04
C-21902-A	1	Off-Road Equipment	09/10/2013	10	0.12
C-21998-A	1	Off-Road Equipment	09/10/2013	10	0.06
C-22745-A	1	Off-Road Equipment	09/11/2013	10	0.35
C-21722-A	1	Off-Road Equipment	09/11/2013	10	0.27
C-21816-A	1	Off-Road Equipment	09/11/2013	10	0.20
C-21622-A	1	Off-Road Equipment	09/12/2013	10	0.08
C-21894-A	1	Off-Road Equipment	09/12/2013	10	0.08
C-21588-A	1	Off-Road Equipment	09/13/2013	10	0.38

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-21586-A	1	Off-Road Equipment	09/13/2013	10	0.23
C-22054-A	1	Off-Road Equipment	09/13/2013	10	0.13
C-21568-A	1	Off-Road Equipment	09/16/2013	10	0.69
C-7674-A	1	Off-Road Equipment	09/16/2013	10	0.38
C-8297-A	1	Off-Road Equipment	09/16/2013	10	0.38
C-21837-A	1	Off-Road Equipment	09/16/2013	10	0.02
C-21276-A	1	Off-Road Equipment	09/17/2013	10	2.79
C-21288-A	1	Off-Road Equipment	09/17/2013	10	1.66
C-21286-A	1	Off-Road Equipment	09/17/2013	10	1.48
C-21290-A	1	Off-Road Equipment	09/17/2013	10	1.42
C-21275-A	1	Off-Road Equipment	09/17/2013	10	1.39
C-21291-A	1	Off-Road Equipment	09/17/2013	10	1.22
C-21887-A	1	Off-Road Equipment	09/17/2013	10	1.13
C-21262-A	1	Off-Road Equipment	09/17/2013	10	1.07
C-21292-A	1	Off-Road Equipment	09/17/2013	10	0.95
C-8097-A	1	Off-Road Equipment	09/17/2013	10	0.63
C-21242-A	1	Off-Road Equipment	09/17/2013	10	0.43
C-22811-A	1	Off-Road Equipment	09/17/2013	10	0.38
C-24094-A	1	Off-Road Equipment	09/17/2013	10	0.24
C-22042-A	1	Off-Road Equipment	09/17/2013	10	0.21
C-22578-A	1	Off-Road Equipment	09/17/2013	10	0.10
C-22544-A	1	Off-Road Equipment	09/18/2013	10	0.52
C-8517-A	1	Off-Road Equipment	09/19/2013	10	1.23
C-21207-A	1	Off-Road Equipment	09/19/2013	10	0.82
C-22242-A	1	Off-Road Equipment	09/19/2013	10	0.62
C-22161-A	1	Off-Road Equipment	09/20/2013	10	0.59
C-22323-A	1	Off-Road Equipment	09/20/2013	10	0.17
C-8473-A	1	Off-Road Equipment	09/21/2013	10	0.40
C-7497-A	1	Off-Road Equipment	09/23/2013	10	0.55
C-21436-A	1	Off-Road Equipment	09/23/2013	10	0.55
C-22193-A	1	Off-Road Equipment	09/23/2013	10	0.12
C-21727-A	1	Off-Road Equipment	09/24/2013	10	0.01
C-8191-A	1	Off-Road Equipment	09/25/2013	10	1.61
C-22431-A	1	Off-Road Equipment	09/25/2013	10	1.10
C-21916-A	1	Off-Road Equipment	09/25/2013	10	1.09
C-21331-A	1	Off-Road Equipment	09/25/2013	10	0.18
C-8307-A	1	Off-Road Equipment	09/26/2013	10	2.01
C-8306-A	2	Off-Road Equipment	09/26/2013	10	1.76
C-22270-A	1	Off-Road Equipment	09/26/2013	10	0.65
C-21815-A	1	Off-Road Equipment	09/26/2013	10	0.25
C-21247-A	1	Off-Road Equipment	09/27/2013	10	1.80
C-22346-A	1	Off-Road Equipment	09/27/2013	10	0.36
C-8846-A	1	Off-Road Equipment	09/28/2013	10	0.20
C-21674-A	1	Off-Road Equipment	09/29/2013	10	1.64
C-8953-A	1	Off-Road Equipment	09/29/2013	10	0.26
C-8303-A	1	Off-Road Equipment	09/29/2013	10	0.26
C-8067-A	1	Off-Road Equipment	09/30/2013	10	0.34

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-22948-A	1	Off-Road Equipment	09/30/2013	10	0.13
C-22317-A	1	Off-Road Equipment	10/01/2013	10	0.62
C-21710-A	1	Off-Road Equipment	10/01/2013	10	0.59
C-22035-A	1	Off-Road Equipment	10/01/2013	10	0.28
C-21374-A	1	Off-Road Equipment	10/01/2013	10	0.25
C-22164-A	1	Off-Road Equipment	10/02/2013	10	4.11
C-21474-A	1	Off-Road Equipment	10/02/2013	10	0.86
C-21897-A	1	Off-Road Equipment	10/03/2013	10	1.28
C-7641-A	1	Off-Road Equipment	10/03/2013	10	0.59
C-25291-A	1	Off-Road Equipment	10/03/2013	10	0.24
C-23889-A	1	Off-Road Equipment	10/03/2013	10	0.09
C-21980-A	1	Off-Road Equipment	10/07/2013	10	0.27
C-23445-A	1	Off-Road Equipment	10/09/2013	10	1.19
C-23443-A	1	Off-Road Equipment	10/09/2013	10	1.01
C-23436-A	1	Off-Road Equipment	10/09/2013	10	0.85
C-22661-A	1	Off-Road Equipment	10/10/2013	10	0.85
C-21258-A	1	Off-Road Equipment	10/10/2013	10	0.67
C-22627-A	1	Off-Road Equipment	10/10/2013	10	0.47
C-23274-A	1	Off-Road Equipment	10/11/2013	10	0.17
C-22143-A	1	Off-Road Equipment	10/14/2013	10	1.68
C-21823-A	1	Off-Road Equipment	10/14/2013	10	1.09
C-21431-A	1	Off-Road Equipment	10/14/2013	10	0.47
C-21824-A	1	Off-Road Equipment	10/15/2013	10	1.55
C-21368-A	1	Off-Road Equipment	10/15/2013	10	0.98
C-21425-A	1	Off-Road Equipment	10/15/2013	10	0.37
C-22350-A	1	Off-Road Equipment	10/15/2013	10	0.25
C-21367-A	1	Off-Road Equipment	10/16/2013	10	2.73
C-21249-A	1	Off-Road Equipment	10/16/2013	10	1.30
C-21252-A	1	Off-Road Equipment	10/16/2013	10	0.66
C-22819-A	1	Off-Road Equipment	10/17/2013	10	0.35
C-21589-A	1	Off-Road Equipment	10/17/2013	10	0.02
C-21590-A	1	Off-Road Equipment	10/17/2013	10	0.02
C-21350-A	1	Off-Road Equipment	10/18/2013	10	0.12
C-22628-A	1	Off-Road Equipment	10/21/2013	10	1.36
C-21682-A	1	Off-Road Equipment	10/21/2013	10	0.21
C-22324-A	1	Off-Road Equipment	10/21/2013	10	0.15
C-21701-A	1	Off-Road Equipment	10/21/2013	10	0.10
C-22273-A	1	Off-Road Equipment	10/22/2013	10	1.00
C-22271-A	1	Off-Road Equipment	10/22/2013	10	0.53
C-21747-A	1	Off-Road Equipment	10/22/2013	10	0.40
C-22497-A	1	Off-Road Equipment	10/22/2013	10	0.38
C-22673-A	1	Off-Road Equipment	10/22/2013	10	0.30
C-22675-A	1	Off-Road Equipment	10/22/2013	10	0.30
C-22630-A	1	Off-Road Equipment	10/22/2013	10	0.20
C-21879-A	1	Off-Road Equipment	10/22/2013	10	0.15
C-22322-A	1	Off-Road Equipment	10/22/2013	10	0.12
C-22669-A	1	Off-Road Equipment	10/23/2013	10	0.33

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-22670-A	1	Off-Road Equipment	10/23/2013	10	0.29
C-21415-A	1	Off-Road Equipment	10/23/2013	10	0.21
C-21554-A	1	Off-Road Equipment	10/23/2013	10	0.20
C-22629-A	1	Off-Road Equipment	10/24/2013	10	1.70
C-22810-A	1	Off-Road Equipment	10/24/2013	10	0.46
C-22791-A	1	Off-Road Equipment	10/24/2013	10	0.06
C-21236-A	1	Off-Road Equipment	10/25/2013	10	0.79
C-21216-A	1	Off-Road Equipment	10/25/2013	10	0.77
C-21300-A	1	Off-Road Equipment	10/25/2013	10	0.57
C-21215-A	1	Off-Road Equipment	10/25/2013	10	0.50
C-21620-A	1	Off-Road Equipment	10/25/2013	10	0.15
C-21833-A	1	Off-Road Equipment	10/25/2013	10	0.05
C-22621-A	1	Off-Road Equipment	10/26/2013	10	0.37
C-22622-A	1	Off-Road Equipment	10/26/2013	10	0.37
C-22623-A	1	Off-Road Equipment	10/26/2013	10	0.37
C-23314-A	1	Off-Road Equipment	10/28/2013	10	0.45
C-21441-A	1	Off-Road Equipment	10/28/2013	10	0.40
C-22619-A	1	Off-Road Equipment	10/28/2013	10	0.37
C-22620-A	1	Off-Road Equipment	10/28/2013	10	0.37
C-22943-A	1	Off-Road Equipment	10/28/2013	10	0.19
C-22802-A	1	Off-Road Equipment	10/30/2013	10	1.03
C-21891-A	1	Off-Road Equipment	10/31/2013	10	1.36
C-22610-A	1	Off-Road Equipment	10/31/2013	10	1.11
C-8828-A	1	Off-Road Equipment	10/31/2013	10	0.88
C-8827-A	1	Off-Road Equipment	10/31/2013	10	0.27
C-21631-A	1	Off-Road Equipment	10/31/2013	10	0.22
C-21628-A	1	Off-Road Equipment	10/31/2013	10	0.22
C-22813-A	1	Off-Road Equipment	10/31/2013	10	0.12
C-22226-A	1	Off-Road Equipment	11/05/2013	10	0.94
C-22232-A	1	Off-Road Equipment	11/05/2013	10	0.33
C-23363-A	1	Off-Road Equipment	11/05/2013	10	0.16
C-22306-A	1	Off-Road Equipment	11/07/2013	10	0.18
C-22158-A	1	Off-Road Equipment	11/07/2013	10	0.16
C-21679-A	1	Off-Road Equipment	11/08/2013	10	2.43
C-22859-A	1	Off-Road Equipment	11/08/2013	10	0.64
C-21909-A	1	Off-Road Equipment	11/08/2013	10	0.54
C-22795-A	1	Off-Road Equipment	11/11/2013	10	0.14
C-22314-A	1	Off-Road Equipment	11/12/2013	10	1.53
C-22798-A	1	Off-Road Equipment	11/12/2013	10	0.88
C-22073-A	1	Off-Road Equipment	11/14/2013	10	1.46
C-22434-A	1	Off-Road Equipment	11/14/2013	10	0.46
C-21987-A	1	Off-Road Equipment	11/15/2013	10	1.55
C-21672-A	1	Off-Road Equipment	11/18/2013	10	1.64
C-21192-A	1	Off-Road Equipment	11/19/2013	10	0.10
C-21748-A	1	Off-Road Equipment	11/20/2013	10	0.23
C-21690-A	1	Off-Road Equipment	11/21/2013	10	1.31
C-22939-A	1	Off-Road Equipment	11/21/2013	10	1.10

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-21675-A	1	Off-Road Equipment	11/22/2013	10	1.67
C-22606-A	1	Off-Road Equipment	11/22/2013	10	0.50
C-21882-A	1	Off-Road Equipment	11/22/2013	10	0.46
C-22034-A	1	Off-Road Equipment	11/25/2013	10	0.64
C-21355-A	1	Off-Road Equipment	11/25/2013	10	0.35
C-21692-A	1	Off-Road Equipment	11/26/2013	10	1.05
C-21375-A	1	Off-Road Equipment	11/27/2013	10	1.24
C-22141-A	1	Off-Road Equipment	11/27/2013	10	0.77
C-21353-A	1	Off-Road Equipment	11/27/2013	10	0.64
C-22103-A	1	Off-Road Equipment	11/27/2013	10	0.57
C-22105-A	1	Off-Road Equipment	11/27/2013	10	0.52
C-21371-A	1	Off-Road Equipment	11/27/2013	10	0.22
C-23449-A	1	Off-Road Equipment	11/27/2013	10	0.06
C-23710-A	1	Off-Road Equipment	11/30/2013	10	1.15
C-22267-A	1	Off-Road Equipment	12/02/2013	10	1.55
C-22947-A	1	Off-Road Equipment	12/02/2013	10	0.59
C-8595-A	1	Off-Road Equipment	12/04/2013	10	0.47
C-21698-A	1	Off-Road Equipment	12/05/2013	10	1.30
C-23248-A	1	Off-Road Equipment	12/05/2013	10	0.61
C-21235-A	1	Off-Road Equipment	12/06/2013	10	0.79
C-21693-A	1	Off-Road Equipment	12/06/2013	10	0.48
C-21595-A	1	Off-Road Equipment	12/09/2013	10	0.67
C-21995-A	1	Off-Road Equipment	12/10/2013	10	1.18
C-22420-A	1	Off-Road Equipment	12/10/2013	10	1.10
C-24311-A	1	Off-Road Equipment	12/10/2013	10	0.59
C-24303-A	1	Off-Road Equipment	12/10/2013	10	0.58
C-23313-A	1	Off-Road Equipment	12/11/2013	10	1.68
C-22179-A	1	Off-Road Equipment	12/11/2013	10	0.69
C-22142-A	1	Off-Road Equipment	12/11/2013	10	0.67
C-23447-A	1	Off-Road Equipment	12/11/2013	10	0.40
C-22182-A	1	Off-Road Equipment	12/11/2013	10	0.25
C-23315-A	1	Off-Road Equipment	12/11/2013	10	0.20
C-23383-A	1	Off-Road Equipment	12/11/2013	10	0.13
C-8813-A	1	Off-Road Equipment	12/12/2013	10	0.72
C-21817-A	1	Off-Road Equipment	12/12/2013	10	0.31
C-21684-A	1	Off-Road Equipment	12/13/2013	10	0.80
C-21683-A	1	Off-Road Equipment	12/13/2013	10	0.51
C-22066-A	1	Off-Road Equipment	12/17/2013	10	0.04
C-22068-A	1	Off-Road Equipment	12/17/2013	10	0.01
C-22069-A	1	Off-Road Equipment	12/17/2013	10	0.01
C-22062-A	1	Off-Road Equipment	12/17/2013	10	0.01
C-22055-A	1	Off-Road Equipment	12/17/2013	10	0.00
C-22058-A	1	Off-Road Equipment	12/17/2013	10	0.00
C-22060-A	1	Off-Road Equipment	12/17/2013	10	0.00
C-21721-A	1	Off-Road Equipment	12/18/2013	10	0.24
C-23191-A	1	Off-Road Equipment	12/18/2013	10	0.20
C-21974-A	1	Off-Road Equipment	12/18/2013	10	0.14

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-22767-A	1	Off-Road Equipment	12/18/2013	10	0.10
C-21896-A	1	Off-Road Equipment	12/19/2013	10	0.43
C-21607-A	1	Off-Road Equipment	12/19/2013	10	0.34
C-23271-A	1	Off-Road Equipment	12/19/2013	10	0.18
C-22945-A	1	Off-Road Equipment	12/20/2013	10	0.37
C-22005-A	1	Off-Road Equipment	12/20/2013	10	0.22
C-22003-A	1	Off-Road Equipment	12/20/2013	10	0.15
C-22159-A	1	Off-Road Equipment	12/23/2013	10	0.21
C-21898-A	1	Off-Road Equipment	12/23/2013	10	0.10
C-21899-A	1	Off-Road Equipment	12/23/2013	10	0.10
C-21734-A	1	Off-Road Equipment	12/26/2013	10	0.25
C-23153-A	1	Off-Road Equipment	12/26/2013	10	0.19
C-22156-A	1	Off-Road Equipment	12/26/2013	10	0.13
C-22654-A	1	Off-Road Equipment	12/26/2013	10	0.00
C-22048-A	1	Off-Road Equipment	12/27/2013	10	0.55
C-22492-A	1	Off-Road Equipment	12/27/2013	10	0.49
C-22052-A	1	Off-Road Equipment	12/27/2013	10	0.42
C-21762-A	1	Off-Road Equipment	12/27/2013	10	0.18
C-21382-A	1	Off-Road Equipment	12/27/2013	10	0.16
C-22495-A	1	Off-Road Equipment	12/27/2013	10	0.14
C-23527-A	1	Off-Road Equipment	12/27/2013	10	0.07
C-21686-A	1	Off-Road Equipment	12/27/2013	10	0.06
C-22438-A	1	Off-Road Equipment	12/30/2013	10	1.12
C-22605-A	1	Off-Road Equipment	12/30/2013	10	0.82
C-23977-A	1	Off-Road Equipment	12/30/2013	10	0.68
C-21414-A	1	Off-Road Equipment	12/30/2013	10	0.45
C-21413-A	1	Off-Road Equipment	12/30/2013	10	0.38
C-22942-A	1	Off-Road Equipment	12/30/2013	10	0.36
C-22031-A	1	Off-Road Equipment	12/30/2013	10	0.30
C-21737-A	1	Off-Road Equipment	12/30/2013	10	0.24
C-23475-A	1	Off-Road Equipment	12/30/2013	10	0.07
C-21251-A	1	Off-Road Equipment	12/31/2013	10	1.31
C-21246-A	1	Off-Road Equipment	12/31/2013	10	1.30
C-21376-A	1	Off-Road Equipment	12/31/2013	10	1.07
C-22806-A	1	Off-Road Equipment	12/31/2013	10	0.57
C-23649-A	1	Off-Road Equipment	12/31/2013	10	0.41
C-21906-A	1	Off-Road Equipment	12/31/2013	10	0.38
C-21907-A	1	Off-Road Equipment	12/31/2013	10	0.25
C-22498-A	1	Off-Road Equipment	12/31/2013	10	0.25
C-22499-A	1	Off-Road Equipment	12/31/2013	10	0.21
C-22992-A	1	Off-Road Equipment	12/31/2013	10	0.15
C-22991-A	1	Off-Road Equipment	12/31/2013	10	0.12
C-9009-A	1	Off-Road Equipment	12/31/2013	10	0.11
C-23195-A	1	Off-Road Equipment	01/06/2014	10	0.15
C-22308-A	1	Off-Road Equipment	01/07/2014	10	0.08
C-21464-A	1	Off-Road Equipment	01/08/2014	10	2.03
C-23499-A	1	Off-Road Equipment	01/12/2014	10	0.23

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-23500-A	1	Off-Road Equipment	01/12/2014	10	0.23
C-23501-A	2	Off-Road Equipment	01/12/2014	10	0.15
C-23497-A	1	Off-Road Equipment	01/13/2014	10	0.38
C-23495-A	1	Off-Road Equipment	01/13/2014	10	0.31
C-23498-A	1	Off-Road Equipment	01/13/2014	10	0.23
C-23502-A	1	Off-Road Equipment	01/13/2014	10	0.23
C-23503-A	1	Off-Road Equipment	01/13/2014	10	0.19
C-23504-A	1	Off-Road Equipment	01/13/2014	10	0.12
C-21446-A	1	Off-Road Equipment	01/14/2014	10	0.38
C-22611-A	1	Off-Road Equipment	01/15/2014	10	1.05
C-25369-A	1	Off-Road Equipment	01/15/2014	10	0.56
C-22609-A	1	Off-Road Equipment	01/15/2014	10	0.33
C-22602-A	1	Off-Road Equipment	01/15/2014	10	0.25
C-23577-A	1	Off-Road Equipment	01/15/2014	10	0.10
C-21269-A	1	Off-Road Equipment	01/16/2014	10	1.81
C-21265-A	1	Off-Road Equipment	01/16/2014	10	1.67
C-21274-A	1	Off-Road Equipment	01/16/2014	10	1.55
C-22275-A	1	Off-Road Equipment	01/16/2014	10	0.51
C-23978-A	1	Off-Road Equipment	01/17/2014	10	0.48
C-22496-A	1	Off-Road Equipment	01/17/2014	10	0.30
C-22258-A	1	Off-Road Equipment	01/20/2014	10	0.60
C-22107-A	1	Off-Road Equipment	01/20/2014	10	0.35
C-22305-A	1	Off-Road Equipment	01/20/2014	10	0.34
C-22260-A	1	Off-Road Equipment	01/20/2014	10	0.09
C-21731-A	1	Off-Road Equipment	01/21/2014	10	1.17
C-21604-A	1	Off-Road Equipment	01/21/2014	10	0.55
C-21596-A	1	Off-Road Equipment	01/21/2014	10	0.47
C-22283-A	1	Off-Road Equipment	01/22/2014	10	0.51
C-22287-A	1	Off-Road Equipment	01/22/2014	10	0.36
C-24586-A	1	Off-Road Equipment	01/27/2014	10	1.49
C-22334-A	1	Off-Road Equipment	01/27/2014	10	0.37
C-23446-A	1	Off-Road Equipment	01/28/2014	10	0.20
C-22439-A	1	Off-Road Equipment	01/31/2014	10	1.08
C-25963-A	1	Off-Road Equipment	01/31/2014	10	0.27
C-21746-A	1	Off-Road Equipment	01/31/2014	10	0.22
C-23270-A	1	Off-Road Equipment	01/31/2014	10	0.18
C-23312-A	1	Off-Road Equipment	02/03/2014	10	0.60
C-25913-A	1	Off-Road Equipment	02/03/2014	10	0.60
C-25962-A	1	Off-Road Equipment	02/05/2014	10	0.27
C-25964-A	1	Off-Road Equipment	02/05/2014	10	0.27
C-25965-A	1	Off-Road Equipment	02/05/2014	10	0.27
C-25031-A	1	Off-Road Equipment	02/05/2014	10	0.07
C-23007-A	1	Off-Road Equipment	02/07/2014	10	1.04
C-23014-A	1	Off-Road Equipment	02/07/2014	10	0.87
C-22277-A	1	Off-Road Equipment	02/07/2014	10	0.70
C-23009-A	1	Off-Road Equipment	02/07/2014	10	0.24
C-22803-A	1	Off-Road Equipment	02/11/2014	10	0.56

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-24609-A	1	Off-Road Equipment	02/11/2014	10	0.55
C-22944-A	1	Off-Road Equipment	02/17/2014	10	0.29
C-21763-A	1	Off-Road Equipment	02/21/2014	10	0.55
C-23160-A	1	Off-Road Equipment	02/21/2014	10	0.12
C-23576-A	1	Off-Road Equipment	02/21/2014	10	0.08
C-21508-A	1	Off-Road Equipment	02/24/2014	10	0.22
C-22178-A	1	Off-Road Equipment	02/26/2014	10	0.19
C-8793-A	1	Off-Road Equipment	02/27/2014	10	1.32
C-24360-A	1	Off-Road Equipment	02/27/2014	10	1.23
C-21975-A	1	Off-Road Equipment	02/27/2014	10	0.45
C-7673-A	1	Off-Road Equipment	03/03/2014	10	0.59
C-22946-A	1	Off-Road Equipment	03/10/2014	10	0.28
C-21759-A	1	Off-Road Equipment	03/13/2014	10	0.34
C-22749-A	1	Off-Road Equipment	03/13/2014	10	0.34
C-22754-A	1	Off-Road Equipment	03/13/2014	10	0.34
C-22050-A	1	Off-Road Equipment	03/13/2014	10	0.03
C-23583-A	1	Off-Road Equipment	03/14/2014	10	0.55
C-22624-A	1	Off-Road Equipment	03/14/2014	10	0.20
C-23766-A	1	Off-Road Equipment	03/15/2014	10	0.64
C-24195-A	1	Off-Road Equipment	03/17/2014	10	0.49
C-24194-A	1	Off-Road Equipment	03/17/2014	10	0.39
C-22318-A	1	Off-Road Equipment	03/19/2014	10	0.33
C-23759-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23762-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23767-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23772-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23776-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23783-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23784-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23785-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23786-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23788-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23789-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23793-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23797-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23798-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-23770-A	1	Off-Road Equipment	03/19/2014	10	0.01
C-24100-A	1	Off-Road Equipment	03/20/2014	10	2.47
C-23704-A	1	Off-Road Equipment	03/20/2014	10	0.62
C-22040-A	1	Off-Road Equipment	03/21/2014	10	0.60
C-21905-A	1	Off-Road Equipment	03/21/2014	10	0.17
C-22801-A	1	Off-Road Equipment	03/24/2014	10	0.84
C-23941-A	1	Off-Road Equipment	03/24/2014	10	0.52
C-23944-A	1	Off-Road Equipment	03/24/2014	10	0.24
C-22800-A	1	Off-Road Equipment	03/24/2014	10	0.24
C-23272-A	1	Off-Road Equipment	03/24/2014	10	0.18
C-21623-A	1	Off-Road Equipment	03/24/2014	10	0.03

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-8962-A	1	Off-Road Equipment	03/25/2014	10	2.40
C-21814-A	1	Off-Road Equipment	03/26/2014	10	2.11
C-21717-A	1	Off-Road Equipment	03/26/2014	10	0.96
C-23545-A	1	Off-Road Equipment	03/26/2014	10	0.30
C-23543-A	1	Off-Road Equipment	03/26/2014	10	0.30
C-22989-A	1	Off-Road Equipment	03/27/2014	10	0.15
C-21587-A	1	Off-Road Equipment	03/27/2014	10	0.04
C-23946-A	1	Off-Road Equipment	03/27/2014	10	0.03
C-23948-A	1	Off-Road Equipment	03/27/2014	10	0.03
C-23593-A	1	Off-Road Equipment	03/28/2014	10	0.70
C-23594-A	1	Off-Road Equipment	03/28/2014	10	0.57
C-23646-A	1	Off-Road Equipment	03/28/2014	10	0.12
C-8306-B	1	Off-Road Equipment	03/31/2014	10	2.80
C-23207-A	1	Off-Road Equipment	03/31/2014	10	1.28
C-23942-A	1	Off-Road Equipment	03/31/2014	10	0.65
C-25174-A	1	Off-Road Equipment	03/31/2014	10	0.38
C-22244-A	1	Off-Road Equipment	03/31/2014	10	0.13
C-22808-A	1	Off-Road Equipment	03/31/2014	10	0.06
C-21572-A	1	Off-Road Equipment	04/01/2014	10	0.34
C-22046-A	1	Off-Road Equipment	04/01/2014	10	0.11
C-22041-A	1	Off-Road Equipment	04/01/2014	10	0.09
C-22792-A	1	Off-Road Equipment	04/01/2014	10	0.06
C-22037-A	1	Off-Road Equipment	04/01/2014	10	0.02
C-22296-A	1	Off-Road Equipment	04/02/2014	10	0.60
C-21919-A	1	Off-Road Equipment	04/03/2014	10	0.28
C-21918-A	1	Off-Road Equipment	04/03/2014	10	0.28
C-22421-A	1	Off-Road Equipment	04/04/2014	10	1.51
C-24361-A	1	Off-Road Equipment	04/04/2014	10	0.75
C-24778-A	1	Off-Road Equipment	04/04/2014	10	0.64
C-26072-A	1	Off-Road Equipment	04/04/2014	10	0.48
C-26073-A	1	Off-Road Equipment	04/04/2014	10	0.28
C-24590-A	1	Off-Road Equipment	04/04/2014	10	0.21
C-23714-A	1	Off-Road Equipment	04/04/2014	10	0.13
C-21996-A	1	Off-Road Equipment	04/09/2014	10	0.49
C-23655-A	1	Off-Road Equipment	04/09/2014	10	0.17
C-23018-A	1	Off-Road Equipment	04/09/2014	10	0.16
C-24135-A	1	Off-Road Equipment	04/10/2014	10	1.58
C-24136-A	1	Off-Road Equipment	04/10/2014	10	0.95
C-22160-A	1	Off-Road Equipment	04/11/2014	10	0.05
C-24768-A	1	Off-Road Equipment	04/14/2014	10	0.70
C-24002-A	1	Off-Road Equipment	04/14/2014	10	0.04
C-22316-A	1	Off-Road Equipment	04/15/2014	10	0.23
C-23311-A	1	Off-Road Equipment	04/16/2014	10	0.59
C-23309-A	1	Off-Road Equipment	04/16/2014	10	0.36
C-23310-A	1	Off-Road Equipment	04/16/2014	10	0.15
C-23476-A	1	Off-Road Equipment	04/17/2014	10	0.64
C-23568-A	1	Off-Road Equipment	04/17/2014	10	0.03

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-23722-A	1	Off-Road Equipment	04/19/2014	10	1.17
C-24441-A	1	Off-Road Equipment	04/21/2014	10	0.08
C-23727-A	1	Off-Road Equipment	04/22/2014	10	1.05
C-22230-A	1	Off-Road Equipment	04/22/2014	10	0.22
C-22233-A	1	Off-Road Equipment	04/22/2014	10	0.22
C-23900-A	1	Off-Road Equipment	04/23/2014	10	0.27
C-23830-A	1	Off-Road Equipment	04/24/2014	10	0.65
C-23590-A	1	Off-Road Equipment	04/24/2014	10	0.43
C-22940-A	1	Off-Road Equipment	04/24/2014	10	0.14
C-23724-A	1	Off-Road Equipment	04/25/2014	10	0.18
C-22657-A	1	Off-Road Equipment	04/25/2014	10	0.09
C-22658-A	1	Off-Road Equipment	04/25/2014	10	0.09
C-23202-A	1	Off-Road Equipment	04/28/2014	10	1.90
C-26096-A	1	Off-Road Equipment	04/28/2014	10	1.26
C-22089-A	1	Off-Road Equipment	04/28/2014	10	0.39
C-22000-A	1	Off-Road Equipment	04/30/2014	10	1.07
C-23720-A	1	Off-Road Equipment	04/30/2014	10	0.78
C-23755-A	1	Off-Road Equipment	04/30/2014	10	0.44
C-23520-A	1	Off-Road Equipment	04/30/2014	10	0.26
C-23526-A	1	Off-Road Equipment	04/30/2014	10	0.25
C-23523-A	1	Off-Road Equipment	04/30/2014	10	0.21
C-21846-A	1	Off-Road Equipment	04/30/2014	10	0.19
C-23521-A	1	Off-Road Equipment	04/30/2014	10	0.17
C-23552-A	1	Off-Road Equipment	04/30/2014	10	0.17
C-23975-A	1	Off-Road Equipment	04/30/2014	10	0.16
C-23522-A	1	Off-Road Equipment	04/30/2014	10	0.14
C-23525-A	1	Off-Road Equipment	04/30/2014	10	0.11
C-23524-A	1	Off-Road Equipment	04/30/2014	10	0.01
C-22789-A	1	Off-Road Equipment	05/01/2014	10	0.80
C-23286-A	1	Off-Road Equipment	05/01/2014	10	0.59
C-25637-A	1	Off-Road Equipment	05/05/2014	10	0.09
C-23831-A	1	Off-Road Equipment	05/07/2014	10	0.36
C-23811-A	1	Off-Road Equipment	05/07/2014	10	0.32
C-23580-A	1	Off-Road Equipment	05/07/2014	10	0.23
C-30504-A	1	Off-Road Equipment	05/07/2014	10	0.22
C-23895-A	1	Off-Road Equipment	05/07/2014	10	0.08
C-23892-A	1	Off-Road Equipment	05/07/2014	10	0.02
C-23893-A	1	Off-Road Equipment	05/07/2014	10	0.02
C-22815-A	1	Off-Road Equipment	05/08/2014	10	0.76
C-24118-A	1	Off-Road Equipment	05/08/2014	10	0.40
C-23807-A	1	Off-Road Equipment	05/08/2014	10	0.09
C-22807-A	1	Off-Road Equipment	05/12/2014	10	0.57
C-25718-A	1	Off-Road Equipment	05/12/2014	10	0.30
C-23650-A	1	Off-Road Equipment	05/12/2014	10	0.25
C-23840-A	1	Off-Road Equipment	05/13/2014	10	0.04
C-22028-A	1	Off-Road Equipment	05/14/2014	10	0.22
C-23894-A	1	Off-Road Equipment	05/14/2014	10	0.06

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-22717-A	1	Off-Road Equipment	05/16/2014	10	0.84
C-23754-A	1	Off-Road Equipment	05/20/2014	10	0.38
C-24065-A	1	Off-Road Equipment	05/20/2014	10	0.24
C-24066-A	1	Off-Road Equipment	05/20/2014	10	0.24
C-23752-A	1	Off-Road Equipment	05/20/2014	10	0.15
C-23751-A	1	Off-Road Equipment	05/20/2014	10	0.14
C-23753-A	1	Off-Road Equipment	05/21/2014	10	1.72
C-22721-A	1	Off-Road Equipment	05/21/2014	10	0.78
C-23746-A	1	Off-Road Equipment	05/21/2014	10	0.29
C-21283-A	1	Off-Road Equipment	05/23/2014	10	0.43
C-21339-A	1	Off-Road Equipment	05/27/2014	10	0.56
C-22566-A	1	Off-Road Equipment	05/27/2014	10	0.40
C-23725-A	1	Off-Road Equipment	05/27/2014	10	0.01
C-23943-A	1	Off-Road Equipment	05/28/2014	10	0.69
C-21812-A	1	Off-Road Equipment	05/28/2014	10	0.60
C-23813-A	1	Off-Road Equipment	05/28/2014	10	0.18
C-23850-A	1	Off-Road Equipment	05/29/2014	10	0.02
C-24140-A	1	Off-Road Equipment	05/30/2014	10	0.69
C-22237-A	1	Off-Road Equipment	05/30/2014	10	0.19
C-23849-A	1	Off-Road Equipment	06/02/2014	10	0.05
C-23757-A	1	Off-Road Equipment	06/03/2014	10	0.58
C-25094-A	1	Off-Road Equipment	06/03/2014	10	0.52
C-23971-A	1	Off-Road Equipment	06/04/2014	10	0.07
C-23839-A	1	Off-Road Equipment	06/05/2014	10	0.89
C-24607-A	1	Off-Road Equipment	06/05/2014	10	0.09
C-23760-A	1	Off-Road Equipment	06/09/2014	10	0.49
C-21811-A	1	Off-Road Equipment	06/09/2014	10	0.47
C-23761-A	1	Off-Road Equipment	06/09/2014	10	0.41
C-23841-A	1	Off-Road Equipment	06/09/2014	10	0.23
C-23980-A	1	Off-Road Equipment	06/10/2014	10	0.45
C-23648-A	1	Off-Road Equipment	06/10/2014	10	0.21
C-22422-A	1	Off-Road Equipment	06/11/2014	10	3.23
C-23765-A	1	Off-Road Equipment	06/11/2014	10	0.52
C-22367-A	1	Off-Road Equipment	06/11/2014	10	0.13
C-22343-A	1	Off-Road Equipment	06/11/2014	10	0.11
C-22342-A	1	Off-Road Equipment	06/11/2014	10	0.10
C-22344-A	1	Off-Road Equipment	06/11/2014	10	0.09
C-24087-A	1	Off-Road Equipment	06/16/2014	10	0.42
C-23533-A	1	Off-Road Equipment	06/16/2014	10	0.24
C-23880-A	1	Off-Road Equipment	06/16/2014	10	0.19
C-23882-A	1	Off-Road Equipment	06/16/2014	10	0.15
C-23883-A	1	Off-Road Equipment	06/16/2014	10	0.15
C-22328-A	1	Off-Road Equipment	06/17/2014	10	2.62
C-24102-A	1	Off-Road Equipment	06/17/2014	10	0.11
C-21972-A	1	Off-Road Equipment	06/19/2014	10	0.64
C-23847-A	1	Off-Road Equipment	06/19/2014	10	0.53
C-24092-A	1	Off-Road Equipment	06/19/2014	10	0.22

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-23535-A	1	Off-Road Equipment	06/19/2014	10	0.21
C-8969-A	1	Off-Road Equipment	06/20/2014	10	0.82
C-24122-A	1	Off-Road Equipment	06/23/2014	10	0.43
C-24050-A	1	Off-Road Equipment	06/23/2014	10	0.07
C-24060-A	1	Off-Road Equipment	06/23/2014	10	0.06
C-8720-A	1	Off-Road Equipment	06/24/2014	10	0.73
C-24142-A	1	Off-Road Equipment	06/24/2014	10	0.55
C-24196-A	1	Off-Road Equipment	06/25/2014	10	0.22
C-23717-A	1	Off-Road Equipment	06/25/2014	10	0.21
C-23389-A	2	Off-Road Equipment	06/25/2014	10	0.16
C-28085-A	1	Off-Road Equipment	06/25/2014	10	0.08
C-21566-A	1	Off-Road Equipment	06/27/2014	10	0.64
C-21582-A	1	Off-Road Equipment	06/27/2014	10	0.63
C-21579-A	1	Off-Road Equipment	06/27/2014	10	0.60
C-21575-A	1	Off-Road Equipment	06/27/2014	10	0.59
C-23537-A	1	Off-Road Equipment	06/27/2014	10	0.12
C-24215-A	1	Off-Road Equipment	06/28/2014	10	0.48
C-24561-A	1	Off-Road Equipment	06/28/2014	10	0.18
C-23899-A	1	Off-Road Equipment	06/28/2014	10	0.14
C-24364-A	1	Off-Road Equipment	06/28/2014	10	0.14
C-23897-A	1	Off-Road Equipment	06/28/2014	10	0.11
C-23661-A	1	Off-Road Equipment	07/01/2014	10	0.64
C-27641-A	1	Off-Road Equipment	07/03/2014	10	0.21
C-22424-A	1	Off-Road Equipment	07/08/2014	10	2.73
C-22425-A	1	Off-Road Equipment	07/08/2014	10	2.23
C-25166-A	1	Off-Road Equipment	07/09/2014	10	0.30
C-25167-A	1	Off-Road Equipment	07/09/2014	10	0.30
C-24560-A	1	Off-Road Equipment	07/09/2014	10	0.25
C-21571-A	1	Off-Road Equipment	07/10/2014	10	0.64
C-23995-A	1	Off-Road Equipment	07/10/2014	10	0.21
C-23997-A	1	Off-Road Equipment	07/10/2014	10	0.20
C-22757-A	1	Off-Road Equipment	07/15/2014	10	0.63
C-26101-A	1	Off-Road Equipment	07/15/2014	10	0.43
C-21356-A	1	Off-Road Equipment	07/15/2014	10	0.38
C-22751-A	1	Off-Road Equipment	07/15/2014	10	0.34
C-24085-A	1	Off-Road Equipment	07/16/2014	10	0.17
C-21920-A	1	Off-Road Equipment	07/17/2014	10	0.41
C-21921-A	1	Off-Road Equipment	07/17/2014	10	0.24
C-21922-A	1	Off-Road Equipment	07/17/2014	10	0.24
C-21923-A	1	Off-Road Equipment	07/17/2014	10	0.24
C-24486-A	1	Off-Road Equipment	07/17/2014	10	0.13
C-23281-A	1	Off-Road Equipment	07/18/2014	10	0.64
C-23282-A	1	Off-Road Equipment	07/18/2014	10	0.64
C-23283-A	1	Off-Road Equipment	07/18/2014	10	0.64
C-23284-A	1	Off-Road Equipment	07/18/2014	10	0.60
C-23285-A	1	Off-Road Equipment	07/18/2014	10	0.60
C-23878-A	1	Off-Road Equipment	07/18/2014	10	0.15

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-23881-A	1	Off-Road Equipment	07/18/2014	10	0.15
C-21573-A	1	Off-Road Equipment	07/21/2014	10	0.58
C-24283-A	1	Off-Road Equipment	07/21/2014	10	0.55
C-22656-A	1	Off-Road Equipment	07/23/2014	10	0.86
C-25024-A	1	Off-Road Equipment	07/23/2014	10	0.45
C-23193-A	1	Off-Road Equipment	07/24/2014	10	0.80
C-24190-A	1	Off-Road Equipment	07/25/2014	10	0.57
C-23591-A	1	Off-Road Equipment	07/25/2014	10	0.43
C-24596-A	1	Off-Road Equipment	07/25/2014	10	0.14
C-23848-A	1	Off-Road Equipment	07/28/2014	10	0.97
C-22719-A	1	Off-Road Equipment	07/30/2014	10	1.57
C-24358-A	1	Off-Road Equipment	07/30/2014	10	0.56
C-31191-A	1	Off-Road Equipment	07/30/2014	10	0.28
C-8871-A	1	Off-Road Equipment	07/31/2014	10	2.03
C-8869-A	1	Off-Road Equipment	07/31/2014	10	1.21
C-24274-A	1	Off-Road Equipment	07/31/2014	10	0.93
C-24038-A	1	Off-Road Equipment	07/31/2014	10	0.18
C-27853-A	1	Off-Road Equipment	07/31/2014	10	0.12
C-24039-A	1	Off-Road Equipment	07/31/2014	10	0.11
C-24040-A	1	Off-Road Equipment	07/31/2014	10	0.11
C-24042-A	1	Off-Road Equipment	07/31/2014	10	0.03
C-24030-A	1	Off-Road Equipment	07/31/2014	10	0.01
C-24034-A	1	Off-Road Equipment	07/31/2014	10	0.01
C-24036-A	1	Off-Road Equipment	07/31/2014	10	0.01
C-24035-A	1	Off-Road Equipment	07/31/2014	10	0.01
C-24037-A	1	Off-Road Equipment	07/31/2014	10	0.01
C-8642-A	1	Off-Road Equipment	08/01/2014	10	0.31
C-24247-A	1	Off-Road Equipment	08/01/2014	10	0.21
C-24148-A	1	Off-Road Equipment	08/04/2014	10	0.82
C-24562-A	1	Off-Road Equipment	08/04/2014	10	0.45
C-25220-A	1	Off-Road Equipment	08/04/2014	10	0.40
C-21477-A	1	Off-Road Equipment	08/04/2014	10	0.31
C-24834-A	1	Off-Road Equipment	08/04/2014	10	0.18
C-22423-A	1	Off-Road Equipment	08/06/2014	10	1.88
C-22426-A	1	Off-Road Equipment	08/06/2014	10	1.55
C-24062-A	1	Off-Road Equipment	08/06/2014	10	0.60
C-24202-A	1	Off-Road Equipment	08/06/2014	10	0.56
C-8847-A	1	Off-Road Equipment	08/11/2014	10	0.68
C-8534-A	1	Off-Road Equipment	08/12/2014	10	0.33
C-25095-A	1	Off-Road Equipment	08/12/2014	10	0.26
C-22941-A	1	Off-Road Equipment	08/12/2014	10	0.24
C-25098-A	1	Off-Road Equipment	08/12/2014	10	0.09
C-25100-A	1	Off-Road Equipment	08/12/2014	10	0.07
C-25096-A	1	Off-Road Equipment	08/12/2014	10	0.05
C-25097-A	1	Off-Road Equipment	08/12/2014	10	0.04
C-25099-A	1	Off-Road Equipment	08/12/2014	10	0.04
C-25469-A	1	Off-Road Equipment	08/13/2014	10	0.25

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-25470-A	1	Off-Road Equipment	08/13/2014	10	0.14
C-24489-A	1	Off-Road Equipment	08/14/2014	10	1.08
C-21369-A	1	Off-Road Equipment	08/14/2014	10	0.80
C-23999-A	1	Off-Road Equipment	08/14/2014	10	0.14
C-24001-A	1	Off-Road Equipment	08/14/2014	10	0.13
C-24363-A	1	Off-Road Equipment	08/14/2014	10	0.13
C-24000-A	1	Off-Road Equipment	08/14/2014	10	0.12
C-23998-A	1	Off-Road Equipment	08/14/2014	10	0.06
C-24288-A	1	Off-Road Equipment	08/15/2014	10	1.22
C-24209-A	1	Off-Road Equipment	08/15/2014	10	0.03
C-21884-A	1	Off-Road Equipment	08/18/2014	10	0.54
C-23564-A	1	Off-Road Equipment	08/18/2014	10	0.17
C-23571-A	1	Off-Road Equipment	08/18/2014	10	0.09
C-24238-A	1	Off-Road Equipment	08/19/2014	10	1.14
C-22473-A	1	Off-Road Equipment	08/19/2014	10	1.04
C-24281-A	1	Off-Road Equipment	08/20/2014	10	0.54
C-23721-A	1	Off-Road Equipment	08/20/2014	10	0.42
C-24480-A	1	Off-Road Equipment	08/21/2014	10	0.38
C-24555-A	1	Off-Road Equipment	08/22/2014	10	0.06
C-24003-A	1	Off-Road Equipment	08/23/2014	10	0.19
C-24243-A	1	Off-Road Equipment	08/25/2014	10	0.89
C-24103-A	1	Off-Road Equipment	08/25/2014	10	0.67
C-24410-A	1	Off-Road Equipment	08/25/2014	10	0.42
C-24355-A	1	Off-Road Equipment	08/25/2014	10	0.40
C-24110-A	1	Off-Road Equipment	08/25/2014	10	0.33
C-24059-A	1	Off-Road Equipment	08/26/2014	10	0.48
C-24155-A	1	Off-Road Equipment	08/26/2014	10	0.47
C-24193-A	1	Off-Road Equipment	08/26/2014	10	0.19
C-23891-A	1	Off-Road Equipment	08/27/2014	10	0.74
C-8334-A	1	Off-Road Equipment	08/28/2014	10	1.24
C-24089-A	1	Off-Road Equipment	08/28/2014	10	0.29
C-24483-A	1	Off-Road Equipment	08/28/2014	10	0.15
C-26563-A	1	Off-Road Equipment	08/28/2014	10	0.13
C-23843-A	1	Off-Road Equipment	08/29/2014	10	0.53
C-24484-A	1	Off-Road Equipment	08/29/2014	10	0.31
C-23877-A	1	Off-Road Equipment	08/29/2014	10	0.18
C-23879-A	1	Off-Road Equipment	08/29/2014	10	0.18
C-25164-A	1	Off-Road Equipment	08/29/2014	10	0.18
C-25165-A	1	Off-Road Equipment	08/29/2014	10	0.18
C-24143-A	1	Off-Road Equipment	08/29/2014	10	0.15
C-24403-A	1	Off-Road Equipment	08/29/2014	10	0.10
C-23884-A	1	Off-Road Equipment	08/29/2014	10	0.07
C-23886-A	1	Off-Road Equipment	08/29/2014	10	0.07
C-21699-A	1	Off-Road Equipment	09/02/2014	10	0.57
C-24151-A	1	Off-Road Equipment	09/04/2014	10	1.30
C-24240-A	1	Off-Road Equipment	09/04/2014	10	0.95
C-24244-A	1	Off-Road Equipment	09/04/2014	10	0.30

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-21904-A	1	Off-Road Equipment	09/08/2014	10	1.06
C-24413-A	1	Off-Road Equipment	09/08/2014	10	0.20
C-24507-A	1	Off-Road Equipment	09/09/2014	10	0.07
C-24434-A	1	Off-Road Equipment	09/11/2014	10	1.52
C-24138-A	1	Off-Road Equipment	09/11/2014	10	1.27
C-24442-A	1	Off-Road Equipment	09/11/2014	10	0.23
C-23542-A	1	Off-Road Equipment	09/11/2014	10	0.19
C-23574-A	1	Off-Road Equipment	09/11/2014	10	0.16
C-23539-A	1	Off-Road Equipment	09/11/2014	10	0.15
C-23474-A	1	Off-Road Equipment	09/12/2014	10	2.53
C-23589-A	1	Off-Road Equipment	09/12/2014	10	0.23
C-24493-A	1	Off-Road Equipment	09/12/2014	10	0.19
C-23945-A	1	Off-Road Equipment	09/15/2014	10	0.54
C-7108-A	1	Off-Road Equipment	09/15/2014	10	0.10
C-24406-A	1	Off-Road Equipment	09/16/2014	10	1.69
C-24407-A	1	Off-Road Equipment	09/16/2014	10	1.52
C-24824-A	1	Off-Road Equipment	09/16/2014	10	0.01
C-24753-A	1	Off-Road Equipment	09/17/2014	10	1.36
C-21461-A	1	Off-Road Equipment	09/17/2014	10	0.39
C-25187-A	1	Off-Road Equipment	09/17/2014	10	0.38
C-24134-A	1	Off-Road Equipment	09/18/2014	10	0.74
C-24559-A	1	Off-Road Equipment	09/18/2014	10	0.24
C-24606-A	1	Off-Road Equipment	09/19/2014	10	0.66
C-24700-A	1	Off-Road Equipment	09/19/2014	10	0.05
C-22805-A	1	Off-Road Equipment	09/22/2014	10	0.48
C-24023-A	1	Off-Road Equipment	09/22/2014	10	0.01
C-24025-A	1	Off-Road Equipment	09/22/2014	10	0.01
C-24027-A	1	Off-Road Equipment	09/22/2014	10	0.01
C-24028-A	1	Off-Road Equipment	09/22/2014	10	0.01
C-24021-A	1	Off-Road Equipment	09/22/2014	10	0.01
C-24779-A	1	Off-Road Equipment	09/23/2014	10	0.36
C-24133-A	1	Off-Road Equipment	09/24/2014	10	1.41
C-24594-A	1	Off-Road Equipment	09/24/2014	10	0.78
C-24858-A	1	Off-Road Equipment	09/24/2014	10	0.56
C-21400-A	1	Off-Road Equipment	09/24/2014	10	0.10
C-21402-A	1	Off-Road Equipment	09/24/2014	10	0.08
C-21401-A	1	Off-Road Equipment	09/24/2014	10	0.03
C-21468-A	1	Off-Road Equipment	09/25/2014	10	1.73
C-23579-A	1	Off-Road Equipment	09/26/2014	10	0.40
C-24592-A	1	Off-Road Equipment	09/26/2014	10	0.35
C-22190-A	1	Off-Road Equipment	09/26/2014	10	0.21
C-24654-A	1	Off-Road Equipment	09/26/2014	10	0.14
C-23642-A	1	Off-Road Equipment	09/29/2014	10	2.57
C-23973-A	1	Off-Road Equipment	09/29/2014	10	0.76
C-24827-A	1	Off-Road Equipment	09/29/2014	10	0.40
C-25175-A	1	Off-Road Equipment	09/30/2014	10	0.48
C-24965-A	1	Off-Road Equipment	09/30/2014	10	0.26

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-24150-A	1	Off-Road Equipment	09/30/2014	10	0.18
C-23361-A	1	Off-Road Equipment	10/01/2014	10	0.51
C-23356-A	1	Off-Road Equipment	10/01/2014	10	0.33
C-23358-A	1	Off-Road Equipment	10/01/2014	10	0.14
C-23360-A	1	Off-Road Equipment	10/01/2014	10	0.11
C-26078-A	1	Off-Road Equipment	10/02/2014	10	0.04
C-26077-A	1	Off-Road Equipment	10/02/2014	10	0.03
C-24074-A	1	Off-Road Equipment	10/03/2014	10	0.39
C-24075-A	1	Off-Road Equipment	10/03/2014	10	0.39
C-24086-A	1	Off-Road Equipment	10/03/2014	10	0.39
C-24079-A	1	Off-Road Equipment	10/03/2014	10	0.13
C-24081-A	1	Off-Road Equipment	10/03/2014	10	0.13
C-24084-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24091-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24097-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24098-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24082-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24083-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24095-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-24099-A	1	Off-Road Equipment	10/03/2014	10	0.01
C-27498-A	1	Off-Road Equipment	10/06/2014	10	0.44
C-24114-A	1	Off-Road Equipment	10/08/2014	10	1.05
C-24123-A	1	Off-Road Equipment	10/08/2014	10	0.39
C-24860-A	1	Off-Road Equipment	10/08/2014	10	0.09
C-29304-A	1	Off-Road Equipment	10/09/2014	10	0.44
C-24211-A	1	Off-Road Equipment	10/10/2014	10	0.26
C-25968-A	1	Off-Road Equipment	10/13/2014	10	0.36
C-24242-A	1	Off-Road Equipment	10/14/2014	10	0.51
C-27852-A	1	Off-Road Equipment	10/14/2014	10	0.46
C-24241-A	1	Off-Road Equipment	10/14/2014	10	0.29
C-31148-A	1	Off-Road Equipment	10/14/2014	10	0.25
C-27029-A	1	Off-Road Equipment	10/14/2014	10	0.22
C-23362-A	1	Off-Road Equipment	10/14/2014	10	0.16
C-21718-A	1	Off-Road Equipment	10/14/2014	10	0.15
C-23845-A	1	Off-Road Equipment	10/14/2014	10	0.13
C-24174-A	1	Off-Road Equipment	10/15/2014	10	0.34
C-24186-A	1	Off-Road Equipment	10/15/2014	10	0.34
C-24182-A	1	Off-Road Equipment	10/15/2014	10	0.03
C-24657-A	1	Off-Road Equipment	10/20/2014	10	0.13
C-23758-A	1	Off-Road Equipment	10/21/2014	10	1.19
C-24828-A	1	Off-Road Equipment	10/21/2014	10	0.19
C-25524-A	1	Off-Road Equipment	10/22/2014	10	0.37
C-24556-A	1	Off-Road Equipment	10/22/2014	10	0.18
C-24767-A	1	Off-Road Equipment	10/22/2014	10	0.15
C-24205-A	1	Off-Road Equipment	10/22/2014	10	0.09
C-24149-A	1	Off-Road Equipment	10/23/2014	10	0.23
C-25189-A	1	Off-Road Equipment	10/23/2014	10	0.19

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-24401-A	1	Off-Road Equipment	10/24/2014	10	0.14
C-28215-A	1	Off-Road Equipment	10/24/2014	10	0.10
C-24761-A	1	Off-Road Equipment	10/25/2014	10	0.01
C-22493-A	1	Off-Road Equipment	10/27/2014	10	0.34
C-24826-A	1	Off-Road Equipment	10/27/2014	10	0.19
C-25087-A	1	Off-Road Equipment	10/29/2014	10	0.13
C-24967-A	1	Off-Road Equipment	10/30/2014	10	0.44
C-24763-A	1	Off-Road Equipment	10/30/2014	10	0.35
C-24405-A	1	Off-Road Equipment	10/30/2014	10	0.12
C-25132-A	1	Off-Road Equipment	10/31/2014	10	0.49
C-25131-A	1	Off-Road Equipment	10/31/2014	10	0.48
C-25163-A	1	Off-Road Equipment	11/01/2014	10	0.15
C-25168-A	1	Off-Road Equipment	11/01/2014	10	0.15
C-23196-A	1	Off-Road Equipment	11/04/2014	10	1.19
C-25378-A	1	Off-Road Equipment	11/04/2014	10	0.63
C-23473-A	1	Off-Road Equipment	11/05/2014	10	1.60
C-23709-A	1	Off-Road Equipment	11/05/2014	10	0.27
C-24278-A	1	Off-Road Equipment	11/05/2014	10	0.27
C-24697-A	1	Off-Road Equipment	11/05/2014	10	0.23
C-22078-A	1	Off-Road Equipment	11/05/2014	10	0.05
C-24554-A	1	Off-Road Equipment	11/07/2014	10	0.88
C-24147-A	1	Off-Road Equipment	11/07/2014	10	0.10
C-24603-A	1	Off-Road Equipment	11/10/2014	10	0.23
C-24366-A	1	Off-Road Equipment	11/11/2014	10	0.45
C-26382-A	1	Off-Road Equipment	11/12/2014	10	0.18
C-22274-A	1	Off-Road Equipment	11/12/2014	10	0.16
C-25643-A	1	Off-Road Equipment	11/13/2014	10	0.39
C-25644-A	1	Off-Road Equipment	11/13/2014	10	0.32
C-23967-A	1	Off-Road Equipment	11/13/2014	10	0.08
C-27623-A	1	Off-Road Equipment	11/14/2014	10	2.66
C-24651-A	1	Off-Road Equipment	11/18/2014	10	0.15
C-25288-A	1	Off-Road Equipment	11/18/2014	10	0.06
C-25287-A	1	Off-Road Equipment	11/19/2014	10	0.18
C-24836-A	1	Off-Road Equipment	11/20/2014	10	0.38
C-29748-A	1	Off-Road Equipment	11/20/2014	10	0.29
C-24964-A	1	Off-Road Equipment	11/20/2014	10	0.25
C-25299-A	1	Off-Road Equipment	11/20/2014	10	0.22
C-25290-A	1	Off-Road Equipment	11/20/2014	10	0.20
C-25013-A	1	Off-Road Equipment	11/21/2014	10	0.98
C-25032-A	1	Off-Road Equipment	11/24/2014	10	1.10
C-25030-A	1	Off-Road Equipment	11/24/2014	10	1.07
C-25039-A	1	Off-Road Equipment	11/24/2014	10	0.85
C-24498-A	1	Off-Road Equipment	11/24/2014	10	0.64
C-24496-A	1	Off-Road Equipment	11/24/2014	10	0.34
C-24497-A	1	Off-Road Equipment	11/24/2014	10	0.28
C-24197-A	1	Off-Road Equipment	11/24/2014	10	0.25
C-24495-A	1	Off-Road Equipment	11/24/2014	10	0.23

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-24494-A	1	Off-Road Equipment	11/24/2014	10	0.18
C-23726-A	1	Off-Road Equipment	11/25/2014	10	0.64
C-23904-A	1	Off-Road Equipment	11/25/2014	10	0.32
C-25868-A	1	Off-Road Equipment	11/26/2014	10	0.79
C-25674-A	1	Off-Road Equipment	11/26/2014	10	0.29
C-25219-A	1	Off-Road Equipment	11/26/2014	10	0.22
C-25028-A	1	Off-Road Equipment	11/28/2014	10	0.80
C-24437-A	1	Off-Road Equipment	12/01/2014	10	0.29
C-21810-A	1	Off-Road Equipment	12/04/2014	10	0.43
C-25831-A	1	Off-Road Equipment	12/04/2014	10	0.09
C-23748-A	1	Off-Road Equipment	12/04/2014	10	0.04
C-23747-A	1	Off-Road Equipment	12/04/2014	10	0.03
C-8799-A	1	Off-Road Equipment	12/08/2014	10	2.03
C-24823-A	1	Off-Road Equipment	12/08/2014	10	0.15
C-24825-A	1	Off-Road Equipment	12/08/2014	10	0.10
C-22766-A	1	Off-Road Equipment	12/09/2014	10	0.09
C-24438-A	1	Off-Road Equipment	12/10/2014	10	0.13
C-25446-A	1	Off-Road Equipment	12/11/2014	10	0.77
S-1771-A	1	Off-Road Equipment	12/11/2014	10	0.52
C-24835-A	1	Off-Road Equipment	12/11/2014	10	0.02
C-23846-A	1	Off-Road Equipment	12/14/2014	10	0.53
C-25136-A	1	Off-Road Equipment	12/15/2014	10	0.49
C-25138-A	1	Off-Road Equipment	12/15/2014	10	0.41
C-25381-A	1	Off-Road Equipment	12/16/2014	10	1.06
C-25680-A	1	Off-Road Equipment	12/16/2014	10	0.27
C-25683-A	1	Off-Road Equipment	12/16/2014	10	0.19
C-24477-A	1	Off-Road Equipment	12/17/2014	10	0.99
C-25464-A	1	Off-Road Equipment	12/17/2014	10	0.42
C-26262-A	1	Off-Road Equipment	12/17/2014	10	0.23
C-25833-A	1	Off-Road Equipment	12/18/2014	10	0.99
C-25834-A	1	Off-Road Equipment	12/18/2014	10	0.52
C-25015-A	1	Off-Road Equipment	12/18/2014	10	0.08
C-25014-A	1	Off-Road Equipment	12/19/2014	10	1.49
C-26003-A	1	Off-Road Equipment	12/19/2014	10	1.23
C-21264-A	1	Off-Road Equipment	12/19/2014	10	0.55
C-25091-A	1	Off-Road Equipment	12/20/2014	10	0.15
C-24446-A	1	Off-Road Equipment	12/22/2014	10	1.53
C-24445-A	1	Off-Road Equipment	12/22/2014	10	0.92
C-8382-A	1	Off-Road Equipment	12/22/2014	10	0.87
C-24591-A	1	Off-Road Equipment	12/22/2014	10	0.56
C-21809-A	1	Off-Road Equipment	12/22/2014	10	0.32
C-25034-A	1	Off-Road Equipment	12/23/2014	10	1.29
C-25029-A	1	Off-Road Equipment	12/23/2014	10	1.27
C-25033-A	1	Off-Road Equipment	12/23/2014	10	0.94
C-25579-A	1	Off-Road Equipment	12/23/2014	10	0.30
C-21900-A	1	Off-Road Equipment	12/23/2014	10	0.08
C-26646-A	1	Off-Road Equipment	12/24/2014	10	0.38

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-25679-A	1	Off-Road Equipment	12/24/2014	10	0.18
C-23546-A	1	Off-Road Equipment	12/24/2014	10	0.10
C-24848-A	1	Off-Road Equipment	12/26/2014	10	0.33
C-23592-A	1	Off-Road Equipment	12/26/2014	10	0.16
C-8956-B	2	Off-Road Equipment	12/29/2014	10	1.28
C-24760-A	1	Off-Road Equipment	12/29/2014	10	0.19
C-24476-A	1	Off-Road Equipment	12/29/2014	10	0.11
C-24690-A	1	Off-Road Equipment	12/30/2014	10	1.72
C-25642-A	1	Off-Road Equipment	12/30/2014	10	1.02
C-25019-A	1	Off-Road Equipment	12/30/2014	10	0.45
C-25241-A	1	Off-Road Equipment	12/30/2014	10	0.27
C-25244-A	1	Off-Road Equipment	12/30/2014	10	0.22
C-25171-A	1	Off-Road Equipment	12/30/2014	10	0.17
C-24408-A	1	Off-Road Equipment	12/30/2014	10	0.16
C-23715-A	1	Off-Road Equipment	12/31/2014	10	3.23
C-25018-A	1	Off-Road Equipment	12/31/2014	10	0.29
C-23365-A	1	Off-Road Equipment	12/31/2014	10	0.25
C-24280-A	1	Off-Road Equipment	01/06/2015	10	0.04
C-24649-A	1	Off-Road Equipment	01/08/2015	10	0.20
C-25407-A	1	Off-Road Equipment	01/13/2015	10	2.81
C-25530-A	1	Off-Road Equipment	01/13/2015	10	1.65
C-25563-A	1	Off-Road Equipment	01/13/2015	10	1.22
C-25027-A	1	Off-Road Equipment	01/14/2015	10	1.43
C-25035-A	1	Off-Road Equipment	01/14/2015	10	1.34
C-25025-A	1	Off-Road Equipment	01/14/2015	10	1.14
C-25126-A	1	Off-Road Equipment	01/14/2015	10	0.39
C-25125-A	1	Off-Road Equipment	01/14/2015	10	0.29
C-25577-A	1	Off-Road Equipment	01/20/2015	10	0.44
C-24962-A	1	Off-Road Equipment	01/20/2015	10	0.32
C-31059-A	1	Off-Road Equipment	01/20/2015	10	0.28
C-24963-A	1	Off-Road Equipment	01/20/2015	10	0.24
C-25472-A	1	Off-Road Equipment	01/20/2015	10	0.17
C-25365-A	1	Off-Road Equipment	01/22/2015	10	0.08
C-25366-A	1	Off-Road Equipment	01/22/2015	10	0.07
C-25367-A	1	Off-Road Equipment	01/22/2015	10	0.01
C-25368-A	1	Off-Road Equipment	01/22/2015	10	0.01
C-32302-A	1	Off-Road Equipment	01/28/2015	10	0.72
C-21469-A	1	Off-Road Equipment	01/29/2015	10	1.33
C-24906-A	1	Off-Road Equipment	01/29/2015	10	0.27
C-24905-A	1	Off-Road Equipment	01/29/2015	10	0.19
C-32389-A	1	Off-Road Equipment	01/29/2015	10	0.09
C-23950-A	1	Off-Road Equipment	01/30/2015	10	0.05
C-26098-A	1	Off-Road Equipment	02/02/2015	10	0.43
C-25685-A	1	Off-Road Equipment	02/05/2015	10	1.39
C-25569-A	1	Off-Road Equipment	02/05/2015	10	0.97
C-25570-A	1	Off-Road Equipment	02/05/2015	10	0.97
C-25010-A	1	Off-Road Equipment	02/05/2015	10	0.07

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-24139-A	1	Off-Road Equipment	02/06/2015	10	0.72
C-23876-A	1	Off-Road Equipment	02/10/2015	10	0.18
C-7741-B	2	Off-Road Equipment	02/12/2015	10	0.15
C-25092-A	1	Off-Road Equipment	02/13/2015	10	0.91
C-23643-A	1	Off-Road Equipment	02/13/2015	10	0.39
C-25687-A	1	Off-Road Equipment	02/16/2015	10	0.83
C-28204-A	1	Off-Road Equipment	02/19/2015	10	1.30
C-27398-A	1	Off-Road Equipment	02/20/2015	10	0.40
C-8958-B	2	Off-Road Equipment	02/21/2015	10	2.23
C-27638-A	1	Off-Road Equipment	02/23/2015	5	1.95
C-27639-A	1	Off-Road Equipment	02/23/2015	5	1.95
C-25162-A	1	Off-Road Equipment	02/23/2015	10	0.57
C-24145-A	1	Off-Road Equipment	02/25/2015	10	2.68
C-25529-A	1	Off-Road Equipment	02/25/2015	10	1.74
C-25041-A	1	Off-Road Equipment	02/26/2015	10	1.91
C-24213-A	1	Off-Road Equipment	02/27/2015	10	0.64
C-25638-A	1	Off-Road Equipment	02/27/2015	10	0.44
C-24762-A	1	Off-Road Equipment	02/27/2015	10	0.32
C-24599-A	1	Off-Road Equipment	02/27/2015	10	0.31
C-24600-A	1	Off-Road Equipment	02/27/2015	10	0.31
C-27618-A	1	Off-Road Equipment	02/27/2015	10	0.13
C-22333-A	1	Off-Road Equipment	02/27/2015	10	0.12
C-22335-A	1	Off-Road Equipment	02/27/2015	10	0.04
C-25578-A	1	Off-Road Equipment	03/03/2015	10	0.89
C-22436-A	1	Off-Road Equipment	03/04/2015	10	1.37
C-26274-A	1	Off-Road Equipment	03/10/2015	10	2.46
C-25519-A	1	Off-Road Equipment	03/11/2015	10	1.55
C-24239-A	1	Off-Road Equipment	03/12/2015	10	3.21
C-24279-A	1	Off-Road Equipment	03/12/2015	10	1.89
C-25568-A	1	Off-Road Equipment	03/17/2015	10	1.21
C-25681-A	1	Off-Road Equipment	03/19/2015	10	0.05
C-25682-A	1	Off-Road Equipment	03/19/2015	10	0.05
C-24214-A	1	Off-Road Equipment	03/20/2015	10	0.20
C-27290-A	1	Off-Road Equipment	03/21/2015	10	1.54
C-24759-A	1	Off-Road Equipment	03/23/2015	10	0.44
C-30868-A	1	Off-Road Equipment	03/24/2015	10	0.21
C-24433-A	1	Off-Road Equipment	03/26/2015	10	1.94
C-25251-A	1	Off-Road Equipment	03/26/2015	10	1.76
C-25459-A	1	Off-Road Equipment	03/27/2015	10	0.29
C-25462-A	1	Off-Road Equipment	03/27/2015	10	0.29
C-25463-A	1	Off-Road Equipment	03/27/2015	10	0.29
C-23269-A	1	Off-Road Equipment	03/27/2015	10	0.17
C-23885-A	1	Off-Road Equipment	03/27/2015	10	0.07
C-23888-A	1	Off-Road Equipment	03/27/2015	10	0.05
C-25880-A	1	Off-Road Equipment	03/30/2015	10	0.28
C-25881-A	1	Off-Road Equipment	03/30/2015	10	0.28
C-25878-A	1	Off-Road Equipment	03/30/2015	10	0.25

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-25879-A	1	Off-Road Equipment	03/30/2015	10	0.25
C-23837-A	1	Off-Road Equipment	03/31/2015	10	0.57
C-27291-A	1	Off-Road Equipment	03/31/2015	10	0.29
C-24598-A	1	Off-Road Equipment	04/02/2015	10	0.35
C-25086-A	1	Off-Road Equipment	04/06/2015	10	0.96
C-25186-A	1	Off-Road Equipment	04/06/2015	10	0.34
C-25808-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25809-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25810-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25811-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25812-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25813-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25815-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25816-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25817-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25820-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25821-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25822-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25823-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25824-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25893-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25894-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25897-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25760-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25776-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25781-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25782-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25783-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-28169-A	1	Off-Road Equipment	04/06/2015	10	0.01
C-25762-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25764-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25766-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25767-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25768-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25769-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25770-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25775-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25784-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25785-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25786-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25787-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25788-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25789-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25791-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25792-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25793-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25794-A	1	Off-Road Equipment	04/06/2015	10	0.00

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-25795-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25796-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25797-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25799-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25800-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25801-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25802-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25803-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25804-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25805-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25806-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25807-A	1	Off-Road Equipment	04/06/2015	10	0.00
C-25037-A	1	Off-Road Equipment	04/07/2015	10	0.17
C-25216-A	1	Off-Road Equipment	04/09/2015	10	2.22
C-25867-A	1	Off-Road Equipment	04/14/2015	10	1.01
C-29583-A	1	Off-Road Equipment	04/21/2015	10	0.24
C-27625-A	1	Off-Road Equipment	04/23/2015	10	0.35
C-24593-A	1	Off-Road Equipment	04/23/2015	10	0.17
C-24656-A	1	Off-Road Equipment	04/24/2015	10	0.41
C-24588-A	1	Off-Road Equipment	04/27/2015	10	0.30
C-24090-A	1	Off-Road Equipment	04/27/2015	10	0.19
C-24741-A	1	Off-Road Equipment	04/27/2015	10	0.03
C-24742-A	1	Off-Road Equipment	04/27/2015	10	0.03
C-24743-A	1	Off-Road Equipment	04/27/2015	10	0.03
C-24740-A	1	Off-Road Equipment	04/27/2015	10	0.03
C-24748-A	1	Off-Road Equipment	04/27/2015	10	0.03
C-24749-A	1	Off-Road Equipment	04/27/2015	10	0.03
C-24744-A	1	Off-Road Equipment	04/27/2015	10	0.01
C-25920-A	1	Off-Road Equipment	04/29/2015	10	0.60
C-25576-A	1	Off-Road Equipment	04/29/2015	10	0.57
C-25921-A	1	Off-Road Equipment	04/30/2015	10	0.84
C-25040-A	1	Off-Road Equipment	04/30/2015	10	0.65
C-24917-A	1	Off-Road Equipment	04/30/2015	10	0.13
C-24918-A	1	Off-Road Equipment	04/30/2015	10	0.09
C-23821-A	1	Off-Road Equipment	05/04/2015	10	0.20
C-24276-A	1	Off-Road Equipment	05/11/2015	10	0.89
C-23154-A	1	Off-Road Equipment	05/11/2015	10	0.38
C-25515-A	1	Off-Road Equipment	05/13/2015	10	2.12
C-24359-A	1	Off-Road Equipment	05/14/2015	10	0.14
C-24608-A	1	Off-Road Equipment	05/15/2015	10	0.86
C-25038-A	1	Off-Road Equipment	05/19/2015	10	0.18
C-25639-A	1	Off-Road Equipment	05/19/2015	10	0.12
C-25135-A	1	Off-Road Equipment	05/20/2015	10	0.49
C-24199-A	1	Off-Road Equipment	05/20/2015	10	0.28
C-24198-A	1	Off-Road Equipment	05/20/2015	10	0.12
C-24201-A	1	Off-Road Equipment	05/20/2015	10	0.02
C-24200-A	1	Off-Road Equipment	05/20/2015	10	0.01

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-27620-A	1	Off-Road Equipment	05/22/2015	10	1.59
C-27619-A	1	Off-Road Equipment	05/22/2015	10	1.45
C-8007-A	1	Off-Road Equipment	05/22/2015	10	0.32
C-27431-A	1	Off-Road Equipment	05/26/2015	10	0.62
C-24766-A	1	Off-Road Equipment	05/26/2015	10	0.17
C-24799-A	1	Off-Road Equipment	05/28/2015	10	0.28
C-25678-A	1	Off-Road Equipment	05/29/2015	10	2.65
C-24207-A	1	Off-Road Equipment	06/04/2015	10	0.15
C-23355-A	1	Off-Road Equipment	06/04/2015	10	0.13
C-23359-A	1	Off-Road Equipment	06/04/2015	10	0.12
C-38791-A	1	Off-Road Equipment	06/10/2015	10	0.14
C-25250-A	1	Off-Road Equipment	06/16/2015	10	0.41
C-25248-A	1	Off-Road Equipment	06/16/2015	10	0.23
C-26564-A	1	Off-Road Equipment	06/18/2015	10	0.22
C-26565-A	1	Off-Road Equipment	06/18/2015	10	0.22
C-26566-A	1	Off-Road Equipment	06/18/2015	10	0.22
C-25522-A	1	Off-Road Equipment	06/19/2015	10	1.53
C-25898-A	1	Off-Road Equipment	06/19/2015	10	0.21
C-8807-A	1	Off-Road Equipment	06/22/2015	10	0.64
C-25011-A	1	Off-Road Equipment	06/23/2015	10	0.09
C-24553-A	1	Off-Road Equipment	06/24/2015	10	0.61
C-25838-A	1	Off-Road Equipment	06/24/2015	10	0.47
C-26434-A	1	Off-Road Equipment	06/25/2015	10	0.57
C-26432-A	1	Off-Road Equipment	06/25/2015	10	0.44
C-25634-A	1	Off-Road Equipment	06/26/2015	10	0.21
C-26769-A	1	Off-Road Equipment	06/29/2015	10	0.42
C-25924-A	1	Off-Road Equipment	06/29/2015	10	0.20
C-25926-A	1	Off-Road Equipment	06/29/2015	10	0.17
C-26761-A	1	Off-Road Equipment	06/29/2015	10	0.14
C-24745-A	1	Off-Road Equipment	06/29/2015	10	0.03
C-24746-A	1	Off-Road Equipment	06/29/2015	10	0.03
C-24747-A	1	Off-Road Equipment	06/29/2015	10	0.03
C-25829-A	1	Off-Road Equipment	06/30/2015	10	2.30
C-25714-A	1	Off-Road Equipment	06/30/2015	10	1.27
C-25927-A	1	Off-Road Equipment	06/30/2015	10	0.70
C-26409-A	1	Off-Road Equipment	06/30/2015	10	0.25
C-26643-A	1	Off-Road Equipment	07/01/2015	10	0.16
C-24847-A	1	Off-Road Equipment	07/02/2015	10	0.16
C-24436-A	1	Off-Road Equipment	07/04/2015	10	0.19
C-37484-A	1	Off-Road Equipment	07/07/2015	10	0.42
C-26410-A	1	Off-Road Equipment	07/07/2015	10	0.13
C-30528-A	1	Off-Road Equipment	07/09/2015	10	0.26
C-30542-A	1	Off-Road Equipment	07/09/2015	10	0.25
C-25899-A	1	Off-Road Equipment	07/10/2015	10	0.17
C-29302-A	1	Off-Road Equipment	07/14/2015	10	2.02
C-26216-A	1	Off-Road Equipment	07/14/2015	10	1.99
C-24144-A	1	Off-Road Equipment	07/14/2015	10	0.23

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-26919-A	1	Off-Road Equipment	07/15/2015	10	0.70
C-27401-A	1	Off-Road Equipment	07/16/2015	10	0.26
C-26918-A	1	Off-Road Equipment	07/20/2015	10	0.61
C-25837-A	1	Off-Road Equipment	07/23/2015	10	0.67
C-26651-A	1	Off-Road Equipment	07/23/2015	10	0.56
C-27437-A	1	Off-Road Equipment	07/23/2015	10	0.29
C-27162-A	1	Off-Road Equipment	07/27/2015	10	0.79
C-26644-A	1	Off-Road Equipment	07/27/2015	10	0.11
C-27331-A	1	Off-Road Equipment	07/28/2015	10	0.22
C-27333-A	1	Off-Road Equipment	07/28/2015	10	0.13
C-27626-A	1	Off-Road Equipment	07/28/2015	10	0.13
C-27627-A	1	Off-Road Equipment	07/28/2015	10	0.10
C-27432-A	1	Off-Road Equipment	07/30/2015	10	0.84
C-25719-A	1	Off-Road Equipment	08/03/2015	10	0.31
C-28992-A	1	Off-Road Equipment	08/04/2015	10	0.10
C-26560-A	1	Off-Road Equipment	08/04/2015	10	0.01
C-25249-A	1	Off-Road Equipment	08/05/2015	10	0.34
C-25883-A	1	Off-Road Equipment	08/05/2015	10	0.24
C-22256-A	1	Off-Road Equipment	08/06/2015	10	0.13
C-27399-A	1	Off-Road Equipment	08/07/2015	10	0.17
C-24187-A	1	Off-Road Equipment	08/10/2015	10	0.49
C-24172-A	1	Off-Road Equipment	08/10/2015	10	0.11
C-24170-A	1	Off-Road Equipment	08/10/2015	10	0.07
C-26567-A	1	Off-Road Equipment	08/11/2015	10	1.25
C-27506-A	1	Off-Road Equipment	08/11/2015	10	1.01
C-26649-A	1	Off-Road Equipment	08/11/2015	10	0.21
C-24764-A	1	Off-Road Equipment	08/11/2015	10	0.11
C-26431-A	1	Off-Road Equipment	08/12/2015	10	3.65
C-28173-A	1	Off-Road Equipment	08/13/2015	10	0.66
C-25471-A	1	Off-Road Equipment	08/14/2015	10	0.05
C-26260-A	1	Off-Road Equipment	08/17/2015	10	0.42
C-25889-A	1	Off-Road Equipment	08/17/2015	10	0.25
C-28636-A	1	Off-Road Equipment	08/19/2015	10	0.82
C-25562-A	1	Off-Road Equipment	08/19/2015	10	0.60
C-24318-A	1	Off-Road Equipment	08/24/2015	10	3.32
C-25961-A	1	Off-Road Equipment	08/24/2015	10	1.64
C-27155-A	1	Off-Road Equipment	08/25/2015	10	0.30
C-21885-A	1	Off-Road Equipment	08/27/2015	10	0.50
C-27643-A	1	Off-Road Equipment	08/27/2015	10	0.36
C-25827-A	1	Off-Road Equipment	08/28/2015	10	0.78
C-26457-A	1	Off-Road Equipment	08/28/2015	10	0.42
C-26458-A	1	Off-Road Equipment	08/28/2015	10	0.39
C-26453-A	1	Off-Road Equipment	08/28/2015	10	0.11
C-25228-A	1	Off-Road Equipment	08/31/2015	10	0.04
C-27400-A	1	Off-Road Equipment	09/04/2015	10	1.19
C-26647-A	1	Off-Road Equipment	09/09/2015	10	0.18
C-26074-A	1	Off-Road Equipment	09/09/2015	10	0.12

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-26075-A	1	Off-Road Equipment	09/09/2015	10	0.11
C-26648-A	1	Off-Road Equipment	09/12/2015	10	0.37
C-26405-A	1	Off-Road Equipment	09/15/2015	10	1.04
C-28053-A	2	Off-Road Equipment	09/16/2015	10	0.26
C-23541-A	1	Off-Road Equipment	09/16/2015	10	0.05
C-27503-A	1	Off-Road Equipment	09/17/2015	10	0.29
C-27504-A	1	Off-Road Equipment	09/17/2015	10	0.29
C-26188-A	1	Off-Road Equipment	09/18/2015	10	0.21
C-26562-A	1	Off-Road Equipment	09/18/2015	10	0.21
C-27508-A	1	Off-Road Equipment	09/23/2015	10	1.84
C-27507-A	1	Off-Road Equipment	09/23/2015	10	1.14
C-25374-A	1	Off-Road Equipment	09/25/2015	10	0.42
C-25371-A	1	Off-Road Equipment	09/25/2015	10	0.40
C-25375-A	1	Off-Road Equipment	09/25/2015	10	0.39
C-25372-A	1	Off-Road Equipment	09/25/2015	10	0.35
C-25376-A	1	Off-Road Equipment	09/25/2015	10	0.33
C-25886-A	1	Off-Road Equipment	09/25/2015	10	0.25
C-25888-A	1	Off-Road Equipment	09/25/2015	10	0.19
C-27995-A	1	Off-Road Equipment	09/29/2015	10	0.51
C-26404-A	1	Off-Road Equipment	09/29/2015	10	0.03
C-27026-A	1	Off-Road Equipment	09/30/2015	10	1.16
C-27024-A	1	Off-Road Equipment	09/30/2015	10	1.12
C-27025-A	1	Off-Road Equipment	09/30/2015	10	1.12
C-27433-A	1	Off-Road Equipment	09/30/2015	10	0.22
C-29671-A	1	Off-Road Equipment	09/30/2015	10	0.20
C-27436-A	1	Off-Road Equipment	09/30/2015	10	0.19
C-26936-A	1	Off-Road Equipment	09/30/2015	10	0.09
C-27197-A	1	Off-Road Equipment	10/01/2015	10	0.19
C-27192-A	1	Off-Road Equipment	10/01/2015	10	0.13
C-27791-A	1	Off-Road Equipment	10/05/2015	10	0.46
C-27632-A	1	Off-Road Equipment	10/05/2015	10	0.38
C-26201-A	1	Off-Road Equipment	10/08/2015	10	1.02
C-26198-A	1	Off-Road Equipment	10/08/2015	10	0.87
C-27168-A	1	Off-Road Equipment	10/12/2015	10	0.11
C-27165-A	1	Off-Road Equipment	10/12/2015	10	0.07
C-27677-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27679-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27680-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27682-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27684-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27689-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27690-A	1	Off-Road Equipment	10/13/2015	10	0.51
C-27687-A	1	Off-Road Equipment	10/13/2015	10	0.43
C-27688-A	1	Off-Road Equipment	10/13/2015	10	0.43
C-27691-A	1	Off-Road Equipment	10/13/2015	10	0.43
C-27671-A	1	Off-Road Equipment	10/13/2015	10	0.42
C-26749-A	1	Off-Road Equipment	10/15/2015	10	0.81

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-24550-A	1	Off-Road Equipment	10/15/2015	10	0.41
C-27788-A	1	Off-Road Equipment	10/15/2015	10	0.27
C-25966-A	1	Off-Road Equipment	10/19/2015	10	0.22
C-27841-A	1	Off-Road Equipment	10/26/2015	10	0.33
C-27849-A	1	Off-Road Equipment	10/26/2015	10	0.31
C-31045-A	1	Off-Road Equipment	10/26/2015	10	0.28
C-27794-A	1	Off-Road Equipment	10/26/2015	10	0.18
C-27847-A	1	Off-Road Equipment	10/26/2015	10	0.16
C-27793-A	1	Off-Road Equipment	10/26/2015	10	0.16
C-27796-A	1	Off-Road Equipment	10/26/2015	10	0.03
C-25456-A	1	Off-Road Equipment	10/27/2015	10	0.27
C-25457-A	1	Off-Road Equipment	10/27/2015	10	0.27
C-25458-A	1	Off-Road Equipment	10/27/2015	10	0.27
C-28058-A	1	Off-Road Equipment	10/27/2015	10	0.10
C-29272-A	1	Off-Road Equipment	10/28/2015	10	1.16
C-26220-A	1	Off-Road Equipment	10/28/2015	10	0.68
C-28833-A	1	Off-Road Equipment	10/28/2015	10	0.43
C-27792-A	1	Off-Road Equipment	10/28/2015	10	0.20
C-28175-A	1	Off-Road Equipment	10/28/2015	10	0.20
C-26080-A	1	Off-Road Equipment	10/29/2015	10	0.71
C-30540-A	1	Off-Road Equipment	10/29/2015	10	0.19
C-30530-A	1	Off-Road Equipment	10/29/2015	10	0.16
C-27795-A	1	Off-Road Equipment	10/29/2015	10	0.09
C-26759-A	1	Off-Road Equipment	10/30/2015	10	4.43
C-25370-A	1	Off-Road Equipment	10/30/2015	10	1.74
C-25373-A	1	Off-Road Equipment	10/30/2015	10	1.65
C-25377-A	1	Off-Road Equipment	10/30/2015	10	1.61
C-27954-A	1	Off-Road Equipment	10/30/2015	10	0.39
C-27840-A	1	Off-Road Equipment	11/02/2015	10	0.59
C-21685-B	2	Off-Road Equipment	11/03/2015	10	5.07
C-28001-A	1	Off-Road Equipment	11/04/2015	10	1.09
C-22299-B	2	Off-Road Equipment	11/05/2015	10	0.84
C-26219-A	1	Off-Road Equipment	11/09/2015	10	0.13
C-32030-A	1	Off-Road Equipment	11/10/2015	10	1.61
C-27996-A	1	Off-Road Equipment	11/10/2015	10	0.82
C-28060-A	1	Off-Road Equipment	11/10/2015	10	0.20
C-28063-A	1	Off-Road Equipment	11/10/2015	10	0.11
C-27958-A	1	Off-Road Equipment	11/13/2015	10	0.15
C-27843-A	1	Off-Road Equipment	11/16/2015	10	0.23
C-25887-A	1	Off-Road Equipment	11/18/2015	10	0.19
C-29203-A	1	Off-Road Equipment	11/18/2015	10	0.06
C-29212-A	1	Off-Road Equipment	11/18/2015	10	0.06
C-29227-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29229-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29231-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29233-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29234-A	1	Off-Road Equipment	11/18/2015	10	0.05

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-29235-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29239-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29247-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29248-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29249-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29250-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29251-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29252-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-29253-A	1	Off-Road Equipment	11/18/2015	10	0.05
C-28981-A	1	Off-Road Equipment	11/18/2015	10	0.04
C-28982-A	1	Off-Road Equipment	11/18/2015	10	0.04
C-28984-A	1	Off-Road Equipment	11/18/2015	10	0.04
C-28985-A	1	Off-Road Equipment	11/18/2015	10	0.04
C-28988-A	1	Off-Road Equipment	11/18/2015	10	0.04
C-28990-A	1	Off-Road Equipment	11/18/2015	10	0.04
C-29208-A	1	Off-Road Equipment	11/18/2015	10	0.03
C-28676-A	1	Off-Road Equipment	11/19/2015	10	0.08
C-28207-A	1	Off-Road Equipment	11/20/2015	10	0.63
C-27789-A	1	Off-Road Equipment	11/20/2015	10	0.22
C-31019-A	1	Off-Road Equipment	11/23/2015	10	1.34
C-27631-A	1	Off-Road Equipment	11/24/2015	10	0.38
C-27441-A	1	Off-Road Equipment	11/24/2015	10	0.23
C-27435-A	1	Off-Road Equipment	11/24/2015	10	0.13
C-29213-A	1	Off-Road Equipment	11/25/2015	10	0.37
C-27845-A	1	Off-Road Equipment	11/30/2015	10	1.73
C-31029-A	1	Off-Road Equipment	11/30/2015	10	1.61
C-26835-A	1	Off-Road Equipment	11/30/2015	10	1.19
C-29574-A	1	Off-Road Equipment	11/30/2015	10	0.78
C-30250-A	1	Off-Road Equipment	11/30/2015	10	0.07
C-27694-A	1	Off-Road Equipment	12/02/2015	10	0.06
C-30468-A	1	Off-Road Equipment	12/02/2015	10	0.06
C-30644-A	1	Off-Road Equipment	12/02/2015	10	0.06
C-32716-A	1	Off-Road Equipment	12/05/2015	10	0.21
C-30641-A	1	Off-Road Equipment	12/05/2015	10	0.17
C-27790-A	1	Off-Road Equipment	12/07/2015	10	1.18
C-25448-A	1	Off-Road Equipment	12/07/2015	10	0.25
C-32062-A	1	Off-Road Equipment	12/08/2015	10	1.69
C-29779-A	1	Off-Road Equipment	12/11/2015	10	0.18
C-31910-A	1	Off-Road Equipment	12/15/2015	10	0.41
C-25977-A	1	Off-Road Equipment	12/16/2015	10	1.39
C-25978-A	1	Off-Road Equipment	12/16/2015	10	0.93
C-26267-A	1	Off-Road Equipment	12/18/2015	10	0.07
C-26400-A	1	Off-Road Equipment	12/20/2015	10	0.01
C-28203-A	1	Off-Road Equipment	12/21/2015	10	0.32
C-27955-A	1	Off-Road Equipment	12/21/2015	10	0.16
C-27956-A	1	Off-Road Equipment	12/21/2015	10	0.16
C-29775-A	1	Off-Road Equipment	12/21/2015	10	0.15

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-29226-A	1	Off-Road Equipment	12/21/2015	10	0.06
C-29201-A	1	Off-Road Equipment	12/21/2015	10	0.06
C-29202-A	1	Off-Road Equipment	12/21/2015	10	0.06
C-29154-A	1	Off-Road Equipment	12/21/2015	10	0.06
C-29214-A	1	Off-Road Equipment	12/21/2015	10	0.06
C-29232-A	1	Off-Road Equipment	12/21/2015	10	0.05
C-30193-A	1	Off-Road Equipment	12/21/2015	10	0.05
C-29215-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-29216-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-29217-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-29221-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-29224-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-29225-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-28979-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-28987-A	1	Off-Road Equipment	12/21/2015	10	0.04
C-29204-A	1	Off-Road Equipment	12/21/2015	10	0.03
C-29206-A	1	Off-Road Equipment	12/21/2015	10	0.03
C-29209-A	1	Off-Road Equipment	12/21/2015	10	0.03
C-29210-A	1	Off-Road Equipment	12/21/2015	10	0.03
C-29211-A	1	Off-Road Equipment	12/21/2015	10	0.03
C-29303-A	1	Off-Road Equipment	12/22/2015	10	1.65
C-29306-A	1	Off-Road Equipment	12/22/2015	10	0.84
C-30467-A	1	Off-Road Equipment	12/22/2015	10	0.44
C-29938-A	1	Off-Road Equipment	12/22/2015	10	0.25
C-28170-A	1	Off-Road Equipment	12/22/2015	10	0.09
C-30146-A	1	Off-Road Equipment	12/23/2015	10	0.39
C-39035-A	1	Off-Road Equipment	12/23/2015	10	0.26
C-26645-A	1	Off-Road Equipment	12/23/2015	10	0.01
C-29856-A	1	Off-Road Equipment	12/28/2015	10	2.67
C-28669-A	1	Off-Road Equipment	12/28/2015	10	0.18
C-26180-A	1	Off-Road Equipment	12/28/2015	10	0.12
C-26187-A	1	Off-Road Equipment	12/28/2015	10	0.12
C-26196-A	1	Off-Road Equipment	12/28/2015	10	0.12
C-26186-A	1	Off-Road Equipment	12/28/2015	10	0.06
C-33316-A	1	Off-Road Equipment	12/29/2015	10	2.35
C-26200-A	1	Off-Road Equipment	12/29/2015	10	1.17
C-26199-A	1	Off-Road Equipment	12/29/2015	10	1.12
C-28206-A	1	Off-Road Equipment	12/29/2015	10	1.07
C-30147-A	1	Off-Road Equipment	12/29/2015	10	0.93
C-31313-A	1	Off-Road Equipment	12/29/2015	10	0.11
C-31842-A	1	Off-Road Equipment	12/29/2015	10	0.09
C-8657-A	1	Off-Road Equipment	12/30/2015	10	1.01
C-25928-A	1	Off-Road Equipment	12/30/2015	10	0.83
C-36892-A	1	Off-Road Equipment	12/30/2015	10	0.36
C-27998-A	1	Off-Road Equipment	12/30/2015	10	0.19
C-24602-A	1	Off-Road Equipment	12/30/2015	10	0.15
C-21883-A	1	Off-Road Equipment	12/30/2015	10	0.12

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-27960-A	1	Off-Road Equipment	12/30/2015	10	0.02
C-30715-A	1	Off-Road Equipment	12/30/2015	10	0.02
C-26758-A	1	Off-Road Equipment	12/31/2015	10	5.54
C-30237-A	1	Off-Road Equipment	12/31/2015	10	2.56
C-28004-A	1	Off-Road Equipment	12/31/2015	10	0.64
C-24780-B	2	Off-Road Equipment	12/31/2015	10	0.51
C-30810-A	1	Off-Road Equipment	12/31/2015	10	0.45
C-27851-A	1	Off-Road Equipment	12/31/2015	10	0.01
C-31193-A	1	Off-Road Equipment	01/04/2016	10	0.60
C-29299-A	1	Off-Road Equipment	01/04/2016	10	0.46
C-29300-A	1	Off-Road Equipment	01/04/2016	10	0.46
C-29301-A	1	Off-Road Equipment	01/04/2016	10	0.41
C-30011-A	1	Off-Road Equipment	01/04/2016	10	0.18
C-41048-A	1	Off-Road Equipment	01/04/2016	10	0.14
C-30333-A	1	Off-Road Equipment	01/11/2016	10	2.43
C-31504-A	1	Off-Road Equipment	01/11/2016	10	0.23
C-30918-A	2	Off-Road Equipment	01/13/2016	10	0.50
C-28818-A	1	Off-Road Equipment	01/13/2016	10	0.35
C-26265-A	1	Off-Road Equipment	01/13/2016	10	0.14
C-29375-A	1	Off-Road Equipment	01/13/2016	10	0.02
C-27535-A	1	Off-Road Equipment	01/14/2016	10	0.94
C-41050-A	1	Off-Road Equipment	01/14/2016	10	0.08
C-26214-A	1	Off-Road Equipment	01/15/2016	10	0.85
C-26436-A	1	Off-Road Equipment	01/15/2016	10	0.71
C-27953-A	1	Off-Road Equipment	01/15/2016	10	0.29
C-29869-A	1	Off-Road Equipment	01/18/2016	10	0.25
C-29846-A	1	Off-Road Equipment	01/18/2016	10	0.09
C-27543-A	1	Off-Road Equipment	01/20/2016	10	0.94
C-23844-A	1	Off-Road Equipment	01/20/2016	10	0.45
C-27552-A	1	Off-Road Equipment	01/20/2016	10	0.38
C-27553-A	1	Off-Road Equipment	01/20/2016	10	0.38
C-27554-A	1	Off-Road Equipment	01/20/2016	10	0.38
C-27202-A	1	Off-Road Equipment	01/21/2016	10	2.22
C-27203-A	1	Off-Road Equipment	01/21/2016	10	1.93
C-31841-A	1	Off-Road Equipment	01/21/2016	10	0.04
C-26939-A	1	Off-Road Equipment	01/28/2016	10	0.41
C-24765-A	1	Off-Road Equipment	01/29/2016	10	0.23
C-26182-A	1	Off-Road Equipment	02/10/2016	10	0.03
C-26185-A	1	Off-Road Equipment	02/10/2016	10	0.03
C-26190-A	1	Off-Road Equipment	02/10/2016	10	0.03
C-26191-A	1	Off-Road Equipment	02/10/2016	10	0.02
C-28202-A	1	Off-Road Equipment	02/12/2016	10	0.34
C-30041-A	1	Off-Road Equipment	02/16/2016	10	0.63
C-30043-A	1	Off-Road Equipment	02/16/2016	10	0.56
C-25871-A	1	Off-Road Equipment	02/17/2016	10	0.39
C-25872-A	1	Off-Road Equipment	02/17/2016	10	0.09
C-31314-A	1	Off-Road Equipment	02/18/2016	10	0.15

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-31691-A	1	Off-Road Equipment	02/19/2016	10	2.21
C-28080-A	1	Off-Road Equipment	02/22/2016	10	0.83
C-30417-A	1	Off-Road Equipment	02/23/2016	10	0.21
C-32006-A	1	Off-Road Equipment	02/24/2016	10	0.12
C-25723-A	1	Off-Road Equipment	02/24/2016	10	0.09
C-28947-A	1	Off-Road Equipment	02/25/2016	10	1.23
C-39742-A	1	Off-Road Equipment	02/25/2016	10	1.01
C-30647-A	1	Off-Road Equipment	02/25/2016	10	0.46
C-32814-A	1	Off-Road Equipment	02/25/2016	10	0.23
C-32815-A	1	Off-Road Equipment	02/25/2016	10	0.23
C-25580-A	1	Off-Road Equipment	02/26/2016	10	0.03
C-33523-A	1	Off-Road Equipment	02/29/2016	10	0.25
C-31838-A	1	Off-Road Equipment	02/29/2016	10	0.01
C-30335-A	1	Off-Road Equipment	03/01/2016	10	2.43
C-29442-A	1	Off-Road Equipment	03/01/2016	10	0.31
C-26763-A	1	Off-Road Equipment	03/03/2016	10	0.63
C-27797-A	1	Off-Road Equipment	03/03/2016	10	0.45
C-25967-A	1	Off-Road Equipment	03/07/2016	10	0.18
C-28673-A	1	Off-Road Equipment	03/08/2016	10	0.04
C-27495-A	1	Off-Road Equipment	03/09/2016	10	0.91
C-30551-A	1	Off-Road Equipment	03/09/2016	10	0.59
C-30774-A	1	Off-Road Equipment	03/09/2016	10	0.39
C-30544-A	1	Off-Road Equipment	03/09/2016	10	0.27
C-36893-A	1	Off-Road Equipment	03/10/2016	10	0.32
C-29747-A	1	Off-Road Equipment	03/10/2016	10	0.17
C-30724-A	1	Off-Road Equipment	03/10/2016	10	0.11
C-29576-A	1	Off-Road Equipment	03/11/2016	10	0.75
C-40935-A	1	Off-Road Equipment	03/11/2016	10	0.25
C-31194-A	1	Off-Road Equipment	03/14/2016	10	0.13
C-27783-A	1	Off-Road Equipment	03/16/2016	10	0.11
C-27622-A	1	Off-Road Equipment	03/16/2016	10	0.06
C-32160-A	1	Off-Road Equipment	03/16/2016	10	0.05
C-31024-A	1	Off-Road Equipment	03/17/2016	10	0.11
C-43367-A	1	Off-Road Equipment	03/18/2016	10	0.64
C-33891-A	1	Off-Road Equipment	03/18/2016	10	0.20
C-27695-A	1	Off-Road Equipment	03/20/2016	10	0.16
C-33894-A	1	Off-Road Equipment	03/21/2016	10	0.18
C-26377-A	1	Off-Road Equipment	03/21/2016	10	0.14
C-29269-A	1	Off-Road Equipment	03/22/2016	10	0.72
C-30249-A	1	Off-Road Equipment	03/24/2016	10	2.35
C-44922-A	1	Off-Road Equipment	03/24/2016	10	0.16
C-30905-A	1	Off-Road Equipment	03/25/2016	10	0.33
C-31834-A	1	Off-Road Equipment	03/28/2016	10	0.44
C-31833-A	1	Off-Road Equipment	03/28/2016	10	0.23
C-41049-A	1	Off-Road Equipment	03/29/2016	10	0.19
C-25874-A	1	Off-Road Equipment	03/29/2016	10	0.11
C-25873-A	1	Off-Road Equipment	03/29/2016	10	0.11

Project Number	Unit	Source Category	Implementation Date	Project Life	Annual Nox Adjusted tons
C-30807-A	1	Off-Road Equipment	03/30/2016	10	0.41
C-26653-A	1	Off-Road Equipment	03/30/2016	10	0.25
C-29297-A	1	Off-Road Equipment	03/31/2016	10	0.62
C-29298-A	1	Off-Road Equipment	03/31/2016	10	0.62
C-37191-A	1	Off-Road Equipment	03/31/2016	10	0.53
C-44875-A	1	Off-Road Equipment	03/31/2016	10	0.13
C-30037-A	1	Off-Road Equipment	04/05/2016	10	0.35
C-26401-A	1	Off-Road Equipment	04/05/2016	10	0.06
C-27696-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27697-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27699-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27700-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27701-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27702-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27703-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27705-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27706-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27707-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27708-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27709-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27710-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27711-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27712-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27713-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27714-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27715-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27716-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27717-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27718-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27719-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27720-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-27721-A	1	Off-Road Equipment	04/06/2016	10	0.21
C-33404-A	1	Off-Road Equipment	04/11/2016	10	0.08
C-33405-A	1	Off-Road Equipment	04/11/2016	10	0.08
C-43364-A	1	Off-Road Equipment	04/12/2016	10	0.38
C-32476-A	1	Off-Road Equipment	04/13/2016	10	0.21
C-33040-A	1	Off-Road Equipment	04/15/2016	10	0.59
C-32713-A	1	Off-Road Equipment	04/28/2016	10	0.93
C-31642-A	1	Off-Road Equipment	04/29/2016	10	0.12
C-31269-A	1	Off-Road Equipment	05/06/2016	10	0.59
C-38567-A	1	Off-Road Equipment	05/20/2016	10	0.16
			Total – tons per day		**3.51**

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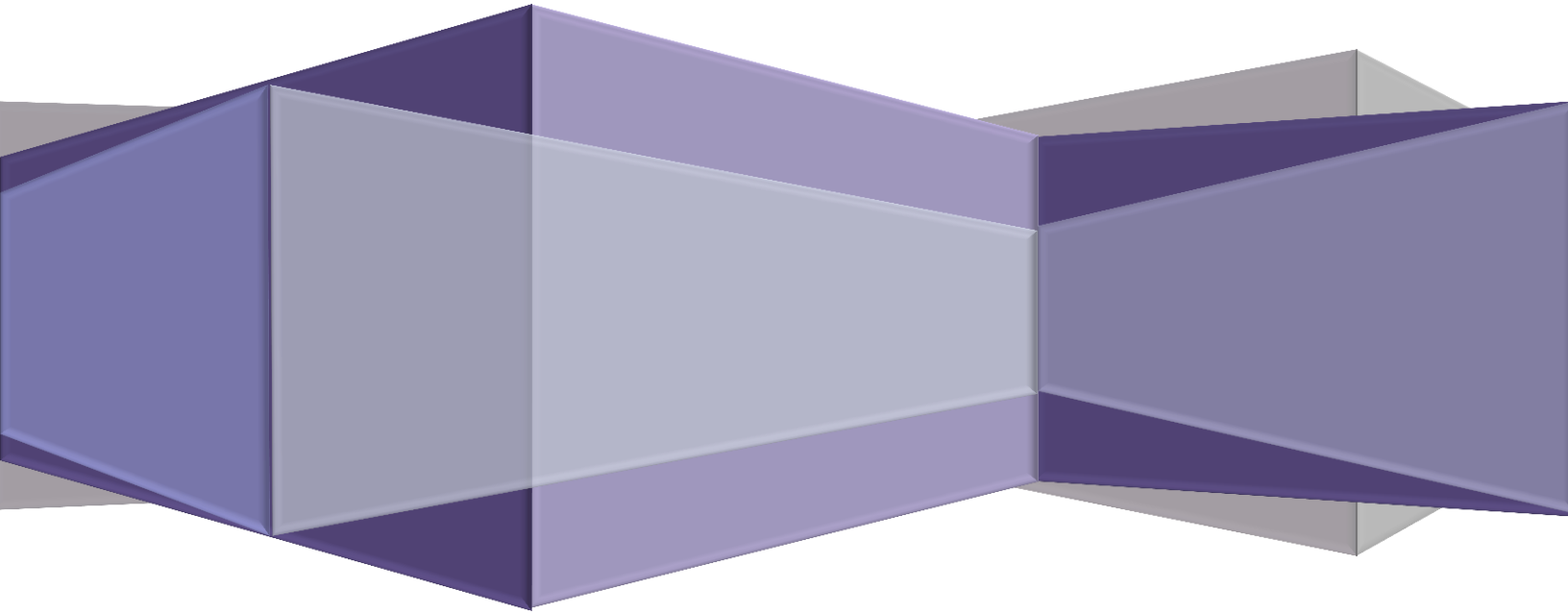
Appendix D

New Source Review and Emission Reduction Credits

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Appendix D: New Source Review and Emission Reduction Credits

D.1 INTRODUCTION

The San Joaquin Valley Air Pollution Control Air District (District) requires most new and modified stationary sources that increase emissions in amounts in excess of specific emission offset thresholds to obtain emission reduction credits (ERCs) to offset the growth in emissions. District Rule 2201 (New and Modified Stationary Source Review, or NSR, Rule) contains the offset requirements. Offsets represent either on-site reductions or the use of banked ERCs. The District expects that some pre-baseline credits (pre-2013 for the modeling used in this PM2.5 Plan) will be used to mitigate growth from permitted stationary sources during the period of this plan. This Appendix discusses the use of such ERCs in the San Joaquin Valley.

D.2 PRE-BASELINE EMISSION REDUCTION CREDITS

The General Preamble to the Federal Clean Air Act (57 FR 13498) states that the pre-baseline ERCs must be reflected as growth and included in the attainment demonstration "*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* (pre-baseline) *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-baseline ERCs in the growth factor, the District has selected the first methodology provided in Seitz's memorandum. However, in either case, the purpose is to show that this plan, by including pre-baseline ERCs as a part of expected growth, will result in a projected inventory adequate to attain the NAAQS and achieve any applicable rate of progress:

projected inventory = baseline inventory + growth + ERCs(pre-baseline) – offsets – reductions

where: growth = non-permitted growth + permitted growth

offsets = ERCs(post-baseline) + ERCs(pre-baseline)

reductions = reductions required by the measures in the Plan

Growth Estimates: The emissions trends and growth estimates in this plan were generated using the reports from the California Emissions Projection Analysis Model (CEPAM). The emissions inventory and associated emissions projections are based on

ARB's latest PM 2.5 SIP Planning Projections (California Emissions Projection Analysis Model: 2016 Ozone SIP External Adjustment Reporting Tool version 1.04). CEPAM's computer tools were used to develop projections and emission estimates based on the most current available growth and control data available at the time of the forecast runs. CEPAM was first developed in the 1990s (called CEFS at the time) to assist in developing air quality plans, determining how and where air pollution can be reduced, tracking progress towards meeting plans goals and mandates, and constructing emission trends, and has been updated regularly since then.

A key component of CEPAM is the growth data. The growth estimates generated by CEPAM include growth in emissions requiring offsets under the New Source Review Rule as well as that which can be accommodated without triggering offsets. Tables D-1 through D-4 show total projected growth from stationary sources of 0.90 tons/day of directly emitted PM2.5, and, for PM2.5 precursors, growth of 2.42 tons/day of NOx, 0.83 tons/day of SOx, and 10.56 tons/day of VOC, for the period of 2013 through 2022. Ammonia is not included in the analysis. Although a PM2.5 precursor, ERCs are not issued for ammonia, so no accounting for ammonia ERCs is necessary or appropriate. The CEPAM inventory shows negative growth for some segments of the economy, representing a shrinking emissions inventory even before considering reductions required by District plans. However, for the purposes of this ERC-use analysis, the District did not include these negative growth numbers (by setting negative growth to zero), as only positive growth requires offsetting with ERCs.

The CEPAM projected inventory for 2022 shown in the table does incorporate the projected growth (both positive and negative) as well as the expected controls from the measures contained in prior plans. Notwithstanding slight rounding errors, the projected 2022 inventory equals the baseline inventory plus the projected growth minus the expected reductions from the controls contained in previously adopted plans. Reductions due to this PM2.5 plan are not incorporated in these projections, and do not affect the amount of offsets estimated to mitigate the projected growth.

Emissions Offset Requirements: Under District's New Source Review Rule 2201, new sources with emissions exceeding the following level must offset their emissions:

NOx ……..	20,000 lbs/year
VOC……..	20,000 lbs/year
PM10…….	29,200 lbs/year
SOx……	54,750 lbs/year

Additionally, for existing facilities with emissions meeting or exceeding the above levels, any increase in emissions that is not due solely to increased utilization allowed by their current permits must be offset.

Also, PM2.5 offsets would be required for any new major PM2.5 source (exceeding 70 tons per year of direct PM2.5 emissions), or for major modifications at existing major PM2.5 sources (emissions increases of 20,000 lbs PM2.5 per year at an existing major

PM2.5 source). The 70 tons per year of direct PM2.5 emissions offset threshold was selected as the District will be adopting a revised New Source Review Rule 2201 that will revise the PM2.5 major source threshold from the current 100 tons per year to 70 tons per year, in accordance with the District's request for classification as Serious Non-attainment of the 1997 and 2006 PM2.5 standards.

Use of Interpollutant Offsets: Rule 2201 allows the use of interpollutant trading amongst criteria pollutants and their precursors upon the appropriate scientific demonstration of an adequate trading ratio. At this time, EPA has not approved an interpollutant trading ratio for PM2.5 precursors. Until EPA approves such ratios in response to the submittal from the District of a future PM2.5 precursor trading analysis, the District will not allow the use of precursor ERCs to offset PM2.5 emissions increases.

Pre-Baseline Offset Usage Estimate: The amount of offsets expected to be consumed during this plan's period was estimated by establishing the percentage of permitting actions for each source category that would be subject to offset requirements under Rule 2201. For each source category, this percentage was established based on past permitting history, the fraction of sources in the category with emissions at or above the offset trigger levels, and any expected changes in permitting activity for the source category. The following factors were used in estimating the potential need for offsets:

- All increases from modifications to existing sources with potential emissions at or above the above offset thresholds would require offsets (District Rule 2201).

- New sources with emissions exceeding the above offset thresholds would require offsets (District Rule 2201).

- The percentage of sources that meet any of the above criteria was estimated by examining past permitting history and by projecting future permitting based on the estimated growth. For instance, the majority of permitting actions with increases in emissions from oil production facilities come from sources with potential emissions in excess of the above offset thresholds. Therefore, for that source category, it was assumed that 80-100% of increases in overall emissions due to facility modifications would require offsets.

The quantity of required offsets was then established by multiplying the expected growth in emissions for each source category (from CEPAM) by this percentage and the expected offset ratio. District Rule 2201 establishes offset ratios ranging from 1.0:1 to 1.5:1 based on the distance from the source of ERCs to the source with increase in emissions. An offset ratio of 1.5:1 applies to all transactions where the distance is greater than 15 miles, and to all off-site VOC and NOx offsetting. For the period of January 2013 through August 15, 2016, the average offset ratio for all permitting actions varied from 1.47:1 for NOx, to 1.45:1 for SOx, to 1.57:1 PM10, to 1.48:1 for VOC. Tables D-1 through D-4 contain the expected growth, percentage of activities subject to offset requirements, and the expected quantity of offsets for each pollutant.

Although some offsets are expected to come from post-baseline reductions, this plan conservatively assumes that all offsets will be pre-baseline. See Table D-5 for a current list of District-issued ERCs, as of August 2016. These ERCs and future ERCs (and any ERCs generated from them) are available to be used in the District's NSR program.

The expected ERC usage after 2013 and through 2022, as shown in Tables D -1 through D-4, has been estimated in this plan as follows:

	Expected ERC Use (tpd)	**Growth (tpd)**
PM 2.5	0.69	0.90
NOx	2.35	2.42
SOx	0.49	0.83
VOC	5.62	10.56

As shown above, the quantity of pre-baseline offsets (conservatively considering all ERCs used to be pre-baseline ERCs) that are expected to be used between 2013 and 2022 ("Expected ERC Use" column) is less than the plan's estimated growth in emissions for each pollutant ("Growth" column).

Therefore, if growth in new and modified sources occurs at the rate estimated in this plan, the use of offsets as required in Rule 2201 will ensure that permitted increases in emissions will not interfere with progress toward attainment of federal PM 2.5 standards. As discussed in Chapter 3, the District also satisfies the requirement for reasonable further progress with the above-mentioned projected inventories and without taking credit for the ERCs required of and provided by new and modified stationary sources permitted during this period.

Finally, because all projected annual use of ERCs is included in the plan's estimated growth, this ERC use is surplus of all plan requirements and may be included as such in the District's annual offset equivalency demonstration required by Section 7.0 of District Rule 2201.

Safeguards to assure plan integrity despite the use of pre-baseline credits: In order to assure that the use of pre-baseline ERCs does not interfere with attainment effort and the applicable rate of progress, this plan incorporates the following safeguards:

- The District will place a cap on the amount of pre-baseline credits that can be used. Although the District has relied on a number of conservative assumptions in estimating the usage quantity of pre-baseline credits, some degree of uncertainty exists. For instance, unexpected growth or irregular permitting activity may occur for one or more source categories. The cap on the use of pre-baseline ERCs will be enforced by tracking the use of such credits and disallowing the use of pre-baseline credits in permitting actions when the above-specified growth levels are reached. The second column of the table above lists expected ERC use for stationary source growth, for each pollutant. The third column of the table above lists the cap on stationary

source growth, for each pollutant. In addition, Rule 2201 allows the use of interpollutant trading amongst criteria pollutants and their precursors upon the appropriate scientific demonstration of an adequate trading ratio. These caps also apply to the use of VOC, NOx, and SOx ERCs in their application as offsets for direct emissions and in their use as PM 2.5 precursor interpollutant offsets. Thus, to the extent that precursor ERCs are used to offset PM 2.5 increases, these same ERCs will no longer be available to offset direct increases of these same precursors. At this time, EPA has not approved an interpollutant trading ratio for PM2.5 precursors. Until EPA approves such ratios, the District will not allow the use of precursor ERCs to offset PM2.5 emissions increases. The appropriate proportion of PM10 credits used as PM 2.5 credits for offsetting purposes will be included in the PM 2.5 cap. These ERC usage caps replace any caps established in prior plans.

- Although some ERCs will come from post-baseline reductions, this plan conservatively assumes that all offsets will come from pre-baseline reductions. As discussed earlier, federal law only requires the pre-baseline ERCs to be included in the growth and the attainment demonstration. This plan assumes that all ERCs used to offset emission increases will be pre-baseline ERCs and, therefore, includes them all within the projected inventory as growth. Using this higher projected inventory leads to conservative conclusions relating to the attainment and rate of progress demonstrations.

Table D-1 Estimated PM2.5 Growth, Control, and Estimated Offset Use

SUMMARY CATEGORY NAME	2013 Emissions Tons/day	Growth Factor (%)	Estimated Growth (tons/day)	Control Factor (%)	Reductions (tons/day)	2022 Emissions Tons/day	Percent Requiring Offsets	Estimated Offsets* (tons/day)
FUEL COMBUSTION								
ELECTRIC UTILITIES	1.34	-8.41	0.00	0.00	0.00	1.22	50	0.00
COGENERATION	0.57	32.53	0.19	0.00	0.00	0.75	50	0.15
OIL AND GAS PRODUCTION (COMBUSTION)	1.68	-18.15	0.00	0.00	0.00	1.37	80	0.00
PETROLEUM REFINING (COMBUSTION)	0.08	0.00	0.00	0.00	0.00	0.08	80	0.00
MANUFACTURING AND INDUSTRIAL	0.13	4.22	0.01	0.00	0.00	0.13	25	0.00
FOOD AND AGRICULTURAL PROCESSING	0.70	-2.62	0.00	-52.22	-0.37	0.45	20	0.00
SERVICE AND COMMERCIAL	0.47	5.85	0.03	0.00	0.00	0.49	25	0.01
OTHER (FUEL COMBUSTION)	0.02	1.90	0.00	-51.61	-0.01	0.01	25	0.00
TOTAL PM2.5: FUEL COMBUSTION	**4.99**		**0.22**		**-0.38**	**4.50**		**0.16**
WASTE DISPOSAL								
SEWAGE TREATMENT	0.01	7.69	0.00	0.00	0.00	0.01	25	0.00
LANDFILLS	0.11	11.64	0.01	0.00	0.00	0.13	50	0.01
INCINERATORS	0.01	10.32	0.00	0.00	0.00	0.01	25	0.00
SOIL REMEDIATION	0.00	14.29	0.00	0.00	0.00	0.00	25	0.00
OTHER (WASTE DISPOSAL)	0.01	11.86	0.00	0.00	0.00	0.01	25	0.00
TOTAL PM2.5: WASTE DISPOSAL	**0.14**		**0.02**		**0.00**	**0.16**		**0.01**
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.00	15.38	0.00	0.00	0.00	0.00	25	0.00
DEGREASING	0.02	33.73	0.01	0.00	0.00	0.03	50	0.01
COATINGS AND RELATED PROCESS SOLVENTS	0.22	18.07	0.04	0.00	0.00	0.26	25	0.02
PRINTING	0.01	40.00	0.00	0.00	0.00	0.01	10	0.00
ADHESIVES AND SEALANTS	0.00	200.00	0.00	0.00	0.00	0.00	10	0.00
OTHER (CLEANING AND SURFACE COATINGS)	0.01	14.10	0.00	0.00	0.00	0.01	50	0.00

TOTAL PM2.5: CLEANING AND SURFACE COATINGS	**0.00**		**0.00**		**0.00**	**0.00**		**0.02**
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	0.04	-17.84	0.00	0.00	0.00	0.04	80	0.00
PETROLEUM REFINING	0.09	0.00	0.00	0.00	0.00	0.09	80	0.00
PETROLEUM MARKETING	0.00	13.33	0.00	0.00	0.00	0.00	80	0.00
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.00		0.00		0.00	0.00	80	0.00
TOTAL PM2.5: PETROLEUM PRODUCTION AND MARKETING	**0.13**		**0.00**		**0.00**	**0.13**		**0.00**
INDUSTRIAL PROCESSES								
CHEMICAL	0.22	16.60	0.04	0.00	0.00	0.25	25	0.01
FOOD AND AGRICULTURE	0.84	15.77	0.13	-1.11	-0.01	0.97	50	0.10
MINERAL PROCESSES	1.41	24.53	0.35	0.00	0.00	1.75	50	0.27
METAL PROCESSES	0.06	14.44	0.01	0.00	0.00	0.06	80	0.01
WOOD AND PAPER	0.26	-0.74	0.00	0.00	0.00	0.26	50	0.00
GLASS AND RELATED PRODUCTS	0.34	28.21	0.10	0.00	0.00	0.44	50	0.08
ELECTRONICS	0.00	-14.63	0.00	0.00	0.00	0.00	25	0.00
OTHER (INDUSTRIAL PROCESSES)	0.24	19.53	0.05	0.00	0.00	0.28	25	0.02
TOTAL PM2.5: INDUSTRIAL PROCESSES	**3.37**		**0.67**		**-3.05**	**4.01**		**0.49**
TOTAL PM2.5: STATIONARY SOURCES	**8.63**		**0.90**		**-27.45**	**8.80**		**0.69**

*Offset distance ratio of 1.57:1 used, calculated only on the “Total (Pollutant)” lines.
California Emissions Projection Analysis Model: 2016 Ozone SIP External Adjustment Reporting Tool version 1.04

Table D-2 Estimated NOx Growth, Control, and Estimated Offset Use

SUMMARY CATEGORY NAME	2013 Emissions Tons/day	Growth Factor (%)	Estimated Growth (tons/day)	Control Factor (%)	Reductions (tons/day)	2022 Emissions Tons/day	Percent Requiring Offsets	Estimated Offsets* (tons/day)
FUEL COMBUSTION								
ELECTRIC UTILITIES	4.41	-1.83	0.00	-0.60	-0.03	4.31	100	0.00
COGENERATION	1.61	27.79	0.45	-0.03	0.00	2.06	75	0.49
OIL AND GAS PRODUCTION (COMBUSTION)	3.08	-18.54	0.00	-13.31	-0.41	2.24	100	0.00
PETROLEUM REFINING (COMBUSTION)	0.19	0.00	0.00	-16.52	-0.03	0.16	100	0.00
MANUFACTURING AND INDUSTRIAL	5.19	2.38	0.12	-1.20	-0.06	5.26	40	0.07
FOOD AND AGRICULTURAL PROCESSING	11.49	-0.59	0.00	-74.57	-8.57	4.56	25	0.00
SERVICE AND COMMERCIAL	4.57	6.38	0.29	-2.13	-0.10	4.76	10	0.04
OTHER (FUEL COMBUSTION)	0.64	1.69	0.01	-41.56	-0.27	0.43	25	0.00
TOTAL NOx: FUEL COMBUSTION	**31.18**		**0.87**		**-9.46**	**23.78**		**0.61**
WASTE DISPOSAL								
SEWAGE TREATMENT	0.03	12.12	0.00	0.00	0.00	0.04		0.00
LANDFILLS	0.17	12.08	0.02	0.00	0.00	0.19	30	0.01
INCINERATORS	0.04	12.47	0.00	0.00	0.00	0.04	90	0.01
SOIL REMEDIATION	0.01	-1.92	0.00	0.00	0.00	0.01		0.00
OTHER (WASTE DISPOSAL)	0.00	7.69	0.00	0.00	0.00	0.00		0.00
TOTAL NOx: WASTE DISPOSAL	**0.25**		**0.03**		**0.00**	**0.28**		**0.02**
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.00	0.00	0.00	0.00	0.00	0.00		0.00
DEGREASING	0.00	0.00	0.00	0.00	0.00	0.00		0.00
COATINGS AND RELATED PROCESS SOLVENTS	0.00	0.00	0.00	0.00	0.00	0.00		0.00
PRINTING	0.00	0.00	0.00	0.00	0.00	0.00		0.00
ADHESIVES AND SEALANTS	0.00	0.00	0.00	0.00	0.00	0.00		0.00
OTHER (CLEANING AND SURFACE COATINGS)	0.00	0.00	0.00	0.00	0.00	0.00		0.00

TOTAL NOx: CLEANING AND SURFACE COATINGS	**0.00**		**0.00**		**0.00**	**0.00**		**0.00**
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	0.36	-18.11	0.00	0.00	0.00	0.30	100	0.00
PETROLEUM REFINING	0.01	0.00	0.00	0.00	0.00	0.01	100	0.00
PETROLEUM MARKETING	0.04	4.19	0.00	0.00	0.00	0.04	20	0.00
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.00		0.00		0.00	0.00	0	0.00
TOTAL NOx: PETROLEUM PRODUCTION AND MARKETING	**0.41**		**0.00**		**0.00**	**0.35**		**0.00**
INDUSTRIAL PROCESSES								
CHEMICAL	0.31	16.44	0.05	0.00	0.00	0.36	50	0.04
FOOD AND AGRICULTURE	0.00		0.00		0.00	0.00	10	0.00
MINERAL PROCESSES	0.20	23.96	0.05	0.00	0.00	0.25	25	0.02
METAL PROCESSES	0.00	0.00	0.00	0.00	0.00	0.00	10	0.00
WOOD AND PAPER	0.00		0.00		0.00	0.00		0.00
GLASS AND RELATED PRODUCTS	6.21	22.86	1.42	-38.55	-2.39	4.69	80	1.67
ELECTRONICS	0.00	0.00	0.00	0.00	0.00	0.00		0.00
OTHER (INDUSTRIAL PROCESSES)	0.00	0.00	0.00	0.00	0.00	0.00	25	0.00
TOTAL NOx: INDUSTRIAL PROCESSES	**6.72**		**1.52**		**-3.05**	**5.30**		**1.72**
TOTAL NOx: STATIONARY SOURCES	**38.56**		**2.42**		**-27.45**	**29.71**		**2.35**

*Offset distance ratio of 1.47:1 used calculated only on the “Total (Pollutant)” lines.
California Emissions Projection Analysis Model: 2016 Ozone SIP External Adjustment Reporting Tool version 1.04

Table D-3 Estimated SOx Growth, Control, and Estimated Offset Use

SUMMARY CATEGORY NAME	2013 Emissions Tons/day	Growth Factor (%)	Estimated Growth (tons/day)	Control Factor (%)	Reductions (tons/day)	2022 Emissions Tons/day	Percent Requiring Offsets	Estimated Offsets* (tons/day)
FUEL COMBUSTION								
ELECTRIC UTILITIES	0.61	2.23	0.01	-0.39	0.00	0.62	50	0.01
COGENERATION	0.19	46.71	0.09	0.00	0.00	0.28	50	0.06
OIL AND GAS PRODUCTION (COMBUSTION)	0.72	-18.17	0.00	-57.87	-0.42	0.25	80	0.00
PETROLEUM REFINING (COMBUSTION)	0.02	0.00	0.00	-47.57	-0.01	0.01	100	0.00
MANUFACTURING AND INDUSTRIAL	0.82	3.48	0.03	-3.75	-0.03	0.81	25	0.01
FOOD AND AGRICULTURAL PROCESSING	0.24	-3.15	0.00	-65.47	-0.16	0.09	10	0.00
SERVICE AND COMMERCIAL	0.35	5.26	0.02	-7.99	-0.03	0.34	25	0.01
OTHER (FUEL COMBUSTION)	0.00	7.41	0.00	-41.38	0.00	0.00		0.00
TOTAL SOx: FUEL COMBUSTION	**2.95**		**0.15**		**-0.64**	**2.40**		**0.09**
WASTE DISPOSAL								
SEWAGE TREATMENT	0.06	11.40	0.01	0.00	0.00	0.07		0.00
LANDFILLS	0.07	12.21	0.01	0.00	0.00	0.08		0.00
INCINERATORS	0.01	14.14	0.00	0.00	0.00	0.01	25	0.00
SOIL REMEDIATION	0.00	7.69	0.00	0.00	0.00	0.00		0.00
OTHER (WASTE DISPOSAL)	0.00	14.29	0.00	0.00	0.00	0.00		0.00
TOTAL SOx: WASTE DISPOSAL	**0.14**		**0.02**		**0.00**	**0.16**		**0.00**
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.00	0.00	0.00	0.00	0.00	0.00		0.00
DEGREASING	0.00	0.00	0.00	0.00	0.00	0.00		0.00
COATINGS AND RELATED PROCESS SOLVENTS	0.00	0.00	0.00	0.00	0.00	0.00		0.00
PRINTING	0.00	0.00	0.00	0.00	0.00	0.00		0.00

ADHESIVES AND SEALANTS	0.00	0.00	0.00	0.00	0.00	0.00		0.00
OTHER (CLEANING AND SURFACE COATINGS)	0.00	0.00	0.00	0.00	0.00	0.00		0.00
TOTAL SOx: CLEANING AND SURFACE COATINGS	**0.00**		**0.00**		**0.00**	**0.00**		**0.00**
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	0.47	-18.13	0.00	0.00	0.00	0.39	90	0.00
PETROLEUM REFINING	0.01	0.00	0.00	0.00	0.00	0.01	100	0.00
PETROLEUM MARKETING	0.00	11.11	0.00	0.00	0.00	0.00		0.00
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.00		0.00		0.00	0.00	80	0.00
TOTAL SOx: PETROLEUM PRODUCTION AND MARKETING	**0.48**		**0.00**		**0.00**	**0.40**		**0.00**
INDUSTRIAL PROCESSES								
CHEMICAL	0.77	16.36	0.13	0.00	0.00	0.90	25	0.05
FOOD AND AGRICULTURE	0.38	16.88	0.06	0.00	0.00	0.45	50	0.05
MINERAL PROCESSES	0.37	23.89	0.09	0.00	0.00	0.46	25	0.03
METAL PROCESSES	0.00	-3.33	0.00	0.00	0.00	0.00	25	0.00
WOOD AND PAPER	0.00		0.00		0.00	0.00		0.00
GLASS AND RELATED PRODUCTS	2.00	18.48	0.37	-12.10	-0.24	2.09	50	0.27
ELECTRONICS	0.00		0.00		0.00	0.00		0.00
OTHER (INDUSTRIAL PROCESSES)	0.10	19.37	0.02	0.00	0.00	0.13	25	0.01
TOTAL SOx: INDUSTRIAL PROCESSES	**3.62**		**0.67**		**-3.05**	**4.03**		**0.40**
TOTAL SOx: STATIONARY SOURCES	**7.19**		**0.83**		**-27.45**	**6.99**		**0.49**

*Offset distance ratio of 1.45:1 used, calculated only on the “Total (Pollutant)” lines.
California Emissions Projection Analysis Model: 2016 Ozone SIP External Adjustment Reporting Tool version 1.04

Table D-4 Estimated VOC Growth, Control, and Estimated Offset Use

SUMMARY CATEGORY NAME	2013 Emissions Tons/day	Growth Factor (%)	Estimated Growth (tons/day)	Control Factor (%)	Reductions (tons/day)	2022 Emissions Tons/day	Percent Requiring Offsets	Estimated Offsets* (tons/day)
FUEL COMBUSTION								
ELECTRIC UTILITIES	0.22	-14.30	0.00	0.00	0.00	0.19	100	0.00
COGENERATION	0.50	14.39	0.07	0.00	0.00	0.57	90	0.10
OIL AND GAS PRODUCTION (COMBUSTION)	1.16	-18.16	0.00	0.00	0.00	0.95	95	0.00
PETROLEUM REFINING (COMBUSTION)	0.10	0.00	0.00	0.00	0.00	0.10	100	0.00
MANUFACTURING AND INDUSTRIAL	0.18	4.15	0.01	0.00	0.00	0.18	25	0.00
FOOD AND AGRICULTURAL PROCESSING	1.02	-1.70	0.00	-65.46	-0.67	0.56	10	0.00
SERVICE AND COMMERCIAL	0.58	7.61	0.04	0.00	0.00	0.62	25	0.02
OTHER (FUEL COMBUSTION)	0.04	0.93	0.00	-49.21	-0.02	0.03	10	0.00
TOTAL VOC: FUEL COMBUSTION	**3.80**		**0.12**		**-0.69**	**3.20**		**0.11**
WASTE DISPOSAL								
SEWAGE TREATMENT	0.03	11.69	0.00	0.00	0.00	0.04	25	0.00
LANDFILLS	1.52	14.60	0.22	0.00	0.00	1.74	50	0.16
INCINERATORS	0.01	15.45	0.00	0.00	0.00	0.01		0.00
SOIL REMEDIATION	0.11	12.81	0.01	0.00	0.00	0.12	10	0.00
OTHER (WASTE DISPOSAL)	22.19	16.57	3.68	-3.73	-0.83	24.91	25	1.36
TOTAL VOC: WASTE DISPOSAL	**23.86**		**3.92**		**-0.83**	**26.82**		**1.53**
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.09	14.04	0.01	0.00	0.00	0.10	0	0.00
DEGREASING	1.60	16.73	0.27	0.00	0.00	1.87	10	0.04
COATINGS AND RELATED PROCESS SOLVENTS	8.21	19.65	1.61	-0.62	-0.05	9.77	50	1.19
PRINTING	5.29	13.32	0.70	0.00	0.00	6.00	25	0.26
ADHESIVES AND SEALANTS	0.57	19.39	0.11	0.00	0.00	0.69	25	0.04

OTHER (CLEANING AND SURFACE COATINGS)	6.63	14.96	0.99	0.00	0.00	7.62	50	0.73
TOTAL VOC: CLEANING AND SURFACE COATINGS	**22.39**		**3.70**		**-0.05**	**26.05**		**2.27**
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	12.56	-18.14	0.00	0.00	0.00	10.28	80	0.00
PETROLEUM REFINING	0.79	0.00	0.00	0.00	0.00	0.79	90	0.00
PETROLEUM MARKETING	5.46	-0.60	0.00	-16.73	-0.91	4.91	40	0.00
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.02	-6.10	0.00	0.00	0.00	0.02	80	0.00
TOTAL VOC: PETROLEUM PRODUCTION AND MARKETING	**18.83**		**0.00**		**-0.91**	**16.00**		**0.00**
INDUSTRIAL PROCESSES								
CHEMICAL	4.85	16.41	0.80	0.00	0.00	5.65	25	0.29
FOOD AND AGRICULTURE	11.22	15.96	1.79	0.00	0.00	13.01	50	1.33
MINERAL PROCESSES	0.24	23.77	0.06	0.00	0.00	0.30	25	0.02
METAL PROCESSES	0.17	5.63	0.01	0.00	0.00	0.17	25	0.00
WOOD AND PAPER	0.01	0.00	0.00	0.00	0.00	0.01	25	0.00
GLASS AND RELATED PRODUCTS	0.02	19.12	0.00	0.00	0.00	0.02	100	0.01
ELECTRONICS	0.00		0.00		0.00	0.00		0.00
OTHER (INDUSTRIAL PROCESSES)	0.82	19.49	0.16	0.00	0.00	0.98	25	0.06
TOTAL VOC: INDUSTRIAL PROCESSES	**17.33**		**2.82**		**0.00**	**20.14**		**1.71**
TOTAL VOC: STATIONARY SOURCES	**86.21**		**10.56**		**-2.48**	**92.21**		**5.62**

*Offset distance ratio of 1.48:1 used calculated only on the “Total (Pollutant)” lines.
California Emissions Projection Analysis Model: 2016 Ozone SIP External Adjustment Reporting Tool version 1.04

Table D-5 List of Emission Reduction Credits PM10 and PM2.5 Precursors

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AERA ENERGY LLC	S	2774	4	PM10	443	368	369	489
AERA ENERGY LLC	S	2782	4	PM10	61	60	58	63
AERA ENERGY LLC	S	32	4	PM10	0	0	69	120
AERA ENERGY LLC	S	202	4	PM10	123	100	70	88
AERA ENERGY LLC	S	215	4	PM10	403	362	361	406
AERA ENERGY LLC	S	254	4	PM10	1093	1174	0	913
AERA ENERGY LLC	S	255	4	PM10	4184	1519	0	1074
AERA ENERGY LLC	S	256	4	PM10	10145	5624	0	0
AERA ENERGY LLC	S	259	4	PM10	1483	1747	0	705
AERA ENERGY LLC	S	260	4	PM10	1858	1946	286	633
AERA ENERGY LLC	S	913	4	PM10	846	548	530	785
AERA ENERGY LLC	S	1026	4	PM10	278	579	252	201
AERA ENERGY LLC	S	3265	4	PM10	1591	0	0	0
AERA ENERGY LLC	S	1040	4	PM10	0	961	467	0
AERA ENERGY LLC	S	272	4	PM10	806	760	721	693
AERA ENERGY LLC	S	319	4	PM10	449	650	497	499
AERA ENERGY LLC	S	802	4	PM10	734	1218	47	623
AERA ENERGY LLC	S	862	4	PM10	1257	1129	1090	1193
AERA ENERGY LLC	S	983	4	PM10	503	106	151	756
AERA ENERGY LLC	S	1006	4	PM10	991	1085	445	696
AERA ENERGY LLC	S	1008	4	PM10	80	100	30	21
AERA ENERGY LLC	S	1010	4	PM10	1975	2028	0	2074
AERA ENERGY LLC	S	1012	4	PM10	350	748	479	91
AERA ENERGY LLC	S	1013	4	PM10	269	2280	694	170
AERA ENERGY LLC	S	1424	4	PM10	787	1901	1476	380
AERA ENERGY LLC	S	1476	4	PM10	262	0	0	74

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AERA ENERGY LLC	S	1477	4	PM10	455	0	0	128
AERA ENERGY LLC	S	2361	4	PM10	4	1	0	2
AERA ENERGY LLC	S	2575	4	PM10	2301	1770	0	548
AERA ENERGY LLC	S	790	4	PM10	153	102	117	167
AERA ENERGY LLC	S	863	4	PM10	5	5	10	9
AERA ENERGY LLC	S	1057	4	PM10	72	81	66	65
AERA ENERGY LLC	S	1091	4	PM10	97	119	120	121
AERA ENERGY LLC	S	1927	4	PM10	1854	2703	2734	2332
AERA ENERGY LLC	S	2025	4	PM10	1028	714	726	684
AGRI-CEL INC	S	3631	4	PM10	31	38	35	4
ALON BAKERSFIELD REFINING	S	3462	4	PM10	1584	1877	1791	1974
ALON BAKERSFIELD REFINING	S	3463	4	PM10	2445	2476	2506	2506
ALON BAKERSFIELD REFINING	S	3464	4	PM10	2500	2500	2500	2500
AMERICAN MOULDING & MILLWORK	N	63	4	PM10	1106	701	809	471
ANDERSEN RACK SYSTEMS, INC	N	950	4	PM10	300	303	306	306
ANDERSON CLAYTON CORP/IDRIA #1	C	959	4	PM10	0	0	0	26896
ANDERSON CLAYTON CORPORATION	N	737	4	PM10	979	0	0	19767
ARDAGH GLASS INC	C	1345	4	PM10	18	18	18	18
ARDAGH GLASS INC	S	4496	4	PM10	0	0	0	118
ARDAGH GLASS INC	N	1293	4	PM10	0	0	0	167
AVENAL POWER CENTER, LLC	C	896	4	PM10	80	80	80	80
AVENAL POWER CENTER, LLC	N	721	4	PM10	0	0	3215	0
AVENAL POWER CENTER, LLC	N	723	4	PM10	0	0	985	0
BAKERSFIELD CITY WOOD SITE	S	2969	4	PM10	18	24	26	22
BAR VP DAIRY	C	797	4	PM10	0	0	0	2180
BAR VP DAIRY	C	798	4	PM10	0	0	0	3204
BAR VP DAIRY	C	799	4	PM10	0	0	0	4111

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
BERRY SEED & FEED COMPANY	N	1223	4	PM10	17557	15262	16796	18901
BRIAN ANDERSON	C	1374	4	PM10	0	0	0	20729
BRITZ AG FINANCE CO., INC.	C	558	4	PM10	0	0	0	5780
BRITZ AG FINANCE CO., INC.	C	559	4	PM10	0	0	0	35897
BRITZ GIN PARTNERSHIP	S	475	4	PM10	0	0	0	4259
BRITZ GIN PARTNERSHIP II	C	871	4	PM10	0	0	0	10903
BRITZ INCORPORATED	C	159	4	PM10	0	0	0	715
BRITZ INCORPORATED	C	586	4	PM10	0	0	0	19720
BROWN SAND INC	N	46	4	PM10	1107	1474	840	1099
BRUCE CARTER INDUSTRIES, INC.	S	4038	4	PM10	14	18	16	2
BUTTONWILLOW GINNING CO	S	2937	4	PM10	0	0	0	28460
BUTTONWILLOW GINNING CO	S	4634	4	PM10	0	0	0	13495
CALAVERAS MATERIALS INC	C	89	4	PM10	45	41	47	38
CALAVERAS MATERIALS INC.	C	233	4	PM10	243	652	759	479
CALIFORNIA DAIRIES	N	498	4	PM10	273	313	128	186
CALIFORNIA DAIRIES, INC.	S	2152	4	PM10	0	0	0	99
CALIFORNIA DAIRIES, INC.	S	2204	4	PM10	0	0	0	405
CALIFORNIA DAIRIES, INC.	N	1343	4	PM10	4	4	4	4
CALIFORNIA RESOURCES ELK HILLS, LLC	S	829	4	PM10	68	72	85	69
CALIFORNIA RESOURCES ELK HILLS, LLC	S	826	4	PM10	71	67	60	68
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4196	4	PM10	428	318	748	875
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4211	4	PM10	895	877	1115	1107
CALIFORNIA RESOURCES PRODUCTION CORP	N	1115	4	PM10	51	40	67	47
CALIFORNIA RESOURCES PRODUCTION CORP	N	1116	4	PM10	136	113	42	96

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALIFORNIA RESOURCES PRODUCTION CORP	N	1169	4	PM10	398	398	225	398
CALIFORNIA RESOURCES PRODUCTION CORP	N	1171	4	PM10	0	0	173	0
CALIFORNIA RESOURCES PRODUCTION CORP	N	1200	4	PM10	5	5	10	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	3996	4	PM10	76	26	48	52
CALIFORNIA RESOURCES PRODUCTION CORP	S	3036	4	PM10	29	29	29	29
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1227	4	PM10	23	69	108	96
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1288	4	PM10	0	0	0	1409
CALIFORNIA RESOURCES PRODUCTION CORP.	S	4647	4	PM10	204	204	203	203
CALMAT CO.	C	50	4	PM10	15	16	23	24
CALMAT OF FRESNO	C	40	4	PM10	75	359	165	553
CALPINE CORPORATION	C	448	4	PM10	1067	1067	1067	1067
CALPINE CORPORATION	C	449	4	PM10	82	28	373	674
CALPINE CORPORATION	C	942	4	PM10	50845	67976	8408	841
CALPINE CORPORATION	S	1577	4	PM10	489	0	0	23085
CALPINE CORPORATION	S	1683	4	PM10	0	0	0	1462
CALPINE CORPORATION	S	1689	4	PM10	0	0	0	2604
CALPINE CORPORATION	S	1693	4	PM10	1091	1103	1115	1115
CALPINE CORPORATION	S	2877	4	PM10	421	0	176	0
CALPINE CORPORATION	S	3198	4	PM10	0	0	0	8699
CALPINE CORPORATION	S	3288	4	PM10	0	0	987	8059
CALPINE CORPORATION	N	297	4	PM10	0	0	101	66394
CALPINE CORPORATION	N	208	4	PM10	715	8177	6581	715
CALPINE ENERGY SERVICES, L.P.	S	3090	4	PM10	751	812	634	694

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALPINE ENERGY SERVICES, L.P.	S	3091	4	PM10	0	0	0	7210
CALPINE ENERGY SERVICES, L.P.	C	1010	4	PM10	1029	0	0	13916
CAMPBELL SOUP COMPANY	N	127	4	PM10	416	289	261	308
CAMPBELL SOUP SUPPLY CO.	N	31	4	PM10	0	434	1064	0
CANANDAIGUA WINE COMPANY INC	C	702	4	PM10	423	422	449	411
CANDLEWICK YARNS	C	507	4	PM10	11	9	7	7
CASTLE AIRPORT AVIATION & DEVELOP CENTER	N	109	4	PM10	6262	6332	6402	6402
CERTAINTEED CORPORATION	C	816	4	PM10	600	600	600	600
CHEVRON U S A INC	S	357	4	PM10	137	116	114	153
CHEVRON U S A INC	S	4304	4	PM10	711	831	839	1007
CHEVRON U S A INC	S	629	4	PM10	24	21	21	21
CHEVRON USA INC	C	331	4	PM10	3766	3767	3767	3767
CHEVRON USA INC	C	339	4	PM10	11300	11300	11301	11301
CHEVRON USA INC	C	966	4	PM10	144	144	144	144
CHEVRON USA INC	S	702	4	PM10	1861	1881	1902	1902
CHEVRON USA INC	S	1485	4	PM10	1890	1911	1932	1932
CHEVRON USA INC	S	4202	4	PM10	1144	1194	1244	1244
CHEVRON USA INC	S	3544	4	PM10	1086	1185	913	966
CHEVRON USA INC	S	3604	4	PM10	699	1081	1219	805
CHEVRON USA INC	S	3679	4	PM10	5317	2839	3598	5227
CHEVRON USA INC	S	4377	4	PM10	297	912	1284	1251
CHEVRON USA INC	S	4668	4	PM10	23064	17442	24065	20486
CHEVRON USA INC	S	77	4	PM10	3067	2768	2607	3422
CHEVRON USA INC (REFINERY)	S	2275	4	PM10	490	1911	1932	532
CHEVRON USA PRODUCTION INC	S	147	4	PM10	50	57	46	46
CHEVRON USA PRODUCTION INC	S	3228	4	PM10	74	85	147	56
CHEVRON USA PRODUCTION INC	S	3533	4	PM10	101	106	124	122

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CHEVRON USA, INC.	C	1147	4	PM10	136	140	95	131
CHEVRON USA, INC.	C	1372	4	PM10	26	61	29	9
CLEAN HARBORS BUTTONWILLOW, LLC	S	49	4	PM10	567	573	580	580
CONAGRA CONSUMER FROZEN FOODS	N	672	4	PM10	135	48	91	137
CORCORAN IRRIGATION DISTRICT	C	560	4	PM10	75	77	74	44
COUNTY LINE GIN	C	997	4	PM10	0	0	0	8549
COUNTY OF SAN JOAQUIN SOLID WASTE DIV	S	2264	4	PM10	0	0	0	471
COUNTY OF SAN JOAQUIN SOLID WASTE DIV	S	2266	4	PM10	0	0	0	1000
COUNTY OF SAN JOAQUIN SOLID WASTE DIV	S	2267	4	PM10	0	0	0	8813
CRAYCROFT BRICK COMPANY	C	71	4	PM10	50	40	39	40
CRESTWOOD WEST COAST LLC	S	4241	4	PM10	16	48	30	8
CRIMSON RESOURCE MANAGEMENT	S	3392	4	PM10	1745	1292	1258	941
CRIMSON RESOURCE MANAGEMENT	S	2161	4	PM10	20	17	12	24
DEL MONTE FOODS MODESTO PLANT 1	N	58	4	PM10	0	0	8410	0
DEL MONTE FOODS MODESTO PLANT 1	N	1238	4	PM10	221	189	388	83
DIAMOND FOODS INCORPORATED	N	645	4	PM10	49	0	4	0
DIAMOND PET FOOD PROCESSORS OF RIPON	N	1136	4	PM10	5198	5320	5320	5442
DOLE PACKAGED FOODS LLC	N	520	4	PM10	5	20	72	14
E & J GALLO WINERY	C	1071	4	PM10	32	32	31	29
E&B NATURAL RESOURCES	S	4408	4	PM10	45	56	57	52
E&B NATURAL RESOURCES MGMT	S	4682	4	PM10	0	0	0	4736
EAGLE VALLEY GINNING LLC	N	847	4	PM10	0	0	0	29098
ECKERT FROZEN FOODS	N	133	4	PM10	5	20	72	14

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
ELBOW ENTERPRISES INC	S	3071	4	PM10	0	0	0	19406
ELEMENT MARKETS, LLC	N	1327	4	PM10	254	228	279	271
EVOLUTION MARKETS INC.	S	2876	4	PM10	0	0	0	46954
EVOLUTION MARKETS INC.	S	2878	4	PM10	0	0	0	11831
EVOLUTION MARKETS INC.	C	941	4	PM10	0	0	0	41215
F & T FARMS	C	1177	4	PM10	0	0	0	17034
FARMERS FIREBAUGH GINNING CO.	C	1061	4	PM10	6374	0	0	9215
FJ MANAGEMENT INC.	N	1334	4	PM10	0	0	320	0
FJ MANAGEMENT INC.	N	1335	4	PM10	0	0	1322	0
FOSTER FARMS, PORTERVILLE PLANT	S	2337	4	PM10	40	40	40	40
FREEPORT-MC MORAN OIL & GAS	S	4105	4	PM10	0	0	0	8500
FREEPORT-MC MORAN OIL & GAS	S	4582	4	PM10	0	0	0	10572
FREEPORT-MCMORAN OIL & GAS, LLC	N	1131	4	PM10	0	0	0	510
FREEPORT-MCMORAN OIL & GAS, LLC	C	1236	4	PM10	0	0	0	2
FREEPORT-MCMORAN OIL & GAS, LLC	C	1274	4	PM10	85	0	375	329
FREEPORT-MCMORAN OIL & GAS, LLC	C	1306	4	PM10	0	0	0	2180
FRESNO/CLOVIS REGIONAL WWTP	C	1211	4	PM10	5	5	4	4
FRITO-LAY INC	N	888	4	PM10	0	0	2339	0
FRITO-LAY INC	N	890	4	PM10	61	0	0	0
FRITO-LAY, INC.	S	3437	4	PM10	210	288	195	174
FRITO-LAY, INC.	S	3412	4	PM10	7136	7320	7507	7506
FRITO-LAY, INC.	S	3414	4	PM10	0	0	0	6935
FRITO-LAY, INC.	S	3416	4	PM10	0	8	306	310
FRITO-LAY, INC.	S	3417	4	PM10	0	0	0	2531
FRITO-LAY, INC.	S	3418	4	PM10	5000	5000	5000	5000
FRITO-LAY, INC.	S	3419	4	PM10	132	132	133	134
FRITO-LAY, INC.	S	3453	4	PM10	17	68	208	207

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
FRITO-LAY, INC.	C	1068	4	PM10	69	70	67	63
FRITO-LAY, INC.	C	1069	4	PM10	286	280	268	259
FRITO-LAY, INC.	C	1136	4	PM10	0	0	0	699
GALLO GLASS COMPANY	N	161	4	PM10	23150	22909	24274	22565
GENERAL CABLE INDUSTRIES, LLC	C	524	4	PM10	2	1	2	1
GENERAL MILLS OPERATIONS, INC	N	608	4	PM10	178	0	385	298
GENERAL MILLS, INC	S	3218	4	PM10	0	0	0	4525
GRANITE CONSTRUCTION COMPANY	C	1065	4	PM10	0	0	0	2
H & H COTTON GINNING COMPANY	C	105	4	PM10	0	0	0	9954
H. J. HEINZ COMPANY	N	60	4	PM10	0	42	226	4
H. J. HEINZ COMPANY	N	694	4	PM10	0	0	1372	0
H. J. HEINZ COMPANY	N	1085	4	PM10	72	73	63	31
H. J. HEINZ COMPANY, L.P.	N	21	4	PM10	0	60	180	60
HARBERT ERC, LLC	C	1384	4	PM10	516	748	553	434
HERSHEY CHOCOLATE & CONF. CORP	N	952	4	PM10	254	230	240	228
HOGAN MANUFACTURING, INC	N	34	4	PM10	1972	4031	2344	2712
HURON GINNING CO	C	521	4	PM10	8	373	186	631
INGREDION INCORPORATED	N	1086	4	PM10	1392	853	1662	1400
J D HEISKELL & COMPANY	S	415	4	PM10	643	322	356	1039
J G BOSWELL COMPANY OIL MILL	C	92	4	PM10	670	460	648	916
J G BOSWELL COMPANY OIL MILL	C	93	4	PM10	2810	2418	2082	4097
J R SIMPLOT COMPANY	C	1039	4	PM10	988	1900	877	1470
KERN DELTA CO LLC	S	4317	4	PM10	0	0	0	26563
KERN OIL & REFINING CO.	S	2649	4	PM10	3313	3812	3561	5082
KERN RIVER HOLDINGS, INC.	C	1370	4	PM10	0	0	0	5298
KOCH SUPPLY & TRADING LP	S	4148	4	PM10	0	0	0	18971
KOCH SUPPLY & TRADING LP	S	4149	4	PM10	0	0	0	3789

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
KOCH SUPPLY & TRADING LP	S	4150	4	PM10	0	0	0	1956
KOCH SUPPLY & TRADING LP	C	1311	4	PM10	0	0	0	2881
KOCH SUPPLY & TRADING LP	N	1154	4	PM10	165	308	333	5030
KOCH SUPPLY & TRADING LP	N	1156	4	PM10	0	4710	4761	4191
KOCH SUPPLY & TRADING LP	N	1161	4	PM10	0	0	0	8300
KODA FARMS	C	856	4	PM10	0	0	0	1396
KODA FARMS MILLING, INC.	S	3196	4	PM10	0	0	0	856
KODA FARMS MILLING, INC.	S	3197	4	PM10	0	0	0	3144
KODA FARMS MILLING, INC.	S	3796	4	PM10	0	0	0	4820
KODA FARMS, INC.	N	1042	4	PM10	0	0	0	5180
KRAFT HEINZ FOODS COMPANY	S	4033	4	PM10	8	70	112	71
LA PALOMA GENERATING CO, LLC	C	1055	4	PM10	0	0	0	360
LA PALOMA GENERATING COMPANY	N	1290	4	PM10	11695	16203	9929	8254
LAND O' LAKES, INC.	S	3625	4	PM10	711	455	821	719
LAND O' LAKES, INC.	S	4712	4	PM10	254	228	279	271
LAND O' LAKES, INC.	N	1374	4	PM10	508	686	481	556
LAWRENCE LIVERMORE NATL. LAB	N	464	4	PM10	8	3	0	6
LIDESTRI FOODS, INC	N	391	4	PM10	0	0	1056	0
LINN OPERATING, INC	S	4510	4	PM10	0	0	0	508
LINN OPERATING, INC	S	4583	4	PM10	0	0	0	14000
LINN OPERATING, INC	N	1206	4	PM10	0	6024	9030	2588
LINN OPERATING, INC	N	1312	4	PM10	0	1322	662	3304
LINN OPERATING, INC	N	1353	4	PM10	896	896	896	896
LINN OPERATING, INC	N	1369	4	PM10	2122	2122	2122	2122
LOS BANOS GRAVEL GROUP, ASPHLT	N	125	4	PM10	85	162	376	168
LOS GATOS TOMATO PRODUCTS	C	1021	4	PM10	0	24	0	0
M CARATAN INC	S	2516	4	PM10	0	0	14	3

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
MACPHERSON OIL COMPANY	C	1321	4	PM10	0	0	0	8
MACPHERSON OIL COMPANY	C	1361	4	PM10	0	0	0	1843
MALAGA POWER, LLC	C	1354	4	PM10	0	0	0	138
MARTIN ANDERSON	C	1051	4	PM10	32	48	28	2
MESA VERDE TRADING CO., INC	S	4309	4	PM10	4439	67	0	1328
MEYERS FARMING LLC	C	1112	4	PM10	0	6074	7699	3185
MID-VALLEY COTTON GROWERS INC	S	3803	4	PM10	0	0	0	2128
MOLYCORP MINERALS, LLC	S	3539	4	PM10	373	329	313	238
MONTEREY RESOURCES, INC.	S	432	4	PM10	906	918	753	837
NAS LEMOORE	C	330	4	PM10	17	17	17	17
NAS LEMOORE	C	1050	4	PM10	7799	3198	5638	1626
OAKWOOD LAKE RESORT	N	601	4	PM10	0	9	15	0
OLAM	N	919	4	PM10	500	1387	1737	15
OLAM	N	1359	4	PM10	231	598	1264	789
OLDUVAI GORGE, LLC	S	4402	4	PM10	0	0	0	2789
OLDUVAI GORGE, LLC	C	789	4	PM10	0	0	0	40000
OLDUVAI GORGE, LLC	C	1250	4	PM10	0	0	0	1785
OLDUVAI GORGE, LLC	C	1319	4	PM10	0	0	0	25891
OLDUVAI GORGE, LLC	C	1376	4	PM10	0	0	0	779
OLDUVAI GORGE, LLC	C	1380	4	PM10	0	0	0	702
OLDUVAI GORGE, LLC	N	611	4	PM10	0	0	3830	1915
OWENS-BROCKWAY GLASS CONTAINER	N	517	4	PM10	0	0	0	490
PACIFIC PIPELINE SYSTEM, LLC	S	576	4	PM10	0	203	181	0
PACIFIC PIPELINE SYSTEM, LLC	S	577	4	PM10	710	860	899	899
PACIFIC PIPELINE SYSTEM, LLC	S	575	4	PM10	0	0	108	0
PACTIV, LLC	S	3865	4	PM10	33	29	7	15
PARAMOUNT FARMS	N	1321	4	PM10	0	0	65	0

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
PARAMOUNT FARMS, INC	N	1084	4	PM10	27	1770	275	275
PARAMOUNT FARMS, INC.	C	1207	4	PM10	0	0	188	20
PARAMOUNT FARMS, INC.	C	1357	4	PM10	0	1000	16305	0
PILKINGTON NORTH AMERICA, INC	N	1289	4	PM10	9505	9322	9357	10678
PILKINGTON NORTH AMERICA, INC	N	1320	4	PM10	0	0	0	52685
PILKINGTON NORTH AMERICA, INC	S	4562	4	PM10	0	0	0	6679
PILKINGTON NORTH AMERICA, INC	S	4584	4	PM10	0	0	0	23321
PILKINGTON NORTH AMERICA, INC	C	1356	4	PM10	1000	0	19695	12000
POHL ALMOND HULLING	N	212	4	PM10	0	0	4279	8511
P-R FARMS, INC.	C	126	4	PM10	0	0	357	180
PSEG GLOBAL LLC	C	1383	4	PM10	515	749	552	435
R M WADE & COMPANY	C	152	4	PM10	14	17	17	16
RANCHERS COTTON OIL	C	817	4	PM10	1327	1325	1323	1323
RIO BRAVO FRESNO	C	244	4	PM10	1000	0	0	0
RIO BRAVO JASMIN	S	4620	4	PM10	5215	4232	5377	5479
RIO BRAVO POSO	S	4713	4	PM10	1192	2632	3418	1978
RIVERSIDE DAIRY	C	819	4	PM10	1225	409	0	3469
RIVERSIDE DAIRY	C	820	4	PM10	4335	0	0	6111
SALIDA HULLING ASSOCIATION	N	44	4	PM10	0	0	12246	0
SAN JOAQUIN FACILITIES MGMT	S	1735	4	PM10	23	20	15	12
SAN JOAQUIN FACILITIES MGMT	S	1253	4	PM10	27	30	32	30
SAN JOAQUIN FACILITIES MGMT	S	1509	4	PM10	7	9	9	9
SAPUTO CHEESE USA INC	S	4655	4	PM10	0	0	0	7
SC JOHNSON HOME STORAGE INC	C	107	4	PM10	326	315	281	269
SC JOHNSON HOME STORAGE INC	C	1173	4	PM10	271	360	355	366
SENECA RESOURCES	N	1367	4	PM10	138	137	84	53
SENECA RESOURCES	N	1368	4	PM10	651	288	1073	376

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
SENECA RESOURCES	C	1359	4	PM10	0	0	0	209
SENECA RESOURCES	C	1360	4	PM10	0	0	0	1509
SENECA RESOURCES	C	1379	4	PM10	0	0	0	5680
SENECA RESOURCES CORP	C	1299	4	PM10	0	0	0	4130
SENECA RESOURCES CORP	C	1300	4	PM10	1130	1039	1076	1135
SHAFTER HAY & CUBE LLC	S	3804	4	PM10	0	691	1099	154
SHAFTER-WASCO GINNING COMPANY	S	3268	4	PM10	0	0	0	4695
SIERRA POWER CORPORATION	S	4626	4	PM10	7119	6156	5991	6540
SOC RESOURCES INC	S	3089	4	PM10	5	4	4	4
SOUTH VALLEY GINS INC	S	4635	4	PM10	1223	0	0	12164
SOUTH VALLEY GINS INC	S	3554	4	PM10	0	0	0	8671
STOCKTON EAST WATER DISTRICT	N	763	4	PM10	214	299	301	271
SWANSON HULLING	N	10	4	PM10	0	0	2984	0
TAFT PRODUCTION COMPANY	S	2670	4	PM10	1914	1959	2000	2000
TAUBER OIL COMPANY	C	1284	4	PM10	0	0	0	1
TEXACO EXPLOR & PROD INC	S	20250361	4	PM10	41	43	37	40
THE DOW CHEMICAL COMPANY	N	799	4	PM10	73	82	83	72
THE ENVIRONMENTAL RESOURCES TRUST, INC	C	1013	4	PM10	418	418	418	418
THE NESTLE COMPANY INC	N	93	4	PM10	5602	5688	4414	7118
TKV CONTAINERS, INC.	C	1015	4	PM10	0	349	349	0
TRI-CITY GROWERS INC	S	4392	4	PM10	1694	0	0	7175
TULE RIVER CO-OP GIN INC	S	2913	4	PM10	0	0	0	484
TURLOCK IRRIGATION DISTRICT	N	433	4	PM10	0	0	0	4720
TURLOCK IRRIGATION DISTRICT	C	510	4	PM10	0	0	0	6430
UNITED STATES GYPSUM COMPANY	S	2543	4	PM10	0	0	0	8032
UNITED STATES GYPSUM COMPANY	S	2576	4	PM10	0	0	0	5078
UNITED STATES GYPSUM COMPANY	S	2577	4	PM10	0	0	350	17130

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
UNITED STATES GYPSUM COMPANY	S	2578	4	PM10	0	0	0	14051
UNITED STATES GYPSUM COMPANY	S	2580	4	PM10	1340	0	0	0
UNITED STATES GYPSUM COMPANY	S	2581	4	PM10	2953	0	0	8168
UNITED STATES GYPSUM COMPANY	S	2582	4	PM10	0	0	0	2736
UNITED STATES GYPSUM COMPANY	S	2583	4	PM10	87	0	721	10072
UNITED STATES GYPSUM COMPANY	S	2584	4	PM10	0	0	0	6407
UNITED STATES GYPSUM COMPANY	C	818	4	PM10	0	0	0	18935
UNITED STATES GYPSUM COMPANY	C	827	4	PM10	0	0	0	4000
UNITED STATES GYPSUM COMPANY	C	828	4	PM10	0	0	0	2848
UNITED STATES GYPSUM COMPANY	C	829	4	PM10	0	0	0	1649
UNITED STATES GYPSUM COMPANY	C	830	4	PM10	0	0	0	5824
UNITED STATES GYPSUM COMPANY	C	831	4	PM10	0	0	0	5395
UNITED STATES GYPSUM COMPANY	C	832	4	PM10	0	0	0	5112
UNITED STATES GYPSUM COMPANY	C	833	4	PM10	1006	44	0	943
UNITED STATES GYPSUM COMPANY	C	834	4	PM10	0	0	0	6788
UNITED STATES GYPSUM COMPANY	C	835	4	PM10	0	0	0	5357
UNITED STATES GYPSUM COMPANY	C	836	4	PM10	0	0	0	6688
UNITED STATES GYPSUM COMPANY	C	837	4	PM10	0	0	0	18959
UNITED STATES GYPSUM COMPANY	C	838	4	PM10	0	0	0	5098
UNITED STATES GYPSUM COMPANY	C	839	4	PM10	0	0	0	5476
UNITED STATES GYPSUM COMPANY	C	840	4	PM10	0	0	0	3470
UNITED STATES GYPSUM COMPANY	C	841	4	PM10	0	0	0	2642
UNITED STATES GYPSUM COMPANY	C	842	4	PM10	0	0	0	3471
UNITED STATES GYPSUM COMPANY	C	843	4	PM10	0	0	0	7953
UNITED STATES GYPSUM COMPANY	C	845	4	PM10	0	0	0	10655
UNITED STATES GYPSUM COMPANY	C	846	4	PM10	0	0	0	11928
UNITED STATES GYPSUM COMPANY	C	847	4	PM10	0	0	0	26284

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
UNITED STATES GYPSUM COMPANY	N	659	4	PM10	0	0	0	23209
UNITED STATES GYPSUM COMPANY	N	660	4	PM10	0	0	0	23515
VALLEY GRAIN/AZTECA MILLING	C	1042	4	PM10	0	0	0	2847
VAN GRONINGEN ORCHARDS	N	894	4	PM10	0	0	2306	1327
VANDERHAM WEST	S	2410	4	PM10	0	0	0	5765
VANDERHAM WEST	S	2411	4	PM10	0	0	0	7592
VANDERHAM WEST	S	2412	4	PM10	0	0	7	3945
VANDERHAM WEST	S	2413	4	PM10	9	0	0	4701
VARCO PRUDEN BUILDINGS, INC.	N	898	4	PM10	3827	4258	7700	6665
VECTOR ENVIRONMENTAL, INC.	S	4039	4	PM10	58	70	66	8
WEST ISLAND COTTON GROWERS INC	C	55	4	PM10	0	0	0	4365
WEST ISLAND COTTON GROWERS INC	C	1017	4	PM10	607	0	1193	1800
WESTERN MILLING LLC	S	2634	4	PM10	0	0	0	579
WESTERN MILLING LLC	S	4220	4	PM10	0	0	0	3065
WESTERN MILLING, LLC	C	621	4	PM10	152	152	152	152
WESTERN MILLING, LLC	C	670	4	PM10	0	0	0	10844
WESTERN STONE PRODUCTS, INC.	N	17	4	PM10	513	513	558	558
WESTSIDE FARMERS COOP #2 & #3	C	1038	4	PM10	3311	0	0	37809
WESTSIDE FARMERS COOP. GIN	C	352	4	PM10	0	0	0	33444
WONDERFUL PISTACHIOS & ALMONDS	S	1446	4	PM10	0	0	1088	18586
AERA ENERGY LLC	C	219	2	NOx	1738	1923	2100	1931
AERA ENERGY LLC	C	681	2	NOx	26900	26900	26900	26900
AERA ENERGY LLC	S	1092	2	NOx	348	242	246	236
AERA ENERGY LLC	S	2023	2	NOx	1108	636	737	993
AERA ENERGY LLC	S	1851	2	NOx	914	455	0	1154
AERA ENERGY LLC	S	158	2	NOx	38057	29690	32405	43791

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AERA ENERGY LLC	S	162	2	NOx	128454	152970	128743	130786
AERA ENERGY LLC	S	163	2	NOx	96698	107197	101158	78678
AERA ENERGY LLC	S	470	2	NOx	3478	4930	5390	5212
AERA ENERGY LLC	S	662	2	NOx	9433	18919	3766	817
AERA ENERGY LLC	S	784	2	NOx	7140	3993	228	0
AERA ENERGY LLC	S	4284	2	NOx	90667	81037	29972	74455
AERA ENERGY LLC	S	4422	2	NOx	6370	2050	2897	6316
AERA ENERGY LLC	S	1477	2	NOx	2153	0	0	607
AERA ENERGY LLC	S	1935	2	NOx	474	508	543	543
AERA ENERGY LLC	S	2361	2	NOx	30	4	0	12
AERA ENERGY LLC	S	3689	2	NOx	76465	88497	87135	83102
AERA ENERGY LLC	S	4063	2	NOx	573	515	438	663
AERA ENERGY LLC	S	4064	2	NOx	359	564	674	586
AERA ENERGY LLC	S	838	2	NOx	442	218	338	338
AERA ENERGY LLC	S	865	2	NOx	6713	6788	6863	6863
AERA ENERGY LLC	S	883	2	NOx	632	160	2073	2061
AERA ENERGY LLC	S	1270	2	NOx	4586	4637	4688	4688
AERA ENERGY LLC	S	1437	2	NOx	42372	49588	46800	43954
AERA ENERGY LLC	S	1476	2	NOx	1242	0	0	350
AERA ENERGY LLC	S	139	2	NOx	11686	11816	11946	11946
AERA ENERGY LLC	S	140	2	NOx	36695	46397	47292	36806
AERA ENERGY LLC	S	2774	2	NOx	5817	4899	4757	8181
AERA ENERGY LLC	S	2782	2	NOx	329	323	318	341
AERA ENERGY LLC	S	135	2	NOx	5032	1152	0	0
AERA ENERGY LLC	S	137	2	NOx	5115	6792	5437	9206
AERA ENERGY LLC	S	1061	2	NOx	8071	8777	10695	9555
AERA ENERGY LLC	S	1062	2	NOx	8530	9784	10046	9903

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AERA ENERGY LLC	S	1063	2	NOx	9423	10057	12159	9776
AERA ENERGY LLC	S	1064	2	NOx	5126	5705	5881	6709
AERA ENERGY LLC	S	1821	2	NOx	5974	7291	7466	4158
AERA ENERGY LLC	S	3267	2	NOx	5519	3439	0	2156
AERA ENERGY LLC	S	3312	2	NOx	2432	4568	1346	162
AERA ENERGY LLC	S	3831	2	NOx	8498	5583	30	1326
AERA ENERGY LLC	S	1065	2	NOx	10366	10483	11017	8841
AERA ENERGY LLC	S	1066	2	NOx	5542	7367	5038	6117
AERA ENERGY LLC	S	1067	2	NOx	1255	893	2650	4592
AERA ENERGY LLC	S	1068	2	NOx	7648	9620	6968	8415
AERA ENERGY LLC	S	1069	2	NOx	4713	5029	4352	2082
AERA ENERGY LLC	S	1070	2	NOx	495	4228	2744	99
AGRI-CEL INC	S	3631	2	NOx	54	67	63	8
ALON BAKERSFIELD REFINING	S	3460	2	NOx	4645	5658	5190	4325
ALON BAKERSFIELD REFINING	S	4334	2	NOx	95700	98089	100530	100530
ALON BAKERSFIELD REFINING	S	4692	2	NOx	1080	1344	1267	1431
ANDERSON CLAYTON CORP/IDRIA #1	C	1279	2	NOx	0	0	0	754
AVENAL POWER CENTER, LLC	C	899	2	NOx	2243	2243	2243	2243
AVENAL POWER CENTER, LLC	C	902	2	NOx	13879	6131	1086	8539
AVENAL POWER CENTER, LLC	N	720	2	NOx	0	9	1255	437
AVENAL POWER CENTER, LLC	N	722	2	NOx	0	1166	88317	1422
AVENAL POWER CENTER, LLC	N	726	2	NOx	0	0	4728	0
AVENAL POWER CENTER, LLC	N	728	2	NOx	10542	3731	2487	5171
AVENAL POWER CENTER, LLC	S	2814	2	NOx	6121	13869	18914	11461
AVENAL POWER CENTER, LLC	S	2955	2	NOx	51000	51000	51000	51000
BAKER COMMODITIES INC	N	482	2	NOx	1194	1194	1196	1194
BAKERSFIELD CITY WOOD SITE	S	2969	2	NOx	1564	2135	2265	1857

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					1st qtr	2nd qtr	3rd qtr	4th qtr
BREITBURN OPERATING LP	S	4057	2	NOx	7	9	7	6
BRITZ AG FINANCE CO., INC.	C	557	2	NOx	0	0	0	232
BRITZ GIN PARTNERSHIP II	C	871	2	NOx	0	0	0	585
BRITZ INCORPORATED	C	586	2	NOx	0	0	0	381
BROWN SAND INC	N	46	2	NOx	90	98	46	83
BRUCE CARTER INDUSTRIES, INC.	S	4038	2	NOx	25	31	29	4
BUILDING MATERIALS MFG. CORP. (DBA GAF)	S	1662	2	NOx	5832	5840	5848	5848
BUTTONWILLOW GINNING CO	S	4634	2	NOx	0	0	0	520
CALAVERAS MATERIALS INC	C	89	2	NOx	284	257	294	236
CALAVERAS MATERIALS INC.	C	233	2	NOx	1265	3371	3913	2469
CALIFORNIA DAIRIES	N	1341	2	NOx	1486	265	264	264
CALIFORNIA DAIRIES, INC	S	2731	2	NOx	50	0	24	1282
CALIFORNIA DAIRIES, INC.	C	635	2	NOx	22	22	22	22
CALIFORNIA DAIRIES, INC.	C	658	2	NOx	0	0	102	75
CALIFORNIA DAIRIES, INC.	C	1364	2	NOx	450	126	356	79
CALIFORNIA DAIRIES, INC.	N	707	2	NOx	0	1270	1363	226
CALIFORNIA DAIRIES, INC.	S	2293	2	NOx	32	33	32	32
CALIFORNIA HEAVY OIL, INC.	N	1219	2	NOx	0	162	162	0
CALIFORNIA HEAVY OIL, INC.	N	1233	2	NOx	0	87	131	0
CALIFORNIA RESOURCES ELK HILLS, LLC	S	3249	2	NOx	89	208	73	157
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4436	2	NOx	1735	332	662	1082
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4707	2	NOx	10221	11071	14626	14976
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4142	2	NOx	17881	18426	18973	18974
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4196	2	NOx	109	69	138	148

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4701	2	NOx	0	0	0	543
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4704	2	NOx	11827	11827	11827	11827
CALIFORNIA RESOURCES PRODUCTION CORP	N	1235	2	NOx	3614	0	0	0
CALIFORNIA RESOURCES PRODUCTION CORP	N	1245	2	NOx	1219	0	0	0
CALIFORNIA RESOURCES PRODUCTION CORP	N	1165	2	NOx	456	465	456	456
CALIFORNIA RESOURCES PRODUCTION CORP	S	3586	2	NOx	0	1512	6228	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	3588	2	NOx	1847	0	0	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4093	2	NOx	159	0	0	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4434	2	NOx	0	5255	2832	6776
CALIFORNIA RESOURCES PRODUCTION CORP	S	4088	2	NOx	80	80	80	80
CALIFORNIA RESOURCES PRODUCTION CORP	S	4361	2	NOx	1476	1476	1476	1476
CALIFORNIA RESOURCES PRODUCTION CORP	S	4484	2	NOx	860	860	860	861
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1231	2	NOx	186	186	186	186
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1329	2	NOx	428	428	428	428
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1335	2	NOx	456	456	456	456
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1343	2	NOx	4973	4972	4973	4738
CALIFORNIA STATE PRISON - CORCORAN	S	3112	2	NOx	135	137	137	138
CALMAT CO.	C	50	2	NOx	104	111	154	159
CALMAT OF FRESNO	C	40	2	NOx	74	355	163	547

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALNEV PIPE LINE LLC	S	2553	2	NOx	1886	1886	1886	1886
CALPINE CORPORATION	S	3298	2	NOx	2103	9681	19140	9076
CALPINE CORPORATION	S	3541	2	NOx	0	242	0	0
CALPINE ENERGY SERVICES, L.P.	C	1014	2	NOx	302	0	0	852
CALPINE ENERGY SERVICES, L.P.	C	1040	2	NOx	0	0	0	684
CALPINE ENERGY SERVICES, L.P.	N	845	2	NOx	4089	4089	4089	3093
CALPINE ENERGY SERVICES, L.P.	N	846	2	NOx	4429	4429	4429	3353
CALPINE ENERGY SERVICES, L.P.	N	903	2	NOx	5833	5834	5834	5833
CALPINE ENERGY SERVICES, L.P.	S	3138	2	NOx	0	0	0	760
CALPINE ENERGY SERVICES, L.P.	S	3277	2	NOx	6400	0	3870	1876
CAMPBELL SOUP COMPANY	N	127	2	NOx	1515	454	409	924
CANANDAIGUA WINE COMPANY INC	C	1203	2	NOx	354	358	380	334
CANDLEWICK YARNS	C	507	2	NOx	90	77	63	58
CASTLE AIRPORT AVIATION & DEVELOP CENTER	N	109	2	NOx	38954	39386	39819	39819
CHEMICAL WASTE MANAGEMENT, INC	N	687	2	NOx	7	7	6	6
CHEVRON U S A INC	S	1325	2	NOx	260	118	276	211
CHEVRON U S A INC	S	4304	2	NOx	1983	2317	2340	2807
CHEVRON U S A INC	S	1428	2	NOx	1968	1990	2011	2011
CHEVRON U S A INC	S	629	2	NOx	2316	2041	2088	1975
CHEVRON U.S.A. INC.	N	1051	2	NOx	15566	8173	19366	19259
CHEVRON U.S.A. INC.	N	1052	2	NOx	0	0	8139	0
CHEVRON U.S.A. INC.	N	1053	2	NOx	0	0	9120	180
CHEVRON U.S.A. INC.	N	1054	2	NOx	500	500	500	500
CHEVRON USA INC	C	966	2	NOx	2	2	2	2
CHEVRON USA INC	C	221	2	NOx	2311	2557	2792	2567
CHEVRON USA INC	C	331	2	NOx	23739	23739	23740	23740
CHEVRON USA INC	C	364	2	NOx	30130	29673	29217	29217

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CHEVRON USA INC	C	1158	2	NOx	0	0	0	132
CHEVRON USA INC	C	1159	2	NOx	0	0	0	137
CHEVRON USA INC	C	1160	2	NOx	175	0	0	1230
CHEVRON USA INC	C	1161	2	NOx	0	0	0	846
CHEVRON USA INC	S	909	2	NOx	3990	3412	3474	3072
CHEVRON USA INC	S	496	2	NOx	5160	233	1734	4212
CHEVRON USA INC	S	1967	2	NOx	973	955	855	984
CHEVRON USA INC	S	2031	2	NOx	5694	4723	4406	0
CHEVRON USA INC	S	40410441	2	NOx	20385	20612	20838	20838
CHEVRON USA INC	S	1487	2	NOx	11663	11793	11923	11923
CHEVRON USA INC	S	2456	2	NOx	32003	32799	31884	32561
CHEVRON USA INC	S	3784	2	NOx	47002	47880	48758	48758
CHEVRON USA INC	S	3817	2	NOx	0	0	9568	154
CHEVRON USA INC	S	3818	2	NOx	0	6312	0	5064
CHEVRON USA INC	S	4666	2	NOx	39135	39676	40218	40218
CHEVRON USA INC	S	1100	2	NOx	62167	62857	63548	63548
CHEVRON USA INC	S	1102	2	NOx	57160	57795	58430	58430
CHEVRON USA INC	S	1106	2	NOx	11814	11942	12075	12075
CHEVRON USA INC	S	1256	2	NOx	45238	45741	46244	46244
CHEVRON USA INC	S	1419	2	NOx	4875	4928	4983	4983
CHEVRON USA INC	S	1445	2	NOx	17602	20114	20328	15867
CHEVRON USA INC	S	2111	2	NOx	7823	15506	21032	12182
CHEVRON USA INC	S	3156	2	NOx	12415	12563	12710	12710
CHEVRON USA INC	S	3544	2	NOx	3027	3303	2542	2691
CHEVRON USA INC	S	3604	2	NOx	1948	3037	3398	2243
CHEVRON USA INC	S	4652	2	NOx	19428	12602	13035	11552
CHEVRON USA INC	S	1605	2	NOx	5672	7143	7028	6447

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CHEVRON USA INC	S	4551	2	NOx	132708	132708	132708	132708
CHEVRON USA INC	S	20410281	2	NOx	3806	3765	3765	3848
CHEVRON USA INC	S	77	2	NOx	2038	1840	1733	2274
CHEVRON USA INC	S	436	2	NOx	12891	9861	9530	10101
CHEVRON USA INC	S	3819	2	NOx	6000	6000	6000	6000
CHEVRON USA INC (REFINERY)	S	4573	2	NOx	24199	24787	25374	25374
CHEVRON USA INC LOST HILLS GP	S	704	2	NOx	5564	5626	5687	5687
CHEVRON USA INC LOST HILLS GP	S	1470	2	NOx	780	789	797	797
CHEVRON USA PRODUCTION INC	S	674	2	NOx	507	781	226	485
CHEVRON USA PRODUCTION INC	S	3228	2	NOx	139	161	275	104
CHEVRON USA PRODUCTION INC	S	3533	2	NOx	181	188	224	219
CHEVRON USA, INC.	C	1147	2	NOx	56	57	39	53
CHEVRON USA, INC.	C	1372	2	NOx	27	70	23	17
CITY OF TULARE	N	902	2	NOx	0	436	436	471
CITY OF TULARE	S	3398	2	NOx	501	0	0	0
CITY OF VISALIA	N	317	2	NOx	0	0	7160	0
CLARK BROTHERS-DERRICK GIN	C	511	2	NOx	0	0	0	43
CLIMECO CORPORATION	N	1324	2	NOx	525	525	525	525
CON AGRA FOOD INGREDIENTS, CO	S	2201	2	NOx	6	6	5	5
CONAGRA CONSUMER FROZEN FOODS	N	487	2	NOx	356	163	243	300
CONAGRA CONSUMER FROZEN FOODS	N	856	2	NOx	0	0	1749	0
CORCORAN IRRIGATION DISTRICT	C	560	2	NOx	352	356	321	209
COTTON ASSOCIATES, INC	S	25	2	NOx	0	0	0	157
CRAYCROFT BRICK COMPANY	C	71	2	NOx	417	336	328	332
CRESTWOOD WEST COAST LLC	S	4236	2	NOx	47	137	86	23
CRESTWOOD WEST COAST LLC	S	4240	2	NOx	125	125	125	125

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CRESTWOOD WEST COAST LLC	S	4242	2	NOx	14	14	14	14
CRIMSON RESOURCE MANAGEMENT	S	3388	2	NOx	4704	3393	3449	2696
CRIMSON RESOURCE MANAGEMENT	S	3389	2	NOx	95	299	319	166
CRIMSON RESOURCE MANAGEMENT	S	2251	2	NOx	316	272	186	375
CRIMSON RESOURCE MANAGEMENT	S	3441	2	NOx	5	4	4	5
DAIRY FARMERS OF AMERICA, INC.	C	689	2	NOx	0	0	253	0
DARLING INGREDIENTS INC	C	1298	2	NOx	0	0	0	270
DARLING INGREDIENTS INC.	N	1225	2	NOx	0	51	107	0
DARLING INGREDIENTS INC.	S	4346	2	NOx	911	860	804	641
DIAMOND FOODS INCORPORATED	N	573	2	NOx	1	1	0	0
DIAMOND FOODS INCORPORATED	N	826	2	NOx	4443	2607	2618	0
E & J GALLO WINERY	C	1071	2	NOx	612	605	563	535
E & J GALLO WINERY	N	1272	2	NOx	0	0	0	953
E & J GALLO WINERY	N	849	2	NOx	0	14	111	0
E & J GALLO WINERY	N	1011	2	NOx	625	625	625	625
E & J GALLO WINERY	N	1012	2	NOx	545	545	545	545
E & J GALLO WINERY	N	1221	2	NOx	9542	9542	10501	9541
E & J GALLO WINERY	N	1270	2	NOx	1276	909	1275	1275
E & J GALLO WINERY	N	1380	2	NOx	1224	1225	1225	1225
E&B NATURAL RESOURCES	S	4408	2	NOx	76	95	96	87
E&B NATURAL RESOURCES MGMT	S	4609	2	NOx	1086	0	0	0
E&B NATURAL RESOURCES MGMT	S	4612	2	NOx	0	1049	919	1379
E&B NATURAL RESOURCES MGMT	S	4684	2	NOx	769	769	768	768
EAGLE VALLEY GINNING LLC	N	847	2	NOx	0	0	0	427
ECKERT FROZEN FOODS	N	133	2	NOx	146	545	2047	395
ELBOW ENTERPRISES INC	S	2535	2	NOx	0	0	0	1168
ELEMENT MARKETS, LLC	N	1327	2	NOx	364	328	400	391

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
ELK HILLS POWER LLC	S	1622	2	NOx	1373	1389	1404	1404
ELK HILLS POWER LLC	S	1994	2	NOx	12485	12624	12762	12762
EVOLUTION MARKETS INC.	C	944	2	NOx	0	298	1590	300
EVOLUTION MARKETS INC.	C	945	2	NOx	0	286	1530	289
EVOLUTION MARKETS INC.	N	776	2	NOx	875	927	771	876
EVOLUTION MARKETS INC.	S	2738	2	NOx	1696	3526	1536	1221
EVOLUTION MARKETS INC.	S	2740	2	NOx	0	27355	0	0
EVOLUTION MARKETS INC.	S	2896	2	NOx	130	131	132	132
EVOLUTION MARKETS INC.	S	2899	2	NOx	1313	1378	1443	1443
EVOLUTION MARKETS INC.	S	2908	2	NOx	1500	1500	1500	1500
EXXONMOBIL CORPORATION	S	4544	2	NOx	5175	5197	5494	4871
EXXONMOBIL CORPORATION	S	4545	2	NOx	3010	2818	2052	3565
EXXONMOBIL CORPORATION	S	4546	2	NOx	1648	1666	1685	1685
FARMERS COOPERATIVE GIN INC	S	2533	2	NOx	0	0	0	598
FORWARD INC LANDFILL	N	1328	2	NOx	131	130	131	130
FREEPORT-MC MORAN OIL & GAS	S	4098	2	NOx	13229	10050	6765	15163
FREEPORT-MC MORAN OIL & GAS	S	4099	2	NOx	10010	10691	10155	6716
FREEPORT-MC MORAN OIL & GAS	S	4100	2	NOx	1411	73	1449	2071
FREEPORT-MC MORAN OIL & GAS	S	4366	2	NOx	148	148	148	148
FREEPORT-MC MORAN OIL & GAS	S	4495	2	NOx	4630	4632	4633	4632
FRESNO/CLOVIS REGIONAL WWTP	C	1211	2	NOx	65	65	65	65
FRITO-LAY, INC.	S	3763	2	NOx	287	442	182	53
FRITO-LAY, INC.	S	3765	2	NOx	7432	7619	7790	7789
G.I.C. FINANCIAL SERVICES, INC.	C	1391	2	NOx	19830	19688	19996	19903
GALLO GLASS COMPANY	N	768	2	NOx	14634	12268	15814	10504
GALLO GLASS COMPANY	N	900	2	NOx	63691	64821	66246	61340
GALLO GLASS COMPANY	N	966	2	NOx	63525	46849	57176	61929

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
GENERAL MILLS OPERATIONS, INC	N	610	2	NOx	52	3	0	100
GENERAL MILLS, INC	S	3217	2	NOx	0	0	0	30
GLOBAL AMPERSAND LLC	S	2976	2	NOx	239	239	239	239
GROWERS COOP	S	88	2	NOx	0	0	22	406
GUARDIAN INDUSTRIES CORP	C	1378	2	NOx	11898	11898	11898	11897
H. J. HEINZ COMPANY	N	534	2	NOx	0	360	3207	0
H. J. HEINZ COMPANY	N	694	2	NOx	0	43	2570	0
H. J. HEINZ COMPANY	N	1085	2	NOx	69	70	60	30
H. J. HEINZ COMPANY, L.P.	N	21	2	NOx	0	1026	3112	1060
HANSEN BROTHERS	C	249	2	NOx	0	0	0	256
HERSHEY CHOCOLATE & CONF. CORP	N	952	2	NOx	114	106	125	125
HILMAR CHEESE COMPANY	S	2138	2	NOx	0	0	0	1070
HOLMES WESTERN OIL CORPORATION	S	3377	2	NOx	1633	1632	1632	1632
HYDROGEN ENERGY CA LLC	C	1058	2	NOx	10100	10100	10100	10100
HYDROGEN ENERGY CALIFORNIA, LLC	S	3273	2	NOx	120500	120500	120500	120500
INGREDION INCORPORATED	N	1384	2	NOx	32807	20182	28536	31750
J.G. BOSWELL CO. (EL RICO)	C	135	2	NOx	14	4	0	40
JOHN T HOPPER	C	712	2	NOx	0	55	295	56
KAWEAH DELTA DISTRICT HOSPITAL	S	2657	2	NOx	100	441	536	667
KERN DELTA CO LLC	S	4315	2	NOx	0	0	0	622
KERN LAKE COOP GIN	S	2074	2	NOx	0	0	0	309
KERN OIL & REFINING CO.	S	2653	2	NOx	94	277	91	215
KERN OIL & REFINING COMPANY	C	1243	2	NOx	3081	4129	2703	716
KERN OIL & REFINING COMPANY	N	878	2	NOx	24	19	32	24
KERN OIL & REFINING COMPANY	N	879	2	NOx	156	188	224	202
KERN RIVER HOLDINGS, INC.	C	1368	2	NOx	1038	1037	1037	1037

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
KRAFT FOODS INC	C	149	2	NOx	284	284	284	284
KRAFT FOODS INC	C	386	2	NOx	9774	9883	9992	9992
KRAFT FOODS INC	C	387	2	NOx	5	5	4	4
KRAFT FOODS INC	C	1138	2	NOx	0	0	0	1632
KRAFT HEINZ FOODS COMPANY	S	4027	2	NOx	0	0	3425	1107
KRAFT HEINZ FOODS COMPANY	S	4028	2	NOx	2070	0	0	94
KRAFT HEINZ FOODS COMPANY	S	4035	2	NOx	0	0	0	24
KRAFT HEINZ FOODS COMPANY	S	4036	2	NOx	0	0	165	0
KRAFT HEINZ FOODS COMPANY	S	4037	2	NOx	1227	3443	0	733
LA PALOMA GENERATING COMPANY	N	1291	2	NOx	0	9612	22455	0
LAND O' LAKES, INC.	C	1393	2	NOx	2070	2212	1904	1997
LAND O' LAKES, INC.	N	1371	2	NOx	136	223	238	198
LAND O' LAKES, INC.	S	3326	2	NOx	214	166	214	214
LAND O' LAKES, INC.	S	3625	2	NOx	618	473	646	602
LAND O' LAKES, INC.	S	4710	2	NOx	364	328	400	391
LAWRENCE LIVERMORE NATL. LAB	N	464	2	NOx	83	31	0	61
LEPRINO FOODS	N	108	2	NOx	2335	2529	2412	2143
LEPRINO FOODS COMPANY	C	60	2	NOx	7878	7985	7810	7898
LIBERTY COMPOSTING INC	S	3855	2	NOx	925	925	925	925
LIDESTRI FOODS, INC	N	391	2	NOx	0	0	1527	0
LINN OPERATING, INC	N	1302	2	NOx	0	0	2915	0
LINN OPERATING, INC	N	1349	2	NOx	112	112	112	112
LINN OPERATING, INC	N	1370	2	NOx	2234	2234	2234	2234
LINN OPERATING, INC	S	4514	2	NOx	4332	1450	4332	1569
LINN OPERATING, INC	S	4515	2	NOx	11433	0	0	0
LINN OPERATING, INC	S	4516	2	NOx	239	239	239	239
LINN OPERATING, INC	S	4530	2	NOx	0	0	5400	1920

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
LINN OPERATING, INC.	N	1332	2	NOx	0	400	0	4000
LOCKHEED MARTIN	S	2990	2	NOx	3000	3000	3000	3000
LOCKHEED MARTIN	S	3079	2	NOx	1160	1840	1500	1500
LOS BANOS GRAVEL GROUP, ASPHLT	N	125	2	NOx	23	113	359	120
LOS GATOS TOMATO PRODUCTS	C	1021	2	NOx	0	4	0	0
LOVELACE & SONS FARMING	C	807	2	NOx	0	0	0	257
M CARATAN INC	S	2516	2	NOx	0	0	189	46
MACPHERSON OIL COMPANY	C	1195	2	NOx	73	73	73	73
MACPHERSON OIL COMPANY	N	1339	2	NOx	1368	1367	1368	1368
MACPHERSON OIL COMPANY	S	4132	2	NOx	145	145	145	145
MALAGA POWER, LLC	C	1355	2	NOx	0	0	1029	0
MARTIN ANDERSON	C	1051	2	NOx	52	77	45	3
MEMORIAL MEDICAL CENTER	S	2268	2	NOx	2550	2550	2550	2550
MEYERS FARMING LLC	C	1112	2	NOx	0	3701	5023	2200
MIDWAY PEAKING LLC	S	4234	2	NOx	283	283	496	354
MODESTO IRRIGATION DISTRICT	C	1111	2	NOx	0	0	74	5923
MODESTO IRRIGATION DISTRICT	N	430	2	NOx	0	0	273	0
MONTEREY RESOURCES, INC.	S	432	2	NOx	2053	2081	1707	1898
NAS LEMOORE	C	1048	2	NOx	26	26	25	25
NORTHERN CALIFORNIA POWER AGENCY	C	1132	2	NOx	0	137	122	117
NORTHERN CALIFORNIA POWER AGENCY	C	1268	2	NOx	0	0	2196	1831
NORTHERN CALIFORNIA POWER AGENCY	N	751	2	NOx	0	0	10015	0
NORTHERN CALIFORNIA POWER AGENCY	N	752	2	NOx	0	791	835	0
NORTHERN CALIFORNIA POWER AGENCY	N	1028	2	NOx	0	274	790	147
NORTHERN CALIFORNIA POWER	S	2854	2	NOx	0	1437	0	0

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AGENCY								
NORTHERN CALIFORNIA POWER AGENCY	S	2857	2	NOx	0	0	0	1031
NORTHERN CALIFORNIA POWER AGENCY	S	2895	2	NOx	0	0	0	3406
NORTHERN CALIFORNIA POWER AGENCY	S	4180	2	NOx	0	0	0	1865
NORTHROP GRUMMAN CORPORATION	N	992	2	NOx	2000	2000	2000	2000
OAKWOOD LAKE RESORT	N	601	2	NOx	0	117	188	0
OLAM	N	1392	2	NOx	0	0	1641	329
OLDUVAI GORGE, LLC	C	998	2	NOx	0	0	0	815
OLDUVAI GORGE, LLC	N	782	2	NOx	1085	1097	1109	1109
OLDUVAI GORGE, LLC	N	1174	2	NOx	61177	57625	59600	61400
OLDUVAI GORGE, LLC	N	1184	2	NOx	2154	287	335	1351
OLDUVAI GORGE, LLC	N	1257	2	NOx	837	923	1010	1010
OLDUVAI GORGE, LLC	S	2802	2	NOx	3233	0	0	5000
OLDUVAI GORGE, LLC	S	4641	2	NOx	14283	649	2200	4032
OXY USA, INC	N	1196	2	NOx	0	396	665	0
PACIFIC COAST PRODUCERS	N	753	2	NOx	195	605	3088	312
PACIFIC GAS & ELECTRIC COMPANY	S	4404	2	NOx	30	16	55	63
PACIFIC PIPELINE SYSTEM, LLC	S	2286	2	NOx	1278	2194	2438	2438
PACIFIC PIPELINE SYSTEM, LLC	S	575	2	NOx	0	4693	10418	3569
PACIFIC PIPELINE SYSTEM, LLC	S	1099	2	NOx	0	13703	12649	0
PACTIV, LLC	S	3863	2	NOx	233	199	51	109
PARAMOUNT FARMS	N	1325	2	NOx	14475	14475	14475	14475
PARAMOUNT FARMS, INC	N	284	2	NOx	3670	3580	3488	3488
PARAMOUNT FARMS, INC.	C	1035	2	NOx	0	0	155	334
PARAMOUNT FARMS, INC.	C	1327	2	NOx	0	930	2965	1965

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
PASTORIA ENERGY FACILITY, LLC	S	1543	2	NOx	10354	8381	11018	11467
PASTORIA ENERGY FACILITY, LLC	S	4163	2	NOx	164079	166154	168230	169711
PASTORIA ENERGY LLC	C	755	2	NOx	2525	1011	0	2038
PHILLIPS 66 PIPELINE LLC	C	1163	2	NOx	0	0	17	0
PILKINGTON NORTH AMERICA, INC	N	410	2	NOx	272	4	43	275
PILKINGTON NORTH AMERICA, INC	N	1333	2	NOx	76237	75102	82677	79027
PLAINS LPG SERVICES, L.P.	C	717	2	NOx	1024	1024	1023	1023
R F MACDONALD	C	579	2	NOx	0	8	0	0
R M WADE & COMPANY	C	152	2	NOx	326	373	379	370
RIO BRAVO JASMIN	S	4620	2	NOx	62026	50075	62747	63660
RIO BRAVO POSO	S	4711	2	NOx	29232	44918	57018	38395
SAN JOAQUIN REFINING COMPANY	C	1341	2	NOx	616	8	41	283
SAN JOAQUIN REFINING COMPANY	S	4452	2	NOx	0	1	1	0
SAN JOAQUIN VALLEY CONCENTRATES	C	1209	2	NOx	13	13	12	15
SAPUTO CHEESE USA INC.	N	834	2	NOx	1810	1810	1810	1810
SENECA RESOURCES	N	906	2	NOx	183	517	517	517
SENECA RESOURCES	N	1338	2	NOx	587	588	587	587
SENECA RESOURCES	S	1427	2	NOx	88	57	76	98
SENECA RESOURCES	S	3718	2	NOx	0	118	0	0
SENECA RESOURCES	S	4327	2	NOx	1750	1750	1750	1750
SENECA RESOURCES	S	4640	2	NOx	1730	1730	1730	1730
SENECA RESOURCES	S	4578	2	NOx	18	18	18	18
SHAFTER-WASCO GINNING COMPANY	S	3268	2	NOx	0	0	0	232
SIERRA POWER CORPORATION	S	4628	2	NOx	20309	17668	17217	18721
SIERRA POWER CORPORATION	S	2910001	2	NOx	2115	2138	2162	2162
SOUTH VALLEY GINS INC	S	4635	2	NOx	77	0	0	752
SOUTH VALLEY GINS INC	S	3554	2	NOx	0	0	0	192

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
SOUTHERN CALIF GAS CO	S	1016	2	NOx	283	288	289	289
SOUTHERN CALIFORNIA GAS CORPORATION	N	299	2	NOx	0	1311	1415	0
STOCKTON EAST WATER DISTRICT	N	763	2	NOx	2654	3705	3750	3359
STRATAS FOODS LLC	C	1020	2	NOx	0	0	0	108
SUN GARDEN-GANGI CANNING CO LL	N	222	2	NOx	0	0	12886	540
TAUBER OIL COMPANY	N	1267	2	NOx	500	500	500	500
TAUBER OIL COMPANY	N	1277	2	NOx	2500	2500	2500	2500
TAUBER OIL COMPANY	S	4356	2	NOx	1500	1500	1500	1500
TAUBER OIL COMPANY	S	4369	2	NOx	1479	2396	1701	1445
TEXACO EXPLOR & PROD INC	S	20250361	2	NOx	7037	7356	6314	6778
THE BEVERAGE SOURCE	N	92	2	NOx	220	800	520	900
THE NESTLE COMPANY INC	N	508	2	NOx	2975	2444	1853	3352
TKV CONTAINERS, INC.	C	1015	2	NOx	0	13	14	0
TRIANGLE PACIFIC CORPORATION	N	18	2	NOx	187	54	54	161
TRI-CITY GROWERS INC	S	4392	2	NOx	54	0	0	229
TURLOCK IRRIGATION DISTRICT	S	3707	2	NOx	3442	2862	2277	2277
UNITED STATES GYPSUM COMPANY	C	818	2	NOx	0	0	0	734
UNITED STATES GYPSUM COMPANY	N	662	2	NOx	308	36838	15649	308
UNITED STATES GYPSUM COMPANY	S	2543	2	NOx	0	0	0	311
UNITED STATES GYPSUM COMPANY	S	2815	2	NOx	39560	6703	27282	33352
VALLEY AIR CONDITIONING & REPAIR INC	C	693	2	NOx	0	0	108	0
VECTOR ENVIRONMENTAL, INC.	S	4039	2	NOx	102	125	117	15
VINTAGE PETROLEUM	N	346	2	NOx	0	165	1432	14
VINTAGE PRODUCTION CALIFORNIA LLC	N	1211	2	NOx	443	443	443	435
WELLHEAD POWER PANOCHE, LLC.	C	874	2	NOx	0	3	3	0
WESTERN STONE PRODUCTS, INC.	N	17	2	NOx	543	543	619	619

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
WESTLAKE FARMS INC	C	645	2	NOx	0	0	0	498
WESTSIDE FARMERS COOP #2 & #3	C	1038	2	NOx	109	0	0	1122
WONDERFUL PISTACHIOS & ALMONDS	C	1270	2	NOx	770	770	770	770
WONDERFUL PISTACHIOS & ALMONDS	C	1313	2	NOx	10770	10770	10770	10770
3H CATTLE COMPANY	S	3672	5	SOx	0	14	0	0
AERA ENERGY LLC	S	1339	5	SOx	102863	63756	0	10468
AERA ENERGY LLC	S	2010	5	SOx	0	3320	0	0
AERA ENERGY LLC	S	3310	5	SOx	281	227	223	281
AERA ENERGY LLC	S	3833	5	SOx	16508	18345	2147	8994
AERA ENERGY LLC	S	4286	5	SOx	16674	26211	11387	5910
AERA ENERGY LLC	S	4424	5	SOx	101854	66432	0	24770
AERA ENERGY LLC	S	272	5	SOx	1735	2907	1810	2494
AERA ENERGY LLC	S	284	5	SOx	19831	12103	6514	16106
AERA ENERGY LLC	S	395	5	SOx	4836	5200	5928	5651
AERA ENERGY LLC	S	548	5	SOx	2803	26	0	0
AERA ENERGY LLC	S	556	5	SOx	1379	869	781	989
AERA ENERGY LLC	S	841	5	SOx	26339	26631	26924	26924
AERA ENERGY LLC	S	847	5	SOx	153	227	173	72
AERA ENERGY LLC	S	989	5	SOx	0	2808	0	0
AERA ENERGY LLC	S	998	5	SOx	735	0	0	0
AERA ENERGY LLC	S	1000	5	SOx	138	2811	489	10
AERA ENERGY LLC	S	1001	5	SOx	275	583	0	0
AERA ENERGY LLC	S	1032	5	SOx	28371	72172	48856	9900
AERA ENERGY LLC	S	1071	5	SOx	10682	10682	10682	10682
AERA ENERGY LLC	S	1072	5	SOx	5	4	4	4

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AERA ENERGY LLC	S	1073	5	SOx	2	2	2	2
AERA ENERGY LLC	S	1075	5	SOx	0	1	0	0
AERA ENERGY LLC	S	1076	5	SOx	12	11	13	11
AERA ENERGY LLC	S	1077	5	SOx	79	176	164	173
AERA ENERGY LLC	S	1133	5	SOx	436	877	687	281
AERA ENERGY LLC	S	1295	5	SOx	1289	2983	696	488
AERA ENERGY LLC	S	1476	5	SOx	21	0	0	6
AERA ENERGY LLC	S	1477	5	SOx	36	0	0	10
AERA ENERGY LLC	S	1865	5	SOx	5592	4295	5749	5942
AERA ENERGY LLC	S	2008	5	SOx	85594	40615	57148	91993
AERA ENERGY LLC	S	2019	5	SOx	582	589	597	597
AERA ENERGY LLC	S	2361	5	SOx	542	71	2	215
AERA ENERGY LLC	S	3363	5	SOx	21065	27266	29310	28564
AERA ENERGY LLC	S	3525	5	SOx	1902	1902	1902	1902
AERA ENERGY LLC	S	3685	5	SOx	52466	53256	54044	54044
AERA ENERGY LLC	S	790	5	SOx	2	1	1	2
AERA ENERGY LLC	S	863	5	SOx	6	7	13	12
AERA ENERGY LLC	S	1057	5	SOx	4	5	4	3
AERA ENERGY LLC	S	1091	5	SOx	57	70	71	71
AGRI-CEL INC	S	3631	5	SOx	12	14	13	1
ALON BAKERSFIELD REFINING	S	4694	5	SOx	2802	13301	9451	16907
ANDERSON CLAYTON CORP	S	1171	5	SOx	0	0	0	3
ANDERSON CLAYTON CORP	S	471	5	SOx	0	0	0	1
ANDERSON CLAYTON CORP	S	314	5	SOx	0	0	0	2
ANDERSON CLAYTON CORP	S	1045	5	SOx	0	0	0	3
ANDERSON CLAYTON CORP	S	1262	5	SOx	0	0	0	2
ANDERSON CLAYTON CORP	S	1263	5	SOx	1	0	0	3

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
ANDERSON CLAYTON CORP.	N	499	5	SOx	0	0	0	24
ANDERSON CLAYTON CORP.	N	181	5	SOx	0	0	0	1
ANDERSON CLAYTON CORP/BURREL	C	806	5	SOx	3	0	0	7
ANDERSON CLAYTON CORP/BUTTE	C	699	5	SOx	0	0	0	31
ANDERSON CLAYTON CORP/CORCORAN	C	81	5	SOx	0	0	0	2
ANDERSON CLAYTON CORP/DAIRYLAN	C	332	5	SOx	0	0	0	9
ANDERSON CLAYTON CORP/DAIRYLND	C	472	5	SOx	0	0	0	21
ANDERSON CLAYTON CORP/EL DORAD	C	427	5	SOx	0	0	0	3
ANDERSON CLAYTON CORP/FIVE PTS	C	78	5	SOx	0	0	0	31
ANDERSON CLAYTON CORP/HANFORD	C	863	5	SOx	0	0	0	4
ANDERSON CLAYTON CORP/IDRIA #1	C	959	5	SOx	0	0	0	53
ANDERSON CLAYTON CORP/IDRIA #2	C	250	5	SOx	0	0	0	42
ANDERSON CLAYTON CORP/KEARNY	C	75	5	SOx	0	0	0	28
ANDERSON CLAYTON CORP/KERMAN	C	428	5	SOx	0	0	0	48
ANDERSON CLAYTON CORP/KINGSRIV	C	460	5	SOx	0	0	0	4
ANDERSON CLAYTON CORP/MURIT #1	C	334	5	SOx	0	0	0	9
ANDERSON CLAYTON CORP/MURIT #2	C	336	5	SOx	0	0	0	9
ANDERSON CLAYTON CORP/MURRAY	C	234	5	SOx	0	0	0	6
ANDERSON CLAYTON CORP/NAPA GIN	C	335	5	SOx	0	0	0	6
ANDERSON CLAYTON CORP/PLSNT VA	C	326	5	SOx	0	0	0	22
ANDERSON CLAYTON CORP/SAN JOAQ	C	79	5	SOx	0	0	0	22
ANDERSON CLAYTON CORP/SETTER	C	76	5	SOx	0	0	0	3
ANDERSON CLAYTON CORP/SUNSET	C	333	5	SOx	0	0	0	6

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
ANDERSON CLAYTON CORP/TRANQLTY	C	80	5	SOx	0	0	0	2
ANDERSON CLAYTON CORPORATION	N	135	5	SOx	0	0	0	1
ANDERSON CLAYTON CORPORATION	N	737	5	SOx	0	0	0	3
ANDERSON CLAYTON-MARICOPA GIN	S	697	5	SOx	0	0	0	3
AVENAL POWER CENTER, LLC	S	2788	5	SOx	5	7	3	6
AVENAL POWER CENTER, LLC	S	2789	5	SOx	6	14	12	8
AVENAL POWER CENTER, LLC	S	2790	5	SOx	12862	491	0	8499
AVENAL POWER CENTER, LLC	S	2791	5	SOx	92179	23666	69157	96288
AVENAL POWER CENTER, LLC	N	762	5	SOx	21000	21000	21000	21000
BAKERSFIELD CITY WOOD SITE	S	2969	5	SOx	3	5	5	4
BAR 20 PARTNERS LTD	N	612	5	SOx	0	0	79	0
BAR 20 PARTNERS LTD	N	617	5	SOx	0	0	304	0
BAR 20 PARTNERS LTD	N	778	5	SOx	0	0	1	0
BAR VP DAIRY	C	810	5	SOx	250	1096	0	682
BAR VP DAIRY	C	811	5	SOx	919	0	117	80
BAR VP DAIRY	N	638	5	SOx	0	0	0	32
BAR VP DAIRY	N	639	5	SOx	10	10	0	7
BAR VP DAIRY	N	640	5	SOx	0	0	16147	0
BAR VP HEIFER RANCH	S	4289	5	SOx	0	1	49	50
BERRY PETROLEUM COMPANY	C	1353	5	SOx	0	807	0	0
BREITBURN OPERATING LP	S	4056	5	SOx	16	20	16	13
BRITZ AG FINANCE CO., INC.	C	557	5	SOx	0	0	0	33
BRITZ GIN PARTNERSHIP II	C	871	5	SOx	0	0	0	4
BRITZ INCORPORATED	C	586	5	SOx	0	0	0	11
BROWN SAND INC	N	46	5	SOx	3	3	2	3
BRUCE CARTER INDUSTRIES, INC.	S	4038	5	SOx	5	7	6	1
BUILDERS CONCRETE, INC.	C	41	5	SOx	8	8	8	8

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
BUTTONWILLOW GINNING CO	S	2937	5	SOx	0	0	0	4
BUTTONWILLOW GINNING CO	S	4634	5	SOx	0	0	0	20
CALAVERAS MATERIALS INC.	C	233	5	SOx	998	2716	3181	1989
CALIFORNIA DAIRIES, INC	S	3058	5	SOx	1401	1401	1399	1399
CALIFORNIA DAIRIES, INC.	N	986	5	SOx	9000	9000	9000	9000
CALIFORNIA OLIVE GROWERS	C	21	5	SOx	10	10	10	10
CALIFORNIA RESOURCES ELK HILLS, LLC	S	826	5	SOx	5	5	4	5
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4196	5	SOx	8	5	14	15
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4211	5	SOx	13	12	16	16
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4709	5	SOx	4691	4683	4680	4680
CALIFORNIA RESOURCES ELK HILLS, LLC.	N	1387	5	SOx	450	456	456	455
CALIFORNIA RESOURCES PRODUCTION CORP	N	1079	5	SOx	0	0	0	936
CALIFORNIA RESOURCES PRODUCTION CORP	N	1080	5	SOx	0	0	9774	0
CALIFORNIA RESOURCES PRODUCTION CORP	N	1118	5	SOx	250	250	250	250
CALIFORNIA RESOURCES PRODUCTION CORP	N	1129	5	SOx	212	212	212	212
CALIFORNIA RESOURCES PRODUCTION CORP	N	1150	5	SOx	250	250	250	250
CALIFORNIA RESOURCES PRODUCTION CORP	N	1215	5	SOx	4612	4612	4612	4612
CALIFORNIA RESOURCES PRODUCTION CORP	N	1237	5	SOx	23884	21221	14279	24460
CALIFORNIA RESOURCES PRODUCTION CORP	S	4016	5	SOx	325	0	0	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4017	5	SOx	5	0	0	0

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALIFORNIA RESOURCES PRODUCTION CORP	S	3593	5	SOx	494	494	492	492
CALIFORNIA RESOURCES PRODUCTION CORP	S	3035	5	SOx	2	2	4	4
CALIFORNIA RESOURCES PRODUCTION CORP	N	1249	5	SOx	3933	3933	3932	3932
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1201	5	SOx	1598	0	0	0
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1259	5	SOx	132	132	132	132
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1295	5	SOx	6500	6500	6500	6500
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1325	5	SOx	4493	4493	4493	4493
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1331	5	SOx	76	76	76	76
CALIFORNIA RESOURCES PRODUCTION CORP.	C	1333	5	SOx	280	280	280	280
CALMAT CO.	C	50	5	SOx	39	41	58	59
CALMAT OF FRESNO	C	40	5	SOx	25	120	55	185
CALPINE CORPORATION	N	844	5	SOx	6925	7045	7164	7164
CALPINE ENERGY SERVICES, L.P.	S	3075	5	SOx	5080	12043	7319	15177
CALPINE ENERGY SERVICES, L.P.	S	3279	5	SOx	1625	0	0	1339
CALPINE ENERGY SERVICES, L.P.	S	3281	5	SOx	3875	5500	5500	4161
CALPINE ENERGY SERVICES, L.P.	S	3294	5	SOx	4000	4000	4000	4000
CALPINE ENERGY SERVICES, L.P.	S	3348	5	SOx	9536	6336	6163	6545
CALPINE ENERGY SERVICES, L.P.	S	3356	5	SOx	24000	24000	24000	24000
CALPINE ENERGY SERVICES, L.P.	S	4165	5	SOx	4332	1562	709	3781
CALPINE ENERGY SERVICES, L.P.	N	841	5	SOx	3041	1167	5891	3122
CALPINE ENERGY SERVICES, L.P.	N	893	5	SOx	0	0	0	52748
CAMPBELL SOUP COMPANY	N	127	5	SOx	18	13	11	13
CAMPBELL SOUP SUPPLY CO.	N	31	5	SOx	0	52	128	0

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CANANDAIGUA WINE COMPANY INC	C	702	5	SOx	33	34	35	32
CANDLEWICK YARNS	C	507	5	SOx	5	5	4	4
CANTUA COOPERATIVE GIN, INC.	C	760	5	SOx	0	0	0	4
CASTLE AIRPORT AVIATION & DEVELOP CENTER	N	109	5	SOx	3179	3214	3249	3249
CHEVRON U S A INC	S	357	5	SOx	6	5	5	7
CHEVRON U S A INC	S	4304	5	SOx	11	13	13	15
CHEVRON U S A INC	S	4375	5	SOx	32630	33083	33538	33538
CHEVRON USA INC	S	171	5	SOx	17	17	16	17
CHEVRON USA INC	S	436	5	SOx	79	72	66	66
CHEVRON USA INC	C	331	5	SOx	1576	1577	1577	1577
CHEVRON USA INC	C	339	5	SOx	4730	4730	4731	4731
CHEVRON USA INC	C	966	5	SOx	2	2	2	2
CHEVRON USA INC	S	907	5	SOx	1527	1306	1330	1176
CHEVRON USA INC	S	891	5	SOx	2712	2742	2773	2773
CHEVRON USA INC	S	906	5	SOx	2470	2498	2526	2526
CHEVRON USA INC	S	1485	5	SOx	1890	1911	1931	1931
CHEVRON USA INC	S	3544	5	SOx	33	36	29	30
CHEVRON USA INC	S	3604	5	SOx	22	33	37	24
CHEVRON USA INC	S	4570	5	SOx	20808	21063	21319	21319
CHEVRON USA INC	S	2454	5	SOx	9938	15295	38474	24993
CHEVRON USA INC	S	4200	5	SOx	7613	17935	24182	23612
CHEVRON USA INC	S	4672	5	SOx	13830	11370	8398	3752
CHEVRON USA INC	S	4674	5	SOx	10743	16072	22931	32748
CHEVRON USA INC	S	1542	5	SOx	25189	21032	18790	30130
CHEVRON USA PRODUCTION INC	S	147	5	SOx	3	3	2	3
CHEVRON USA PRODUCTION INC	S	3228	5	SOx	11	13	22	8
CHEVRON USA PRODUCTION INC	S	3533	5	SOx	1	1	1	1

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CHEVRON USA, INC.	C	1147	5	SOx	7	7	5	6
CHEVRON USA, INC.	C	1372	5	SOx	1	2	1	0
CITY OF TULARE	S	3396	5	SOx	26	26	26	26
CLARK BROTHERS-DERRICK GIN	C	511	5	SOx	0	0	0	3
COALINGA FARMERS CO-OP GIN	C	537	5	SOx	0	0	0	14
COIT RANCH	C	532	5	SOx	0	0	0	4
CONAGRA CONSUMER FROZEN FOODS	N	489	5	SOx	7	4	5	6
CORCORAN IRRIGATION DISTRICT	C	560	5	SOx	4	5	4	3
COTTON ASSOCIATES, INC	S	25	5	SOx	0	0	0	1
COVANTA DELANO INC	S	2721	5	SOx	890	916	941	941
CRANBROOK ASSOCIATES LLC	N	140	5	SOx	24	24	391	31
CRAYCROFT BRICK COMPANY	C	71	5	SOx	2	2	2	2
CRESTWOOD WEST COAST LLC	S	4238	5	SOx	290	290	290	290
DANELL BROTHERS INC	N	682	5	SOx	10000	10000	10000	10000
DEL MONTE FOODS MODESTO PLANT 1	N	1238	5	SOx	17	15	43	8
DIAMOND FOODS INCORPORATED	N	645	5	SOx	2699	2294	2340	1357
DOLE PACKAGED FOODS LLC	N	520	5	SOx	1	3	9	8
DTE STOCKTON, LLC	N	1007	5	SOx	0	0	27720	0
DUNAVANT OF CALIFORNIA	C	297	5	SOx	22	29	19	25
DUNCAN ENTERPRISES	C	33	5	SOx	3	3	3	2
E & J GALLO WINERY	C	1071	5	SOx	1	2	1	1
E & J GALLO WINERY	S	4214	5	SOx	1750	1750	1750	1750
E & J GALLO WINERY	S	4215	5	SOx	6377	6377	6376	6376
E & J GALLO WINERY	C	1280	5	SOx	20	20	21	21
E & J GALLO WINERY	C	1281	5	SOx	2603	2603	2603	2603
E&B NATURAL RESOURCES	S	4408	5	SOx	3	3	3	3

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
E&B NATURAL RESOURCES MGMT	S	4458	5	SOx	0	827	0	0
EAGLE VALLEY GINNING LLC	N	847	5	SOx	0	0	0	3
ECKERT FROZEN FOODS	N	133	5	SOx	1	3	9	8
ELBOW ENTERPRISES INC	S	2535	5	SOx	0	0	0	33
ELEMENT MARKETS LLC	S	4679	5	SOx	5785	5785	5785	5785
ELEMENT MARKETS LLC	S	4688	5	SOx	5548	5771	4951	5990
ELEMENT MARKETS LLC	S	4693	5	SOx	7327	7104	7923	6884
ELEMENT MARKETS, LLC	N	1327	5	SOx	20	18	22	22
ELK HILLS POWER LLC	S	1950	5	SOx	496	306	118	118
EVOLUTION MARKETS INC.	S	2632	5	SOx	11102	11225	11348	11348
EVOLUTION MARKETS INC.	S	2741	5	SOx	0	0	8706	0
EVOLUTION MARKETS INC.	S	2742	5	SOx	5836	1652	9106	19927
EVOLUTION MARKETS INC.	S	2743	5	SOx	0	0	2666	551
EVOLUTION MARKETS INC.	S	2750	5	SOx	0	0	0	28
EVOLUTION MARKETS INC.	C	882	5	SOx	0	0	0	23
EVOLUTION MARKETS INC.	N	711	5	SOx	0	0	4595	4591
EVOLUTION MARKETS INC.	N	713	5	SOx	19238	23422	0	0
FARMERS COOPERATIVE GIN INC	S	2533	5	SOx	0	0	0	4
FARMERS FIREBAUGH GINNING CO.	C	956	5	SOx	2	0	0	6
FIBREBOARD CORP.	N	209	5	SOx	9	7	4	10
FOSTER FARMS, SPERRY RANCH	S	3795	5	SOx	175	175	0	0
FREEPORT-MC MORAN OIL & GAS	S	4102	5	SOx	5	5	3	3
FREEPORT-MC MORAN OIL & GAS	S	4218	5	SOx	674	350	28	28
FREEPORT-MCMORAN OIL & GAS, LLC	N	1130	5	SOx	35	35	33	33
FREEPORT-MCMORAN OIL & GAS, LLC	N	1243	5	SOx	2087	2087	2087	2087
FREEPORT-MCMORAN OIL & GAS, LLC	C	1233	5	SOx	61	55	49	49
FREEPORT-MCMORAN OIL & GAS, LLC	C	1234	5	SOx	6	0	16	17

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
FREEPORT-MCMORAN OIL & GAS, LLC	C	1235	5	SOx	22	22	22	22
FRITO-LAY, INC.	S	3423	5	SOx	137	176	113	64
FRITO-LAY, INC.	S	3427	5	SOx	8	8	9	9
FRITO-LAY, INC.	S	3767	5	SOx	5203	5000	8796	8796
G.I.C. FINANCIAL SERVICES, INC.	C	1059	5	SOx	70500	70500	70500	70500
GENERAL MILLS OPERATIONS, INC	N	139	5	SOx	2	2	2	2
GLOBAL AMPERSAND LLC	S	2978	5	SOx	29	0	0	0
GRIMMIUS CATTLE COMPANY	S	4739	5	SOx	0	0	404	0
GRIMMIUS CATTLE COMPANY	N	636	5	SOx	21307	28000	6627	20577
GROWERS COOP	S	88	5	SOx	0	0	0	3
GUARDIAN INDUSTRIES CORP	C	1397	5	SOx	5217	5217	5217	5217
H. J. HEINZ COMPANY	N	60	5	SOx	0	0	32	0
H. J. HEINZ COMPANY	N	694	5	SOx	0	0	117	0
H. J. HEINZ COMPANY	N	1085	5	SOx	6	6	4	3
HANSEN BROTHERS	C	249	5	SOx	0	0	0	2
HARBERT ERC, LLC	C	1386	5	SOx	1694	1889	1916	2778
HERSHEY CHOCOLATE & CONF. CORP	N	373	5	SOx	2	2	2	2
HERSHEY CHOCOLATE & CONF. CORP	N	952	5	SOx	3	3	3	3
HOLLY COMMERCE CENTER LLC	N	1226	5	SOx	0	2146	1749	1492
HYDROGEN ENERGY CA LLC	C	1058	5	SOx	24500	24500	24500	24500
HYDROGEN ENERGY CALIFORNIA, LLC	S	3275	5	SOx	42000	42000	42000	42000
INGREDION INCORPORATED	N	264	5	SOx	39050	39050	39050	39050
INGREDION INCORPORATED	N	1086	5	SOx	51681	26912	37684	61746
INTERLAKE MATERIAL HANDLING	N	414	5	SOx	8	8	7	8
J G BOSWELL CO. (SEED STORAGE)	C	47	5	SOx	2	1	2	2
J.G. BOSWELL CO. (EL RICO)	C	135	5	SOx	2	1	0	5
JR SIMPLOT COMPANY	S	3570	5	SOx	688	715	742	742

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
KERMAN CO-OP GIN & WAREHOUSE 1	C	1002	5	SOx	0	0	0	2
KERN DELTA CO LLC	S	4313	5	SOx	0	0	0	15
KERN DELTA CO LLC	S	4318	5	SOx	0	0	0	4
KERN LAKE COOP GIN	S	2074	5	SOx	0	0	0	14
KERN OIL & REFINING CO.	S	2387	5	SOx	7500	7500	7500	7500
KERN OIL & REFINING CO.	S	3106	5	SOx	78598	78599	51520	78598
LAND O' LAKES, INC.	S	3352	5	SOx	158	835	687	274
LAND O' LAKES, INC.	S	3625	5	SOx	5	5	6	5
LAND O' LAKES, INC.	S	4716	5	SOx	20	18	22	22
LAND O' LAKES, INC.	C	1392	5	SOx	2273	1825	1572	2075
LAND O' LAKES, INC.	N	1372	5	SOx	230	230	230	230
LAND O' LAKES, INC.	N	1375	5	SOx	15	21	22	19
LATON CO-OP GIN, INC.	C	746	5	SOx	0	0	0	3
LAWRENCE LIVERMORE NATL. LAB	N	464	5	SOx	30	11	0	22
LIDESTRI FOODS, INC	N	391	5	SOx	0	0	84	0
LINN OPERATING, INC	S	4508	5	SOx	4606	5021	4825	6146
LINN OPERATING, INC	S	4533	5	SOx	342	284	342	398
LINN OPERATING, INC	S	4539	5	SOx	929	929	929	929
LINN OPERATING, INC	N	1307	5	SOx	0	0	749	0
LINN OPERATING, INC	N	1309	5	SOx	749	0	0	693
LINN OPERATING, INC	N	1356	5	SOx	1424	1424	1424	1424
LODI GAS STORAGE LLC	N	515	5	SOx	5	5	5	5
LOS BANOS GRAVEL GROUP, ASPHLT	N	125	5	SOx	4	22	72	24
LOS GATOS TOMATO PRODUCTS	C	1021	5	SOx	0	1	0	0
M CARATAN INC	S	2516	5	SOx	0	0	2	0
MACPHERSON OIL COMPANY	S	3927	5	SOx	0	3	13	4
MADERA CO-OP GIN, INC.	C	943	5	SOx	0	0	0	2

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
MARTIN ANDERSON	C	1051	5	SOx	18	27	16	1
MEYERS FARMING LLC	C	1112	5	SOx	0	26875	37739	16268
MID-VALLEY COTTON GROWERS INC	S	2989	5	SOx	0	0	0	4
MINTURN CO-OP GIN	N	441	5	SOx	0	0	0	31
MODESTO IRRIGATION DISTRICT	S	2686	5	SOx	25188	2688	78	8578
MODESTO IRRIGATION DISTRICT	C	599	5	SOx	2078	1671	0	0
MODESTO IRRIGATION DISTRICT	N	989	5	SOx	23945	25082	12500	0
MOLYCORP MINERALS, LLC	N	938	5	SOx	8250	8250	8250	8250
MOLYCORP MINERALS, LLC	N	939	5	SOx	21899	23000	0	14704
MONTEREY RESOURCES, INC.	S	432	5	SOx	32	32	26	29
NAS LEMOORE	C	138	5	SOx	16	6	13	4
NAS LEMOORE	C	330	5	SOx	1	1	1	1
NAVERUS INC	N	526	5	SOx	1	1	1	1
NORTHERN CALIFORNIA POWER AGENCY	S	4182	5	SOx	1504	0	9485	9940
NORTHERN CALIFORNIA POWER AGENCY	N	1022	5	SOx	0	0	5751	0
NRG POWER MARKETING INC	C	426	5	SOx	16	13	5	15
OAKWOOD LAKE RESORT	N	601	5	SOx	0	0	1	0
OLAM	N	917	5	SOx	7118	18526	23007	910
OLAM	N	1359	5	SOx	50	144	271	166
OLDUVAI GORGE, LLC	S	2483	5	SOx	0	0	1600	0
OLDUVAI GORGE, LLC	S	2604	5	SOx	0	0	0	6
OLDUVAI GORGE, LLC	S	2671	5	SOx	1744	1744	1744	1744
OLDUVAI GORGE, LLC	S	2692	5	SOx	22146	30918	8240	22190
OLDUVAI GORGE, LLC	S	4639	5	SOx	1112	1273	1431	1431
OLDUVAI GORGE, LLC	N	769	5	SOx	13	12	12	12
OLDUVAI GORGE, LLC	N	786	5	SOx	46	46	40	36

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
OLDUVAI GORGE, LLC	N	1087	5	SOx	63898	63775	13652	13652
OLDUVAI GORGE, LLC	N	1262	5	SOx	762	60023	0	0
OLDUVAI GORGE, LLC	N	1264	5	SOx	46372	2294	0	0
PACIFIC PIPELINE SYSTEM, LLC	S	576	5	SOx	0	175	161	0
PACIFIC PIPELINE SYSTEM, LLC	S	577	5	SOx	42	57	61	61
PACIFIC PIPELINE SYSTEM, LLC	S	575	5	SOx	1	39	115	24
PANOCHE ENERGY CENTER, LLC	N	1177	5	SOx	2784	0	0	1787
PANOCHE ENERGY CENTER, LLC	N	1179	5	SOx	0	0	24703	0
PANOCHE GINNING CO	C	904	5	SOx	0	0	0	5
PARAMOUNT FARMS, INC.	C	291	5	SOx	0	0	8	1
PARAMOUNT FARMS, INC.	C	501	5	SOx	26	81	126	112
PASTORIA ENERGY FACILITY, LLC	S	2744	5	SOx	11324	11450	11576	11576
PG & E ENERGY TRADING POWER LP	N	200	5	SOx	8	999	321	8
PILKINGTON NORTH AMERICA, INC	N	1289	5	SOx	33330	33017	37136	36864
PSEG GLOBAL LLC	C	1385	5	SOx	1694	1889	1917	2778
R M WADE & COMPANY	C	152	5	SOx	2	2	2	2
R W MARTELLA	S	3108	5	SOx	0	351	351	922
RICHARD OPPEDYK	S	2620	5	SOx	2750	2750	2750	2750
RIO BRAVO JASMIN	S	4620	5	SOx	19750	16305	19093	20056
RIO BRAVO POSO	S	4717	5	SOx	4906	9631	13827	6905
RIVER RANCH FARMS	S	2930	5	SOx	4702	0	0	11853
RON VANDER WEERD/ROSALINDA VANDER WEERD	N	1108	5	SOx	0	0	6702	0
RON/ROSALINDA VANDER WEERD	S	2751	5	SOx	6250	6200	6134	6249
RON/ROSALINDA VANDER WEERD	C	883	5	SOx	0	3800	3800	0
RON/ROSALINDA VANDER WEERD	C	884	5	SOx	3750	0	66	3751
SAN JOAQUIN REFINING COMPANY	S	4450	5	SOx	3	2	2	2
SAN JOAQUIN VALLEY ENERGY	N	129	5	SOx	391	555	565	244

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
SAPUTO CHEESE USA INC	N	1361	5	SOx	1	0	0	0
SEMI TROPIC COOP GIN	S	426	5	SOx	0	0	0	2
SENECA RESOURCES	S	3720	5	SOx	0	0	0	20
SENECA RESOURCES	S	4325	5	SOx	800	800	800	800
SENECA RESOURCES	S	4590	5	SOx	154	153	154	154
SENECA RESOURCES	S	4638	5	SOx	796	796	796	796
SENECA RESOURCES	S	4580	5	SOx	4	4	4	4
SHAFTER-WASCO GINNING COMPANY	S	3268	5	SOx	0	0	0	19
SIERRA POWER CORPORATION	S	4585	5	SOx	5028	4439	4338	4674
SJVEP I, L.P. (CHOW II)	C	137	5	SOx	298	263	274	342
SOC RESOURCES INC	S	3089	5	SOx	94	89	87	90
SOUTH LAKES DAIRY	S	2638	5	SOx	300	300	300	300
SOUTH VALLEY GINS INC	S	4635	5	SOx	2	0	0	240
SOUTH VALLEY GINS INC	S	3554	5	SOx	0	0	0	5
STOCKTON EAST WATER DISTRICT	N	763	5	SOx	8	10	11	9
SUN GARDEN-GANGI CANNING CO LL	N	100	5	SOx	0	0	23440	4
SUNLAND REFINING CORPORATION	S	698	5	SOx	1293	1123	1211	1241
TAFT PRODUCTION COMPANY	S	2672	5	SOx	1695	1733	1771	1771
TAUBER OIL COMPANY	S	4216	5	SOx	123	123	124	124
TAUBER OIL COMPANY	C	1308	5	SOx	2090	2090	2090	2090
TAUBER OIL COMPANY	N	1240	5	SOx	90	90	90	90
THE ENVIRONMENTAL RESOURCES TRUST, INC	C	1013	5	SOx	9823	9823	9823	9823
THE NESTLE COMPANY INC	N	93	5	SOx	2491	39	48	6273
TKV CONTAINERS, INC.	C	1015	5	SOx	0	0	1	0
TRI-CITY GROWERS INC	S	4392	5	SOx	2	0	0	6
TULE RIVER CO-OP GIN INC	S	2682	5	SOx	0	0	0	3
TURLOCK IRRIGATION DISTRICT	S	3709	5	SOx	29865	14110	0	32286

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
TWIN EAGLE RESOURCE MANAGEMENT, LLC	S	4425	5	SOx	13197	17604	0	0
TWIN EAGLE RESOURCE MANAGEMENT, LLC	N	1265	5	SOx	0	12555	0	0
TWIN EAGLE RESOURCE MANAGEMENT, LLC	N	1266	5	SOx	9370	0	0	0
UNITED STATES GYPSUM COMPANY	S	2543	5	SOx	0	0	0	9
UNITED STATES GYPSUM COMPANY	C	818	5	SOx	0	0	0	5
UNIVERSITY ENERGY SERVICES	S	561	5	SOx	63	54	59	61
VALLEY AIR CONDITIONING & REPAIR INC	C	438	5	SOx	41	105	154	162
VALLEY AIR CONDITIONING & REPAIR INC	C	502	5	SOx	7	22	36	30
VANDER WOUDE DAIRY	S	4055	5	SOx	3613	0	3800	3160
VANDERHAM WEST	S	3233	5	SOx	1453	1452	1452	1452
VECTOR ENVIRONMENTAL, INC.	S	4039	5	SOx	22	27	25	3
WESTERN COTTON SERVICES	S	98	5	SOx	0	0	0	27
WESTERN STONE PRODUCTS, INC.	N	17	5	SOx	636	636	725	725
WESTLAKE FARMS INC	C	645	5	SOx	0	0	0	29
WESTSIDE FARMERS COOP #2 & #3	C	1038	5	SOx	1	0	0	10
WESTSIDE FARMERS COOP GIN #6	C	592	5	SOx	10	0	0	71
WESTSIDE FARMERS COOP. GIN	C	164	5	SOx	0	0	0	37
AERA ENERGY LLC	C	219	1	VOC	268	297	324	298
AERA ENERGY LLC	C	679	1	VOC	11014	11468	11508	11211
AERA ENERGY LLC	S	1058	1	VOC	8179	8280	8354	8353
AERA ENERGY LLC	S	1587	1	VOC	26	28	26	26
AERA ENERGY LLC	S	1681	1	VOC	10	10	10	10
AERA ENERGY LLC	S	3451	1	VOC	20480	438	2608	1572
AERA ENERGY LLC	S	3223	1	VOC	16	16	16	17

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
AERA ENERGY LLC	S	663	1	VOC	544	495	483	454
AERA ENERGY LLC	S	868	1	VOC	724	735	729	672
AERA ENERGY LLC	S	1138	1	VOC	162	233	2	25
AERA ENERGY LLC	S	1142	1	VOC	39631	39976	40411	40489
AERA ENERGY LLC	S	1162	1	VOC	713	719	730	730
AERA ENERGY LLC	S	1476	1	VOC	190	0	0	54
AERA ENERGY LLC	S	4064	1	VOC	98	154	184	160
AERA ENERGY LLC	S	4444	1	VOC	118983	120436	121890	121890
AERA ENERGY LLC	S	4489	1	VOC	9052	10114	11697	8982
AERA ENERGY LLC	S	4624	1	VOC	50080	50508	51652	52619
AERA ENERGY LLC	S	4733	1	VOC	178135	180723	183366	183419
AERA ENERGY LLC	S	2725	1	VOC	65082	65830	66578	66578
AERA ENERGY LLC	S	3110	1	VOC	21914	22310	22708	22708
AERA ENERGY LLC	S	3272	1	VOC	2642	2701	2759	2759
AERA ENERGY LLC	S	3308	1	VOC	2266	1066	1090	2320
AERA ENERGY LLC	S	3687	1	VOC	17245	18573	17870	17768
AERA ENERGY LLC	S	4063	1	VOC	157	140	120	181
AERA ENERGY LLC	S	1477	1	VOC	329	0	0	93
AERA ENERGY LLC	S	1874	1	VOC	40	10	1	22
AERA ENERGY LLC	S	1880	1	VOC	360	591	251	0
AERA ENERGY LLC	S	2136	1	VOC	3772	3393	3836	3913
AERA ENERGY LLC	S	2237	1	VOC	5394	5463	5539	5539
AERA ENERGY LLC	S	2361	1	VOC	27	4	0	11
AERA ENERGY LLC	S	2939	1	VOC	6264	3536	3647	6483
AERA ENERGY LLC	S	2774	1	VOC	8176	5745	5185	3973
AERA ENERGY LLC	S	2782	1	VOC	44	43	42	46
AGRI-CEL INC	S	3631	1	VOC	21495	26078	24122	2902

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
ALON BAKERSFIELD REFINING	S	4678	1	VOC	34099	34898	35307	35215
ALON BAKERSFIELD REFINING	S	4690	1	VOC	24865	24865	24865	24866
ANDERSEN RACK SYSTEMS, INC	N	950	1	VOC	7335	7335	7335	7335
ANDERSON CLAYTON CORP	C	903	1	VOC	0	0	0	4
ANDERSON CLAYTON CORP	S	1262	1	VOC	1	0	0	19
ANDERSON CLAYTON CORP	S	1263	1	VOC	9	0	0	24
ANDERSON CLAYTON CORP	S	1171	1	VOC	3	0	0	24
ANDERSON CLAYTON CORP	S	471	1	VOC	0	0	0	9
ANDERSON CLAYTON CORP	S	314	1	VOC	0	0	1	18
ANDERSON CLAYTON CORP	S	1045	1	VOC	0	0	0	22
ANDERSON CLAYTON CORP.	N	499	1	VOC	0	0	0	15
ANDERSON CLAYTON CORP.	N	181	1	VOC	0	0	0	6
ANDERSON CLAYTON CORP/BURREL	C	806	1	VOC	14	0	0	42
ANDERSON CLAYTON CORP/BUTTE	C	699	1	VOC	0	0	0	19
ANDERSON CLAYTON CORP/CORCORAN	C	81	1	VOC	0	0	0	15
ANDERSON CLAYTON CORP/DAIRYLAN	C	332	1	VOC	0	0	0	7
ANDERSON CLAYTON CORP/DAIRYLND	C	472	1	VOC	0	0	0	13
ANDERSON CLAYTON CORP/EL DORAD	C	427	1	VOC	1	0	0	17
ANDERSON CLAYTON CORP/FIVE PTS	C	78	1	VOC	0	0	0	8
ANDERSON CLAYTON CORP/HANFORD	C	863	1	VOC	0	0	0	36
ANDERSON CLAYTON CORP/HANFORD	C	74	1	VOC	0	0	0	5
ANDERSON CLAYTON CORP/IDRIA #1	C	959	1	VOC	0	0	0	76
ANDERSON CLAYTON CORP/IDRIA #2	C	250	1	VOC	0	0	0	9
ANDERSON CLAYTON CORP/KEARNY	C	75	1	VOC	0	0	0	7

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
ANDERSON CLAYTON CORP/KERMAN	C	428	1	VOC	0	0	0	11
ANDERSON CLAYTON CORP/KINGSRIV	C	460	1	VOC	2	0	0	31
ANDERSON CLAYTON CORP/MURIT #1	C	334	1	VOC	0	0	0	7
ANDERSON CLAYTON CORP/MURIT #2	C	336	1	VOC	0	0	0	7
ANDERSON CLAYTON CORP/MURRAY	C	234	1	VOC	0	0	0	12
ANDERSON CLAYTON CORP/NAPA GIN	C	335	1	VOC	0	0	0	5
ANDERSON CLAYTON CORP/PLSNT VA	C	326	1	VOC	0	0	0	18
ANDERSON CLAYTON CORP/SAN JOAQ	C	79	1	VOC	0	0	0	5
ANDERSON CLAYTON CORP/SETTER	C	76	1	VOC	0	0	0	7
ANDERSON CLAYTON CORP/STRATFOR	C	56	1	VOC	0	0	0	4
ANDERSON CLAYTON CORP/SUNSET	C	333	1	VOC	0	0	0	5
ANDERSON CLAYTON CORP/TRANQLTY	C	80	1	VOC	0	0	0	12
ANDERSON CLAYTON CORPORATION	N	135	1	VOC	0	0	0	5
ANDERSON CLAYTON CORPORATION	N	737	1	VOC	1	0	0	16
ANDERSON CLAYTON-MARICOPA GIN	S	697	1	VOC	0	0	0	25
APTCO LLC	C	663	1	VOC	0	147	788	148
APTCO LLC	C	664	1	VOC	0	149	796	150
APTCO LLC	C	665	1	VOC	0	141	758	143
APTCO LLC	C	684	1	VOC	0	138	241	139
APTCO LLC	N	390	1	VOC	1370	1266	1618	948
APTCO LLC	N	397	1	VOC	12104	11748	9416	0
APTCO LLC	N	540	1	VOC	5000	5000	5000	5000
APTCO LLC	N	854	1	VOC	3141	4397	2894	0
APTCO LLC	S	872	1	VOC	9	8	9	9

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
APTCO LLC	S	1990	1	VOC	1306	1709	1829	1157
ARCO PIPELINE FACILITY	C	271	1	VOC	419	417	417	417
ARDAGH GLASS INC	C	1344	1	VOC	0	0	0	7
ARDAGH GLASS INC	N	1292	1	VOC	0	0	0	135
ARDAGH GLASS INC	S	4497	1	VOC	0	0	0	34
ASV WINES	C	1395	1	VOC	0	0	379	0
ASV WINES, INC.	N	892	1	VOC	0	0	189	0
AVENAL POWER CENTER, LLC	C	897	1	VOC	45	45	45	45
AVENAL POWER CENTER, LLC	C	898	1	VOC	5480	6496	4696	6616
AVENAL POWER CENTER, LLC	N	724	1	VOC	0	0	241	0
AVENAL POWER CENTER, LLC	N	725	1	VOC	0	0	709	0
AVENAL POWER CENTER, LLC	S	2951	1	VOC	12500	12500	12500	12500
AVENAL POWER CENTER, LLC	S	2988	1	VOC	0	69	0	0
BAKERSFIELD CITY WOOD SITE	S	2969	1	VOC	46	59	61	52
BAKERSFIELD CRUDE TERMINAL, LLC	S	4189	1	VOC	3821	3819	9800	5042
BAKERSFIELD CRUDE TERMINAL, LLC	S	4190	1	VOC	877	878	30	0
BAKERSFIELD CRUDE TERMINAL, LLC	S	4191	1	VOC	8302	8303	3170	7958
BAR 20 PARTNERS LTD	S	2593	1	VOC	0	9	345	350
BAR 20 PARTNERS LTD	S	2594	1	VOC	7	15	38	38
BAR 20 PARTNERS LTD	S	2595	1	VOC	873	882	892	892
BAR 20 PARTNERS LTD	S	2915	1	VOC	445	419	50	45
BREA OIL COMPANY, INC.	S	3355	1	VOC	149	391	193	112
BREITBURN OPERATING LP	S	4059	1	VOC	15	19	16	13
BRITZ AG FINANCE CO., INC.	C	557	1	VOC	0	0	0	8
BRITZ GIN PARTNERSHIP II	C	871	1	VOC	0	0	0	32
BRITZ INCORPORATED	C	586	1	VOC	0	0	0	21
BRONCO WINE COMPANY	S	3732	1	VOC	125	125	125	125

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
BROWN SAND INC	N	46	1	VOC	2	2	1	2
BRUCE CARTER INDUSTRIES, INC.	S	4038	1	VOC	10031	12170	11257	1354
BUILDERS CONCRETE, INC.	C	41	1	VOC	35	35	35	35
BUTTONWILLOW GINNING CO	S	2937	1	VOC	0	0	0	40
BUTTONWILLOW GINNING CO	S	4634	1	VOC	0	0	0	105
CALAVERAS MATERIALS INC	C	89	1	VOC	92	83	95	76
CALAVERAS MATERIALS INC.	C	233	1	VOC	148	410	483	300
CALIFORNIA DAIRIES	N	497	1	VOC	33	33	33	33
CALIFORNIA DAIRIES, INC.	C	683	1	VOC	0	0	454	0
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1593	1	VOC	3128	3163	3197	3197
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1703	1	VOC	394	1333	1998	1038
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1708	1	VOC	1664	3970	4474	1890
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1713	1	VOC	1093	2620	3078	1181
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1714	1	VOC	1290	3038	3527	1472
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1717	1	VOC	1239	3804	4274	1639
CALIFORNIA RESOURCES ELK HILLS, LLC	S	3225	1	VOC	648	1755	1926	805
CALIFORNIA RESOURCES ELK HILLS, LLC	S	3379	1	VOC	386	6020	8655	1509
CALIFORNIA RESOURCES ELK HILLS, LLC	S	3947	1	VOC	83	2429	3196	464
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4470	1	VOC	55150	63829	66405	61718
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4643	1	VOC	435	2800	3881	892
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4687	1	VOC	33	3285	4104	0

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1728	1	VOC	1692	4025	4596	2098
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1773	1	VOC	379	0	0	468
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1779	1	VOC	0	656	559	0
CALIFORNIA RESOURCES ELK HILLS, LLC	S	2120	1	VOC	55	794	1411	55
CALIFORNIA RESOURCES ELK HILLS, LLC	S	2488	1	VOC	9	4650	5387	2519
CALIFORNIA RESOURCES ELK HILLS, LLC	S	2627	1	VOC	52	52	52	52
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1719	1	VOC	928	1948	2037	1118
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1722	1	VOC	1132	2723	3230	1359
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1723	1	VOC	1723	4185	4934	2003
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1725	1	VOC	1169	2764	3251	1348
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1726	1	VOC	1603	3911	4662	1932
CALIFORNIA RESOURCES ELK HILLS, LLC	S	1727	1	VOC	1061	2580	3064	1240
CALIFORNIA RESOURCES ELK HILLS, LLC	S	3627	1	VOC	3730	3448	3015	3510
CALIFORNIA RESOURCES ELK HILLS, LLC	S	3951	1	VOC	75129	76311	77494	77493
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4196	1	VOC	74	74	74	74
CALIFORNIA RESOURCES ELK HILLS, LLC	S	4704	1	VOC	1700	2072	5392	4827
CALIFORNIA RESOURCES PRODUCTION CORP	N	1125	1	VOC	179	179	179	179
CALIFORNIA RESOURCES PRODUCTION CORP	N	1153	1	VOC	885	885	885	885

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALIFORNIA RESOURCES PRODUCTION CORP	N	1193	1	VOC	1604	1604	1604	1604
CALIFORNIA RESOURCES PRODUCTION CORP	S	4049	1	VOC	32	796	1783	481
CALIFORNIA RESOURCES PRODUCTION CORP	S	4062	1	VOC	26	178	115	66
CALIFORNIA RESOURCES PRODUCTION CORP	S	4432	1	VOC	0	116	741	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	3574	1	VOC	145	2915	4020	260
CALIFORNIA RESOURCES PRODUCTION CORP	S	4080	1	VOC	0	255	0	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4256	1	VOC	87	19	0	4
CALIFORNIA RESOURCES PRODUCTION CORP	S	4258	1	VOC	0	1513	676	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4297	1	VOC	0	2124	2849	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4348	1	VOC	0	2138	3271	7
CALIFORNIA RESOURCES PRODUCTION CORP	S	4350	1	VOC	738	4013	5529	908
CALIFORNIA RESOURCES PRODUCTION CORP	S	4388	1	VOC	846	4119	5670	1044
CALIFORNIA RESOURCES PRODUCTION CORP	S	4482	1	VOC	0	325	774	0
CALIFORNIA RESOURCES PRODUCTION CORP	S	4630	1	VOC	70	138	199	152
CALIFORNIA RESOURCES PRODUCTION CORP	S	4440	1	VOC	74	74	74	74
CALIFORNIA RESOURCES PRODUCTION CORP	S	4454	1	VOC	170	170	170	170
CALIFORNIA RESOURCES PRODUCTION CORP	S	4487	1	VOC	8711	8711	8711	8711
CALIFORNIA-WASHINGTON CAN CO.	N	77	1	VOC	2664	0	0	1583
CALMAT CO.	C	50	1	VOC	2	2	3	3

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CALMAT OF FRESNO	C	40	1	VOC	2	11	5	17
CALPINE CORPORATION	C	1080	1	VOC	2235	2037	1988	2251
CALPINE CORPORATION	S	1666	1	VOC	0	0	0	9
CALPINE CORPORATION	S	3116	1	VOC	1440	1546	1621	1621
CALPINE ENERGY SERVICES, L.P.	N	927	1	VOC	10503	10981	11573	11536
CALPINE ENERGY SERVICES, L.P.	S	3261	1	VOC	4454	4972	3890	4155
CALPINE ENERGY SERVICES, L.P.	S	3283	1	VOC	0	150	171	0
CALPINE ENERGY SERVICES, L.P.	S	3292	1	VOC	4804	6146	6632	3338
CALPINE ENERGY SERVICES, L.P.	S	3300	1	VOC	4636	4705	4774	4771
CALPINE ENERGY SERVICES, L.P.	S	3368	1	VOC	1500	1500	1500	1500
CALPINE ENERGY SERVICES, L.P.	S	3503	1	VOC	5500	5500	5500	5500
CALPINE ENERGY SERVICES, L.P.	S	3504	1	VOC	1000	1000	1000	1000
CALPINE ENERGY SERVICES, L.P.	S	3555	1	VOC	5000	5000	5000	5000
CAMPBELL SOUP COMPANY	N	127	1	VOC	84	58	52	61
CANANDAIGUA WINE COMPANY INC	C	1085	1	VOC	21	17	30	15
CANDLEWICK YARNS	C	507	1	VOC	23	20	16	14
CANTUA COOPERATIVE GIN, INC.	C	760	1	VOC	0	0	0	38
CASTLE AIRPORT AVIATION & DEVELOP CENTER	N	523	1	VOC	31801	32175	32549	32549
CENTRAL CALIFORNIA SHEETS, LLC	S	4675	1	VOC	3298	3298	3298	3298
CHEMICAL WASTE MANAGEMENT, INC	N	1284	1	VOC	5785	0	0	10355
CHEMICAL WASTE MANAGEMENT, INC.	S	2645	1	VOC	1513	2602	2033	2038
CHEVRON U S A INC	S	3404	1	VOC	171	202	232	232
CHEVRON U S A INC	S	4304	1	VOC	226	264	267	320
CHEVRON U S A INC	S	629	1	VOC	48	42	43	41
CHEVRON USA INC	C	966	1	VOC	6	6	6	6
CHEVRON USA INC	C	221	1	VOC	357	395	431	396

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CHEVRON USA INC	C	277	1	VOC	2209	2209	2209	2209
CHEVRON USA INC	C	331	1	VOC	1220	1220	1221	1221
CHEVRON USA INC	S	1878	1	VOC	230	136	143	82
CHEVRON USA INC	S	2430	1	VOC	2459	2142	1336	1543
CHEVRON USA INC	S	2674	1	VOC	1848	1848	1848	1848
CHEVRON USA INC	S	2675	1	VOC	1835	1835	1835	1835
CHEVRON USA INC	S	3148	1	VOC	181	163	274	216
CHEVRON USA INC	S	3518	1	VOC	1780	1780	1780	1780
CHEVRON USA INC	S	4670	1	VOC	116015	117519	119022	119022
CHEVRON USA INC	S	3701	1	VOC	25142	25559	25976	25976
CHEVRON USA INC	S	4198	1	VOC	37461	38412	39324	39358
CHEVRON USA INC	S	4355	1	VOC	6428	6428	6428	6428
CHEVRON USA INC	S	4379	1	VOC	4124	4209	4295	3637
CHEVRON USA INC	S	4558	1	VOC	39502	40427	41352	41348
CHEVRON USA INC	S	4576	1	VOC	99488	100764	102130	102151
CHEVRON USA INC	S	165	1	VOC	2970	3003	3036	3036
CHEVRON USA INC	S	410	1	VOC	5	7	11	15
CHEVRON USA INC	S	1912	1	VOC	225	238	250	250
CHEVRON USA INC	S	2708	1	VOC	1605	1634	1664	1664
CHEVRON USA INC	S	703	1	VOC	2084	2107	2130	2130
CHEVRON USA INC	S	1793	1	VOC	1420	1443	1335	1334
CHEVRON USA INC	S	3811	1	VOC	3947	4032	4121	4125
CHEVRON USA INC	S	4004	1	VOC	460	466	471	470
CHEVRON USA INC	S	4066	1	VOC	1281	1477	1673	1673
CHEVRON USA INC	S	4068	1	VOC	522	567	615	615
CHEVRON USA INC	S	4110	1	VOC	90	93	83	66
CHEVRON USA INC	S	4549	1	VOC	0	184	257	706

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CHEVRON USA INC	S	4553	1	VOC	341	364	388	388
CHEVRON USA INC	S	4729	1	VOC	3353	3449	3544	3542
CHEVRON USA INC	S	2107	1	VOC	651	638	666	666
CHEVRON USA INC	S	3544	1	VOC	346	378	292	308
CHEVRON USA INC	S	3604	1	VOC	223	345	388	256
CHEVRON USA INC	S	77	1	VOC	42	38	36	47
CHEVRON USA INC	S	647	1	VOC	235	699	540	95
CHEVRON USA INC	S	1049	1	VOC	3461	0	0	0
CHEVRON USA INC	S	2373	1	VOC	11698	11110	8970	9796
CHEVRON USA INC (REFINERY)	S	657	1	VOC	35011	35399	35788	35788
CHEVRON USA INC LOST HILLS GP	S	1847	1	VOC	2764	2793	2825	2825
CHEVRON USA PRODUCTION INC	S	674	1	VOC	5779	5851	5903	5902
CHEVRON USA PRODUCTION INC	S	3533	1	VOC	6	4	9	8
CHEVRON USA, INC.	C	1147	1	VOC	77	79	54	74
CHEVRON USA, INC.	C	1372	1	VOC	14	36	12	9
CILION INC.	S	3373	1	VOC	2978	2979	2979	2978
CILION, INC.	S	3132	1	VOC	13000	13000	13000	13000
CITY OF TULARE	C	1063	1	VOC	0	107	678	109
CLARK BROTHERS-DERRICK GIN	C	511	1	VOC	0	0	0	2
CLEAN HARBORS BUTTONWILLOW, LLC	S	685	1	VOC	31195	31541	31888	31888
COALINGA FARMERS CO-OP GIN	C	537	1	VOC	0	0	0	8
COIT RANCH	C	532	1	VOC	0	0	0	8
CONAGRA CONSUMER FROZEN FOODS	N	858	1	VOC	5	0	0	8
CONOCOPHILLIPS COMPANY	N	1276	1	VOC	1445	766	67	0
CORCORAN IRRIGATION DISTRICT	C	560	1	VOC	154	163	159	90
COTTON ASSOCIATES, INC	S	25	1	VOC	0	0	0	8

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
CRAYCROFT BRICK COMPANY	C	71	1	VOC	24	20	19	19
CRESTWOOD WEST COAST LLC	S	4237	1	VOC	7	22	14	4
CRESTWOOD WEST COAST LLC	S	4239	1	VOC	197	24	0	1
CRESTWOOD WEST COAST LLC	S	4293	1	VOC	1079	1108	1139	1137
CRIMSON RENEWABLE ENERGY, LP	S	4730	1	VOC	131	131	131	132
CRIMSON RESOURCE MANAGEMENT	S	3386	1	VOC	67	138	142	94
CRIMSON RESOURCE MANAGEMENT	S	3387	1	VOC	23009	20107	19072	13925
CRIMSON RESOURCE MANAGEMENT	S	2161	1	VOC	54	49	31	63
CRIMSON RESOURCE MANAGEMENT	S	3441	1	VOC	13	4	13	22
DART CONTAINER CORPORATION	C	555	1	VOC	30481	26626	14213	50680
DEL MONTE FOODS MODESTO PLANT 1	N	1238	1	VOC	82	71	116	28
DELTA TRADING L P	S	4735	1	VOC	1844	1941	2034	2037
DIAMOND FOODS INCORPORATED	N	572	1	VOC	126	45	138	120
DIAMOND FOODS INCORPORATED	N	645	1	VOC	1695	1419	1451	783
DIAMOND FOODS INCORPORATED	N	828	1	VOC	1495	671	1063	1914
DOLE PACKAGED FOODS LLC	N	520	1	VOC	3	11	41	8
DTE STOCKTON, LLC	S	3715	1	VOC	1450	1450	1450	1450
DTE STOCKTON, LLC	S	4485	1	VOC	725	725	725	725
DUNCAN ENTERPRISES	C	33	1	VOC	26	26	27	18
E & J GALLO WINERY	C	1071	1	VOC	23	22	21	20
E & J GALLO WINERY	C	1229	1	VOC	8075	8075	8041	8040
E & J GALLO WINERY	N	2	1	VOC	9	9	26	28
E & J GALLO WINERY	S	4354	1	VOC	16065	16065	16065	16065
E & J GALLO WINERY	S	4381	1	VOC	827	771	816	805
E & J GALLO WINERY	S	4414	1	VOC	2761	2761	2783	2783
E & J GALLO WINERY	S	4442	1	VOC	7039	7032	7025	7013
E & J GALLO WINERY	S	4480	1	VOC	16946	16904	16875	16857

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
E & J GALLO WINERY	S	4601	1	VOC	2107	2106	1527	1407
E & J GALLO WINERY	S	4727	1	VOC	48335	48335	48335	48335
E & J GALLO WINERY	S	4744	1	VOC	67500	117500	117500	117500
E&B NATURAL RESOURCES	S	4408	1	VOC	9	11	11	10
E&B NATURAL RESOURCES MGMT	S	2773	1	VOC	7	12	5	9
E&B NATURAL RESOURCES MGMT	S	3791	1	VOC	7500	7500	7500	7500
EAGLE VALLEY GINNING LLC	N	847	1	VOC	0	0	0	23
ECKERT FROZEN FOODS	N	133	1	VOC	3	11	41	8
ELBOW ENTERPRISES INC	S	2535	1	VOC	0	0	0	70
ELEMENT MARKETS LLC	S	3370	1	VOC	5	4	4	4
ELEMENT MARKETS LLC	S	4689	1	VOC	14082	14082	14082	14082
ELEMENT MARKETS, LLC	N	1327	1	VOC	184	165	202	196
ENRON OIL & GAS COMPANY	S	1044	1	VOC	5516	5576	5638	5638
EQUILON ENTERPRISES LLC	N	1167	1	VOC	23	3	20	19
EVERGREEN BEVERAGE PACKAGING	S	4412	1	VOC	5	6	4	5
EXXONMOBIL CORPORATION	S	4547	1	VOC	128	130	131	131
FARMERS COOPERATIVE GIN INC	S	2533	1	VOC	0	0	0	39
FARMERS FIREBAUGH GINNING CO.	C	956	1	VOC	16	0	0	47
FIBREBOARD CORP.	N	209	1	VOC	41	34	16	45
FJ MANAGEMENT INC.	S	4745	1	VOC	498467	440690	465137	469896
FOSTER FOOD PRODUCTS	S	1501	1	VOC	432	437	442	442
FOSTER FOOD PRODUCTS	S	1502	1	VOC	68	63	58	58
FREEPORT-MC MORAN OIL & GAS	S	4106	1	VOC	821	821	822	822
FREEPORT-MC MORAN OIL & GAS	S	4107	1	VOC	840	840	840	840
FREEPORT-MC MORAN OIL & GAS	S	4364	1	VOC	24	24	24	24
FREEPORT-MCMORAN OIL & GAS, LLC	C	1241	1	VOC	892	0	1736	2684
FREEPORT-MCMORAN OIL & GAS, LLC	C	1272	1	VOC	2299	2271	2242	2243

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
FRESNO/CLOVIS REGIONAL WWTP	C	1211	1	VOC	6	6	5	5
FRITO-LAY, INC.	S	3426	1	VOC	380	474	377	337
FRITO-LAY, INC.	S	3429	1	VOC	55	57	58	58
FRITO-LAY, INC.	S	3430	1	VOC	76	96	74	72
FRITO-LAY, INC.	S	3411	1	VOC	4018	6573	9128	9128
G3 ENTERPRISES	S	4076	1	VOC	183	183	182	182
G3 ENTERPRISES	S	4371	1	VOC	137	137	137	136
G3 ENTERPRISES	S	4663	1	VOC	1500	1500	1500	1500
GENERAL MILLS OPERATIONS, INC	N	139	1	VOC	16	13	13	19
GROWERS COOP	S	88	1	VOC	0	0	1	15
GUARDIAN INDUSTRIES CORP	S	4651	1	VOC	1461	1549	1353	1378
H. J. HEINZ COMPANY	N	60	1	VOC	0	23	129	0
H. J. HEINZ COMPANY	N	694	1	VOC	0	0	701	0
H. J. HEINZ COMPANY	N	1085	1	VOC	52	53	45	23
H. J. HEINZ COMPANY, L.P.	N	21	1	VOC	0	60	180	60
HANSEN BROTHERS	C	249	1	VOC	0	0	0	13
HECK CELLARS	S	4053	1	VOC	9715	9715	9715	9715
HERSHEY CHOCOLATE & CONF. CORP	N	42	1	VOC	1	1	1	1
HERSHEY CHOCOLATE & CONF. CORP	N	373	1	VOC	9	11	13	11
HERSHEY CHOCOLATE & CONF. CORP	N	952	1	VOC	5	5	6	6
HOLMES WESTERN OIL CORPORATION	C	823	1	VOC	0	0	0	10
HOLMES WESTERN OIL CORPORATION	N	652	1	VOC	324	326	311	301
HOLMES WESTERN OIL CORPORATION	N	653	1	VOC	30	30	25	24
HOLMES WESTERN OIL CORPORATION	N	1390	1	VOC	23	22	21	21
HOLMES WESTERN OIL CORPORATION	S	4032	1	VOC	216	562	641	200

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
HUNTER EDISON OIL DEVELOPMENT	S	3723	1	VOC	2186	2256	2234	2282
HYDROGEN ENERGY CALIFORNIA, LLC	S	3305	1	VOC	14625	14625	14625	14625
HYDROGEN ENERGY CALIFORNIA, LLC	S	3557	1	VOC	11437	11438	11438	11437
HYDROGEN ENERGY CALIFORNIA, LLC	S	3605	1	VOC	7937	7938	7938	7937
INGREDION INCORPORATED	S	4696	1	VOC	416	415	415	414
INTERNATIONAL PAPER COMPANY	S	2995	1	VOC	875	875	875	875
J.G. BOSWELL CO. (EL RICO)	C	135	1	VOC	1	0	0	1
KAWEAH DELTA DISTRICT HOSPITAL	S	2656	1	VOC	460	738	828	938
KERMAN CO-OP GIN & WAREHOUSE 1	C	1002	1	VOC	0	0	0	13
KERN DELTA CO LLC	S	4311	1	VOC	0	0	0	17
KERN DELTA CO LLC	S	4314	1	VOC	0	0	0	38
KERN LAKE COOP GIN	S	2074	1	VOC	0	0	0	134
KERN OIL & REFINING CO.	S	3693	1	VOC	952	966	951	1099
KERN OIL & REFINING CO.	S	4295	1	VOC	126	126	126	126
KERN OIL & REFINING CO.	S	4394	1	VOC	808	808	808	808
KERN OIL & REFINING CO.	S	4649	1	VOC	29	29	29	29
KERN OIL & REFINING CO.	S	4724	1	VOC	1500	1500	1500	1500
KERN RIVER HOLDINGS, INC.	S	4598	1	VOC	54	54	54	53
LAND O' LAKES, INC.	C	1044	1	VOC	258	0	0	683
LAND O' LAKES, INC.	N	1373	1	VOC	40	53	55	49
LAND O' LAKES, INC.	S	3284	1	VOC	527	893	642	0
LAND O' LAKES, INC.	S	3625	1	VOC	57	43	59	55
LAND O' LAKES, INC.	S	4658	1	VOC	164	76	272	247
LAND O' LAKES, INC.	S	4714	1	VOC	184	165	202	196
LATON CO-OP GIN, INC.	C	746	1	VOC	0	0	0	8
LAWRENCE LIVERMORE NATL. LAB	N	464	1	VOC	2	1	0	1

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
LEPRINO FOODS COMPANY	C	60	1	VOC	137	139	136	138
LIDESTRI FOODS, INC	N	391	1	VOC	0	0	389	0
LINN OPERATING, INC	N	1202	1	VOC	66	66	66	66
LINN OPERATING, INC	N	1295	1	VOC	157	144	137	134
LINN OPERATING, INC	N	1296	1	VOC	0	0	20	0
LINN OPERATING, INC	N	1297	1	VOC	0	1027	0	0
LINN OPERATING, INC	S	4500	1	VOC	8	1433	8	8
LINN OPERATING, INC	S	4501	1	VOC	9428	9428	9428	9428
LINN OPERATING, INC	S	4502	1	VOC	1307	1307	1307	1308
LINN OPERATING, INC	S	4504	1	VOC	284	0	0	0
LINN OPERATING, INC	S	4537	1	VOC	2415	1551	0	1322
LINN OPERATING, INC	S	4593	1	VOC	22190	22190	22190	22189
LINN OPERATING, INC	S	4622	1	VOC	1334	6262	4415	645
LINN OPERATING, INC	S	4653	1	VOC	1536	1536	1536	1536
LIVE OAK LIMITED	S	3	1	VOC	198	200	202	202
LOS ANGELES CNTY SANITATION DIST NO.2	N	472	1	VOC	5953	6019	6086	6086
LOS ANGELES CNTY SANITATION DIST NO.2	N	1068	1	VOC	269	1452	271	426
LOS ANGELES COUNTY SANITATION DISTRICT 2	S	2147	1	VOC	12500	12500	12500	12500
LOS BANOS GRAVEL GROUP, ASPHLT	N	125	1	VOC	16	81	258	86
LOS GATOS TOMATO PRODUCTS	C	1021	1	VOC	0	3	0	0
M CARATAN INC	S	2516	1	VOC	0	0	26	6
MACPHERSON OIL COMPANY	N	1254	1	VOC	0	0	0	493
MACPHERSON OIL COMPANY	N	1337	1	VOC	1428	1428	1428	935
MACPHERSON OIL COMPANY	S	4419	1	VOC	2	2	2	2
MADERA CO-OP GIN, INC.	C	943	1	VOC	0	0	0	11
MALIBU BOATS LLC	N	942	1	VOC	13753	22879	14803	14093

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
MALIBU BOATS LLC	S	2555	1	VOC	5000	5000	5000	5000
MARTIN ANDERSON	C	1051	1	VOC	8699	12348	6585	90
MESA VERDE TRADING CO., INC	S	4307	1	VOC	4	0	0	1
MEYERS FARMING LLC	C	1112	1	VOC	0	767	1032	454
MID VALLEY DISPOSAL, INC.	S	4492	1	VOC	6681	6681	6681	6681
MID-VALLEY COTTON GROWERS INC	S	317	1	VOC	0	0	0	6
MID-VALLEY COTTON GROWERS INC	S	2989	1	VOC	0	0	0	16
MIDWAY PEAKING LLC	S	4233	1	VOC	0	0	0	10
MINTURN CO-OP GIN	N	441	1	VOC	0	0	0	20
MODESTO IRRIGATION DISTRICT	C	1109	1	VOC	4342	4331	4373	4371
MODESTO IRRIGATION DISTRICT	N	479	1	VOC	0	0	305	0
MODESTO IRRIGATION DISTRICT	N	739	1	VOC	0	0	27	0
MONTEREY RESOURCES, INC.	S	1983	1	VOC	708	720	557	640
NAS LEMOORE	C	1046	1	VOC	1607	453	1066	59
NORTHERN CALIFORNIA POWER AGENCY	S	3744	1	VOC	240	103	0	0
NUSTAR ENERGY LP	S	3299	1	VOC	1000	1000	1000	1000
OAKWOOD LAKE RESORT	N	601	1	VOC	0	72	115	0
OILDALE ENERGY LLC	S	1096	1	VOC	100	100	100	100
OLAM	N	920	1	VOC	0	0	3	0
OLAM	N	1359	1	VOC	118	338	652	425
OLDUVAI GORGE, LLC	N	1364	1	VOC	9103	0	786	0
OLDUVAI GORGE, LLC	N	1366	1	VOC	89	0	0	0
O'NEILL VINTNERS & DISTILLERS	S	3886	1	VOC	404	404	404	404
PACIFIC ETHANOL VISALIA	S	4438	1	VOC	2273	2271	2270	2264
PACIFIC GAS & ELECTRIC CO.	N	1382	1	VOC	393	5292	4501	81
PACIFIC GAS & ELECTRIC COMPANY	S	4742	1	VOC	1200	1200	1200	1200
PACIFIC PIPELINE SYSTEM, LLC	S	776	1	VOC	28	67	77	34

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
PACTIV CORPORATION	N	1062	1	VOC	27192	27192	27192	27192
PACTIV, LLC	C	1182	1	VOC	9986	9206	9494	9041
PACTIV, LLC	C	1183	1	VOC	2001	1688	2462	1110
PACTIV, LLC	C	1184	1	VOC	47518	2227	0	17129
PACTIV, LLC	C	1185	1	VOC	51342	0	0	0
PACTIV, LLC	N	1241	1	VOC	23529	14812	15264	14520
PACTIV, LLC	S	3862	1	VOC	1513	1972	1571	1510
PANOCHE GINNING CO	C	904	1	VOC	0	0	0	49
PARAMOUNT FARMS, INC.	C	291	1	VOC	0	0	63	12
PELCO INC A DELAWARE CORPORATION	C	1121	1	VOC	374	374	349	349
PELCO INC A DELAWARE CORPORATION	C	1122	1	VOC	1842	2601	2219	1756
PHOENIX BIO INDUSTRIES LLC	C	824	1	VOC	500	500	500	500
PILKINGTON NORTH AMERICA, INC	N	1198	1	VOC	79	78	99	93
PLAINS LPG SERVICES LP	S	3793	1	VOC	583	583	583	583
PLAINS LPG SERVICES LP	S	4561	1	VOC	0	972	1020	381
RIO BRAVO JASMIN	S	4620	1	VOC	237	187	242	247
RIO BRAVO POSO	S	4715	1	VOC	7	165	212	78
SAN JOAQUIN FACILITIES MGMT	S	4446	1	VOC	0	0	13	8
SAN JOAQUIN FACILITIES MGMT	S	4448	1	VOC	34	8	34	39
SAN JOAQUIN FACILITIES MGMT	S	4741	1	VOC	33496	28211	32294	37578
SAN JOAQUIN FACILITIES MGMT	S	3801	1	VOC	228	225	223	223
SC JOHNSON HOME STORAGE INC	C	1173	1	VOC	1055	1415	1403	1447
SEALED AIR CORPORATION	C	851	1	VOC	19000	19000	19000	19000
SEMI TROPIC COOP GIN	S	426	1	VOC	1	0	1	28
SENECA RESOURCES	N	1336	1	VOC	108	108	108	108
SENECA RESOURCES	N	1363	1	VOC	0	0	695	0

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
SENECA RESOURCES	N	1365	1	VOC	1500	287	2514	1004
SENECA RESOURCES	S	3440	1	VOC	0	0	0	339
SENECA RESOURCES	S	4323	1	VOC	1500	1500	1500	1500
SEQUOIA FOREST INDUSTRIES	C	67	1	VOC	2	9	0	6
SEQUOIA FOREST INDUSTRIES	C	72	1	VOC	7	0	1	1
SFPP, L.P.	S	4188	1	VOC	2374	2374	2372	2372
SHAFTER-WASCO GINNING COMPANY	S	3268	1	VOC	0	0	0	13
SHELL CALIFORNIA PIPELINE COMPANY LLC	C	467	1	VOC	185	0	0	0
SHELL OIL PRODUCTS US	S	4223	1	VOC	0	20	3	3
SHELL OIL PRODUCTS US	S	4251	1	VOC	431	460	493	492
SHELL OIL PRODUCTS US	S	4336	1	VOC	61	33	0	0
SHELL PIPELINE COMPANY LP	S	2303	1	VOC	0	658	431	0
SILGAN CONTAINERS LODI MFG CORP	N	431	1	VOC	5103	3464	3573	3865
SILGAN CONTAINERS MANUFAC CORP	C	1208	1	VOC	4279	3921	3042	3166
SOUTH KERN INDUSTRIAL CENTER LLC	S	3006	1	VOC	0	190	382	0
SOUTH VALLEY GINS INC	S	4635	1	VOC	4	0	0	42
SOUTH VALLEY GINS INC	S	3554	1	VOC	0	0	0	10
SOUTHERN CALIF GAS CO	S	671	1	VOC	570	576	583	583
SOUTHERN CALIF GAS CO	S	1739	1	VOC	1322	1337	1354	1352
STOCKTON EAST WATER DISTRICT	N	763	1	VOC	1627	2271	2299	2059
SYNAGRO WEST, INC DBA CENTRL VLY COMPOST	N	1394	1	VOC	8	0	47	0
TAUBER OIL COMPANY	N	1239	1	VOC	234	203	211	182
TAUBER OIL COMPANY	S	4725	1	VOC	500	500	500	500
TAUBER OIL COMPANY	S	4743	1	VOC	1718	1792	1883	1893
TESORO LOGISTICS OPERATIONS LLC	N	1078	1	VOC	1539	1539	1539	1537

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
TESORO LOGISTICS OPERATIONS LLC	S	4736	1	VOC	4937	4938	4937	4938
TEXACO EXPLOR & PROD INC	S	904	1	VOC	492	551	403	459
THE DOW CHEMICAL COMPANY	N	799	1	VOC	218	212	236	224
THE NESTLE COMPANY INC	N	93	1	VOC	997	1820	1874	1007
THE WINE GROUP LLC	S	4147	1	VOC	250	250	249	249
THE WINE GROUP LLC	S	4661	1	VOC	500	500	500	500
TKV CONTAINERS, INC.	C	1015	1	VOC	0	83	83	0
TRC CYPRESS GROUP LLC	S	2292	1	VOC	1412	1412	1412	1412
TRC OPERATION COMPANY, INC.	S	767	1	VOC	394	399	403	403
TRI-CITY GROWERS INC	S	4392	1	VOC	3	0	0	14
TULARE CITY WASTEWATER PLANT	S	2697	1	VOC	60	60	60	87
TULE RIVER CO-OP GIN INC	S	2682	1	VOC	0	0	0	13
TURLOCK IRRIGATION DISTRICT	C	607	1	VOC	297	297	297	297
TURLOCK IRRIGATION DISTRICT	C	1116	1	VOC	1080	1080	1079	1079
UNITED STATES GYPSUM COMPANY	C	818	1	VOC	0	0	0	40
UNITED STATES GYPSUM COMPANY	N	661	1	VOC	15000	16335	16334	12331
UNITED STATES GYPSUM COMPANY	S	2543	1	VOC	0	0	0	17
UNITED STATES GYPSUM COMPANY	S	2816	1	VOC	20000	20000	20000	20000
UNIVERSITY ENERGY SERVICES	S	561	1	VOC	63	54	59	61
VALERO LP	N	578	1	VOC	2372	2372	2372	2371
VANDERHAM WEST	S	3235	1	VOC	240	240	240	240
VARCO PRUDEN BUILDINGS, INC.	N	898	1	VOC	5404	6473	10921	8632
VECTOR ENVIRONMENTAL, INC.	S	4039	1	VOC	40127	48678	45027	5416
VINTAGE PRODUCTION CALIFORNIA LLC	N	1213	1	VOC	163	163	163	163
VISALIA WASTEWATER TREATMENT	S	1837	1	VOC	5067	2634	4107	4614
WESTERN COTTON SERVICES	S	606	1	VOC	0	0	0	9
WESTERN STONE PRODUCTS, INC.	N	17	1	VOC	6	6	7	7

Facility Name	Emissions Reduction Certificate (ERC) Number			Pollutant	Emissions Reduction (lb/qtr)			
					1st qtr	2nd qtr	3rd qtr	4th qtr
WESTLAKE FARMS INC	C	645	1	VOC	0	0	0	18
WESTSIDE FARMERS COOP #2 & #3	C	1038	1	VOC	5	0	0	57
WESTSIDE FARMERS COOP GIN #6	C	592	1	VOC	6	0	0	44
WESTSIDE FARMERS COOP. GIN	C	164	1	VOC	0	0	0	31

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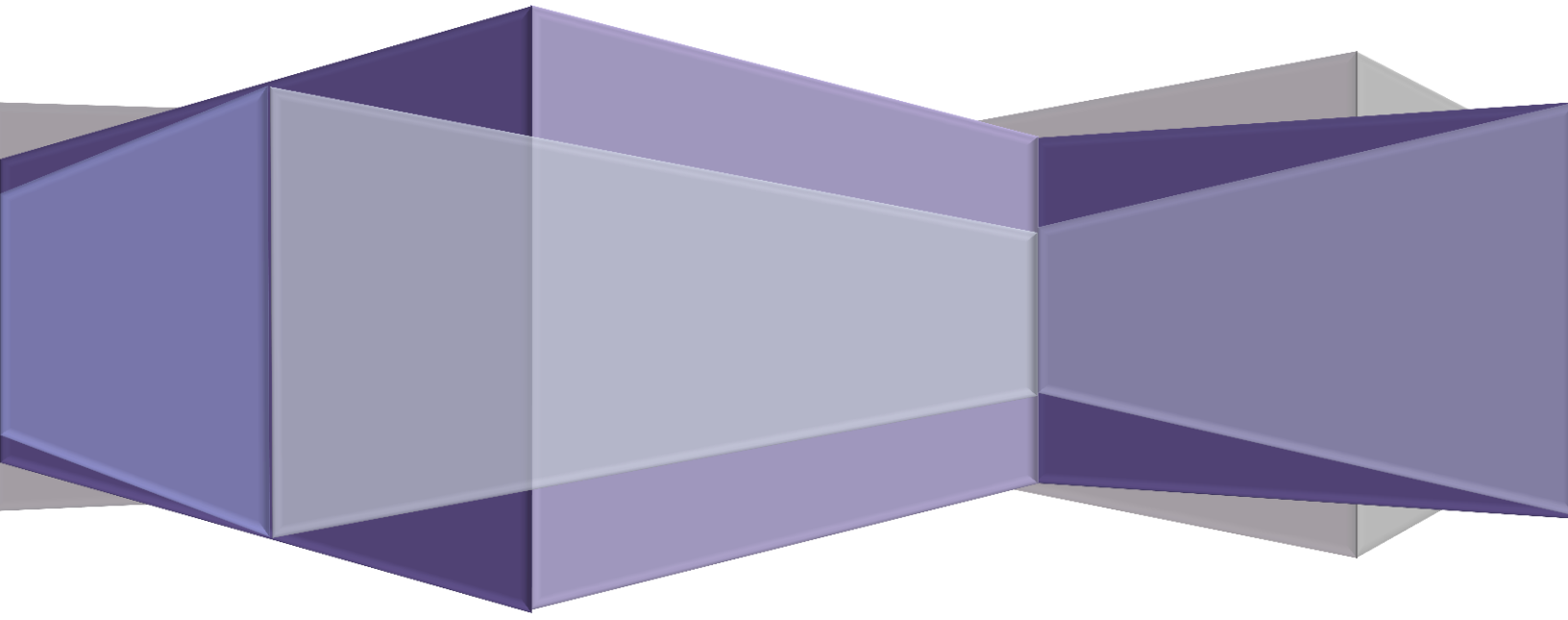
Appendix E

Summary of Significant Comments and Responses

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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APPENDIX E: SUMMARY OF SIGNIFICANT COMMENTS & RESPONSES

The District did not receive comments from EPA Region IX, ARB or the public.

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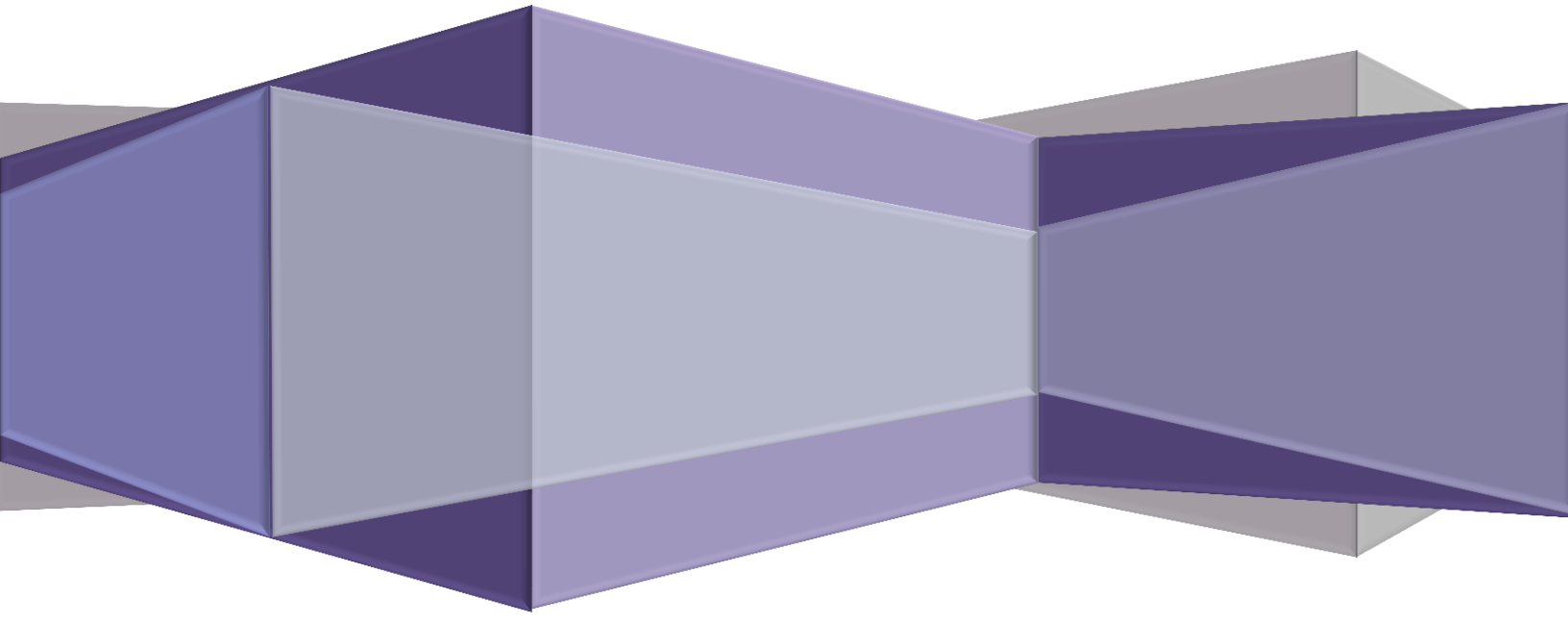
Attachment 1

Stationary and Area Source Control Measure Analyses

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Appendix C

BACM and MSM for Stationary and Area Sources

2015 Plan for the 1997 PM2.5 Standard
SJVUAPCD

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Appendix C: BACM and MSM for Stationary and Area Sources

C.i Introduction

The San Joaquin Valley (Valley) faces significant challenges in meeting National Ambient Air Quality Standards (NAAQS). The San Joaquin Valley Air Pollution Control District (District) has demonstrated leadership in developing and implementing groundbreaking regulatory strategies to reduce emissions. Tough and innovative rules, such as those for indirect source review, residential wood burning, glass manufacturing, and agricultural burning, have set benchmarks for California and the nation.

Multiple regulatory control measures have been adopted under the District's air quality attainment plans that reduce particulate matter (PM) that is 2.5 microns or less in diameter (PM2.5), including but not limited to commitments made in the *2007 Ozone Plan, 2008 PM2.5 Plan, 2012 PM2.5 Plan,* and *2013 Plan for the Revoked 1-Hour Ozone Standard.* All of these commitments serve as control measures that will reduce emissions under the *2015 Plan for the 1997 PM2.5 Standard (2015 PM2.5 Plan)*. Under the U.S. Environmental Protection Agency (EPA) policy, there is a preference for reliance on control measures that have already been adopted. The *2015 PM2.5 Plan* regulatory control measures that have already been adopted include both stationary and area source control measures, as well as California Air Resources Board (ARB) rules for mobile sources.

Table C-1 below identifies the control measures that the District has already adopted and that are contributing to attainment of the 1997 PM2.5 standard. These adopted District rules are achieving new emissions reductions after 2012, the base year for this plan. Even pre-2012 emissions reductions are contributing, and will continue to contribute, to the Valley's progress toward clean air.

Table C-1 District Regulations Contributing to Attainment of PM2.5 NAAQS

Rule #	Adopted District Rule	Last Adoption/ Amendment Date
4307	Boilers, Steam Generators, and Process Heaters—2.0 MMBtu/hr to 5.0 MMBtu/hr	5/19/11
4308	Boilers, Steam Generators, and Process Heaters—0.075 MMBtu/hr to less than 2.0 MMBtu/hr	11/14/13
4311	Flares	6/18/09
4320	Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	10/16/08
4354	Glass Melting Furnaces	5/19/11
4702	Internal Combustion Engines	8/18/11
4703	Stationary Gas Turbines	9/20/07
4901	Wood Burning Fireplaces and Wood Burning Heaters	9/18/14
4902	Residential Water Heaters	3/19/09
4905	Natural Gas-Fired, Fan-Type Central Furnaces	1/22/15
9310	School Bus Fleets	9/21/06
9410	Employer-based Trip Reduction	12/17/09

One of the requirements for a Serious nonattainment area plan under Subpart 4 is to demonstrate that the plan includes the best available control measures (BACM) that can be feasibly and cost effectively implemented. EPA defines BACM as being more stringent than reasonably available control measures (RACM), but less stringent than the lowest achievable emission rate (LAER), which does not take into consideration the cost effectiveness of implementing a particular control measure.[1]

As a Serious nonattainment area, the Valley would have until December 31, 2015 to attain the 1997 PM2.5 standard. As demonstrated in Chapter 2 and Appendix A, the Valley will not attain the 1997 PM2.5 standard by the attainment date and is therefore requesting an extension of the attainment date. Under Subpart 4, EPA may grant one extension of the attainment date of up to five years for a Serious nonattainment area provided the attainment plan for that area satisfies several federal requirements, including the most stringent measures (MSM) that are included in the implementation plan of any State or are achieved in practice in any State, and can feasibly be implemented in the area. EPA defines MSM as the, "maximum degree of emission reduction that has been required or achieved from a source or source category in other SIPs or in practice in other states and can be feasibly implemented in the area."[2] This appendix demonstrates that the control measures in this *2015 PM2.5 Plan* satisfy both BACM and MSM requirements.

The analysis in this appendix consists of a literature review and evaluation of emission reduction opportunities for a variety of stationary and area source categories. District staff in multiple departments with expertise in these various sectors contributed to this effort. The evaluations in this appendix capture relevant background information, examine potential emission reduction opportunities for technological and economic feasibility, and make recommendations for appropriate District actions moving forward. This appendix reflects the comprehensive evaluation performed by the District to examine the Valley's various emissions sources and identify any potential BACM or MSM for inclusion in this plan.

C.ii BACM/MSM Evaluation Process

As discussed in detail in Chapter 5, the District must demonstrate that its rules meet both BACM and MSM requirements.

The Maricopa County PM10 nonattainment area is the only other area in the nation that has conducted a BACM and MSM analysis. Within the technical support document (TSD) for the Maricopa County Serious Area Nonattainment Plan,[3] EPA defined the process for determining BACM and MSM. EPA noted that MSM follows the same process for determining BACM, but with one additional step to compare the potential MSM against the measures already adopted in the area to determine if the existing

[1] EPA. 1994 Addendum to the General Preamble, p. 10.
[2] EPA. Technical Support Document for Maricopa County PM10 Nonattainment Area. 2001, p. 237.
[3] EPA. Technical Support Document (Notice of Proposed Rulemaking on the Serious Area PM-10 State Implementation Plan for the Maricopa County PM-10 Nonattainment Area Provisions for Attaining the 24-Hour Standard and Contingency Measures). (2001, September 14).

measures are most stringent. Because this is the only EPA guidance available for a Serious Nonattainment area under Subpart 4 (to evaluate BACM and MSM) at the time of the development of this *2015 PM2.5 Plan,* the District will follow this process as summarized below:

1. Develop a detailed emissions inventory of PM2.5 sources and source categories (Appendix B).

2. Model to evaluate the impact of various source categories on PM2.5 concentrations over the NAAQS to determine which sources are significant and which sources are de minimis (less than significant) for the purposes of adopting BACM and MSM[4] (Chapter 5).
    a. ARB relative response factor (RRF) results demonstrate that the significance levels for PM2.5, oxides of nitrogen (NOx), and oxides of sulfur (SOx) are as follows (*see Chapter 5 for the full calculations*):
        i. PM2.5: 1.4 tons per day (tpd) for combustion, 4.0 tpd for dust
        ii. NOx: 13.1 tpd
        iii. SOx: 1.0 tpd
    b. To determine if a particular source category is significant for the purposes of adopting BACM and MSM, the 2012 baseline emissions inventory for each source category was compared to the significance thresholds above.

3. Identify potential BACM and MSM in other implementation plans or used in practice in other states for each significant source category, and for each measure evaluate the technological and economic feasibility for the area, as necessary (Appendix C).

4. Compare potential BACM/MSM for each significant source category against the control measures, if any, already adopted for that source category (Appendix C).

5. Provide for the adoption of any BACM/MSM that is more stringent than existing similar local measures and provide for implementation as expeditiously as practicable or, in lieu of adoption, provide a reasoned justification for rejecting the potential MSM, i.e., why such measures cannot be feasibly implemented in the area (Appendix C).

Using the BACM/MSM process summarized above, emission control requirements for stationary and area source categories are evaluated to determine if they satisfy both BACM and MSM requirements or if there are any potential technologies or practices

[4] EPA stated in the Maricopa County TSD that more source categories should be subject to the MSM analysis than those subject to a BACM analysis by lowering the threshold for what is considered a de minimis source category. What constitutes a de minimis source category for BACM is dependent upon the specific facts of the nonattainment problem under consideration. EPA states that one means of determining an appropriate de minimis level is to determine if applying MSM to the proposed de minimis source categories would meaningfully expedite attainment. If it did, then the established de minimis level is too high, and if it did not, then the de minimis level is appropriate.

that could further reduce PM2.5 and precursor emissions and prove to be technologically and economically feasible for sources in the Valley.

C.iii Appendix C Organization and Evaluation

Each control measure evaluation includes a discussion of the rule applicability and rule adoption/amendment history; an overview of the source category and affected sources; an emissions inventory table for the source category; a regulatory evaluation; a technological feasibility and cost effectiveness analysis of any other potential BACM/MSM; and a summary of the evaluation findings. The sections below elaborate in more detail with respect to the information included within each individual rule evaluation.

Discussion

This section provides an overview of rule applicability, identifies what types of emissions the rule controls, provides the rule adoption/amendment history, and discusses additional pertinent details, as necessary. This section is not included for the source categories where there is no current District prohibitory rule.

Source Category

This section discusses what types of units, industries, or operations are included in the respective source category.

Emissions Inventory

Each emissions inventory table lists the annual average and wintertime average (November through April) PM2.5, NOx, and SOx emissions for the respective source category for the years 2012 through 2020. The data provided in this section is a compilation of the data sources identified in the emission inventory appendix. See Appendix B (Emission Inventory) for additional information.

This section also includes a significance discussion, which compares the emissions from the respective source category to the applicable significance/de minimis thresholds developed by ARB, as shown in Chapter 5 of the plan.

Regulatory Evaluation

As part of the regulatory evaluation, District rules and source categories are compared to federal and state air quality regulations and standards, and the regulations and standards in other air districts. The following regulations and guidelines are referenced in the comparisons:

- **Federal Regulations –** Federal regulations include the following regulations and guidance documents:
    - Control Techniques Guidelines (CTG)[5]
    - Alternative Control Techniques (ACT)[6]

[5] EPA. Control Techniques Guidelines. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[6] EPA. Alternative Control Techniques. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html

- New Source Performance Standards (NSPS)[7]
- National Emission Standards for Hazardous Air Pollutants (NESHAP)[8]
- Maximum Achievable Control Technology (MACT)[9]

- **State Regulations –** Generally, state regulations are specific to mobile sources and consumer products. However, there are some California Health and Safety Code (CH&SC) requirements and ARB Airborne Toxic Control Measures (ATCM)[10] that apply to stationary and area sources. While most of the rules evaluated in this *2015 PM2.5 Plan* do not have a state regulation associated with their source category, any relevant state guidelines are evaluated within this section.

- **Other Air Districts' Rules –** As agreed to by EPA for the *2009 RACT SIP*, the rules were also compared to analogous regulations adopted by California's most progressive air districts. Control strategies and measures in other air districts and agencies include, but are not limited to the following air districts:

  - South Coast Air Quality Management District (SCAQMD)[11]
  - Bay Area Air Quality Management District (BAAQMD)[12]
  - Sacramento Metropolitan Air Quality Management District (SMAQMD)[13]
  - Ventura County Air Pollution Control District (VCAPCD)[14]

All potential BACM/MSM identified through this regulatory evaluation were then thoroughly evaluated using the following key factors, defined by EPA in the Maricopa County TSD, to determine if potential opportunities qualify as BACM/MSM for the Valley:

- **Technological feasibility**[15] – This analysis determines if the new control can be integrated with the existing controls without reducing or delaying the emission reductions from the existing control. If it cannot, then it would not be considered

[7] EPA. 40 CFR 60 – Standards of Performance for New Stationary Sources (NSPS). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/60/60hmpg.html
[8] EPA. 40 CFR 61 – National Emission Standards for Hazardous Air Pollutants (NESHAPs). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/61/61hmpg.html
[9] EPA. 40 CFR 63 – Maximum Achievable Control Technology (MACT). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/63/63hmpg.html
[10] California Air Resources Board (ARB). Airborne Toxic Control Measures (ATCMs). Retrieved from http://www.arb.ca.gov/toxics/atcm/atcm.htm
[11] South Coast Air Quality Management District (SCAQMD). Rules and Regulations. Retrieved from http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/table-of-contents
[12] Bay Area Air Quality Management District (BAAQMD). Rules and Regulations. Retrieved from http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx
[13] Sacramento Metropolitan Air Quality Management District (SMAQMD). Rules and Regulations. Retrieved from http://www.airquality.org/rules/
[14] Ventura County Air Pollution Control District (VCAPCD). Rules and Regulation. Retrieved from http://www.vcapcd.org/Rulebook/RuleIndex.htm
[15] EPA. (2001, June 22). *Technical Support Document for Maricopa County PM10 Nonattainment Area,* p. 34. Retrieved from http://www.epa.gov/region9/air/phoenixpm/pdf/tsd.pdf.

to be technologically feasible for the area unless the emission benefit of the new measure is substantially greater than the existing measure.

- **Economic feasibility**[16] – If the potential control is determined to be technologically feasible, it is then evaluated for economic feasibility. The District has evaluated the economic feasibility of various control measures by conducting cost effectiveness analyses within this appendix. A cost effectiveness analysis examines the added cost, in dollars per year, of the control technology or technique, divided by the emissions reductions achieved, in tons per year. EPA cautions that the threshold for economic feasibility should be addressed on a case-by-case basis.

Additional Emission Reduction Opportunities

The District reviewed the following areas to identify any additional potential BACM/MSM, exclusive of potential BACM/MSM evaluated in the Regulatory Evaluation section:

- Any emission reduction opportunities identified/considered in previously adopted District plans that were determined to be beyond reasonably available control technology (RACT) at that time.
- New emission reduction opportunities adopted in California SIPs, SIPs in other states, or achieved in practice in other areas.

All potential BACM/MSM identified were then thoroughly evaluated for technological and economic feasibility, as previously defined. The District reviewed staff reports and studies from other air districts, EPA technical guidance documents, and applicable study data from the scientific community to assist in evaluating the technological and economic feasibility of potential BACM/MSM.

Evaluation Findings

This section provides a summary of the District's findings based on the control measure evaluation.

[16] EPA. (2001, June 22). *Technical Support Document for Maricopa County PM10 Nonattainment Area,* p. 34. Retrieved from http://www.epa.gov/region9/air/phoenixpm/pdf/tsd.pdf.

C.iv Ammonia Regulations

Under Subpart 4 of the federal Clean Air Act (CAA), regions are required to address ammonia as a precursor in BACM/MSM analyses unless EPA determines that ammonia sources do not contribute significantly to PM concentrations. As demonstrated in Appendix A, ammonia emissions controls are not effective in significantly reducing ambient PM2.5 concentrations and do not contribute to the Valley's PM2.5 attainment. As such, the District is not required to evaluate its ammonia regulations as part of the BACM/MSM analysis for this *2015 PM2.5 Plan.*

Nevertheless, the District has implemented the most stringent controls feasible for local sources of ammonia and the Valley's ammonia emissions have been significantly reduced through stringent District regulations which include the following:

- Rule 4570 (Confined Animal Facilities)
- Rule 4566 (Organic Material Composting)
- Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations)

Even though the District is not required to evaluate ammonia as part of this plan, Section C.41 (Ammonia Controls) includes a full analysis for the above sources and demonstrates that existing requirements meet or exceed BACM and MSM levels of control. Therefore, even if ammonia was a significant precursor to PM2.5 concentrations in the Valley (which they are not), there are no current opportunities for additional ammonia emission reductions.

C.1 RULE 4103 OPEN BURNING

Discussion

The provisions of Rule 4103 apply to open burning conducted in the Valley, with the exception of prescribed burning and hazard reduction burning, as defined in Rule 4106 (Prescribed Burning and Hazard Reduction Burning). The purpose of Rule 4103 is to permit, regulate, and coordinate the use of open burning while minimizing smoke impacts on the public.

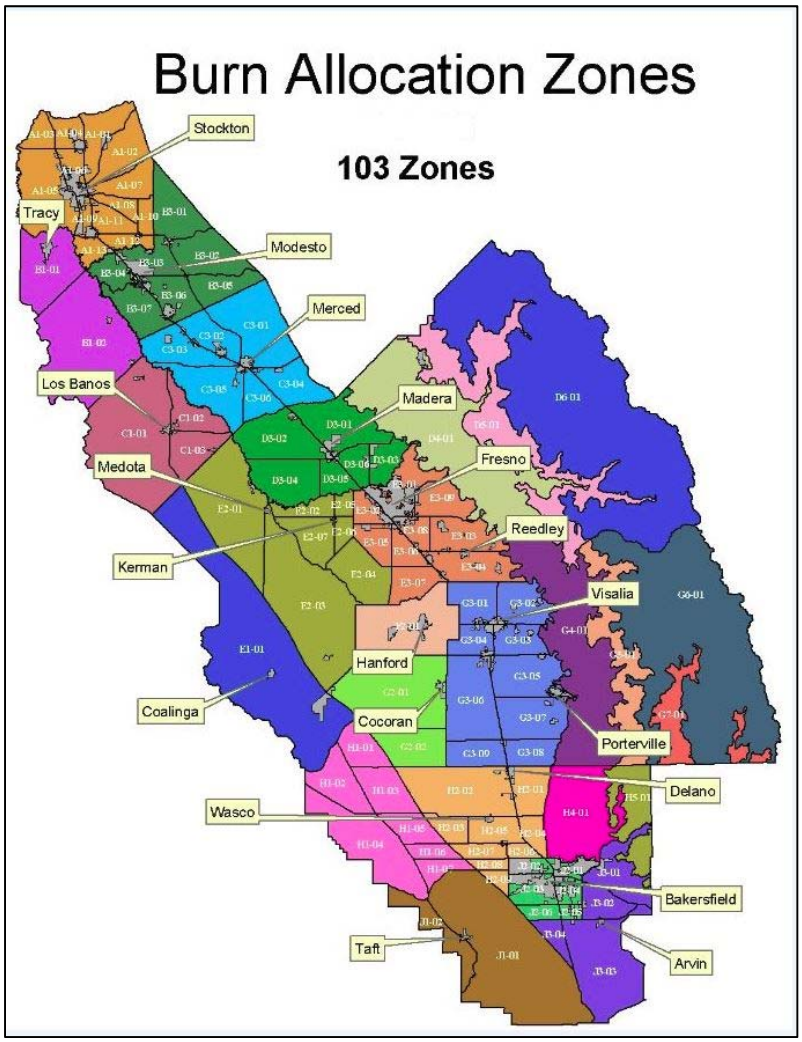
Rule 4103 was originally adopted on June 18, 1992 and it has been amended several times to incorporate state law requirements. In 2003, California Senate Bill (SB) 705 (CH&SC Section (§) 41855.5 and 41855.6) established a schedule for specific types of agricultural material to no longer be openly burned in the field, but provided for a postponement of the phase-out where justified by technical and economic impediments. The air quality impacts from open burning in the Valley are of significant concern for the District and Valley growers; as such, Valley growers have reduced open burning through the use of sustainable agricultural practices. Those practices have contributed to a significant reduction in PM emissions since 1992.

The historical cultural practice for disposing of agricultural materials, such as prunings and orchard removals, is to burn the materials. Burning agricultural materials provided an economically feasible method for the timely disposal of these materials, helped prevent the spread of plant diseases, and controlled weeds and pests. As part of implementing SB 705 and enhancing the effectiveness of the District's burn reduction efforts, in 2004 the District established the Smoke Management System (SMS), a more refined method of authorizing or prohibiting individual burns, based on modeled smoke impacts. Rule 4103 and the District's SMS have reduced the total acreage of agricultural materials burned in the Valley to date by more than 80% since 2002.

Smoke Management System

The District uses the SMS to manage the Valley's remaining open burning of agricultural crops and materials. The District's air quality forecasters incorporate projected meteorological information and air quality statistical modeling to determine the amount and location of agricultural burning that can be allowed without resulting in ambient air pollutant concentrations that exceed federal health-based standards. Through the results of this daily analysis, the SMS allows the District to manage 103 burn zones in the Valley through allocating daily burning allowances in each zone based on local meteorology, the air quality conditions, the atmospheric holding capacity, the amount of burning already approved in a given area, and the potential impacts on downwind populations (see Figure C-1). This approach allows the District to better distribute air pollutant emissions from open burning temporally and spatially, providing flexibility of burn days for growers while minimizing the impact on the public.

Figure C-1 Agricultural Burn Zones Defined in the District SMS



Properly managed burning allocations under the existing District SMS ensures that air quality and health impacts of open burning of agricultural materials, prescribed burning, and hazard reduction burning are minimized to the fullest extent feasible. Under the SMS, emissions within a zone are limited to levels below the exceedance threshold of any applicable federal ambient air quality standard and burns are not allowed in zones on days when exceedances of the federal standards are projected to occur in that zone. Additionally, zones directly adjacent to an area where open burning is restricted are also allocated zero emissions in an effort to reduce pollutant transport into an area with already elevated pollutant concentrations.

During the wood-burning season from November through February, the District implements even tighter open burning restrictions based on the daily residential wood-burning declarations issued for the Check Before You Burn program. With the recent amendment of Rule 4901, residential wood-burning with unregistered devices is no longer allowed when an area's forecasted PM2.5 concentration is expected to be greater than or equal to 20 $\mu g/m^3$. This threshold is now lower compared to past years

when it was set at 30 μg/m^3. To be consistent with the residential wood-burning declaration, an area's burn zones in SMS are allocated zero emissions when residential wood-burning is prohibited in that area. Following similar procedures discussed above, zones directly adjacent to an area where residential wood-burning is restricted are also allocated zero emissions. Under this policy, agricultural burning is placed under tighter control during the winter season and burning is only allowed when air quality is expected to be below 20 μg/m^3, when meteorological conditions are projected to be conducive for pollutant dispersion, which is well below the current federal 24-hour average PM2.5 standard of 35 μg/m^3.

Under the SMS, individuals who need to burn their agricultural waste first submit their permit request to the District, which includes information regarding the material that needs to be burned and the location of the burn project (see attachment for sample burn permit). If there are positive air quality and atmospheric dispersion conditions, the District allocates a certain amount of emissions to the applicable burn allocation zone. The SMS will then automatically call the specified contact's phone number to notify them that burn allocation is available in their zone for their project. Through the phone system, the individual can then either notify SMS that they will proceed with their burn or hold off until another time.

Through this process, SMS is able to automatically manage and notify a large number of stakeholders in the agricultural community on whether they can proceed with their burn project. If there are more requests for burning than there are emissions allocated in the system for a day, those individuals will be placed on a waiting list and given priority when another burn window opens.

As agricultural burning projects are occurring across the Valley, District air quality enforcement staff inspect the region to observe permitted agricultural burns to ensure their practices conform to District regulations. In addition, on days when agricultural burning is not permitted, enforcement staff inspect the region to ensure that un-permitted agricultural burning is not occurring and to issue notices of violation (NOVs), as needed.

The continued issuance of burn permits for certain crop categories is not expected to cause or substantially contribute to a violation of an applicable federal ambient air quality standard because the District follows its SMS procedures.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	2.27	2.27	2.26	2.26	2.25	2.25	2.24	2.24	2.23
NOx	1.61	1.60	1.60	1.59	1.59	1.59	1.58	1.58	1.57
SOx	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Winter Average - Tons per day								
PM2.5	3.47	3.46	3.46	3.45	3.44	3.43	3.43	3.42	3.41
NOx	2.44	2.44	2.43	2.42	2.42	2.41	2.41	2.40	2.39
SOx	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

As previously stated, the emissions from this source category continue to decline and contribute 5.2% of average winter NOx and 5.6% of average winter PM2.5 emitted from stationary and area sources in the 2014 emission inventory. District regulatory efforts have fostered significant reductions in emissions from this source category.

As detailed in Chapter 5, the significance threshold for source categories for the purpose of evaluating the application of BACM and MSM requirements is 1.4 tons per day (tpd) for PM2.5 combustion emissions, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from open burning are lower than the NOx and SOx BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a NOx and SOx control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for Rule 4103.

How does District Rule 4103 compare to federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

The following state regulation applies to sources covered under Rule 4103:

- CH&SC §41850-41866 (Agricultural Burning)

The District has continued to work closely with the stakeholders to identify economically feasible alternatives to open burning of various agricultural materials and to meet its legal obligation under the CH&SC. To fulfill the state law requirements, the District has implemented the requirements for most crop categories identified in CH&SC §41855.5. In addition to those requirements, the state law authorizes the District to postpone the burn prohibition dates for specific types of agricultural material if the District makes three specific determinations and the Air Resources Board (ARB) concurs. The determinations are: (1) there are no economically feasible alternatives to open burning for that type of material; (2) open burning for that type of material will not cause or

substantially contribute to a violation of an air quality standard; and (3) there is no long-term federal or state funding commitment for the continued operation of biomass facilities in the Valley or the development of alternatives to burning.

The District amended Rule 4103 in April 2010 to incorporate CH&SC requirements and committed the District to review its determinations for any postponed crops and materials at least once every five years. In 2010, the District also evaluated each crop category identified in CH&SC §41855.5 to determine any technologically and economically feasible alternatives to open burning. After working extensively with stakeholders to understand viable alternatives to open burning and the associated costs, the District provided recommendations for allowing or prohibiting the open burning of agricultural material categories in the District's *2010 Final Staff Report and Recommendations on Agricultural Burning*. ARB concurred with the District's determinations and recommendations; however, ARB made a one-time request that the District re-visit the 2010 findings after two years to determine if additional reductions in open burning were feasible.

The District revisited its 2010 analysis in 2012 and submitted those findings to ARB. The 2012 Report showed that in the two years since the 2010 Report, there had been no significant changes in the economic feasibility of various alternatives to agricultural burning. The amount of agricultural materials accepted at biomass facilities continued to fluctuate based on market conditions and there were no long-term federal or state funding commitments for the operation of biomass facilities or development of alternatives to burning. EPA finalized approval for Rule 4103 on January 4, 2012 and deemed this rule as at least meeting RACT requirements.[17] The District most recently reevaluated the availability of alternatives to open burning in the *2014 Reasonably Available Control Technology Demonstration for the 8-Hour Ozone State Implementation Plan* (*2014 RACT SIP*). The District is committed to review its determinations for any postponed crops and materials by December of 2015.

Current Status of Biomass Facilities

Biomass power plants in the Valley will generally accept agricultural, forestry, construction, and urban residues. The power plants burn the material in combustors to produce steam and the steam is then used to spin turbines to generate electricity.

Biomass power plants do not universally accept all agricultural material due to concerns that some materials may harm power plant machinery. Several issues have been noted concerning the types of material, such as citrus chips, that can be burned by the biomass power plants and the amount of agricultural materials that is accepted at the plants at any given time.

Using the orchard removal materials for fuel at the biomass power plant is currently the most viable and cost effective alternative to open burning for growers due to available

[17] Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District, 75 Fed. Reg. 2, pp 214-217 (2012, January 4). (to be codified at 40 CFR Part 52)

tax credits for biomass facilities and required agricultural offsets for some biomass power plants. However, the ability to meet the needs of the agricultural industry in a timely and cost effective fashion is a critical factor in any action taken by the District to address the biomass industry's long-term viability as an alternative to open burning. Farmers need certainty and timely removal of material so that they do not miss planting seasons. In the past, lack of coordination and available storage for biomass fuels has led to uncertainty as to when material would be removed from the field. This has been a major concern of the agriculture industry. If the process is not optimized, it can quickly result in a system that does not meet agriculture's needs.

In addition, the reliance on biomass fuel as a primary alternative to open burning is somewhat uncertain since there are no long-term federal or state funding commitments for biomass facilities in the Valley. In fact, the biomass industry has indicated that given current energy policy in California there is concern that biomass power facilities are in jeopardy. Many biomass plants in the Valley are nearing the end of their long-term contracts with utilities and find themselves in a position where the power that they provide is not the type of power that utilities are seeking (base load vs. intermittent) and that the prices being offered for new contracts are too low to support their operations.

Two biomass power plants serving the Valley have shut down due to their inability to secure contracts with utilities at rates that are sufficient to sustain their operations. Greenleaf Power that operates the Tracy Biomass Plant, located in Tracy, reported that they shut down on October 31, 2014 and the Covanta facility located in Mendota was shut down in January 2015. Initially, another Covanta facility in Delano had indicated that they were likely to shut down, but is now reporting that they were able to secure a one-year extension on their current utility contract at the same rate that enables them to continue to operate.

Staff has convened a number of productive meetings with agricultural stakeholders and representatives of the biomass industry in order to more fully understand the issues faced by the industry and develop a common vision of the future of biomass power amongst the stakeholders in the Valley. The meetings have been helpful in forging a better working relationship between agriculture representatives and biomass power producers and developing consensus on short-term and long-term solutions.

The District and representatives from agriculture and biomass industries are working to develop and pursue specific actions with the legislative branch, utilities, Public Utility Commission, CalRecycle, and other government agencies to help level the playing field and allow the biomass industry to fairly compete.

In June 2014, the District's Governing Board adopted positions on two pieces of legislation that impact the biomass industry. The District adopted a position in support of AB 2363 (Dahle), which was sponsored by the biomass industry, and would make biomass plants more competitive by fully accounting for the costs associated with intermittent sources of renewable power (solar and wind) when comparing them to other sources of power. AB 2363 was signed by the Governor and will begin to help level the renewable energy playing field. The District also took a position in opposition to SB

1139 (Hueso) that would have given preferential treatment to new geothermal power plants by requiring that utilities purchase specified amounts of new geothermal power. Ultimately, AB 1139 was not passed by the legislature.

The District is also working with the stakeholders, including the Federal Department of Energy, California Energy Commission, and other partner agencies, to pursue clean alternatives to biomass power production for agricultural waste disposal.

How does District Rule 4103 compare to rules in other air districts?

BAAQMD

- Regulation 5 (Open Burning)

The District evaluated the requirements contained within BAAQMD's Regulation 5 and found no requirements that were more stringent than those already in Rule 4103. BAAQMD Regulation 5 was amended on June 19, 2013 to add new fee requirements. The amendments did not implement any requirements more stringent than the current requirements in District Rule 4103.

SMAQMD

- Rule 407 (Open Burning)

The District evaluated the requirements contained within SMAQMD's Rule 407 and found no requirements that were more stringent than those already in Rule 4103.

VCAPCD

- Rule 56 (Open Burning)

The District evaluated the requirements contained within VCAPCD's Rule 56 and found no requirements that were more stringent than those already in Rule 4103.

SCAQMD

- Rule 444 (Open Burning)

The District evaluated the requirements contained within SCAQMD's Rule 444 and found no requirements that were more stringent than those already in Rule 4103. SCAQMD Rule 444 was amended on July 12, 2013 to include beach burning in the rule applicability. The amendments apply to sources that do not exist within District's boundaries. Rule 444 also restricts burning on residential wood combustion curtailment days. As discussed in detail above, this is a practice that has already been implemented within the District. District Rule 4103 is still as stringent as SCAQMD Rule 444.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in another area or included in another state implementation plan. As demonstrated above, Rule 4103 currently has in place the most stringent measures

feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. Therefore, there are no recommendations for additional regulatory actions for Rule 4103.

The District carefully manages agricultural burning with its SMS with even tighter open burning restrictions based on the daily residential wood-burning declarations issued within the Check Before You Burn program. With the recent amendment of Rule 4901, residential wood-burning with unregistered devices is no longer allowed when an area's forecasted PM2.5 concentration is expected to be greater than or equal to 20 $\mu g/m^3$. This threshold is now lower compared to past years when it was set at 30 $\mu g/m^3$. Burning is only allowed when air quality is forecasted to be below 20 $\mu g/m^3$, which is well below the current federal 24-hour average PM2.5 standard of 35 $\mu g/m^3$. By restricting open burning to this level, impacts to ambient air quality are significantly minimized and are not expected to contribute to a violation of the federal PM2.5 standards. Furthermore, the District continues to consider the economic feasibility of burning alternatives on a case-by-case basis and in accordance with the five year evaluation period outlined in Rule 4103 with the next evaluation scheduled for 2015.

Further progress and complete phase-out of agricultural burning requires economically feasible alternatives that do not currently exist. Subsidies or preferential utility rates for power produced from biomass can serve as measures to enhance the economic feasibility of this alternative. Additional research is also needed to identify other technologically and economically feasible alternatives. A comprehensive strategy to promote these alternatives will also help in meeting renewable power goals and standards. As the District continues to develop new attainment plans that address increasingly stringent federal air quality standards, the District will continue to evaluate potential opportunities to reduce emissions from open burning in the Valley.

Figure C-2 Sample Agricultural Burn Permit (Front Page)

San Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue, Fresno, CA 93726
Smoke Management Program (559) 227-7143 or 1 (800) 665-BURN (2876)
www.valleyair.org

PERMIT FOR AGRICULTURAL BURNING

SJVAPCD
DISTRICT_T SMS-TESTING
1990 EAST GETYSBURG
FRESNO, CA 93726

Permit #: **140111**
Security Code: 5252
Expiration Date: 3 February 2017

Location and Crop List

Location Number	LocationDescription (Cross Streets)	Acres	County	Crop Code	Material allowed to be burned
1	1990 EAST GETTYSBURG WEB TEST(A1-01)	30	FRESNO	140	* ALMOND PRUNING <20
				151	* ALMOND ATTRITION

* Indicates a restriction exists for this crop. Refer to Crop Restrictions for details.

Crop Restrictions

140: ALMOND PRUNING <20 ACRES - Pruning do not include suckers, dead or broken branches and trees, or orchard removals. This crop code is limited to a total of 20 land acres across all agricultural operational sites per year.

151: ALMOND ATTRITION - Attrition materials include suckers and dead or broken branches and trees, but do not include annual prunings or orchard removals. When requesting to burn attrition materials using the automated system, report each ton of material as one acre.

GENERAL BURN PERMIT CONDITIONS

1. **Please read and follow all permit conditions.** All burning shall conform to general conditions 1-14, any site-specific conditions of this permit, and any applicable local and state regulations.
2. **Igniting an open burn without first receiving a burn authorization with a confirmation number is a violation subject to penalties.** Prior to ignition, you must contact the District to obtain burn authorization by calling **(559) 227-7143** or **1 (800) 665-BURN (2876)**, or accessing the District's web site via the Internet at **www.valleyair.org**. A confirmation number will be provided to you once the burn has been approved.

Please refer to the backside of this permit for additional conditions.

(Back Page)

GENERAL BURN PERMIT CONDITIONS – Continued

3. **All ignition and burning shall comply with any special conditions given at the time of authorization.** Daily authorizations are required in cases where burning continues for more than one day. Materials and/or piles burning for more than one day may not be moved or actively tended to promote burning without a daily authorization.

4. **The permit holder is responsible for monitoring and managing the smoke created by the burn.** Burning shall cease immediately if the smoke impacts sensitive receptor areas. Active burns may be extinguished at the owner's expense if it becomes necessary for public health and safety or if the burn creates a nuisance as determined by the District or any public officer. Creating a nuisance will result in the issuance of a Notice of Violation to the permit holder.

5. **This permit is valid only for the materials listed on the permit.** The burning of any other types of materials, such as petroleum wastes; demolition or construction debris; garbage and residential rubbish; non-agricultural vegetation; tires; tar; wood waste; chemically treated, painted, or stained wood; or other combustible or flammable solid, liquid, or gaseous wastes is prohibited.

6. **Orchard or vineyard removals must be specifically listed on the permit and additional burn restrictions may apply.**

7. **Minimum material drying times are required.** In cold or wet seasons or for certain crop residue it will be necessary to extend these minimum drying times in order to facilitate burning with the least amount of smoke.

Spread rice straw	3 days	Prunings and small branches	3 weeks
Rowed rice straw	10 days	Large branches and trees	6 weeks

8. **Materials shall be properly dried and loosely stacked to facilitate efficient combustion.** Piles shall be free of dirt, soil, and visible surface moisture in order to avoid smoldering or excessive smoke. Smoldering produces twice the smoke and is a rule violation.

9. **Burns are to be ignited by the use of approved ignition devices that will ignite the burn without the production of black smoke.** Approved ignition devices include: matches, paper, and flame producing devices (i.e. propane or gas burners). The spraying or dousing of materials with any accelerant such as gasoline or diesel fuel or using other types of flammable materials (e.g. motor oil or tires) to ignite an open burn is prohibited.

10. **Open burning is limited to materials produced in commercial agricultural operations.** Regardless of where they are produced, waste materials from landscaping, family orchards, or private garden crops cannot be burned. Such waste materials should be disposed of by other legal methods such as recycling, chipping, mulching, composting, or re-incorporation into the soil.

11. **Materials may not be transported from one location to another for burning.** Materials may only be burned at the location where they were produced.

12. **Paper pesticide, fertilizer, and seed sacks shall only be burned in the field where they are emptied.** The burning of plastic sacks or jugs, cardboard boxes, and packing materials is prohibited. These must be disposed of by recycling or proper waste disposal. Commercial applicators are not eligible to obtain agricultural burn permits for burning these and other materials under any circumstances.

13. **The burn area or materials shall not be left unattended until the burn is extinguished and dead out.** The law requires the application of common sense and reasoning by persons using fire so the fire does not escape control and do damage to others. Burning shall be attended by a sufficient number of able-bodied adults with adequate tools and equipment to control the fire at all times. The burn shall be confined by cleared firebreaks or barriers adequate to prevent it from escaping control.

14. **This permit may be revoked or suspended for violations of any burn permit condition, rule requirement, or if necessary for the protection of public health and safety.** Any person who violates any provision of the District's Rules and Regulations can be subject to significant penalties plus the costs associated with extinguishing the fire.

The issuance of this permit shall not be construed as imposing on the issuing agency, any official, or any employee thereof any responsibility whatsoever for damages incurred by the use of the permit.

Our air quality standards are health-based standards. Please keep in mind that they exist for everyone's benefit.

For burn authorization, please call (559) 227-7143 or 1 (800) 665-BURN (2876), or access the District's web site via the Internet at www.valleyair.org.

Reference Authority: SJVAPCD Open Burning Rule 4103, Nuisance Rule 4102, the California Health and Safety Code § 41852 and § 41853 of California Code of Regulations Title 17.

C.2 RULE 4104 REDUCTION OF ANIMAL MATTER

Discussion

Rule 4104 is applicable to any source operation used for the reduction of animal matter. Adopted on May 21, 1992, primarily to control pathogens, this rule was amended for District rule number reorganization on December 17, 1992. Rule 4104 requires 100% VOC capture and a high level of destruction (1,200 degrees for 0.3 seconds). EPA finalized approval for Rule 4104 on March 9, 2010 and deemed this rule as being at least as stringent, if not more stringent than, RACT requirements.

Source Category

The reduction of animal matter includes rendering, cooking, drying, dehydration, digesting, evaporating, and protein concentration processes. The emission control equipment for these processes generally includes a condenser for VOC control and a venturi scrubber or cyclone, followed by either a packed bed scrubber or a thermal oxidizer. Blood drying facilities have additional processes controlled by cyclones and a baghouse.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

These facilities generally use steam from a boiler (indirect-fired) or a rotary dryer (direct-fired) for their operations, which generates NOx emissions from these combustion units. Combustion units are regulated by other District rules; as such, those emissions are controlled by and accounted for as a part of other District rules.

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from this source category are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for the reduction of animal matter.

How does District Rule 4104 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 4104 compare to rules in other air districts?

SCAQMD
- Rule 472 (Reduction of Animal Matter)

The District evaluated the requirements contained within SCAQMD's Rule 472 and found no requirements that were more stringent than those already in Rule 4104.

BAAQMD
- Regulation 12 Rule 2 (Rendering Plants)

The District evaluated the requirements contained within BAAQMD's Regulation 12 Rule 2 and found no requirements that were more stringent than those already in Rule 4104.

SMAQMD
- Rule 410 (Reduction of Animal Matter)

The District evaluated the requirements contained within SMAQMD's Rule 410 and found no requirements that were more stringent than those already in Rule 4104.

VCAPCD
- Rule 58 (Reduction of Animal Matter)

The District evaluated the requirements contained within VCAPCD's Rule 58 and found no requirements that were more stringent than those already in Rule 4104.

Additional Emission Reduction Opportunities

Packed Bed Scrubbers
The District evaluated the potential opportunity to reduce emissions if facilities were to replace their thermal oxidizers with packed bed scrubbers. In certain installations, packed bed scrubbers may be more efficient at removing PM from the exhaust and additionally do not generate NOx or SOx emissions. However, determining the scrubber medium may take some experimenting on the part of the facility to ensure it does not cause an increase in emissions or violate other District rules. It would also need to be replaced periodically, adding to the cost of upkeep. Thermal oxidizers do

not present similar issues. Also, facilities subject to Rule 4104 produce only a very small amount of directly emitted PM2.5 and are otherwise already required to have a high level of control for emissions. The current requirements are as stringent as possible for these types of facilities.

Regenerative Thermal Oxidizers

The District also evaluated the potential opportunity to reduce emissions from facilities by replacing thermal oxidizers with regenerative thermal oxidizers (RTOs) with heat recovery, which is a current practice at some facilities in the Valley. RTO devices use less supplementary fuel. While using less fuel may reduce NOx emissions, this is not necessarily the case. The PM control efficiency is nearly the same for both thermal oxidizers and RTOs, and the total NOx emissions from this category are relatively small given that there are only a few units subject to this rule that are not already subject to other combustion rules limiting NOx emissions. Any new units would be evaluated through the District's Best Available Control Technology New Source Review requirements.

Evaluation Findings

Even though the reduction of animal matter is not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4104 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from this source category in the Valley.

C.3 RULE 4106 PRESCRIBED BURNING AND HAZARD REDUCTION BURNING

Discussion

Adopted in June 2001 and approved by EPA as a SIP amendment in February 2002, [18] Rule 4106 is applicable to all prescribed burning and to hazard reduction burning in the wildland/urban interface within the Valley. Rule 4106 incorporated provisions made necessary by the March 23, 2000 amendment of Title 17 of the California Code of Regulations. Recognizing the importance of both prescribed burning and hazard reduction burning, the purpose of Rule 4106 is to permit, regulate, and coordinate the use of prescribed burning and hazard reduction burning while minimizing smoke impacts on the public. Through this rule, the District has expended considerable resources to ensure that the ignition of burn projects is only allowed when air quality and dispersion conditions are favorable, thus lessening the health impacts on Valley citizens and on air quality in the Valley.

Source Category

This rule is applicable to range improvement burning, forest management burning, wildland vegetation management burning, and hazard reduction burning. Agricultural burning, which is subject to Rule 4103, is generally done by farmers to dispose of tree prunings, crop residue, and other agricultural materials; disease and pest control; and orchard removal. In contrast, prescribed burning generally includes forest waste, fire hazard reduction, rangeland management, wildlife habitat improvement, and ecosystem (forest health) burning.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.76	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.77
NOx	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
SOx	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Winter Average - Tons per day								
PM2.5	0.88	0.88	0.88	0.88	0.89	0.89	0.89	0.90	0.90
NOx	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11
SOx	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from prescribed burning and hazard reduction burning are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does

[18] 67 Federal Register 39, pp. 8894-8897 (to be codified at 40 CFR Part 52). (2002, February 27). *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District*. Retrieved from https://www.federalregister.gov/articles/2002/02/27/02-4526/revisions-to-the-california-state-implementation-plan-san-joaquin-valley-unified-air-pollution.

not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for prescribed burning and hazard reduction burning.

How does District Rule 4106 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 4106 compare to rules in other air districts?

SCAQMD
- Rule 444 (Open Burning)

The District evaluated the requirements contained within SCAQMD's Rule 444 and found no requirements that were more stringent than those already in Rule 4106.

BAAQMD
- Regulation 5 (Open Burning)

The District evaluated the requirements contained within BAAQMD's Regulation 5 and found no requirements that were more stringent than those already in Rule 4106.

SMAQMD
- Rule 501 (Agricultural Burning)

The District evaluated the requirements contained within SMAQMD's Rule 501 and found no requirements that were more stringent than those already in Rule 4106.

VCAPCD
- Rule 56 (Open Burning)

The District evaluated the requirements contained within VCAPCD's Rule 56 and found no requirements that were more stringent than those already in Rule 4106.

Placer County APCD (PCAPCD)
- PCAPCD Rule 301 (Nonagricultural Burning Smoke Management)

The District evaluated the requirements contained within PCAPCD Rule 301 and found no requirements that were more stringent than those already in Rule 4106.

- PCAPCD Rule 303 (Prescribed Burning Smoke Management)

The District evaluated the requirements contained within PCAPCD Rule 303 and found no requirements that were more stringent than those already in Rule 4106.

Additional Emission Reduction Opportunities

Prescribed Burning Emission Reduction Opportunities

Land Management Agencies (LMAs) are the agencies that regularly conduct prescribed burning operations. Since the adoption of Rule 4106, the District has developed cooperative relationships with the LMAs. Through this cooperation, the District advises the LMAs on which days would be the most conducive for igniting a burn project, based on air quality and meteorological conditions. The District continues to work with LMAs to identify favorable burning conditions with the goal of completing a maximum number of prescribed burning projects while minimizing air quality impacts. This collaborative effort ensures that the ignition of burn projects occurs when air quality and dispersion conditions are favorable, thus lessening the impacts on air quality in the Valley. Potential opportunities to reduce emissions from prescribed burning include the mechanical removal of the materials, firebox air curtain burners, and management of wild fires.

Mechanical Removal of Materials

One potential option to reduce burning materials would be to physically remove material from a project site. As these locations are not near roadways, it is often not practical or possible to bring mechanical equipment to remote and dense forest lands to collect and remove the material. Additionally, mechanical removal is much more expensive for the LMAs, who are already subject to budgeting restrictions, to reduce the fuels in an area as compared to burning. Mechanical removal of materials from forest areas is not technologically or economically feasible.

Firebox Air Curtain Burners

Assuming that a LMA could mechanically remove all of the material from a project burn site and that the material was placed in piles and prepared for burning, an alternative to open burning would be to use a firebox air curtain burner. A firebox air curtain burner is a device that circulates large volumes of air over a burning fire in an open topped fire proof metal box. When compared to open burning, firebox air curtain burners have been shown to greatly reduce PM and carbon dioxide emissions; however, the potential NOx emissions compared to open burning have not been fully evaluated yet. Because the Valley is a NOx-limited area, more research on the technology is needed to verify that there would be potential NOx emission reductions by switching from open burning practices to the use of firebox air curtain burners.

Wildfires

Often, primarily during the warm summer months, wildfires are naturally ignited through lightning strikes from passing storms. These wildfires have the potential to produce significant emissions and heavily impact residents within the Valley. When these wildfires occur, the District works with the responsible LMA in managing the fire as the

dispersion and air quality conditions fluctuate. This cooperation allows the LMA to be more aggressive with the fire when meteorological conditions are favorable and more defensive when the conditions are poor. The District will continue to use the tools available to guide the activities of LMAs when wildfires occur, and is continuously seeking opportunities to work with LMAs to improve the management of these fires in order to reduce emissions and impacts to Valley residents.

Hazard Reduction Burning Emission Reduction Opportunities

Hazard reduction burning is used exclusively by landowners in the wildland/urban interface within the foothill and mountain regions in the State Responsibility Areas, which comprise about 20% of the total land area in the Valley. Section 4291 of the California Public Resources Code (CPRC) states that structures must maintain a defensible perimeter of 100 feet in all directions; this defensible perimeter is commonly created through the clearing of vegetation. Although Section 4291 does not require it, most of this vegetation is burned because it is less expensive, faster, and more convenient than other options. Potential opportunities evaluated below include the reorganization of hazard reduction zones and alternatives to burning the vegetation.

Reorganization of Hazard Reduction Zones

Under Rule 4106, hazard reduction burning is only allowed when the District forecasts favorable air quality and dispersion conditions. Currently this forecast is based on a county-by-county basis, with appropriate elevation breaks. As an improvement to this zone system, and similar to agricultural burning, the Valley could be separated into smaller hazard reduction zones to provide more effective smoke management. Managing the allowance of hazard reduction burning under this type of scheme also has the potential to limit smoke impacts on residents. Establishing this type of management system would not cause an increase in costs for landowners, making this a cost effective opportunity. However, emissions reduced, if any, would be minimal, since the burning would still occur, just on different days when conditions are favorable.

Alternatives to Burning

As an alternative to the open burning of the vegetation, the District could encourage alternative methods like chipping or burn boxes through grant programs targeted at communities that regularly conduct hazard reduction burning.

1. Chipping

One potential alternative to the open burning of material is to use a chipper to break down the material into small pieces suitable for landscaping, dust control cover, or biomass burning. Evaluation of this alternative option revealed that chippers are not a viable alternative. The requirement by the CPRC to maintain a defensible perimeter of 100 feet is enforced annually; therefore, the organic materials to be cleared and disposed of consist of leaves, pine needles, weeds, and some small brush, all of which are not acceptable materials for wood chippers.

2. Firebox Air Curtain Burners

Another potential opportunity examined is the feasibility of usage of a firebox air curtain burner, which was described earlier. Again, this is not a feasible option for the Valley because the potential NOx emission reductions have not been verified.

3. Biomass Removal Program

A potential opportunity to reduce emissions from hazard reduction burning would be by removing the biomass from the area and sending it for combustion at a biomass plant, similar to a pilot program implemented by the PCAPCD in 2007. The pilot program in Placer County was evaluated below to determine feasibility for implementation in the Valley.

PCAPCD Program

PCAPCD implemented a "Biomass Box" program beginning in the spring of 2007 to collect and utilize biomass that would traditionally be collected and burned as a part of hazard reduction efforts, for use as fuel for producing energy. The program, funded with a grant from PCAPCD, collected the biomass by distributing 20 to 40 foot industrial containers throughout participating communities in the county. When full, the containers were transported to another location where the materials were grinded into useable fuel that biomass energy companies could accept. The chipped biomass was then loaded onto larger trucks and hauled to one of two biomass facilities.

Figure C-3 Image of a Typical 40' Biomass Box Used in Placer County in 2007

The final report by PCAPCD that evaluated this pilot program documented that from an emissions reductions standpoint the project was a success, with net air pollution reductions at 88.6%, including 24.7 tons of particulates and 4.0 tons of NOx reduced at a cost of $80,000. Based on the perceived success of this study, the District

evaluated this pilot program for potential emissions reductions and feasibility of implementation in the Valley.

Hazard reduction in Placer County is overseen by the Placer County Biomass Program with help from local fire departments and land managers. The Placer County Biomass Program and PCAPCD confirmed that the community biomass bins are no longer prominently used. The program was initially designed to change the culture of hazard reduction burning by providing an alternative to burning. However, the bin program proved to have many complications that rendered it an ineffective program. One issue was that residents were disposing of items other than biomass into the bins. This caused problems for the chippers and produced less than ideal fuel for biomass plants. Additionally, PCAPCD determined that the transport of biomass bins any further than 30 miles round trip was cost prohibitive.[19]

A few biomass bins were still in use as of 2013, but only in communities that explicitly requested them following the 2007 pilot project. PCAPCD determined that there are more cost effective options for removing residential biomass then using community biomass bins, such as using mobile chippers to provide residents with a low cost "curb side" chipping service. The chipped biomass is blown back onto the property for use as mulch or as a dust suppressant. The program is supported in part by grants from Placer County Resource Conservation District, Placer County Sheriff's Department, PCAPCD, and Calfire. As stated above, chipping is not a feasible option to implement in the Valley.

Evaluation Findings

Even though prescribed burning and hazard reduction burning are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4106 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from prescribed burning and hazard reduction burning in the Valley.

[19] Storey, B., Biomass Program Manager, Placer County Executive Office, Personal Communication.

C.4 RULE 4203 PARTICULATE MATTER EMISSIONS FROM THE INCINERATION OF COMBUSTIBLE REFUSE

Discussion

Rule 4203 is applicable to any person, operation, facility, incinerator, or equipment used to dispose or process combustion refuse. The rule limits the concentration of particulate matter emissions based on process weight rates, and prohibits the discharge of visible emissions. Rule 4203 was adopted on May 21, 1992 and subsequently amended for District rule number reorganization on December 17, 1992.

Source Category

There are currently 3 facilities in the Valley subject to Rule 4203. Units subject to this rule already meet BACT level requirements, which require the mitigation of air pollution to the maximum degree achievable using control technologies like baghouses and lime scrubbers.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance threshold for source categories for the purpose of evaluating the application of BACM and MSM requirements is 1.4 tons per day (tpd) for PM2.5 combustion. As identified in the above table, emissions from the incineration of combustible refuse are lower than the BACM/MSM PM2.5 significance threshold. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for the incineration of combustible refuse.

How does District Rule 4203 compare with federal and state rules and regulations?

Federal Regulations

There are no specific federal guidelines for particulate matter concentration in terms of EPA CTG, ACT, NSPS, NESHAP, or MACT requirements. EPA BACT standards require the use of a fabric filter or baghouse. District BACT standards are as stringent and require existing facilities to use a natural gas supplemental fuel with a baghouse.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 4203 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 473 (Disposal of Solid and Liquid Wastes)

The District evaluated the requirements contained within SCAQMD's Rule 473 and found no requirements that were more stringent than those already in Rule 4203.

SMAQMD
- Rule 407 (Open Burn)

The District evaluated the requirements contained within SMAQMD's Rule 407 and found no requirements that were more stringent than those already in Rule 4203.

VCAPCD
- Rule 57 (Incinerators)

The District evaluated the requirements contained within VCAPCD's Rule 57 and found no requirements that were more stringent than those already in Rule 4203.

Evaluation Findings
Even though particulate matter emissions from the incineration of combustible refuse are not a significant source of PM2.5 in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4203 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from the incineration of combustible refuse in the Valley.

C.5 RULE 4204 COTTON GINS

Discussion

Adopted on February 17, 2005, Rule 4204 is intended to reduce particulate emissions from cotton ginning facilities operating within the Valley. The implementation of this rule has achieved 0.79 tpd of PM10 reductions from this source category. EPA finalized approval of Rule 4204 on November 9, 2006 and deemed this rule as meeting established RACT standards.

The *2003 PM10 Plan* identified cotton gins as a significant source of PM10 emissions in the Valley. The federal CAA requires air districts designated as Serious nonattainment for PM10 to implement BACM, including BACT, on significant stationary and area sources of PM10 and PM10 precursors. Although many gins in the Valley were already retrofitted with 1D3D high-efficiency cyclones, considered BACT, the District developed Rule 4204 to assure that all cotton gins met BACT requirements at the earliest practicable date.

Source Category

There are two types of cotton gins: saw and roller. A saw gin is commonly used for short fiber cotton where the cotton is pulled across knifed edges to remove seeds and trash. A roller gin is instead used for long fiber cotton and the cylinders or rollers carry the cotton across screens or perforated metal where the trash is removed. Throughput for saw gins can be higher than that of a roller gin, but a roller gin produces a higher quality end-product.

Modern ginning uses pneumatic conveyance, in the form of fans blowing air, which moves the cotton gin material. Particulate matter emissions are the unwanted by-products of this otherwise very efficient means of transferring massive quantities of cotton gin material from one process to the next process, such as from unloading to drying and cleaning. PM emissions from cotton ginning facilities occur mostly during a three-month period from October to December, the time of year during which the Valley's ambient PM concentrations are highest.

Cotton ginning, the process of separating the lint from the seed, has evolved from a labor-intensive process capable of producing small quantities of cotton to a highly efficient industry producing millions of bales. With this increase in production came the problem of how to handle the debris made up of plant and soil material that comes from machine harvesting the cotton. Since cotton gins use large quantities of air for conveying, the use of cyclones for air pollution abatement was a logical choice.

Cotton gins are regulated through a combination of permit conditions and other prohibitory rules aside from Rule 4204. Permit conditions cite Rules 1070, 2201, 4101, 4102, 4201, and 4202 as the regulatory basis for cotton gins:

- **Rule 1070** requires the keeping of daily records, which are available for District inspection upon request.
- **Rule 2201** covers the following areas:

a. Type of cyclones or other control devices for specific exhaust points.
b. Allowable PM10 emission rate for the cotton gins as an integrated system and allowable PM10 emission rate for specific exhaust points.
c. Bale throughput in bales/day or bales/season.

- **Rule 4101** prohibits the discharge into the atmosphere of air contaminants for a period or periods aggregating more than three minutes in any one hour, which is as dark as or darker than Ringelmann 1 or 20% opacity.
- **Rule 4102** prohibits the release of air contaminants that causes a public nuisance.
- **Rule 4201** limits particulate matter emissions concentration to 0.1 grains/dscf or less.
- **Rule 4202** limits particulate matter emissions by establishing allowable emission rates based on process weights.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.22	0.22	0.23	0.22	0.22	0.23	0.23	0.24	0.24
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.34	0.35	0.35	0.35	0.35	0.36	0.36	0.37	0.37
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from cotton gins are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for cotton gins.

How does District Rule 4204 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4204 compare to rules in other air districts?

There are no analogous rules for this source category in SCAQMD, BAAQMD, SMAQMD, or VCAPCD.

Other Analogous Rules

- New Mexico Administrative Code 20.2.66.1 (Cotton Gins)

The District evaluated the requirements contained within New Mexico Administrative Code 20.2.66.1 and found no requirements that were more stringent than those already in Rule 4204.

- Louisiana Department of Environmental Quality, Title 33 (Environmental Regulatory Code), Part III (Air)

The District evaluated the requirements contained within Louisiana Department of Environmental Quality, Title 33 and found no requirements that were more stringent than those already in Rule 4204.

- North Carolina Administrative Code Title 15A, Subchapter 2D, Section .0542 (Control of Particulate Emissions from Cotton Ginning Operations)

The District evaluated the requirements contained within North Carolina Administrative Code Title 15A, Subchapter 2D, Section .0542 and found no requirements that were more stringent than those already in Rule 4204.

- South Carolina Air Pollution Control Regulations and Standards, Regulation 61-62.5, Standard No. 4, Section V (Cotton Gins)

The District evaluated the requirements contained within South Carolina Regulation 61-62.5, Standard No. 4, Section V and found no requirements that were more stringent than those already in Rule 4204.

- Oklahoma Department of Environmental Quality, Air Pollution Control, 252:100-23 (Cotton Gins)

The District evaluated the requirements contained within South Carolina Regulation 61-62.5, Standard No. 4, Section V and found no requirements that were more stringent than those already in Rule 4204.

- Texas Commission on Environmental Quality, Air Quality Standard Permit for Cotton Gin Facilities and Cotton Burr Tub Grinders

The District evaluated the requirements contained within the above rules and found no requirements that were more stringent than those already in Rule 4204.

Additional Emission Reduction Opportunities

Research and PM2.5 Fraction

Research was completed in 2013 by the United States Department of Agriculture Agricultural Research Service (USDA-ARS), in partnership with cotton associations, EPA, ARB, and the District to measure actual PM10 and PM2.5 emissions from stack sources and fugitive emissions in and around several ginning facilities. This research provided emission factors for comparison to previous estimations that are included in emission inventories and provided data for both types of cotton gins currently in use in California. This project was designed to measure emissions from facilities with current emissions control technologies in place and to improve emissions estimations by measurement with the highest quality methods and instruments. The project was not designed to evaluate new technologies or measures to further reduce emissions. Results for the seven gins that were sampled for the project indicate the estimated ratio of PM2.5 to PM10 is approximately 16%.[20] This fraction of PM2.5 to PM10 is lower than indicated in the emissions inventory currently being used. Future research will include particle size analysis of EPA Method 17 samples, and modeling to compare model output and ambient sampling data and develop suggested modeling corrections.

1D3D Cyclones with Expansion Chamber

Currently, all cotton gins in the Valley are required to operate using a 1D3D cyclone. About two thirds of the 1D3D cyclones used in the Valley have an expanded chamber outlet. Research has shown that an expansion chamber allows for more flow since it is not as narrow. In initial tests, a larger D/3 size expanded chamber exit produced PM10 emissions that were about 8% lower than those resulting from use of the standard, small-diameter (D/4) exit.[21] However, there is no completed research indicating the fraction of PM2.5 emitted or the effectiveness of reducing PM2.5 by installing an expanded chamber. Since 1D3D cyclones are already required by the current rule, and there is no definitive data to verify the effectiveness in reducing PM2.5 emissions with an expansion chamber, this is not a feasible opportunity to reduce emissions.

Loadout

Rule 4204 currently requires wind screens for loadout. Two potential opportunities to reduce emissions through control options to capture PM10 emissions from the truck loading operation were identified as follows: 1) venting the loadout area to pre-cleaning cyclones and a baghouse; and 2) venting the receiving pit to a 1D-3D cyclone. While it is technologically feasible to enclose the loadout area and receiving pits and vent to the respective control devices, the District's BACT Guideline 5.1.8 has found those options to not be cost effective. This analysis was calculated according to PM10 emission factors and again, the PM2.5 fraction is unknown at this time.

[20] United States Department of Agriculture, Agricultural Research Service. (2013). *Characterization of Cotton Gin Particulate Matter Emissions.* Obtained from http://buser.okstate.edu/air-quality/cotton-gin/national-study/.
[21] Baker R.V. and Hughs S.E. (1998). *Influence of Air Inlet and Outlet Design and Trash Exit Size on 1D3D Cyclone Performance*. Transactions of the ASAE, vol. 42(1): 17-21.

Mechanical Conveyance

Mechanical conveyance for the main trash handling system could be a potential opportunity to reduce emissions, but it has only been demonstrated as feasible for newly constructed or rebuilt cotton gins. Mechanical conveyance almost entirely eliminates emissions from cotton gin trash handling exhaust streams, which were previously moved pneumatically. The cotton gin trash handling systems only comprise a fraction of the emissions that are released from the full cotton ginning process. Newer or rebuilt cotton gins are able to accommodate a mechanical conveyance system since they are able to design the cotton gin around the equipment and space needed. Operators that have installed a mechanical conveyance system for their cotton gin have had to build a lower floor, below the main level containing the major cotton gin equipment, to house the mechanical conveyors. Therefore, as confirmed by industry representatives and equipment manufacturers, it is not technologically feasible to retrofit existing cotton gins with mechanical conveyance systems to replace existing trash handling equipment. Additionally, any new facilities would trigger New Source Review requirements and would be required to implement BACT level controls.

Plenum Chambers

Plenum chambers are in use at a number of cotton gins in the Valley. Plenum chambers are placed upstream of selected cyclones to remove large trash. Studies have been inconclusive in demonstrating an increase in PM control efficiency with the utilization of a plenum chamber. Most cotton ginning facilities that have installed plenum chambers are using those devices to reduce wear and tear on the cyclones, thus prolonging the life of the cyclones, and not for increased PM controls.

Evaluation Findings

Even though cotton gins are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4204 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from cotton gins in the Valley.

C.6 RULE 4301 FUEL BURNING EQUIPMENT

Discussion
Rule 4301 was last amended in 1992 and applies to all types of fuel burning equipment, except air pollution control equipment. The purpose of this rule is to limit emissions of air contaminants from fuel burning equipment by specifying maximum emission rates for SOx, NOx, and PM (identified in the rule as combustion contaminant emissions). EPA finalized approval of the 1992 amendments to Rule 4301 on May 18, 1999 and deemed this rule as being at least as stringent as established RACT requirements.

Source Category
Rule 4301 has a very broad applicability, as it applies to all types of fuel burning equipment. Since its early adoption in 1992, it has largely been superseded by several District rules with more stringent NOx requirements for specific types of fuel burning equipment. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4352, and 4703 for more specific information about the individual fuel burning equipment source categories.

Emissions Inventory
There is no emissions inventory specific to Rule 4301; see Rules 4306, 4307, 4308, 4309, 4352, and 4703 for the individual emissions inventories.

How does District Rule 4301 compare with federal and state rules and regulations?
Facilities subject to Rule 4301 are subject to various state rules and federal requirements, such as CTG, ACT, NSPS, NESHAP, and MACT. However, as previously mentioned, several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable federal and state rules are discussed within those control measure evaluations.

How does District Rule 4301 compare to rules in other air districts?
There are no analogous rules in BAAQMD, SMAQMD, and VCAPCD.

SCAQMD
- Rule 474 (Fuel Burning Equipment—Oxides of Nitrogen)

The District evaluated the requirements contained within SCAQMD's Rule 474 and found no requirements that were more stringent than those already in Rule 4301.

Evaluation Findings
District Rule 4301 alone cannot be considered to fulfill BACM/MSM requirements for this source category. The NOx requirements of this rule have been superseded by the requirements of other District rules that satisfy BACM/MSM for fuel burning equipment since all units subject to Rule 4301 are subject to a more specific NOx rule discussed elsewhere in this appendix. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4352, and 4703.

C.7 RULE 4306 AND RULE 4320 ADVANCED EMISSION REDUCTION OPTIONS FOR BOILERS, STEAM GENERATORS, AND PROCESS HEATERS GREATER THAN 5.0 MMBTU/HR

Discussion

Rules 4306 and 4320 apply to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million British thermal units per hour (MMBtu/hr). The purpose of these rules is to limit NOx and carbon monoxide (CO) emissions from boilers, steam generators, and process heaters of this size range.

Rule 4320 is the third generation rule for this source category. The first District rule for this source category, Rule 4305 (Boilers, Steam Generators, and Process Heaters), was adopted on December 16, 1993. Rule 4305 was superseded by Rule 4306 (Boilers, Steam Generators, and Process Heaters – Phase 3) on September 18, 2003 to implement a NOx control measure from the District's ozone and PM10 attainment plans, lowering the NOx emissions limits in Rule 4305. Since adoption, Rule 4306 has been amended twice.

The amendment of Rule 4306 in October 2008 was initially proposed to lower the NOx emission limit from 9 ppmv to 6 ppmv for units greater than 20 MMBtu/hr. It was determined that the proposed NOx limits could be accomplished by using selective catalytic reduction (SCR) or a combination of SCR and ultra-low NOx burners (ULNBs), thus making the lower limits technologically feasible. However, through the public workshop process and additional research it was also determined that most of the units subject to Rule 4306 have undergone several generations of NOx controls, and consequently, certain applications of SCR may not be cost effective and/or technological infeasible because of physical limitations. Therefore, the lower NOx limits were included in new Rule 4320 and an option was provided in the rule that allows for the payment of an annual emissions fee based on total actual emissions, rather than installation of additional NOx controls. These fees are used by the District to achieve cost effective NOx reductions through District incentive programs, the District's Technology Advancement Program, and other routes. The previous versions of Rule 4305 and 4306 combined with the implementation of Rule 4320 achieve approximately 96% control of NOx emissions from this source category.

The implementation of Rule 4320 does not substitute the requirements of Rule 4306, but enforces requirements supplementary to Rule 4306. As such, this evaluation is applicable to both Rule 4306 and Rule 4320.

Source Category

Facilities with units subject to this rule represent a wide range of industries, including but not limited to electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities.

To recognize the operational and technical differences between different types of equipment subject to Rules 4306 and 4320, the different equipment types were separated into several major categories, with different requirements, including the following:

- Units with a total rated heat input greater than 5.0 MMBtu/hr to 20.0 MMBtu/hr
- Units with a total rated heat input greater than 20.0 MMBtu/hr
- Oilfield steam generators of all ratings and fuel types
- Refinery units of all ratings and fuel types
- Low-use units limited by a Permit to Operate to an annual heat input greater than 1.8 billion Btu/year but less than or equal to 30 billion Btu/year
- Units at a wastewater treatment facility using less than 50% PUC quality fuel
- Small specialty units operated by a small producer

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	1.27	1.25	1.23	1.21	1.19	1.17	1.14	1.13	1.10
NOx	1.93	1.83	1.72	1.61	1.56	1.51	1.46	1.41	1.36
SOx	0.60	0.59	0.24	0.24	0.23	0.23	0.23	0.22	0.22
	Winter Average - Tons per day								
PM2.5	1.25	1.24	1.21	1.19	1.17	1.15	1.13	1.11	1.09
NOx	1.88	1.78	1.68	1.57	1.51	1.47	1.42	1.38	1.32
SOx	0.58	0.57	0.24	0.23	0.23	0.23	0.22	0.21	0.21

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion emissions, 13.1 tons per day (tpd) for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from boilers, steam generators, and process heaters greater than 5.0 MMBtu/hr are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for this source category.

How does District Rule 4306/4320 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG requirements for this source category.

ACT

- EPA-453/R-93-034 (Alternative Control Techniques Document – NOx emissions from Process Heaters)

The District evaluated the requirements contained within the ACT for NOx Emissions from Process Heaters and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- EPA-453/R-93-022 (Alternative Control Techniques Document – NOx Emissions from Industrial/Commercial/Institutional Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- EPA-453/R-93-023 (Alternative Control Techniques Document – NOx Emissions from Utility Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rules 4306 and 4320.

NSPS

- 40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel Fired Steam Generators for Which Construction Is Commenced After August 17, 1971)

The District evaluated the requirements contained within 40 CFR 60 Subpart D and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- 40 CFR 60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)

The District evaluated the requirements contained within 40 CFR 60 Subpart Db and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- 40 CFR 60 Subpart Dc (Standards of Performance for Small Industrial- Commercial-Institutional Steam Generating Units)

The District evaluated the requirements contained within 40 CFR 60 Subpart Dc and found no requirements that were more stringent than those already in Rules 4306 and 4320.

NESHAP/ MACT

- 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR 63 Subpart DDDDD was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin

emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches for compliance with the PM limit. The PM limit in District Rule 4320 is more stringent for liquid fuels because it only allows liquid fuels to be burned during PUC quality natural gas curtailment periods. It is equivalent to DDDDD for all gasses burned except for gasses exceeding 40 $\mu g/m^3$ of mercury.

The District evaluated the requirements contained within the above NESHAP and found no requirements that were more stringent than those already in Rules 4306 and 4320.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 4306/4320 compare to rules in other air districts?

SCAQMD
- Rule 1146 (Emissions of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

SCAQMD Rule 1146 was amended on November 1, 2013 to include rule language clarifications and revisions to address SIP creditability issues. None of the amendments affected emissions reductions.

The District evaluated the requirements contained within SCAQMD's Rule 1146 and found no requirements that were more stringent than those already in Rules 4306 and 4320.

BAAQMD
- Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 7 and found no requirements that were more stringent than those already in Rules 4306 and 4320.

- Regulation 9 Rule 10 (Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 10 and found no requirements that were more stringent than those already in Rules 4306 and 4320.

SMAQMD
- Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)

The District evaluated the requirements contained within SMAQMD's Rule 411 and found no requirements that were more stringent than those already in Rules 4306 and 4320.

VCAPCD

- Rule 74.15 (Boilers, Steam Generators and Process Heaters)

The District evaluated the requirements contained within VCAPCD's Rule 74.15 and found no requirements that were more stringent than those already in Rules 4306 and 4320.

Additional Emission Reduction Opportunities

Over the years, the District has adopted numerous generations of rules and rule amendments for boilers greater than 5 MMBtu/hr that have significantly reduced NOx and PM emissions from this source category. The emissions inventory for NOx from these boilers has dropped from 40.2 tpd in 1993 to 1.61 tpd in 2015. As part of these regulatory efforts, hundreds of boilers in the Valley have been equipped with the best available NOx and PM control technologies. Given the significant effort already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions.

Low Temperature Oxidation

The District researched emerging technologies that may have the potential to reduce emissions. A Low Temperature Oxidation (LTO) System was installed at a dairy in the SCAQMD and was able to reach NOx limits between 1.0- 3.2 ppmv for loads 4.1-13 MMBtu/hr. The LTO system utilizes ozone to oxidize and control various pollutants, including NOx. According to the SCAQMD BACT database information, capital and installation costs ranged from $360,000 - $400,000 for the LTO system when it was installed in 1997.[22] Installation within the South Coast region was heavily subsidized with government funding and the installation costs appear cost prohibitive for an installation that is not subsidized. In addition, the LTO system is classified as "Other Technologies" in the SCAQMD BACT guidelines, which means that the technology has not met the achieved in practice (AIP) criteria of six months of continuous operation at a minimum of 50% operating capacity and does not qualify as the lowest achievable emission rate (LAER). Since the technology has not been achieved in practice and cost prohibitive without significant subsidies, this is not a feasible opportunity at this time.

EMx

The District researched the potential for emissions reductions through EMx, the second generation of the SCONOx technology that is a post-combustion control that reduces NOx, SOx, CO, and volatile organic compound (VOC) emissions. This technology has not been AIP in the District and there is no available data that indicates that SCONOx or EMx has been installed on boilers even though the manufacturer's website states that the technology is transferrable to industrial boilers. Based on research of the best available controls from EPA and other air districts, the SCONOx and EMx systems have only been utilized by power plants for control of turbine emissions. In fact, cost effectiveness analyses conducted by the District for the installation of SCONOx/EMx

[22] South Coast Air Quality Management District. (2012). *SCAQMD Best Available Control Technology (BACT) Database*.

units on large power plant turbine installations within the Valley have been found to not be cost effective. Given the high cost effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, this technology is not feasible or cost effective for reducing emissions from this category.

PM2.5 Limits for Alternative Fuels

The majority of boilers (>5 MMBtu/hr) in the Valley combust Public Utilities Commission (PUC) quality natural gas, which contains a very low sulfur content and inherently has low emissions. Few boilers in the Valley use alternative fuels for their combustion processes. Alternative fuels include digester gas, produced gas, and liquid fuel. Units fired on digester gas or produced gas are already required to use inlet gas scrubbers to meet District rule requirements. Current rule language requires that liquid fuel shall be used only during a PUC-quality natural gas curtailment period provided it contains no more than 15 ppm sulfur. While the use of liquid fuel is strictly limited, the feasibility of reducing PM emissions through adding PM2.5 limits for units using liquid fuel was explored as part of the District's comprehensive control measure evaluation.

There are 83 units that are permitted to utilize liquid fuel in the Valley (>5 MMBtu/hr) during a natural gas curtailment with an average combined emissions inventory of approximately 0.034 tons per year of total PM. The low emissions inventory is attributed to the fact that these units either utilize liquid fuel as a backup if there is a natural gas curtailment. The following three technologies were researched as potential opportunities to reduce PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Baghouses control total PM and PM2.5 emissions by 90-99%; ESPs control total PM and PM2.5 emissions by 90-99%; and wet scrubbers control large particulates (>PM5) by 99% and PM2.5 emissions by approximately 50%.[23] Currently, there are a few crude oil-fired or field gas-fired steam generators operating in crude oil production facilities that are required by their permits to operate SOx scrubbers and ESPs. However, baghouses are typically not used with liquid-fired boilers due to the potential clogging of the baghouse[24] and are therefore not a recommended technology due to infeasibility and safety issues.

[23] Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

[24] Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

PM Potential Emissions Reductions for an ESP and Scrubber

For the purposes of these calculations, the following assumptions were made:

1. For simplicity, the analysis will evaluate the cost effectiveness of these technologies for total PM reductions from liquid fuel fired units.
2. The PM control efficiency of an ESP is 99%.
3. The PM control efficiency of a scrubber is 99%.

Potential Emissions Reductions $_{(ESP)}$ = (Total PM Emissions) x (Control Efficiency)
Potential Emissions Reduction $_{(ESP)}$ = 0.034 tons/year X 0.99
Potential Emissions Reduction $_{(ESP)}$ = 0.0337 tons/ year (tpy)

Potential Emissions Reductions $_{(scrubber)}$ = (Total PM Emissions) x (Control Efficiency)
Potential Emissions Reduction $_{(scrubber)}$ = 0.034 tons/year X 0.99
Potential Emissions Reduction $_{(scrubber)}$ = 0.0337 tons/ year (tpy)

Annualized Cost of an ESP and Wet Scrubber

The capital cost for the installation of an ESP for a 1-5 MMBtu/hr boiler ranges from $90,000 - $100,000 and the annual maintenance cost is $1,000-$2,000.[25] For the wet scrubber system, EPA estimated the annualized cost at $5,300-$102,000 per sm^3/sec at an average air flow rate of 0.7-47 sm^3/sec.[26] The District used the following assumptions in the cost effectiveness calculations:

1. The capital cost of an ESP for a 5 MMBtu/hr boiler is assumed to be $100,000.
2. The annual maintenance cost of an ESP for a 5 MMBtu/hr boiler is assumed to be $2,000.
3. The annualized cost of a wet scrubber system is assumed to be the median of the range above ($53,650 per sm^3/sec).
4. The average air flow rate for a wet scrubber system is assumed to be the median of the range above (23.85 sm^3/sec).
5. The total capital and maintenance cost of an ESP will be calculated by multiplying the cost of 1 unit by the total number of units.
6. The total annualized cost of a wet scrubber will be calculated by multiplying the annualized cost of 1 unit by the total number of units.
7. Lifetime of the ESP is 10 years at 10% interest. To account for this, the annualized capital cost will be calculated by multiplying the total capital cost by the capital recovery factor of 0.1627 and adding the annual maintenance costs.

Annual Cost$_{(ESP)}$ = (Total Capital Cost) x (0.1627) + (Annual Maintenance Cost x 83)
Annual Cost$_{(ESP)}$ = ($100,000 x 83) x (0.1627) + ($2,000 x 83)
Annual Cost$_{(ESP)}$ = $1,516,410/year

[25] Catherine Roberts. (March 2009) *Information on Air Pollution Control Technology for Woody Biomass Boilers.* Environmental Protection Agency Office of Air Quality Planning and Standards and Northeast States for Coordinated Air Use Management.
[26] EPA. (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber.* Retrieved from http://www.epa.gov/ttncatc1/dir1/fsprytwr.pdf.

Annual $Cost_{(scrubber)}$ = (Annualized Cost of 1 unit) x (Number of Units) x (Avg. Flow Rate)
Annual $Cost_{(scrubber)}$ = ($53,650/ sm^3/sec) x (83) x (23.85 sm^3/sec)
Annual $Cost_{(scrubber)}$ = $106,202,858/ year

Cost Effectiveness of an ESP and Wet Scrubber
Cost Effectiveness = Annual Cost / Annual Emissions Reductions

Cost $Effectiveness_{(ESP)}$ = ($1,516,410/year) / (0. 0337 tons/ year)
Cost $Effectiveness_{(ESP)}$= $44,997,329/ton of PM

Cost $Effectiveness_{(scrubber)}$= ($106,202,858/year) / (0. 0337 tons/ year)
Cost $Effectiveness_{(scrubber)}$ = $3,151,420,104/ton of PM

As illustrated above, neither PM control technology is a cost effective option for this source category. The cost of the ESP technology does not include costs of retrofitting equipment and/or the facility or compliance monitoring costs, which would drive the cost effectiveness up even more.

Evaluation Findings

Even though boilers, steam generators, and process heaters greater than 5.0 MMBtu/hr are not a significant source of NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4306 and 4320 currently have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from this source category in the Valley.

C.8 RULE 4307 BOILERS, STEAM GENERATORS AND PROCESS HEATERS– 2.0 MMBTU/HR TO 5.0 MMBTU/HR

Discussion

This rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input of 2.0 million British thermal units per hour (MMBtu/hr) up to and including 5.0 MMBtu/hr. The purpose of this rule is to limit emissions of NOx, carbon monoxide (CO), sulfur dioxide (SO2), and particulates from units subject to this rule.

Rule 4307 was adopted on December 15, 2005 to establish emissions limits and control requirements for these units which were previously exempt because of their smaller size. Since its adoption, the rule has been amended three times. The October 2008 amendments strengthened the rule by removing some exemptions, imposing NOx limits of 9 or 12 ppmv for new and replacement units, and adding a menu-approach for particulate matter control that also encompasses SOx controls. The rule was amended again in 2011 to specifically incorporate tree nut pasteurizers as a separate type of unit. EPA published a direct final approval of the 2011 amendments to Rule 4307 on February 12, 2015 and deemed this rule as being at least as stringent as established RACT requirements. NOx emissions have been controlled by over 84% for units in this source category.

Source Category

Based on District permits information, there are currently 540 permitted and Permit-Exempt Equipment Registration (PEER) units subject to Rule 4307 requirements. Facilities with units subject to this rule represent a wide range of industries, including but not limited to, medical facilities, educational institutions, office buildings, prisons, military facilities, hotels, and industrial facilities.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28
NOx	0.49	0.46	0.43	0.41	0.39	0.38	0.37	0.36	0.34
SOx	0.15	0.15	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Winter Average - Tons per day								
PM2.5	0.32	0.31	0.31	0.30	0.30	0.29	0.28	0.28	0.27
NOx	0.47	0.45	0.42	0.40	0.38	0.37	0.36	0.35	0.33
SOx	0.15	0.14	0.06	0.06	0.06	0.06	0.06	0.05	0.05

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from boilers, steam generators, and process heaters 2.0 to 5.0 MMBtu/hr are lower than the BACM/MSM significance thresholds. Therefore, the

Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for this source category.

How does District Rule 4307 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG or NSPS requirements for this source category.

ACT

- EPA–453/R-93-034 (Alternative Control Techniques Document–NOx Emissions from Process Heaters)

The District evaluated the requirements contained within the ACT for NOx Emissions from Process Heaters and found no requirements that were more stringent than those already in Rule 4307.

- EPA–453/R-94-022 (Alternative Control Techniques Document–NOx Emissions from Industrial/Commercial/Institutional Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no requirements that were more stringent than those already in Rule 4307.

- EPA–453/R-94-023 (Alternative Control Techniques Document–NOx Emissions from Utility Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rule 4307.

NESHAP/ MACT

- 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR 63 Subpart DDDDD was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches for compliance with the PM limit. The PM limits in 40 CFR 63 Subpart DDDDD would not apply to Rule 4307 sources. Subpart DDDDD contains alternative requirements for units less than 10 MMBtu/hr and requires tuning every 2-5 years.

The District evaluated the requirements contained within 40 CFR 63 Subpart DDDDD and found no requirements that were more stringent than those already in Rule 4307.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 4307 compare to rules in other air districts?

SCAQMD
- Rule 1146.1 (Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The District evaluated the requirements contained within SCAQMD's Rule 1146.1 and found no requirements that were more stringent than those already in Rule 4307.

BAAQMD
- Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 7 and found no requirements that were more stringent than those already in Rule 4307.

- Regulation 9 Rule 10 (Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 10 and found no requirements that were more stringent than those already in Rule 4307.

SMAQMD
- Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)

The District evaluated the requirements contained within SMAQMD's Rule 411 and found no requirements that were more stringent than those already in Rule 4307.

VCAPCD
- Rule 74.15.1 (Boilers, Steam Generators, and Process Heaters)

The District evaluated the requirements contained within VCAPCD's Rule 74.15.1 and found no requirements that were more stringent than those already in Rule 4307.

Additional Emission Reduction Opportunities
The District has adopted numerous rule amendments over the years for boilers that have significantly reduced emissions from units subject to Rule 4307. Most units subject to Rule 4307 are fired on Public Utilities Commission (PUC) quality natural gas, and are inherently low-emitters of SOx and PM2.5 emissions. The NOx limits implemented through Rule 4307 and its amendments will reduce emissions from over 1,000 small (2-5 MMBtu/hr) boilers in the Valley when fully implemented, including from units that were previously exempt. As a result of these regulatory efforts, the emissions inventory for NOx from these boilers has dropped from 3.81 tpd in 2005 to 0.41 tpd in

2015. Additional emissions reductions are forthcoming with existing Rule 4307 as additional compliance dates are approaching in 2016. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions.

EMx as Potential Control

The District researched post-combustion controls such as EMx, the second generation of the SCONOx technology that reduces NOx, SOx, CO, and volatile organic compound (VOC) emissions. This technology has not been achieved in practice (AIP) in the District and there is no available data that indicates that SCONOx or EMx has been installed on boilers, particularly in this size range, even though the manufacturer's website states that the technology is transferrable to industrial boilers. Based on research of the best available controls from EPA and other air districts, the SCONOx and EMx systems have only been utilized by power plants for the control of turbine emissions. In fact, cost effectiveness analyses conducted by the District for the installation of SCONOx/EMx units on large power plant turbine installations within the Valley have shown that this technology is not cost effective. Given the high cost effectiveness demonstrated for turbines and lack of demonstrated practice with boilers, this technology is not feasible or cost effective for reducing emissions from this category.

PM2.5 Limits for Alternative Fuels

The majority of boilers (2-5 MMBtu/hr) in the Valley combust PUC-quality natural gas; PUC natural gas contains a very low sulfur content and inherently has low emissions. Few boilers in the Valley use alternative fuels for their combustion processes. Alternative fuels include digester gas, produced gas, and liquid fuel. Units fired on digester gas or produced gas are already required to use inlet gas scrubbers to meet District rule requirements. Current rule language requires that on and after July 1, 2015 liquid fuel shall be used only during a PUC quality natural gas curtailment period provided it contains no more than 15 ppm sulfur. While the currently limited use of liquid fuel will become even more strictly limited by July 2015, the feasibility of reducing PM emissions through adding PM2.5 limits for units using liquid fuel was explored as part of the District's comprehensive control measure evaluation.

There are 24 liquid fuel fired units in the Valley (2-5 MMBtu/hr) with an average combined emissions inventory of approximately 0.00077 tons per year of total PM. The low emissions inventory is attributed to the fact that these units either utilize liquid fuel as a backup if there is a natural gas curtailment or are minimally operated units. The following three technologies were evaluated as potential control options for reducing PM emissions: baghouses, electrostatic precipitators (ESPs), and wet scrubbers. Baghouses control total PM and PM2.5 emissions by 90-99%; ESPs control total PM and PM2.5 emissions by 90-99%; and wet scrubbers control large particulates (>PM5) by 99% and PM2.5 emissions by approximately 50%.[27] However, baghouses are

[27] Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Retrieved from

typically not used with liquid-fired boilers due to the potential clogging of the baghouse and are therefore not a recommended technology due to infeasibility and safety issues.[28]

PM Potential Emissions Reductions for an ESP and Scrubber

For the purposes of these calculations, the following assumptions were made:

1. For simplicity, the analysis will evaluate the cost effectiveness of these technologies for total PM reductions from liquid fuel fired units.
2. The PM control efficiency of an ESP is 99%.
3. The PM control efficiency of a scrubber is 99%.

Potential Emissions Reductions $_{(ESP)}$ = (Total PM Emissions) x (Control Efficiency)
Potential Emissions Reductions $_{(ESP)}$ = 0.00077 tons/year X 0.99
Potential Emissions Reductions $_{(ESP)}$ = 0.00076 tons/ year (tpy)

Potential Emissions Reductions $_{(scrubber)}$ = (Total PM Emissions) x (Control Efficiency)
Potential Emissions Reductions $_{(scrubber)}$ = 0. 00077 tons/year X 0.99
Potential Emissions Reductions $_{(scrubber)}$ = 0.00076 tons/ year (tpy)

Annualized Cost of an ESP and Wet Scrubber

The capital cost for the installation of an ESP for a 1-5 MMBtu/hr boiler ranges from $90,000 - $100,000 and the annual maintenance cost is $1,000-$2,000.[29] For the wet scrubber system, EPA estimated the annualized cost at $5,300-$102,000 per sm^3/sec at an average air flow rate of 0.7- 47 sm^3/sec.[30] The following assumptions were made for this cost effectiveness analysis:

1. The capital cost of an ESP is assumed to be the median of the range above ($95,000).
2. The annual maintenance cost of an ESP is assumed to be the median of the range above ($1,500).

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http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

[28] Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVlXQ&bvm=bv.86956481,d.cWc.

[29] Catherine Roberts. (March 2009) *Information on Air Pollution Control Technology for Woody Biomass Boilers.* Environmental Protection Agency Office of Air Quality Planning and Standards and Northeast States for Coordinated Air Use Management.

[30] EPA. (2002). *Air Pollution Control Technology Fact Sheet: Spray-Chamber/Spray-Tower Wet Scrubber.* Retrieved from http://www.epa.gov/ttncatc1/dir1/fsprytwr.pdf.

3. The annualized cost of a wet scrubber system is assumed to be the median of the range above ($53,650 per sm^3/sec).
4. The average air flow rate for a wet scrubber system is assumed to be the median of the range above (23.85 sm^3/sec).
5. The total capital and maintenance cost of an ESP will be calculated by multiplying the cost of 1 unit by the total number of units.
6. The total annualized cost of a wet scrubber will be calculated by multiplying the annualized cost of 1 unit by the total number of units.
7. Lifetime of the ESP is 10 years at 10% interest. To account for this, the annualized capital cost will be calculated by multiplying the total capital cost by the capital recovery factor of 0.1627 and adding the annual maintenance costs.

Annual Cost $_{(ESP)}$ = (Total Capital Cost) x (0.1627) + (Annual Maintenance Cost)
Annual Cost $_{(ESP)}$ = ($95,000 x 24) x (0.1627) + ($1,500 x 24)
Annual Cost $_{(ESP)}$ = $406,956/year

Annual Cost $_{(scrubber)}$ = (Annualized Cost of 1 unit) x (Number of Units) x (Average Flow Rate)
Annual Cost $_{(scrubber)}$ = ($53,650/ sm^3/sec) x (24) x (23.85 sm^3/sec)
Annual Cost $_{(scrubber)}$ = $30,709,260/ year

Cost Effectiveness of an ESP and Wet Scrubber

Cost Effectiveness = Annual Cost / Annual Emissions Reductions

Cost Effectiveness $_{(ESP)}$ = ($406,956/year) / (0.00076 tons/ year)
Cost Effectiveness $_{(ESP)}$ = $535,468,421/ton of PM

Cost Effectiveness $_{(scrubber)}$ = ($30,709,260/year) / (0.00076 tons/ year)
Cost Effectiveness $_{(scrubber)}$ = $40,406,921,053/ton of PM

As illustrated above, neither PM control technology is a cost effective option for this source category. The cost of the ESP technology does not include costs of retrofitting equipment and/or the facility or compliance monitoring costs, which would drive the cost effectiveness up even more.

Evaluation Findings

Even though boilers, steam generators, and process heaters 2.0 to 5.0 MMBtu/hr are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4307 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from this source category in the Valley.

C.9 RULE 4308 BOILERS, STEAM GENERATORS AND PROCESS HEATERS– 0.075 MMBTU/HR TO LESS THAN 2.0 MMBTU/HR

Discussion

This rule applies to any person who supplies, sells, offers for sale, installs, or solicits the installation of any boiler, steam generator, process heater or water heater with a rated heat input capacity greater than or equal to 0.075 MMBtu/hr and less than 2.0 MMBtu/hr. The purpose of this rule is to limit NOx and carbon monoxide (CO) emissions from units within this source category. As a point of sale rule, Rule 4308 achieves emissions reductions as units subject to the rule are replaced over time. This rule has resulted in more than 93% control of emissions from this source category.

Rule 4308 was adopted on October 20, 2005 to establish NOx emissions limits for these units which were previously exempt from District regulations because of their small size. The rule was amended in December 2009 to lower the NOx emissions limits to 20 ppmv for units fired on natural gas, with the exception of instantaneous water heaters and pool heaters greater than or equal to 0.075 MMBtu/hr but less than or equal to 0.4 MMBtu/hr. In 2013, the District determined that a 20 ppmv limit was now technologically feasible and cost effective for instantaneous water heaters 0.075 MMBtu/hr to 0.4 MMBtu/hr; as such, that emission limit was lowered during the November 2013 amendment of Rule 4308. EPA published a direct final approval the 2013 amendments to Rule 4308 on February 12, 2015.

Source Category

Units subject to Rule 4308 are used in settings including, but not limited to, apartment buildings, large homes, small businesses, commercial buildings, manufacturing facilities, government facilities, restaurants, hotels, hospitals, educational institutions, and religious organizations. Affected persons include water heater manufacturers, plumbing wholesalers, supply stores, plumbers, contractors, and end-users. This point-of-sale approach allows the District to achieve NOx emission reductions without forcing immediate replacement of existing units to comply with rule requirements and thus placing an undo financial burden on the consumer.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.61	0.60	0.59	0.58	0.57	0.56	0.55	0.54	0.53
NOx	0.92	0.87	0.82	0.77	0.74	0.72	0.70	0.67	0.65
SOx	0.28	0.28	0.12	0.11	0.11	0.11	0.11	0.10	0.10
	Winter Average - Tons per day								
PM2.5	0.59	0.58	0.57	0.56	0.55	0.54	0.53	0.52	0.51
NOx	0.89	0.84	0.79	0.74	0.72	0.69	0.67	0.65	0.63
SOx	0.28	0.27	0.11	0.11	0.11	0.11	0.10	0.10	0.10

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from these units are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for boilers, steam generators, and process heaters 0.075 to 2.0 MMBtu/hr.

How does District Rule 4308 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, NSPS, NESHAP, or MACT requirements for boilers, steam generators, and process heaters of this size.

ACT

- EPA – 453/R-93-034 (Alternative Control Techniques Document—NOx Emissions from Process Heaters)

The District evaluated the requirements contained within the ACT for NOx Emissions from Process Heaters and found no requirements that were more stringent than those already in Rule 4308.

- EPA – 453/R-94-022 (Alternative Control Techniques Document—NOx Emissions from Industrial/Commercial/ Institutional Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no requirements that were more stringent than those already in Rule 4308.

- EPA – 453/R-94-023 (Alternative Control Techniques Document—NOx Emissions from Utility Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rule 4308.

State Regulations

There are no state regulations that apply to this source category.

How does District Rule 4308 compare to rules in other air districts?

SCAQMD

- Rule 1146.2 (Emissions of Oxides of Nitrogen From Large Water Heaters and Small Boilers and Process Heaters)

The District evaluated the requirements contained within SCAQMD's Rule 1146.2 and found no requirements that were more stringent than those already in Rule 4308.

BAAQMD

- Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 6 and found no requirements that were more stringent than those already in Rule 4308.

- Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 7 and found no requirements that were more stringent than those already in Rule 4308.

SMAQMD

- Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)

The District evaluated the requirements contained within SMAQMD's Rule 411 and found no requirements that were more stringent than those already in Rule 4308.

- Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu Per Hour)

The District evaluated the requirements contained within SMAQMD's Rule 414 and found no requirements that were more stringent than those already in Rule 4308.

VCAPCD

- Rule 74.11.1 (Large Water Heaters and Small Boilers)

VCAPCD Rule 74.11.1 was amended on September 11, 2012 to implement a 20 ppmv NOx emission limit for all natural gas fired units with a rated heat input of 0.075-1.0 MMBtu/hr, with the exception of pool heaters. All District units 0.075-1.0 MMBtu/hr (with the exception of pool heaters 0.075-0.4 MMBtu/hr) are currently subject to a 20 ppmv NOx emission limit. As such, there are no requirements in VCAPCD Rule 74.11.1 that are more stringent than those already in Rule 4308.

- Rule 74.15.1 (Boilers, Steam Generators, and Process Heaters)

VCAPCD Rule 74.15.1 was also amended on September 11, 2012. The amendments incorporated a 20 ppmv NOx emission limit for natural gas fired units 1-2 MMBtu/hr and other administrative recordkeeping requirements. Rule 4308 contains a 20 ppmv NOx emission limit for all natural gas fired units 1-2 MMBtu/hr so the amendments did not implement any requirements more stringent than the requirements in District Rule 4308. Therefore, there are no requirements in VCAPCD Rule 74.15.1 that are more stringent

than those already in Rule 4308.

Placer County APCD (PCAPCD)

- Rule 247 (Natural Gas-Fired Water Heaters, Small Boilers and Process Heaters)

PCAPCD Rule 247 was amended on February 13, 2014; however, the amendments incorporated the same emission limits contained within District Rule 4308. Therefore, there are no requirements in PCAPCD Rule 247 that are more stringent than those already in Rule 4308.

Additional Emission Reduction Opportunities

Mobile Home Exemption

The District evaluated the possibility of removing the exemption for water heaters used in mobile homes because multiple air districts do not exempt these sources in their analogous rules. However, because those air districts have different rule structures with regards to the size of devices regulated, District Rule 4308 requirements are as stringent as the other districts' rules.

For example, SCAQMD Rule 1146.2 does not regulate mobile home water heaters, per the definition for type 1 units, because they are subject to Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters). SCAQMD Rule 1121 regulates units less than 0.075 MMBtu/hr, which is out of the size range of District Rule 4308. Similarly, in SMAQMD Rule 414, mobile home units are regulated in the size range of units less than 0.075 MMBtu/hr. District Rule 4902 (Residential Water Heaters) applies to units less than 0.075 MMBtu/hr and currently regulates mobile home water heaters with the same emission limit contained in SCAQMD and SMAQMD rules. BAAQMD Rule Regulation 9 Rule 6 regulates all units less than 2 MMBtu/hr, essentially combining the requirements of District Rules 4308 and 4902.

In addition, after researching the size of mobile home water heaters, it was found that mobile home water heaters are not available in the 0.075-2.0 MMBtu/hr size range. Four mobile home retailers and three mobile home manufacturers were contacted to inquire about the size of mobile home water heaters. All seven contacts stated that the average size of a mobile home water heater is 30-40 gallons, whereas a 0.075 MMBtu/hr water heater is approximately 80 gallons. One manufacturer and one retailer stated that 50 gallon mobile home water heaters are available but rarely used. If the exemption for mobile home water heaters in Rule 4308 were to be removed, it would not result in any additional emissions reductions since units do not exist in this size range.

Recreational Vehicle Exemption

The District evaluated the potential opportunity to remove the exemption for recreational vehicles (RVs). Stakeholder input indicates that there are very few units in RVs that fall under the size category subject to this rule. Most units in RVs are 12 gallons, which is

significantly smaller than the 80 gallon size of a typical 0.075 MMBtu/hr unit.[31] Also, RV units are typically not used on a frequent basis and thus are small contributors to the NOx emissions of this source category. Other air districts, such as SCAQMD and BAAQMD, include this exemption in their rules. Removing this exemption would result in little to no emissions reductions because of the lack of units within this size range and the intermittent use of units in RVs.

Evaluation Findings

Even though boilers, steam generators, and process heaters 0.075 to 2.0 MMBtu/hr are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4308 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from this source category in the Valley.

[31] SJVAPCD. (2009). *Final Staff Report for Amendments to Rule 4308 (Boilers, Steam Generators, and Process Heaters—0.075 MMBtu/hr to less than 2.0 MMBtu/hr)*.

C.10 RULE 4309 DRYERS, DEHYDRATORS, AND OVENS

Discussion

Rule 4309 is applicable to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel, or is fired on gaseous and liquid fuel sequentially, and the total rated heat input for the unit is 5.0 million British thermal units per hour (5.0 MMBtu/hr) or greater. The purpose of this rule is to limit NOx and carbon monoxide (CO) emissions from these units, which result from the combustion of fuel in the burners. The rule enforces NOx emission limits between 3.5-12 ppmv for four categories of equipment, achieving approximately 34% control of total NOx emissions.

Rule 4309 was adopted on December 15, 2005 and has not been amended. EPA finalized approval of Rule 4309 on May 30, 2007 and deemed this rule as being at least as stringent as established RACT requirements.

Source Category

Dryers, dehydrators, and ovens are utilized in a broad range of industries. Analyses performed for the rule adoption separated the unit types into four broad industry groups: dehydrators; asphalt/concrete; milk, cheese, and other dairy processing; and other. Dryers, dehydrators, and ovens currently operate either seasonally or year-round depending on the industry and the unit's purpose within the process. There are 126 units subject to this rule, ranging in size from 5.0 MMBtu/hr to 200 MMBtu/hr.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.85	0.88	0.90	0.92	0.95	0.98	1.00	1.02	1.04
NOx	0.20	0.20	0.21	0.22	0.22	0.23	0.24	0.24	0.25
SOx	0.47	0.48	0.49	0.50	0.52	0.53	0.55	0.56	0.57
	Winter Average - Tons per day								
PM2.5	0.80	0.82	0.85	0.87	0.89	0.92	0.95	0.96	0.98
NOx	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.21	0.22
SOx	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from dryers, dehydrators, and ovens are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for dryers, dehydrators, and ovens.

How does District Rule 4309 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, NSPS, NESHAP, or MACT requirements for this source category.

Alternative Control Techniques (ACT)

- EPA – 453/R-94-004 (Alternative Control Techniques Document–NOx Emissions from Cement Manufacturing)

The District evaluated the requirements contained within the ACT for NOx Emissions from Cement Manufacturing and found no requirements that were more stringent than those already in Rule 4309.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4309 compare to rules in other air districts?

There are no analogous rules for this source category in BAAQMD, SMAQMD, or VCAPCD.

SCAQMD

- SCAQMD Rule 1147 (NOx Reductions from Miscellaneous Sources)

The District evaluated the requirements contained within SCAQMD's Rule 1147 and found no requirements that were more stringent than those already in Rule 4309.

Additional Emission Reduction Opportunities

The adoption of Rule 4309 has considerably reduced NOx and PM emissions from this source category. The emissions inventory for NOx from dryers, dehydrators, and ovens has dropped from 1.93 tpd in 2005 to 0.20 tpd in 2012. Although this source category had a relatively small emissions inventory prior to the adoption of Rule 4309, stakeholders have installed control equipment and modified their operations considerably to reduce emissions to ultra-low levels. Given the significant effort already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions.

Asphalt Plants

PUC-quality natural gas fuel is part of the BACT requirements for asphalt plants for the District, BAAQMD, and SCAQMD. There are currently nine asphalt plants in the Valley that do not utilize PUC-quality natural gas because some facilities are physically too far removed from natural gas lines to use natural gas. Six of these asphalt plants use LPG fuel or propane to comply with the same gaseous fuel fired limit as PUC-quality natural gas-fired facilities. The other three facilities utilize diesel gas; however, none of the facilities operate full time and their combined NOx emissions are less than 7 tons per

year. Therefore, requiring natural gas for all asphalt facilities is not a feasible opportunity that would generate significant emission reduction benefits.

The District evaluated the potential opportunity to lower the NOx emissions limits for asphalt plants from the current limits of 4.3 ppmv (gaseous fuel) and 12 ppmv (liquid fuel) to make them closer or equivalent to the BAAQMD BACT limit of 3.9 ppmv @ 19% O2. To meet this limit, operators would need to install low-NOx burners or modify existing burners to comply with lower limits; however, all of the asphalt plants have already installed new low-NOx burners or modified their units to meet the 4.3 ppmv @ 19% O2 and 12 ppmv @ 19% O2 emissions limits in Rule 4309.

Based on District permit records, a good portion of the asphalt units fired on gaseous fuel would be in compliance with a 3.9 ppmv @ 19% O2 NOx limit. However, reducing the limit to 3.9 ppmv @ 19% O2 would reduce the margin of compliance the facility has, and would make it more difficult for the facility to show continued compliance. In addition, reducing the limit from 4.3 ppmv to 3.9 ppmv would be an administrative change in nature, since it would not require any additional control equipment or changes in operating techniques or practices to comply, and it would not generate additional emissions reductions from these units.

A higher NOx limit is required for the liquid fuel fired facilities due to the characteristics of liquid fuels. In BAAQMD's BACT guideline for hot mix asphalt facilities, there is a clause that states, *"For remote locations where natural gas is not available, liquefied petroleum gas may be permitted up to 38 ppmvd NOx @ 15% O2 and fuel oil < 0.05 wt. % sulfur may be permitted up to 55 ppmvd NOx @ 15% O2."* This equates to 12.24 ppmv @ 19% O2 for liquefied petroleum gas and 17.73 ppmv @ 19% O2 for fuel oil. The District's Permits department enforces a limit of 4.3 ppmv @ 19% O2 for liquefied petroleum gas and 12 ppmv for other liquid fuels. Therefore, the District's requirements are more stringent than both limits in the BAAQMD BACT guideline.

Dehydrators

Rule 4309 requires dehydrators be fired on PUC-quality natural gas. The District evaluated the potential opportunity to further reduce emissions by requiring the use of low-NOx burners; however, this option is infeasible due to the potential negative effects on product quality. Additionally, enforcing the emissions limits is potentially infeasible because monitoring and source testing of dehydrators is difficult to perform, if not impossible.

Dryers

The District considered the potential opportunity to add a requirement for the use of dust collection devices, such as baghouses. Through the District's New Source Review Rule (Rule 2201), dust collection devices are already in place in the permit requirements for units that create PM emissions from handling the products they are drying. These facilities install baghouses or cyclones because they do not want to blow their product

out of their stack. While baghouses can foster PM2.5 reductions, cyclones are generally not as effective in removing fine particulate matter. [32]

The District researched the potential installation of baghouses on dryers. However, it is technologically infeasible to install a baghouse for some of the dryers subject to Rule 4309. The purpose of a dryer is to remove moisture from a product, which means that the exhaust from dryers have a high humidity. Baghouses can have problems with high humidity exhaust streams because the bags become caked. The air stream would have to be dried somehow before entering the baghouse. As a result, this is not a feasible opportunity at this time.

The District also evaluated the possibility of removing the exemption for column dryers and dryers with no stack and one or more sides open to the atmosphere. However, compliance with the proposed limits would be difficult to determine reliably given the design of these units. Column dryers have large fans to move the warm air through the material and air escapes through screens that cover the side of the dryer. Similarly, dryers with no stack and at least one side open deal with air escape, which makes monitoring and testing emissions difficult, if not impossible. Since source testing of these types of dryers is difficult due to the fact that there is not a stack where all emissions are exhausted, this is not a technologically feasible opportunity at this time.

Evaluation Findings

Even though dryers, dehydrators, and ovens are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4309 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from dryers, dehydrators, and ovens in the Valley.

[32] Northeast States for Coordinated Air Use Management. (November 2008) *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fici-boilers-20081118-final.pdf%2F&ei=7nfvVIivFai1sAT07IHIAg&usg=AFQjCNFBdQn7MVAibSTZIbHV7-ojXkVIXQ&bvm=bv.86956481,d.cWc.

C.11 RULE 4311 FLARES

The purpose of Rule 4311 is to limit volatile organic compounds (VOC), NOx, and SOx emissions from any operation involving the use of flares, with the exception of a limited list of sources identified in the rule. Any unreasonable restrictions on flaring could potentially result in catastrophic consequences which may lead to explosions resulting in loss of property, injury, and potentially loss of human life.

Flaring is a high temperature oxidation process used to burn combustible components, primarily hydrocarbons, of waste gases from industrial operations, primarily for the purpose of controlling emissions and as a safety device. The majority of waste gases flared are natural gas, propane, ethylene, propylene, butadiene and butane. During combustion, gaseous hydrocarbons react with atmospheric oxygen to form carbon dioxide (CO_2) and water. In some waste gases, carbon monoxide (CO) is the major combustible component. In addition to serving as safety devices, the combustion of industrial gas streams in flares is also recognized as a means of reducing greenhouse gases (GHG), in line with California's AB32 GHG reduction goals and emerging federal GHG reduction goals.

Combustion efficiency depends on flame temperature, residence time in the combustion zone, vent gas flammability, auto ignition temperature, heating value, and turbulent mixing. When operated at an optimal combination of these factors, flares have a destruction efficiency of 98 percent or greater. Complete combustion converts all VOCs to CO_2 and water; however incomplete combustion generates air pollutants such as NOx, sulfur dioxide, carbon monoxide, and particulate matter. Additionally, there is a possibility of release of hydrocarbons if they have not been completely combusted. To prevent the creation of smoke or soot, which is influenced by fuel characteristics and the amount and distribution of oxygen in the combustion zone, most industrial flares are steam-assisted or air-assisted. In some cases, another fuel must be added to flare gas to achieve the minimum heating value of 200-250 Btu/ft^3 required for complete combustion.

There are two general types of flares: open and enclosed flares. Flares are further categorized by the height of the flare tip, and by the method of enhancing combustion by mixing at the flare tip (i.e., steam-assisted, air-assisted, pressure assisted, or non-assisted).

Flaring in the San Joaquin Valley

Flares serve two basic functions: as a safety device during unforeseeable and unpreventable emergency situations/standby situations and less commonly as a primary emissions control device for VOC emissions. As safety devices, flares are necessary to prevent catastrophic consequences such as the release of toxic gases and explosions, which could result in loss of property, injury, and loss of human life. In the Valley, the vast majority of flares are employed as emergency/standby control devices, which is in direct contrast with other regions, such as North Dakota, where flares are used for primary disposal of waste gas from oil and natural gas production. Also, while regions like North Dakota utilize flares to combust associated gas during the initial extraction

phase of the production process (i.e., directly from the well), Valley flares are typically used further down the process chain, primarily as a safety device associated with gas collection systems, resulting in far lower quantities of flared gas.

Valley operators have generally evaluated all feasible and cost effective options for handling and disposing of the associated/waste gases generated by their facilities and installing a flare as the primary method of disposal would be the last resort. In addition to Rule 4311 requirements to evaluate and implement all feasible measures to reduce flaring activities, other associated rules also implement stringent capture and control of these gases. Therefore, most facilities have made significant investments to capture and utilize these process gases in a variety of methods and this ability has allowed facilities to maximize income generation. Some capture and treat these gases and sell them to natural gas/utility providers (generates monetary income), while others utilize these gases on-site to fuel equipment that generates electricity and/or provides process heating (saves fuel costs). In fact, most Valley facilities regard flaring events as a significant monetary cost, through directly lost profit or increased fuel costs.

In the District's evaluation of Valley flaring activity,[33] nearly all of the flaring events were either one-time events due to new control equipment installation or maintenance of existing equipment, and therefore not repeated, or in response to emergency situations or process upsets. For example, one Valley facility (light oil production facility) experienced abnormally high flaring because the sales transmission pipeline was offline for repairs, an event beyond their control. Another facility (wastewater treatment plant) normally uses the fuel onsite to produce electricity and process heating, but could not do so because additional air pollution control devices were being installed.

Flares in the Valley subject to the requirements in Rule 4311 are employed by a diverse group of industries for a wide variety of applications, as illustrated by the below list. In contrast, other air districts' flare rules generally limit the applicability of their rules to petroleum production facilities or refineries.

- Gas plants
- Heavy oil production/ thermally enhanced oil recovery
- Light oil production
- Refinery operations
- Wastewater treatment plants
- Cheese production
- Wine
- Dairy operations
- Flat glass production
- Correctional facility

[33] SJVAPCD. (2014). *Rule 4311 (Flares) Further Study*. Retrieved February 3, 2015 from: http://valleyair.org/Air_Quality_Plans/docs/R4311.pdf.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17
NOx	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54
SOx	0.33	0.33	0.33	0.33	0.32	0.32	0.33	0.32	0.32
	Winter Average - Tons per day								
PM2.5	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17
NOx	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54
SOx	0.33	0.33	0.33	0.33	0.32	0.32	0.33	0.32	0.32

As detailed in Chapter 5, the significance threshold for source categories for the purpose of evaluating the application of BACM and MSM requirements is 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from flares are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for Rule 4311.

Valley Flaring Activity Compared to Other Regions

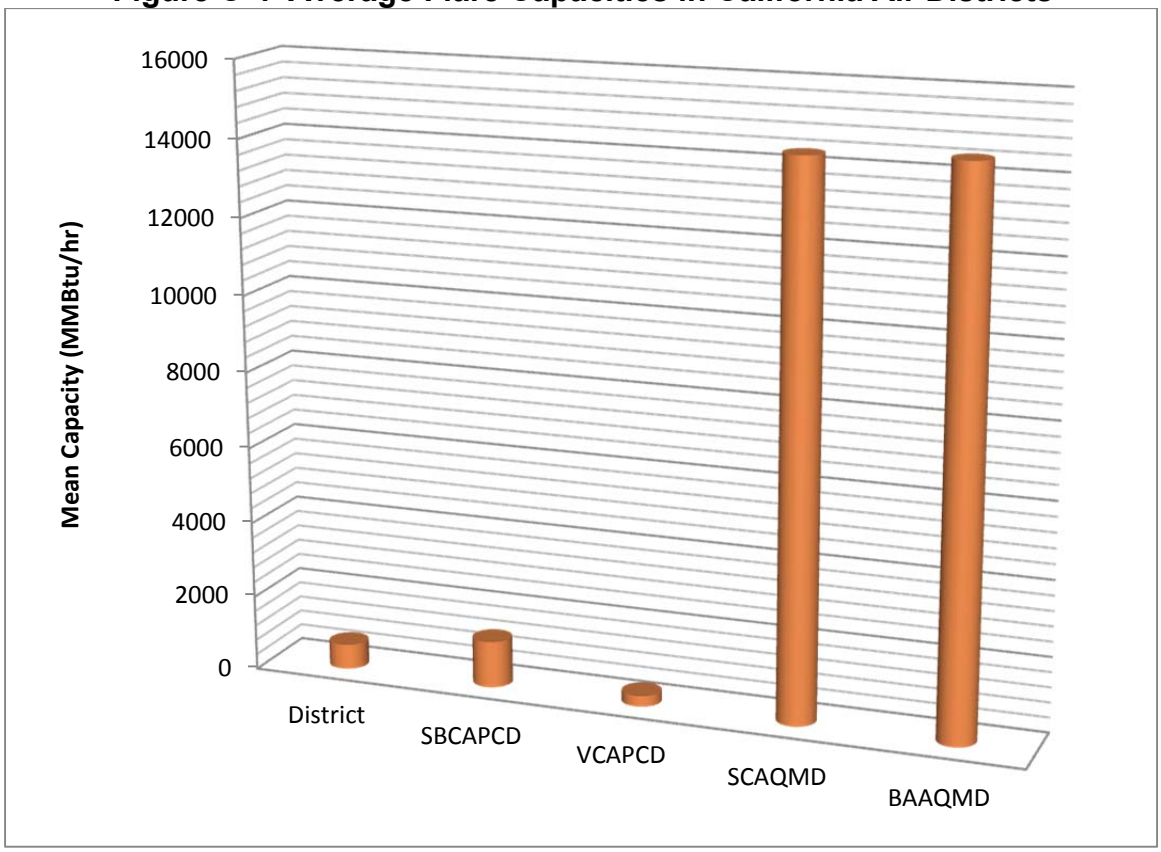
Flares in the Valley and other air districts are primarily engineered for emergency operation during process upsets and emergency situations. Given this use, any unreasonable restrictions on flaring could potentially result in catastrophic consequences which may lead to explosions resulting in loss of property, injury and potentially loss of human life. While flares can be used during maintenance, new equipment installations, and startup/shut-down, the main concern is safety. In this regard, Valley flares are similar to those in other districts, the difference being that facilities in SCAQMD, BAAQMD, and SBCAPCD are much larger. The facilities in those districts are mostly operated at massive oil and gas refineries, with significantly higher throughputs than those in the Valley. Temperatures and pressures are higher, cracking occurs regularly, and the flares must be engineered to control emergencies and process upsets on a larger scale. Flare gas is typically sent to a flare header, where it is distributed to multiple large flares. The flares at these facilities are much larger in physical size, as well as capacity, as shown in the table below.

Table C-2 Comparison of Flaring Capacity for Flares in California Air Districts

Air District	Total Flares	Median (MMBtu/hr)	Mean (MMBtu/hr)	Largest (MMBtu/hr)
SJVAPCD	235	33	663	40,000
SCAQMD	29	10,234	14,328	72,751
BAAQMD	23	108	14,442	246,612
VCAPCD	55	34	284	7,100
SBCAPCD	75	17	1,242	18,200

Flaring capacities of the flares in the SCAQMD, BAAQMD, and SBCAPCD are all significantly higher than the flaring capacities of flares in the Valley, while those in VCAPCD are similar size to Valley flares. Flares in BAAQMD have a wide range of capacities, while those in SCAQMD are all greater than 1,000 MMBtu/hr. The figure below shows the average capacity of flares in the District, SCAQMD, BAAQMD, VCAPCD, and SBCAPCD.

Figure C-4 Average Flare Capacities in California Air Districts



With roughly ten times the number of flares, the Valley has total NOx emissions from flares that are less than BAAQMD and less than half of SCAQMD, as illustrated in the emission inventory tables below. The flaring data in the tables below is compiled from all flaring activities in each air district's jurisdiction and is provided in the ARB-maintained 2012 CEPAM: NORCAL 2012 PM2.5 SIP Baseline Emission Projection Tool.

Table C-3 NOx Emissions Inventories for Flares in California Air Districts (tpd)

Air District	2012	2013	2014	2015	2016	2017	2018	2019
SJVAPCD	0.57	0.57	0.57	0.56	0.56	0.55	0.55	0.55
SCAQMD	1.19	1.20	1.20	1.21	1.22	1.22	1.23	1.23
BAAQMD	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.65
VCAPCD	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13
SBCAPCD	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08

Table C-4 VOC Emissions Inventories for Flares in California Air Districts (tpd)

Air District	2012	2013	2014	2015	2016	2017	2018	2019
SJVAPCD	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.25
SCAQMD	0.40	0.41	0.41	0.41	0.41	0.41	0.41	0.41
BAAQMD	1.32	1.33	1.33	1.33	1.33	1.33	1.33	1.33
VCAPCD	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
SBCAPCD	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05

Table C-5 SOx Emissions Inventories for Flares in California Air Districts (tpd)

Air District	2012	2013	2014	2015	2016	2017	2018	2019
SJVAPCD	0.34	0.34	0.34	0.34	0.33	0.33	0.33	0.33
SCAQMD	3.27	3.27	3.27	3.27	3.28	3.28	3.28	3.28
BAAQMD	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
VCAPCD	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
SBCAPCD	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15

In summary:

- Emissions in SCAQMD, BAAQMD, and SBCAPCD are much higher per flare than in the Valley;
- Valley facilities flare a far lower volume;
- Each facility contributes only a small fraction of emissions;
- Emissions are effectively controlled at these facilities; and
- Flaring is necessary for safety.

To supplement the discussion found later in this chapter comparing North Dakota Century Code 38-08-06.4 to District Rule 4311, the District examined flaring in North Dakota. Research indicates that North Dakota has become the second largest producer of oil in the United States, behind Texas. The recent boom in oil production has led to far greater production, without the infrastructure and regulation to support emissions control. Oil production facilities in North Dakota have focused on expanding oil production by opening new wells, and as a consequence have not invested in the installation of onsite cogeneration equipment or sales transmission pipelines. The result

has been the flaring off of approximately 29% of all natural gas produced in North Dakota[34], compared to approximately 3.8% in the Valley (as shown in the table below).

Rule 4311 Regulatory Background

Rule 4311 was adopted in June 2002 to establish flaring requirements and reduce emissions from flares. Amendments were adopted on June 15, 2006 and June 18, 2009. The September 2009 amendment incorporated requirements for flare minimization plans and increased the stringency of existing requirements for sulfur emissions. EPA finalized approval of the 2009 amendments to Rule 4311 on November 3, 2011 and deemed this rule as being at least as stringent as established RACT requirements.[35] On January 10, 2012 EPA finalized a partial approval/partial disapproval of the *2009 RACT SIP* and deemed this rule as still being at least as stringent as established RACT requirements.[36]

Rule 4311 Components

Rule 4311 applies to all operations involving the use of flares. Exemptions include flares operated in municipal solid waste landfills subject to the requirements of Rule 4642, flares subject to the requirements of 40 CFR 60 Subpart WWW (Standards of Performance for Municipal Waste Landfills) or Subpart Cc (Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills), and except for recordkeeping requirements, any stationary source that does not have the potential to emit at least ten tons per year of VOC and NOx (non-major sources).

Of the 235 flares operating in the Valley, 126 are exempt from Rule 4311 requirements other than basic recordkeeping due to one of the following reasons:

- The flare is not part of a major source - 60 flares
- The flare is subject to other rules regulating landfills – 27 flares
- The flare is not stationary (i.e. transportable units) – 39 flares

Of the flares exempt from Rule 4311 requirements (other than record keeping), over 90% flaring activity is associated with landfills that utilize flares as part of their federally mandated gas collection systems. These flares are already required to meet strict local and federal requirements through 40 CFR 60 Subpart WWW (Standards of Performance for Municipal Solid Waste Landfills), or Subpart Cc (Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills) and District Rule 4642 (Solid Waste Disposal Sites). Rule 4642 applies to any solid waste disposal sites which have a gas collection system and/or control device in operation or undergoing maintenance or repair. Major requirements include:

[34] Scientific American. (2013, September 12). *North Dakota flared off $1 billion worth of natural gas last year*. Retrieved February 14, 2015 from http://blogs.scientificamerican.com/plugged-in/2013/09/12/north-dakota-flared-off-1-billion-worth-of-natural-gas-last-year/.
[35] EPA. (2011, November 3). 76 FR 68106. Retrieved April 4, 2014 from http://www.gpo.gov/fdsys/pkg/FR-2011-11-03/pdf/2011-28391.pdf
[36] EPA. (2012, January 10). 77 FR 1417. Retrieved April 4, 2014 from http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf

- For gas collection system: operate so that TOC concentrations do not exceed 1000 ppmv at any point on the surface of the solid waste disposal site or along the gas transfer path of the gas collection system; install sampling ports on each well head; operate in a manner which maximizes the amount of landfill gas extracted while preventing overdraw that can cause fires or damage the gas collection system; control by a control device that meet the control device requirements.
- For a control device: achieve a VOC destruction efficiency of at least 98% by weight, or reduce the VOC concentration to 20 ppmv or less; for those that have an Authority to Construct (ATC) permit issued prior to July 20, 1995, achieve a destruction efficiency of at least 90% by weight or reduce the VOC concentration to 20 ppmv; operate enclosed flares in accordance with 40 CFR 60.756(b) and 40 CFR 60.18 and open flares in accordance with 40 CFR 60.756(c) and 40 CFR 60.18.
- During maintenance, notify the APCO 24 hours in advance, minimize the emissions during shutdown, and prevent shut down for more than 144 cumulative hours in any calendar year.
- Other requirements not applicable to flares.

In addition to Rule 4311 requirements, any new flares are subject to New Source Review (NSR) requirements (District Rule 2201) including Best Available Control Technology (BACT) requirements, meaning they may be required to implement even more stringent controls regardless of whether they are subject to Rule 4311. All sources must obtain an ATC permit before they are operated.

Rule 4311 includes the following major requirements (described in more detail in the following sections):

- Operation requirements that ensure the flare is achieving maximum destruction efficiency
- Operation of measurement and monitoring devices to ensure all requirements are being met
- VOC and NOx emission limits for ground-level enclosed flares
- Flare minimization plans
- Petroleum refinery SO2 performance targets
- Extensive recordkeeping requirements including annual monitoring reports and reportable flaring event reports

Operation Requirements

General requirements for flare operation include:

- Maintain a flame at all times when combustible gases are vented through the flare
- Equip the outlet with an automatic ignition system, or operate with a pilot flame present at all times when combustible gases are vented through the flare, except during purge periods for automatic-ignition equipment flares
- Except for flares equipped with a flow-sensing ignition system, install and operate a heat sensing device such as a thermocouple, ultraviolet beam sensor, infrared

sensor, or an alternative equivalent device, capable of continuously detecting at least one pilot flame or the flare
- Use purge gas for purging flares that use flow-sensing automatic ignition systems and that do not use a continuous flame pilot
- For open flares (air-assisted, steam-assisted, or non-assisted) in which the flare gas pressure is less than 5 psig, operate the flare pursuant to 40 CFR 60.18

Emission Limits
Emission reductions are obtained directly by requiring ground-level enclosed flares to meet the following emission standards for VOC and NOx:

Table C-6 Rule 4311 Emission Limits for Ground-level Enclosed Flares

Type of Flare and Heat Release Rate in MMBtu/hr	VOC (lb/MMBtu)	NOx (lb/MMBtu)
Without Steam-assist		
<10 MMBtu	0.0051	0.0952
10-100 MMBtu	0.0027	0.1330
>100 MMBtu	0.0013	0.5240
With Steam-assist		
All	0.14 as TOG	0.068

Flare Minimization Plans
Rule 4311 requires a Flare Minimization Plan (FMP) to be submitted to and approved by the District for any petroleum refinery with a flare or any flare with a flaring capacity greater than or equal to 5.0 MMBtu/hr. The rule prohibits facilities subject to FMP requirements from flaring unless it is consistent with a District-approved FMP and all commitments in that FMP have been met. FMPs must include all necessary information to satisfy the underlying regulatory requirements, and must be submitted to the District for approval. In addition to their initial submittal, FMPs must be modified prior to making any modifications to related equipment or processes, and at least every five years. FMPs are required to include the following:
- Description and technical specifications for each flare and associated knock-out pots, surge drums, water seals, and flare gas recovery systems
- Process flow diagrams of upstream equipment and process units venting to each flare (with identification of type and location of control equipment)
- Description of equipment, processes, or procedures the operator plans to install or implement to eliminate or minimize flaring, and planned date of installation or implementation
- Evaluation of prevention measures to reduce flaring that has occurred or may be expected to occur during planned major maintenance activities, including startup and shutdown

- Evaluation of preventative measures to reduce flaring that may be expected to occur due to issues of gas quantity and quality. This includes an audit of vent gas recovery capacity of each flare system, storage capacity for excess vent gas, and scrubbing capacity available for vent gas for use as a fuel; and shall determine the feasibility of reducing flaring through the recovery, treatment, and use of the gas
- Evaluation of preventative measures to reduce flaring caused by the recurrent failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Evaluation shall determine adequacy of existing maintenance schedules and protocols for such equipment. A failure is recurrent if it occurs more than twice during any five year period as a result of the same cause.

Of the 109 facilities subject to Rule 4311 requirements, 14 do not have a flaring capacity of at least 5.0 MMBtu/hr and are not operated at a petroleum refinery and are therefore not subject to FMP requirements. The remaining 95 are subject to FMP requirements. FMP submittals by facility type are summarized in the below table.

Table C-7 Submitted FMPs Summarized by Industry

Industry Summary	Qty
Cheese production	1
Wine	2
Correctional Facility	1
Oil and natural gas production, processing, and transmission	76
Petroleum refinery	7
Dairy	1
Flat glass	1
Wastewater	6
Total	95

Actions identified in the FMPs are typically dependent on the facility and operation type, as well as the quality of gas being flared. Similarly, the feasibility of potential control options is highly dependent on the same factors. The following table is a sample of measures committed to in FMPs submitted to the District:

Table C-8 Sample FMP Measures by Facility Type

Facility Category	Actions Identified in FMP to Minimize Flaring*
Oil and Gas Production and Transmission	Include permit limit on gas flared daily and annually Streamline startup, shutdown, and maintenance procedures to minimize equipment downtime, thereby minimizing flaring Hydrogen sulfide scrubbing of flare gases to condition for sale Inject flare gas in DOGGR-approved wells Use other combustion devices (and offset the need for other natural gas fuel sources) such as glycol re-boiler/thermal oxidizer
Wastewater Treatment/ Reclamation	Install new equipment to combust digester gas in internal combustion engines, fuel cells, and process heaters Install equipment to allow digester gas storage and conditioning for greater use in turbines (additional storage is minimal and only capable of handling excess gas during minor process upsets)
Wine Production	Burn flare gas in steam generation boilers; coordinate plant operations that generate the flare gas with production operations requiring steam
Cheese Production	Modify boiler to combust a natural gas/digester gas blend
Flat Glass Manufacturing	Reduce idle time during calibration and purge test to reduce necessary flaring
Dairy Farming	Install additional gensets (electricity generation equipment located near the end user) to combust more produced biogas

Many of the above measures are not feasible for all facilities. For oil and gas production, the flare gas produced is often in excess of what could be used onsite to power equipment. For these facilities, flares are generally used only under abnormal conditions, as the flare gas is usually high enough quality to sell for use at other facilities.

For facilities other than oil and gas production, the gas produced is usually a much lower heating value and requires conditioning if combusted for electrical generation or process heating. Expensive modifications or new equipment is often required to allow said combustion activities and the flare gas is sometimes of too low quality or quantity to make these installations cost effective. Additionally, emissions from other combustion devices would likely be higher because flares are inherently low emitting and serve as combustion control devices.

Of the 95 flares required to submit FMPs, 92 are standby flares or emergency flares that are only utilized when needed such as during maintenance or to dispose of excess flare gas or during emergencies. Only the remaining 3 flares in the Valley are permitted to

be used as primary disposal devices. Two of the three flares are used at an oil and natural gas production facility as strictly an emissions control device for vapors displaced from trucks only during load-out operations pursuant to requirements in District Rule 2201 (New and Modified Stationary Source Review Rule). The third flare is used at a cheese making facility as an emissions control device for gases generated at the wastewater anaerobic digester at the facility. As a component of their submitted FMP, this cheese making facility has committed to modify an on-site boiler to combust a natural gas/digester gas as a means of reducing current flaring activity.

Petroleum Refinery SO2 Performance Targets

Operators of petroleum refineries are required to minimize SO2 emissions to less than 1.5 tons per million barrels of crude processing capacity. Starting January 1, 2017, operators of petroleum refineries will be required to lower this target to 0.5 tons SO2 per million barrels of crude processing capacity.

Annual Monitoring Reports

Rule 4311 also requires the operator of any petroleum refinery flare or any flare with a flaring capacity equal to or greater than 50 MMBtu/hr to submit an Annual Monitoring Report (AMR) to the District no later than July 31st of each calendar year, containing the following information:

- Total volumetric flow of vent gas
- Hydrogen sulfide content, methane content, and hydrocarbon content of vent gas
- If vent gas composition is monitored by a continuous analyzer: average total hydrocarbon content by volume, average methane content by volume, and depending upon the analytical method used, total reduced sulfur content by volume or hydrogen sulfide content by volume of vent gas flared for each hour of the month
- If the flow monitor measures molecular weight, the average molecular weight for each hour of each month
- For any pilot and purge gas used, the type of gas used, the volumetric flow for each day and for each month, and the means used to determine flow
- Flare monitoring system downtime periods, including dates and times
- For each day and each month provide calculated sulfur dioxide emissions
- A flow verification report for each flare

Of the facilities subject to FMP requirements, 40 are not required to submit annual monitoring reports. Some of these facilities are too small or do not utilize their flares, but the majority have accepted specific limiting conditions on their permits to operate that limit the amount of flaring the facility can conduct to less than the threshold for reportable flaring events. The remaining 55 facilities are therefore subject to AMR requirements. Of these 55 flares, only one is used as a primary disposal device, one is dormant, and eleven are designated for emergency use only. The remaining flares are standby flares.

Information from the AMRs has allowed the District to evaluate the total amount of vent gases combusted and their compositions and increased understanding of flaring

activities in the Valley. This information in turn allows the District to calculate the amounts of emissions from reported flaring and compare those values to verify the accuracy of the emissions inventory for flares.

Reportable Flaring Events

Rule 4311 requires annual reports to be submitted each year summarizing all reportable flaring events. A flaring event is considered a reportable flaring event if more than 500,000 standard cubic feet (scf) of vent gas is flared per calendar day, or where sulfur oxide emissions are greater than 500 pounds per calendar day. Assuming an estimated heating value for flare gas of 1,000 Btu/scf, a flare must have a capacity greater than or equal to 20.8 MMBtu/hr to achieve a reportable flaring event, although most flares commonly operate at a small fraction of maximum capacity. Additionally, some low quality waste gases can have heating values of 200-300 Btu/scf, which would lower the minimum capacity for reportable flaring events. Reportable flaring event requirements are applicable to the operator of a flare subject to FMP requirements with the exception of flares that the operator can verify are not capable of producing reportable flaring events.

The reports are required to include at least the following:

- The results of an investigation to determine the primary cause and contributing factors of the flaring event
- Any prevention measures considered or implemented to prevent recurrence together with a justification for rejecting any measures that were considered but not implemented
- If appropriate, an explanation of why the flaring was an emergency and necessary to prevent accident, hazard or release of vent gas to the atmosphere, or where, due to a regulatory mandate to vent a flare, it cannot be recovered, treated, and used as a fuel at the facility
- The date, time, and duration of the flaring event

The majority of reportable flaring events are planned—thereby allowing for greater preparation and control—for repair, maintenance, or new equipment installations, including new air pollution control devices. Most of the events are one-time events. Of the gas flared, less than 20% is salable quality, lending support to the fact that facilities sell flare gas when feasible.

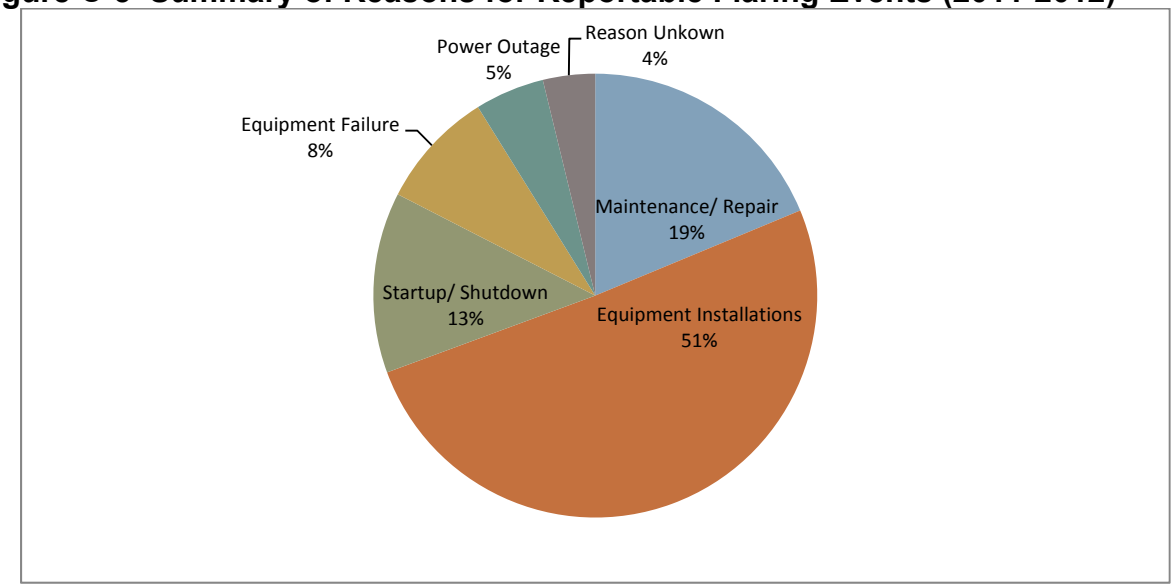
Of the 109 flares subject to Rule 4311, 21 flares generated 395 reportable flaring events during the 2011-2012 period. This period is a conservative reflection of potential reporting flaring event activity in the Valley given the unusually high number of events reported by a single facility (described in more detail below). The table below summarizes these events by facility type.

Table C-9 Summary of Total Reportable Flaring Events from 2011-2012 Period

Industry Summary	Qty of Flares	Reportable Flare Events – Total (MMscf)
Crude Oil and natural gas production	3	27.8
Gas plant	2	12.0
Light oil production	3	7.7
Natural gas processing and production	5	42.8
Oil and natural gas production	4	52.5
Petroleum and NG production	1	20.9
Petroleum refining	2	59.4
Wastewater reclamation facility	1	124.2
Total	21	347.4

The following graph illustrates the fact that the majority of flaring events are for equipment installations, maintenance, and repair.

Figure C-5 Summary of Reasons for Reportable Flaring Events (2011-2012)

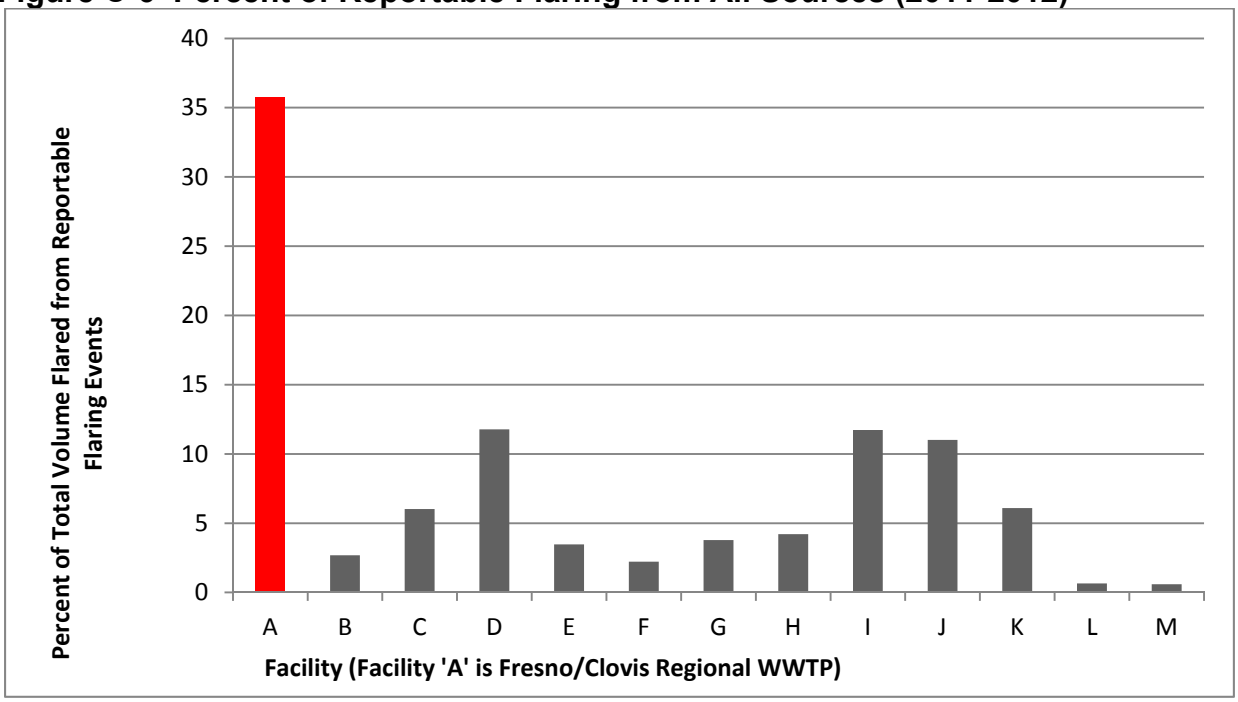


During this period, the largest percent of all gas flared during reportable flaring events was by a single wastewater treatment plant. According to the District-approved FMP for this facility, digester gas is utilized to create electricity and provide heat for the digesters (and offset the combustion of pipeline natural gas). The WWTP uses two 3.4 MW turbine engines and one 16.7 MMBtu/hr process boiler that are almost completely fueled by digester gas. Because there is no significant gas storage capacity, any excess digester gas or gas produced during interruptions to the turbines or boiler must be flared to avoid direct emissions to the atmosphere or potential gas build-up leading to explosions at the plant. To fulfill commitments in the FMP, the facility installed a small digester gas storage tank, installed additional digester gas conditioning, and increased the allowable digester gas fuel for the turbines from 50% to 100%. The

storage tank is capable of holding gas for small periods, such as during switchover between turbines, and the gas conditioning allows the use of selective catalytic reduction (SCR) on the turbines. The addition of this equipment has resulted in a 71% reduction in the volume of gas flared by the WWTP; however, during the 2011-2012 reporting period the facility experienced abnormally high flaring activity. During this period, the turbines were out of service to allow installation of SCR control devices for reducing over 90% of NOx emissions from the turbines pursuant to District Rule 4703 (Stationary Gas Turbines) and permitted emission limits. As a result, a large portion of the digester gas was flared. Out of the 395 total reportable flaring events in the Valley during the 2011-2012 reporting period, 164 occurred at the WWTP. Those events accounted for 36% of the total volume of gas flared during reportable events, more than three times the next highest volume at any facility. By contrast, the 2012-2013 reporting period showed only 46 reportable flaring events at this facility, all of which were for regular activities except one due to failure of a turbine. Because the majority of flaring events during the 2011-2012 reporting period were due to installations and are therefore one-time events, they are not part of normal facility operations.

The following graph illustrates the percentages of gas flared from all sources during reportable flaring events for the 2011-2012 period.

Figure C-6 Percent of Reportable Flaring from All Sources (2011-2012)



Comparison of Rule 4311 to State, Federal, and Local Regulations

Comparison of Rule 4311 to Federal Regulations

There are no EPA CTG or ACT requirements for this source category.

The following federal regulations apply to Rule 4311 sources:

- NESHAP/MACT:
  - 40 CFR 63 Subpart SS (National Emission Standards for Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process)
- NSPS:
  - 40 CFR 60.18 (General Control Device and Work Practice Requirements)
  - 40 CFR 65.147 (Flares)
  - 40 CFR 60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)
  - 40 CFR 60 Subpart Ja (Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007)

Rule 4311 is as stringent as or more stringent than the above NSPS and NESHAP requirements. The most recently amended NSPS (40 CFR 60 Subpart OOOO and 40 CFR 60 Subpart Ja) are discussed below.

40 CFR 60 Subpart OOOO is a new NSPS requirement that was finalized by EPA on August 16, 2012. This NSPS may indirectly affect some Valley flares since there is a possibility that a flare is exempt from the majority of Rule 4311 and is used as a control device for a vapor controlled tank that is subject to Subpart OOOO.

Affected facilities under this subpart that may use flares as an approved control device include centrifugal compressors, storage vessels, and onshore natural gas processing plants. If the facility chooses to meet the control requirements, then the flare must be designed and operated in accordance with §60.18(b) and must conduct the compliance determination using Method 22 at 40 CFR part 60, appendix A-7, to determine visible emissions. §60.18(b) was last amended on December 22, 2008, which is before the last amendment for District Rule 4311 (June 18, 2009). The requirements of the 2008 amendments were closely evaluated during the District's 2009 Rule amendment. EPA deemed Rule 4311 as being at least as stringent as established RACT requirements on January 10, 2012.[37] Since Subpart OOOO has no new requirements for flares after the 2012 EPA RACT approval, Rule 4311 continues to be at least as stringent as these requirements.

40 CFR 60 Subpart Ja was amended by EPA on September 12, 2012. Amendments clarified existing requirements and applicability, including what constitutes a flare modification, clarification of secondary flares, and clarification of the records that must be maintained by the operator. EPA also added new requirements to Subpart Ja as part of these amendments, including flare related unit and process descriptions, assessments, and evaluations; analyses of causes and corrective actions for reportable flaring events; and sulfur limits for petroleum refineries.

[37] EPA. (2012, January 10). 77 FR 1417. Retrieved 2/11/15 from http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf.

Subpart Ja did not implement more stringent requirements than District Rule 4311. Subpart Ja has one new exemption for continuous monitoring, which allows for fewer requirements than previously required in the NSPS, and therefore, is not more stringent than current rule language. While there may be some minor differences in terminology or requirements making direct comparisons not possible, the same level of controls and emission reductions are achieved through District regulations as through this NSPS. Additionally, the District's Permit Services Department continuously evaluates NSPS on a case-by-case basis to ensure the relevant flares comply with all federal requirements as they are promulgated. Rule 4311 is as stringent as, if not more stringent than, this NSPS.

As demonstrated by the discussion above, Rule 4311 is as stringent as or more stringent than the applicable federal regulations.

Comparison to State Regulations
There are no state rules or regulations that apply to this source category.

Comparison to Regulations in other Air Districts
As previously stated, EPA analysis of Rule 4311 resulted in the 2012 determination that Rule 4311 is as stringent as requirements in other air districts in California (76 FR 68106); however, in keeping with the methodology of this plan, the District conducted a thorough examination of rules in other air districts, including the following:

- SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)
- BAAQMD:
    - Regulation 12 Rule 11 (Flare Monitoring at Petroleum Refineries)
    - Regulation 12 Rule 12 (Flares at Petroleum Refineries)
- SMAQMD and VCAPCD do not have an analogous rule for this source category.

The District also conducted an exhaustive search for rules in all other air districts, including those outside of California, to identify any that might contain more stringent requirements. While Rule 4311 is as stringent as or more stringent than any rules in the nation, the District prepared comparisons to Santa Barbara County Air Pollution Control District (SBCAPCD) Rule 359 and North Dakota Century Code 38-08-06.4. The North Dakota rule is not included in the comparison table below because it does not contain most of the core requirements of California air district flare regulations. The following table compares major elements of Rule 4311 with those in other California air districts.

Table C-10 Summary of Rule Requirement Comparisons

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
DATES OF ADOPTION/ AMENDMENT					
Adopted Jun 20, 2002; Amended Jun 15, 2006; Jun 18, 2009	Adopted Feb 13, 1998; Amended Nov 4, 2005	Adopted Jun 4, 2003	Adopted Jul 20, 2005	Adopted Jul, 1968; Revised Oct 1968; Jun 1969; May	Adopted Jun 28, 1994

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
				1972; Jul 1983; Jun 1994	
APPLICABILITY					
All flares	Flares used at: • Petroleum (petro.) refineries • Sulfur recovery plants • Hydrogen production plants	Flares used at petro. refineries	Flares used at petro. refineries	Any person who discharges sulfur compounds from any source	Flares and thermal oxidizers used at: • Oil and gas production • Petro. refinery • Natural gas services and transportation • Wholesale trade in petro./petro. products
EXEMPTIONS					
• Municipal solid waste landfill flares subject to Rule 4642 • Flares subject to 40 CFR 60 WWW or Cc • Stationary sources w/ potential to emit <10 tons VOC and <10 tons NOx per year (Not exempt from recordkeeping)	Exempt from sampling and analyses for higher heating values and sulfur concentration for flare event that: • Results from catastrophic event • Is safety hazard to sampling personnel; Sulfur dioxide (SO_2) emissions (emissions) from flaring events caused by: • External power curtailment beyond operator's control • Natural disasters • Acts of war or terrorism (Not exempt from flare monitoring system requirements)	Flares and thermal oxidizers used for: • Emissions from organic liquid storage vessels (subj. to R. 8-5) • Emissions from loading racks (subj. to R. 8-6, 8-33, or 8-39) • Emissions from marine vessel loading terminals (subj. to R. 8-44) Thermal oxidizers used for: • Emissions from wastewater treatment systems (subj. to R. 8-8) • Emissions from pump seals (subj. to R. 8-18) (except when emissions from pump	Same as Rule 11 (except last exemption on list)	Sulfur emission limit and avg. concentration limit don't apply to: Unplanned flaring for emergency or safety if: • Not result of intentional or negligent act, omission, improper maintenance or setting of shut-in sensors • Results from operational problems (emergency blowdowns, process upsets, power outages, equipment breakdown) • Records of event kept • corrective measures immediately taken • Event lasts <24 hr. • Notify <4 hr. after	Burning of sulfur, hydrogen sulfide, acid sludge, or other sulfur compounds in manufacturing of sulfur or sulfur compounds For oil and gas sources that recover sulfur as by-product of gas treating/sweetening, manufacturing exemption applies only to those specific processes (Except technology-based std.) Burning gas w/ net heating value <300 Btu/scf if fuel used to incinerate gas has sulfur compounds: • <15 grain/100 ft3 in Southern Zone • <50 grain/100 ft3 in Northern Zone Flare and thermal oxidizer units rated $\leq$1.7 MMBtu/hr., unless total cumulative rating of all such units at a source is $\geq$5 MMBtu/hr. (Not exempt from sulfur

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
		are routed to flare header) Monitoring and reporting total hydrocarbon (HC) or methane composition doesn't apply to flare that burns flexicoker gas if weekly sampling shows methane/non-methane content of vent gas flared is <2%/<1% by volume		detection and submit report if event >1 hr. Planned flaring if: • Notice submitted >72 hr. in advance, justifying work (reasons and steps to minimize sulfur emissions) • Notice can be submitted <72 hr. if hazardous situation, economic harm, or excess emissions • Submit planned flaring mgmt. plan • Records kept 2 yrs. • District notified when work complete • Sulfur emissions are minimized • Excess emissions fee paid to District each year ($5.00/lb. SO2 emitted)	content std., technology std., monitoring, recordkeeping, and recording.) Flares and thermal oxidizers exempt from FMP: • Rated at <15 MMBtu/hr, unless cumulative rating >50 MMBtu/hr. • Operations of only planned, continuous flaring due to non-availability of a produced gas pipeline outlet
FLARE MINIMIZATION PLAN (FMP) REQUIREMENTS					
FMP requirements don't apply if flaring caused by emergency and necessary to prevent accident, hazard or release of vent gas directly to the	Owner/operator of petro. refinery exceeding performance targets submit FMP: • <90 days from end of year w/ emissions	None	FMP required for flares subject to rule and 3-month status reports required until FMP completed: • Technical	Each operator submits a planned flaring management plan: • Measures to decrease FG volume and reduce sulfur	Sources subject to rule and flares and thermal oxidizers rated at ≥15 MMBtu/hr submit FMP: • Planned flaring: targeted max monthly FG volume

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
atmosphere FMP required for petro. refinery flare or any flare w/ capacity ≥5.0 MMBtu/hr.: • Technical specs for each flare, knock-out pots, surge drum, water seal, and flare gas (FG) recovery system • Process flow diagrams of upstream equipment and process units venting to each flare • Equipment, processes, or procedures planned to install or implement to minimize flaring and planned date • Evaluations of preventative measures to reduce flaring expected due to planned major maintenance activities, gas quantity and quality issues, and recurrent failure of equipment or processes • Submit updated FMP every 5 years and for new or modified equipment prior to installing	exceeding target • Plan is pursuant to Rule 221 and fees pursuant to Rule 306 • List all actions to be taken to meet targets: o Technical specs for flares, knock-out pots, surge drums, water seals and FG recovery systems o Process flow diagrams of upstream equipment and process units venting to flares o Policies, procedures, and equipment improvements to minimize flaring and flare emissions o FG recovery equipment and treatment systems to be installed • FMPs available for 60-day public review prior to approval • 45 days allowed to correct deficiencies • Facility in violation if FMP denied • Revised FMP submitted 90 days after end of year if performance		information for each flare • Upstream equipment and processes (Same as SJVAPCD and SCAQMD) • Equipment, processes, and procedures implemented in last 5 years to reduce flaring and those planned to be installed or implemented • Prevention measures, including schedule for implementation for flaring: o That has or will occur during planned major maintenance o Expected to occur due to issues of gas quantity and quality (include audits of capacities), or caused by recurrent failure of equipment or processes	emissions • Description of planned operational or maintenance procedures that may cause flaring • Description of each flare system including design features • Description of any sulfur reduction system • Measures to be implemented to reduce the number of planned flaring events	o <5% avg. monthly gas handled/ produced/ treated at source based on 3 years o Higher limit may be granted by APCO if demonstrated to be infeasible • Submit emissions mitigation plan if: o Volume limit >10% of avg. monthly gas o Sulfur content of flared gas >239 ppmv/ >796 ppmv in Southern/ Northern Zone • The emissions mitigation plan must achieve 50% reduction of greater of actual or proposed avg. monthly FG volume limit • Owner/operator reimburses for review and approval of plans FMP includes: • Measures to decrease volume of FG and planned flaring events • Measures to prevent emergency flaring and unplanned flaring • Flare system • FG monitoring system • Design and operation features of pilot and purge gas system • Design features of flare to handle nominal and peak gas flows and range of compositions

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
	targets exceeded				• Plans to reduce planned flaring emissions • Schedules to reduce planned shutdowns • Proposed study of different settings to minimize emissions • Summary of scheduled/typical planned flaring • Review FMP every 5 years
ANNUAL MONITORING REPORTS					
For refinery flare or flare w/ flaring capacity ≥50 MMBtu/hr: Operator submit annual report ≤30 days after end of each 12 month period including: • Total volumetric flow of vent gas (scf) for each day • Contents of vent gas composition: o Hydrogen sulfide o Methane o HC • If vent gas composition monitored by continuous analyzer or analyzers: the following for each hour of the month: o Avg. total HC content by volume o Avg. methane content by volume o Total reduced sulfur content by volume or hydrogen sulfide content by volume • Avg. molecular	Submit quarterly report ≤30 days after end of each quarter including: • Information required to be monitored: o Table of nine operating parameters, based on flare type (clean service, emergency service, general service) o Alternative flare vent gas sampling information necessary to calculate flare emissions o Flare monitoring system data o Images of visible emissions o Presence of pilot flame o Pilot gas and purge gas flow to each flare • Total daily and quarterly emissions of criteria	Monthly report: • Total volumetric flow each day and month • If gas composition monitored w/ sampling, content by volume for each sample of total HC, methane, and H_2S • If composition monitored w/ continuous analyzer, avg. content by volume of: total HC; methane; total reduced sulfur; H_2S • Avg. molecular weight for each hour of the month (if measured) • For pilot & purge gas o Type of gas o Volumetric flow for each day and month o Means used to	None	None	Submitted annually, by March 1 of the following calendar year, including: • Monthly volumes of gas flared per planned continuous and planned intermittent flaring categories • Summary of total gas volume released during emergencies and weighted-average H2S content for the entire volume • Monthly reporting on any exceedance of the allowable monthly volume of gases planned for flaring

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
weight for each hour of each month (if measured) • For pilot and purge gas: o Type of gas used o Volumetric flow for each day and each month o Means used to determine flow • Flare monitoring system downtime • SO_2 emissions for each day and each month • Flow verification report for each flare	pollutants from each flare and each flare event along with information used to calculate emissions • Description of cause and category of each flare event • Records of annual acoustical or temperature leak survey • Flare monitoring system downtime periods • Copy of written notices for all reportable air releases related to any flare event	determine flow • For any 24-hr period when 1 million scf flared, description: o Cause o Time and duration o Source o Measures to reduce or eliminate flaring • Monitoring system downtime periods • Images recorded for the month • Methane, non-methane, and SO_2 emissions for each day and for the month Semi-annual flow verification report, comparing flow measured by monitoring system and flow verification for same period of time			
REPORTABLE FLARING EVENT REPORTS					
• Definition: o Flaring event where >500,000 scf gas flared/day or o SO2 emissions >500 lb/day o Ends when water seal integrity demonstrated or	Requirements: • Notify by telephone ≤1 hr. of unplanned flare event w/ emissions >100 lb. VOC, >500 lb. SO2, or >500,000 scf gas • Submit Specific Cause Analysis	For any 24-hour period during which >1 million scf of vent gas was flared: • Cause • Time of occurrence and duration • Source or equipment of origin	Notify if volume flared >500,000 scf per day: • Results of cause investigation • Measures to prevent recurrence • Justification for rejecting measures • Explanation	For unplanned flaring >1 hr. in duration: • Notify <4hr. after detection • Submit report: o Date, time, duration, volume of gas flared o Reasons for flaring	Exceedance not a violation if emergency: • Inform <4 hr. after start of next business day • Document event occurrence and causes • Submit <7days after end of event: o Description of event and

District Rule 4311 (Flares)	SCAQMD Rule 1118 (Control of Emissions from Refinery Flares)	BAAQMD Reg. 12 Rule 11 (Flare Monitoring at Petroleum Refineries)	BAAQMD Reg. 12 Rule 12 (Flares at Petroleum Refineries)	VCAPCD Rule 54 (Sulfur Compounds)	SBCAPCD Rule 359 (Flares and Thermal Oxidizers)
o For flares w/o water seal, ends when flow <0.12 ft/s • Submit annual report summarizing all reportable flaring events: o Results of cause investigation o Mitigation/ corrective actions to prevent recurrence o Justification for rejecting measures o Explanation of why emergency and cannot be recovered o Date, time, duration	w/in 30 days – cause, duration, mitigation/ corrective actions	• Measures taken to reduce or eliminate flaring	why consistent with FMP • Explanation of why emergency and cannot be recovered • Volume flared • Methane, non-methane, HC, and SO_2 emissions	o Settings pressure relief valves and max/min allowed safety settings o Corrective measures and actions to prevent recurrence o Sulfur emissions o Equipment or controls that failed For planned flaring: • Notice submitted >72 hr. prior: o Work that requires o Date and time o Expected gas volume and sulfur emissions o Steps or equipment to minimize sulfur emissions	mitigating and corrective actions implemented o Demonstration reasonable steps taken to minimize excess emissions o Demonstration that emergency not caused by improperly designed equipment; lack of preventative maintenance; careless or improper operation; operator error; willful misconduct o Document that source was properly operated at time event occurred

As demonstrated above, Rule 4311 is as stringent as or more stringent than analogous rules in other California air districts.

SBCAPCD Rule 359 (Flares and Thermal Oxidizers)[38]

SBCAPCD Rule 359 was adopted on June 28, 1994. Provisions of this rule apply to the use of flares and thermal oxidizers at oil and gas production sources, petroleum refinery and related sources, and natural gas services. Rule 359 sets specific requirements for the sulfur content in gaseous fuels, technology based standards, flare minimization plans, emergency events, and emission and operational limits.

[38] Santa Barbara County Air Pollution Control District. (1994, June 28). *Rule 359 Flares and Thermal Oxidizers. Retrieved February 13, 2015 from http://www.ourair.org/wp-content/uploads/rule359.pdf.*

Section D.3 of Rule 359 requires a FMP be submitted by any source subject to this rule that operates a flare rated at 15 MMBtu/hour or greater. For planned flaring, the FMP for all sources subject to this rule shall list a targeted maximum monthly flared gas volume, which shall not exceed 5% of the average monthly gas handled/produced/treated at the source unless the operator demonstrates such a maximum volume to be infeasible based on safety, engineering or cost constraints and proposes a different percentage. Any flaring that causes an exceedance of the emission limits or standards of Rule 359 is also not considered to be in violation if the operator demonstrates that the exceedance resulted from an emergency event.

Unlike District Rule 4311, SBCAPCD Rule 359 does not apply to the burning of sulfur compounds in the manufacturing of sulfur compounds. Additionally, under SBCAPCD Rule 359, flares for which flaring operations solely consist of planned, continuous flaring due to the non-availability of a produced gas pipeline are exempt from FMP requirements.

Although FMPs in SBCAPCD Rule 359 are required to list a targeted maximum monthly flared gas volume of five percent (5%) of the average monthly gas handled/produced/treated, the operator can obtain approval of a higher percentage by demonstrating that the maximum flare volume limit is infeasible based on safety, engineering, or cost constraints, which leaves the rule open to allow a higher amount of flaring. The District evaluated the percentage of gas flared in the Valley and found that the average percentage of gas flared between 2009 and 2013 was well below SBCAPCD's 5% theoretical level at 3.8% as shown in the table below.

Table C-11 Percent of Gas Flared at Valley Facilities

Year Of Data	Gas Produced (MCF)	5% Flared (if meeting SBCAPCD target) (Mscf)	Actual Flared (Mscf)	Percent of gas flared
2009	223,220,118	11,161,006	7,134,977	3.2
2010	241,676,822	12,083,841	7,884,879	3.3
2011	240,000,594	12,000,030	8,324,237	3.5
2012	216,232,509	10,811,625	10,147,080	4.7
2013	238,058,188	11,902,909	10,581,415	4.4
			Total Average Percent of Gas Flared in Valley	**3.8%**

In addition, unlike SBCAPCD rule 359, Rule 4311 does not allow an exceedance of any emissions limits or the requirement to minimize flaring activity, regardless of the cause. Allowing such a measure in the Valley would result in a serious relaxation of rule requirements and a potential increase in emissions. Under the District's rule, any exceedance or excess flaring not allowed under Rule 4311, regardless of the cause, would result in a violation and be subject to enforcement action. Flares subject to SBCAPCD Rule 359 whose flaring operations solely consist of planned, continuous flaring due to the non-availability of a produced gas pipeline outlet are also exempt from

FMP requirements while such flares subject to Rule 4311 are not exempt from FMP requirements and are still required to identify and implement actions that reduce flaring.

Based on the discussion above, District Rule 4311 is clearly more stringent than SBCAPCD Rule 359 for the following reasons:

- Rule 4311 applies to a broader range of sources than SBCAPCD Rule 359
- SBCAPCD Rule 359 includes a performance standard for the volume of gas flared (5%), but also includes APCO discretion for allowing unlimited flaring activity
- SBCAPCD Rule 359 contains several exemptions not allowed in Rule 4311, including the allowance for exceedance of emission limits
- EPA analysis resulted in the 2012 determination that Rule 4311 is as stringent as requirements in SBCAPCD Rule 359 in terms of core RACT requirements
- Overall, Rule 4311 results in significantly less flared gas relative to flaring capacity in the District as compared the allowable levels of flaring under SBCAPCD

State of North Dakota

- **Century Code 38-08-06.4**[39]
- **Industrial Commission Order**[40]

North Dakota Century Code 38-08-06.4 applies to flaring of gas produced with crude oil from an oil well. The North Dakota rule allows for the uncontrolled flaring of all gases during the first year after opening a new crude oil production well, after which flaring of the entire volume of gas must cease and the well must be:

- Capped;
- Connected to a gas gathering line;
- Equipped with an electrical generator that consumes at least seventy-five percent (75%) of the gas from the well;
- Equipped with a system that intakes at least seventy-five percent (75%) of the gas and natural gas liquids volume from the well for beneficial consumption by means of compression to liquid for use as fuel, transport to a processing facility, production of petrochemicals or fertilizer, conversion to liquid fuels, separating and collecting over fifty percent (50%) of the propane and heavier hydrocarbons; ***or***
- Equipped with other value-added processes as approved by the industrial commission, which reduce the volume or intensity of the flare by more than sixty percent (60%).

[39] North Dakota Legislative Branch. (2013, August). *Century Code 38-08-06.4 Flaring of Gas Restricted – Imposition of Tax – Payment of Royalties – Industrial Commission Authority. Retrieved February 13, 2015 from* http://www.legis.nd.gov/cencode/t38c08.pdf?20150213153521.

[40] North Dakota Industrial Commission. (2014, July 1). *Order of the Commission*. Obtained February 3, 2015 from https://www.dmr.nd.gov/oilgas/or24665.pdf.

Because of excessive flaring in North Dakota, the North Dakota Industrial Commission acted on a motion of the commission to consider amending the current oil production rule to reduce the amount of flared gas by issuing an order in July 2014 to increase gas capture from oil wells. The order requires 74% of gas capture (instead of flaring) by October 2014, 77% by January 2015, 85% by 2016, and 90% by 2020. If such gas capture percentage is not attained at a maximum efficient oil production rate, the well may still continue to produce 200 barrels of oil per day if at least 60% of the monthly volume of associated gas produced from the well is captured. If the 60% gas capture target is not met, the well may continue to produce 100 barrels of oil per day. This Order of the Commission is not an actual rule amendment and, because it did not pass through the entire public process, could be defeated in court or simply expire January 2016.[41]

Many of the sources subject to Rule 4311 design and operate their equipment and processes in a manner that inherently results in minimal flaring activity. Flare gas is typically flared further along in the process, rather than directly from production wells, resulting in less flaring activity. In contrast, sources in North Dakota flare large portions of the gas generated at oil production wells. This is a rudimentary oil production method that is often seen in regions with little to no history of emission regulations. Flaring in North Dakota has increased more than 50% in the past two years to levels previously unknown in the United States and comparable to those of Russia and Nigeria.[42] According to North Dakota's Department of Mineral Resources, 29 percent (29%) of the natural gas now extracted in North Dakota is flared off, which accounts for almost 28% of all flaring in the United States and one percent (1%) of all flaring worldwide.[43] In April, 2014 alone, North Dakota wells burned off 10.3 billion scf of natural gas, worth almost $50 million on the spot market. The annual value of flared gas is reportedly worth as much as $1 billion.[44] This excessive flaring is due in part to the addition of 1,100 to 2,700 wells per year, with tens of thousands of wells still lacking access to a gas transmission pipeline.[45,46]

Even with the recent order from the North Dakota Industrial Commission to increase gas capture to 74% by October 2014, 77% by January 2015, 85% by 2016, and 90% by 2020, the District already requires a minimum of 95% gas capture and achieves over 96%. In addition, because the North Dakota rule contains no requirements to control

[41] The Bismarck Tribune. (2015, January 19). *Helm says tax revenue at risk if flaring, oil conditioning orders voided*. Retrieved February 13, 2015 from http://bismarcktribune.com/news/state-and-regional/helms-says-tax-revenue-at-risk-if-flaring-oil-conditioning/article_e615f72d-d2ff-50a6-a151-4875945792c5.html

[42] King & Spalding. (2014, June). *Dispute Resolution, Oil & Gas Litigation*. Retrieved February 13, 2015 from http://www.kslaw.com/library/newsletters/EnergyNewsletter/2014/June/article2.html.

[43] North Dakota Pipeline Authority. *Natural Gas Facts*. Retrieved February 13, 2015 from http://northdakotapipelines.com/natgasfacts/.

[44] General Electric. (2014, September 10). *Taming North Dakota's Gas Flares*. Retrieved February 13, 2015 from http://www.gereports.com/post/97136504480/taming-north-dakotas-gas-flares.

[45] Oil & Gas Monitor. (2014, August 11). *Can a Flaring Problem Become Natural Gas Industry Advantage in North Dakota?* Retrieved February 13, 2015 from http://www.oilgasmonitor.com/can-flaring-problem-become-natural-gas-industry-advantage-north-dakota/7617/.

[46] North Dakota Department of Mineral Resources. Retrieved February 13, 2015 from http://www.ndoil.org/image/cache/NDPCAnnual092111_2.pdf.

the fraction of gas not addressed by one of the required options, a producer would be able to vent up to 40% of produced gas directly to the atmosphere and still have the ability to flare the full captured amount. For the first year of operation, operators of new oil production wells are permitted to flare 100% of produced gas. Additionally, the optional equipment used to control the captured gas, such as uncontrolled internal combustion engines, could easily increase emissions because flaring in itself is a highly effective control technology. Finally, a producer may obtain an exemption by demonstrating to the industrial commission that connection of the well to a natural gas gathering line is economically infeasible or that a market for the gas is not available and equipping the well with an electrical generator to produce electricity from gas or employing a collection system is economically infeasible. North Dakota regulators granted ninety-five percent (95%) of extension requests over the last two years.[47]

In the Valley, operators do not have the flexibility to capture only 60% of associated gas or to obtain extensions or exemptions from rule requirements as allowed in the North Dakota rule. New steam enhanced wells (the vast majority of wells in the District are heavy oil steam enhanced wells) require an ATC permit before they are operated. As part of receiving an ATC, these wells are subject to the District's New Source Review rule (District Rule 2201), which requires the installation of Best Available Control Technology (BACT) consisting of a system that collects and controls well vapors and must comply with a multitude of additional requirements (i.e, offsets, public noticing, health risk assessment, etc.).

The District has two rules specific to the operation of crude oil wells. Rule 4401 (Steam-Enhanced Crude Oil Production Wells) and Rule 4409 (Components at Light Crude Oil Production Facilities, Natural gas Production Facilities, and Natural Gas Processing Plants). These rules contain control requirements including a minimum 95% capture and control, periodic leak detection, and repair requirements for steam enhanced wells and light oil wells. These rules also require the development of an Operator Management Plan (OMP) that describes how a facility will comply. The OMP must be updated annually to reflect any changes to the OMP, including changes to address newly installed wells. These prohibitory rules are applicable to both existing and new wells.

Regions such as North Dakota have only recently begun controlling emissions from flares and, as such, must make significant progress before matching the District in capture and control technology and stringency of regulations. After extensive analysis of the North Dakota rule requirements and comparison to those in the District, it is clear that Rule 4311 is significantly more stringent than North Dakota Century Code 38-08-06.4 for at least the following reasons:

- Rule 4311 applies to a broader range of sources than the North Dakota rule

[47] Scientific American. (2013, September 12). *North Dakota flared off $1 billion worth of natural gas last year*. Retrieved February 14, 2015 from http://blogs.scientificamerican.com/plugged-in/2013/09/12/north-dakota-flared-off-1-billion-worth-of-natural-gas-last-year/.

- Rule 4311 requires 95% capture and treatment of produced gas, whereas the North Dakota rule only requires 60% capture and allows one year of unlimited flaring
- The North Dakota rule does not contain any requirements that address the remaining 40% of produced gas
- 95% of facilities that requested extensions to the requirements of the North Dakota rule were approved

Evaluation Findings

Even though flares are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4311 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category.

As described in the section detailing FMP requirements, operators of flares in the Valley are already implementing all feasible measures to reduce flaring activity. Even for those devices that have been committed to in FMPs, alternative methods of disposal do not necessarily decrease emissions, and could even increase emissions compared to the baseline from flares; however, combusting gas onsite or transmitting it for use at other sources could prevent the additional combustion of other fuel, thereby reducing overall emissions in the Valley, if not actually reducing emissions from the combustion of the flare gas.

In other air districts, the addition of transmission pipelines is the only major viable possible measure to reduce emissions. In the Valley, most producers of associated gas have access to transmission pipelines and are already selling as much gas as possible. The addition of pipelines would most likely not be performed by the facilities operating flares, but would instead be installed by utility companies such as PG&E. Requiring oil and gas producers that do not have access to transmission pipelines to construct them would be cost prohibitive and is beyond the scope of what is required by any other air district.

Although Rule 4311 already meets BACM and MSM requirements, the District is committing to further evaluate Rule 4311 beginning in 2015. See Chapter 8 (Commitment to Leave No Stone Unturned to Evaluate Additional Opportunities) for more information.

C.12 RULE 4313 LIME KILNS

Discussion

Rule 4313 was adopted in 2003 to limit NOx emissions from the operation of lime kilns. Lime kilns can be used in a variety of manufacturing and processing operations, including food and agriculture. EPA finalized approval of the 2003 adoption of Rule 4313 on September 4, 2003 and deemed this rule as being at least as stringent as established RACT requirements.

Source Category

There are currently no lime kilns operating in the Valley. At the time of rule adoption, there were a total of three lime kilns in the Valley, used at two sugar processing plants; however, these plants have been non-operational since 2008. Any lime kilns beginning operation in the Valley in the future would be required to meet District BACT requirements, per District Rules 2201 (New and Modified Stationary Source Review Rule) and 4001 (New Source Performance Standards).

Emissions Inventory

There is no emissions inventory associated with lime kilns because there are no lime kilns operating in the Valley; no lime kilns are in the preliminary permitting process to become operational in the Valley, nor are any lime kilns expected to be operated in the Valley in the future.

How does District Rule 4313 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG or ACT requirements for this source category.

NSPS

- 40 CFR 60 Subpart HH (Standards of Performance for Lime Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 60 Subpart HH and found no requirements that were more stringent than those already in Rule 4313.

NESHAP/ MACT

- 40 CFR 63 Subpart AAAAA (National Emission Standards for Hazardous Air Pollutants for Lime Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 63 Subpart AAAAA and found no requirements that were more stringent than those already in Rule 4313.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4313 compare to rules in other air districts?

There are no analogous rules for this source category in SCAQMD, BAAQMD, SMAQMD, and VCAPCD.

Evaluation Findings

There are no lime kilns operating in the Valley and thus no emissions or emission reduction opportunities for this source category. As previously mentioned, any lime kilns beginning operation in the future would be required to meet District BACT requirements. As such, Rule 4313 meets or exceeds both BACM and MSM requirements for this source category.

C.13 RULE 4352 SOLID FUEL FIRED BOILERS, STEAM GENERATORS, AND PROCESS HEATERS

Discussion

The purpose of Rule 4352 is to limit NOx and carbon monoxide (CO) emissions from any boiler, steam generator or process heater fired on solid fuel. Prior to September 14, 1994 solid fuel fired units were exempt from the requirements of District Rule 4305. The adoption of Rule 4352 established NOx limits of 200 parts per million volume (ppmv) for municipal solid waste facilities (MSW), 0.35 pounds per million British thermal units per hour (lb/MMBtu) for biomass facilities, and 0.20 lb/MMBtu for all other solid fuel fired units. Since its adoption, the rule has been amended three times. The December 2011 amendments strengthened the rule by lowering NOx emissions limits for all three source categories. However, no emissions reductions were quantified because the rule amendments were meant to satisfy EPA RACT requirements and all units were determined to be operating at the new emission limits. EPA finalized approval of Rule 4352 on November 6, 2012 and deemed this rule as being at least as stringent as established RACT requirements.

While previous rule-amending projects for Rule 4352 have not quantified specific emissions reductions, the use of biomass facilities in the Valley has fostered emissions reductions. As an energy source, biomass can either be used directly or converted into other energy products such as biofuel. Biomass facilities in the Valley reduce the amount of pollutants created by open burning practices and the landfilling of potential biofuels such as agricultural materials, and urban and forest wood waste products by utilizing these materials. The District has reduced the total acreage of agricultural materials burned in the Valley to date by more than 80%.

Source Category

Boilers, steam generators, and process heaters are used in a broad range of industrial, commercial, and institutional settings. Units subject to this rule fire on a variety of solid fuels: coal, petroleum coke, biomass, tire-derived fuel, and MSW. Although the output from units subject to the rule could be utilized in many settings, all of the operators within the Valley use the units' output to generate electricity. There are 17 units subject to this rule located at 15 facilities.

The two primary methods of controlling NOx emissions from boilers, steam generators, and process heaters are either to change the combustion parameters to reduce NOx formation (i.e., combustion modification) or to treat the NOx formed in the process before the NOx is emitted into the atmosphere (i.e., post-combustion control or flue gas treatment).

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.62	0.65	0.67	0.72	0.76	0.79	0.82	0.84	0.87
NOx	2.69	2.77	2.85	2.99	3.14	3.21	3.30	3.36	3.47
SOx	0.56	0.57	0.59	0.61	0.64	0.66	0.68	0.69	0.71
	Winter Average - Tons per day								
PM2.5	0.61	0.64	0.66	0.71	0.75	0.77	0.81	0.83	0.86
NOx	2.40	2.49	2.56	2.71	2.85	2.91	3.01	3.07	3.18
SOx	0.54	0.56	0.57	0.59	0.62	0.64	0.66	0.68	0.69

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from solid fuel fired boilers, steam generators, and process heaters are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for solid fuel fired boilers, steam generators, and process heaters.

How does District Rule 4352 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG requirements for this source category.

ACT

- EPA–453/R-94-022 (Alternative Control Techniques Document– NOx Emissions from Industrial/Commercial/ Institutional Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Industrial/Commercial/Institutional Boilers and found no requirements that were more stringent than those already in Rule 4352.

- EPA – 453/R-94-023 (Alternative Control Techniques Document– NOx Emissions from Utility Boilers)

The District evaluated the requirements contained within the ACT for NOx Emissions from Utility Boilers and found no requirements that were more stringent than those already in Rule 4352.

NSPS

- 40 CFR 60 Subpart Cb (Emission Guidelines and Compliance Times for Municipal Waste Combustors that are Constructed on or before December 19, 1995)

The District evaluated the requirements contained within 40 CFR 60 Subpart Cb and found no requirements that were more stringent than those already in Rule 4352.

- 40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel-Fired Steam Generators for which Construction is Commenced after August 17, 1971)

The District evaluated the requirements contained within 40 CFR 60 Subpart D and found no requirements that were more stringent than those already in Rule 4352.

- 40 CFR 60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)

The District evaluated the requirements contained within the 40 CFR 60 Subpart Db and found no requirements that were more stringent than those already in Rule 4352.

NESHAP/ MACT

- 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR 63 Subpart DDDDD was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches. The District evaluated the requirements contained within this NESHAP and found no requirements that were more stringent than those already in Rule 4352.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4352 compare to rules in other air districts?

There are no analogous rules for this source category in VCAPCD.

SCAQMD

- Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The District evaluated the requirements contained within SCAQMD's Rule 1146 and found no requirements that were more stringent than those already in Rule 4352.

BAAQMD

- Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 7 and found no requirements that were more stringent than those already in Rule 4352.

- Regulation 9 Rule 11 (Nitrogen Oxides and Carbon Monoxide from Electric Power Generating Steam Boilers)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 11 and found no requirements that were more stringent than those already in Rule 4352.

SMAQMD

- Rule 411 (NOx from Boilers, Process Heaters, and Steam Generators)

The District evaluated the requirements contained within SMAQMD's Rule 411 and found no requirements that were more stringent than those already in Rule 4352.

Additional Emission Reduction Opportunities

Biomass Facilities

The presence of biomass facilities in the Valley, from either new facilities or other solid fuel fired boilers that have converted to biomass, continues to significantly reduce NOx and PM emissions from open burning practices. However, the biomass industry has indicated that given current energy policy in California there is concern that biomass power facilities are in jeopardy. Many biomass plants in the Valley are nearing the end of their long-term contracts with utilities and find themselves in a position where the power that they provide is not the type of power that utilities are seeking (base load vs. intermittent) and that the prices being offered for new contracts are too low to support their operations.

The District has learned that two biomass power plants have shut down due to their inability to secure contracts with utilities at rates that are sufficient to sustain their operations. Greenleaf Power that operates the Tracy Biomass Plant, located in Tracy, reported that they shut down on October 31, 2014 and the Covanta facility located in Mendota was shut down in January 2015. Initially, another Covanta facility in Delano had indicated that they were likely to shut down but is now reporting that they were able to secure a one-year extension on their current utility contract at the same rate that enables them to continue to operate. With additional biomass facilities on the brink of closure, it has become even more infeasible to require citrus orchard removals to be sent for use in biomass.

The District has convened a number of productive meetings with agricultural stakeholders and representatives of the biomass industry in order to more fully understand the issues faced by the industry and develop a common vision of the future of biomass power amongst the stakeholders in the Valley. The meetings have been helpful in forging a better working relationship between agriculture representatives and biomass power producers and developing consensus on long-term solutions. The group has also discussed potential short term solutions.

In June 2014, the District's Governing Board adopted positions on two pieces of legislation that impact the biomass industry. The District adopted a position in support

of AB 2363 (Dahle), which was sponsored by the biomass industry, and would make biomass plants more competitive by fully accounting for the costs associated with intermittent sources of renewable power (solar and wind) when comparing them to other sources of power. AB 2363 was signed by the Governor and will begin to help level the renewable energy playing field. The District also took a position in opposition to SB 1139 (Hueso) that would have given preferential treatment to new geothermal power plants by requiring that utilities purchase specified amounts of new geothermal power. Ultimately, AB 1139 was not passed by the legislature.

Long-Term Solutions for Biomass

There is consensus that biomass power producers currently are not on a level playing field in competing with other renewable sources of power for utility contracts. They are also not receiving any preferential treatment for the societal benefits for providing a cleaner alternative to the open burning of agricultural waste and assisting with meeting landfill diversion goals.

Contracts between power producers and utilities are confidential, but the current market rate that the biomass plants can garner is approximately 6 cents/KWH. This is the rate that the utilities obtain through contracts with solar power providers. This low cost is made possible largely due to government subsidies provided for solar power production. Biomass power producers have indicated that it takes approximately 9-10 cents/KWH for the plants to cover their operating costs.

The District and representatives from agriculture and biomass industries are working to develop and pursue specific actions with the legislative branch, utilities, Public Utility Commission, CalRecycle, and other government agencies to help level the playing field and allow the biomass industry to fairly compete.

The District will also work with the stakeholders including the Federal Department of Energy, California Energy Commission, and other partner agencies to pursue clean alternatives to biomass power production for agricultural waste disposal.

Selective Catalytic Reduction

When comparing Rule 4352 to EPA and other air districts' BACT requirements, it was noted that SCR systems are considered BACT. A SCR system reduces NOx emissions by converting the emissions to water and elemental nitrogen. In the analyses below, the District evaluated the cost effectiveness of requiring SCR for all three categories of solid fuel fired boilers: MSW, biomass, and other fuels.

Cost Effectiveness of SCR for MSW Units

Currently, facilities are generally equipped with Selective Non-Catalytic Reduction (SNCR) and utilize this technology to meet emission limits ranging between 165 ppmv to 210 ppmv. Although it appears that facilities can achieve a lower NOx limit beyond the current rule requirements, an additional NOx control technology such as Selective Catalytic Reduction (SCR) would be needed. In fact, the installations that are achieving lower NOx emissions were installed as new installations equipped with the SCR

technology. The District could not find an example of an SCR installation as a retrofit on an existing MSW facility.

Though a retrofit installation has not been demonstrated in practice, the District conducted a cost effectiveness analysis to determine if installing SCR as a retrofit would be reasonable. The District used the following methodology and assumptions for this cost effectiveness analysis:

Assumptions

- Baseline emission factor is 0.286 lb-NOx/MMBtu (equivalent to 165 ppmv @ 12% CO2)
- SCR provides control to 50 ppmv at 7% O2 (47 ppmv @ 12% CO2)
- Capital cost annualized at 10% interest for 10 years

Cost data was obtained from a preconstruction approval by the Florida Department of Environmental Protection (FDEP) issued on December 23, 2010. The approval was issued for an MSW-fired combustor equipped with SCR for NOx control. The control equipment costs from the FDEP application include uncontrolled NOx emissions of 250 ppmv and controlled NOx emissions of 50 ppmv which represents an 80% reduction in NOx from the SCR. However, 80% reduction from 165 ppmv @ 12% CO2 would yield controlled emissions of 33 ppmv, which is well below BACT. Therefore, controlled emissions are evaluated at the BACT limit of 47 ppmv @ 12% CO2.

The SCR installation is sized for a unit rated at approximately 460 MMBtu/hr used to produce superheated steam for an electrical generator. The District reviewed the expected exhaust parameters and found them comparable to the parameters for solid fuel-fired boilers in the Valley. Therefore, it is believed that this cost estimate provides a valid basis for estimating costs for installing SCR on boilers in the Valley.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 350 MMBtu/hr unit operating at full fire at 100% capacity factor year round for the MSW facility. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Emissions are calculated in the following table:

Table C-12 Emissions from a MSW Unit

Fuel	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (lb/yr)	Emissions (tons/yr)
MSW (baseline)	350	8,760	0.286	876,000	438
MSW (controlled)	350	8,760	0.081	248,346	124

The capital and operational costs are sized to the facility size using the six-tenths rule, where:

- CA is a known cost of equipment of size A
- CB is the estimated cost of equipment of size B

- SB is the size of equipment B
- SA is the size of equipment A

$$C_B = C_A \times (S_B \div S_A)^{0.6}$$

It is standard District policy for Best Available Control Technology (BACT) analyses to use a 10 year life and 10% interest rate unless information indicates otherwise; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs.

It is noted that the FDEP cost analysis is for a new unit with an adequately-sized induced draft (ID) fan. However, for a new unit the ductwork can be laid out in a way that minimizes pressure losses, allowing for a smaller ID fan than may be required for a retrofit. Affected sources have provided some estimates for additional electrical costs associated with the larger ID fan required for a retrofit, so these have been incorporated into the analysis. In addition, the FDEP analysis is for a new unit so it does not include the loss of revenue from taking a unit off-line to retrofit the new technology. For each unit it is estimated that the retrofit would require at least six months of downtime at $118/MW-hr; this will be added to the capital cost. Finally, the FDEP analysis specifically ignored sales tax on capital equipment on the grounds it is exempt from sales tax in Florida. This would not be the case in California, so 8% sales tax has been included.

The cost effectiveness analysis for installing SCR on a MSW unit is as follows:

Table C-13 Cost Effectiveness for Installing SCR on a MSW Unit

Description of Cost	Cost Factor	Cost	Source
Direct Capital Costs (DC):			
Purchase Equipment Costs (PE):			
(A) Basic Equipment:			
1) SCR System (Quote from Babcock Power)		6,790,099	FDEP[48]
2) Additional Ductwork (220 ft)	$1,800/ft	336,110	FDEP
3) Increased ID fan size		7,384	FDEP
Subtotal of Basic Equipment	A	7,133,593	FDEP
(B) Instrumentation and controls: (1% of A)	0.01 A	71,336	FDEP
(C) Freight: (5% of A)	0.05 A	356,680	FDEP
(D) Taxes	0.08 (A+B+C)	604,929	OAQPS
PE Total:		8,166,538	
Direct Installation Costs (DI): Assume Modular SCR w/ simple installation			
Foundation and Supports:	0.16 PE	1,306,646	FDEP
Handling and Erection:	0.40 PE	3,266,615	FDEP
Electrical: (quote from CH2M Hill)	0.10 PE	816,654	Industry
Piping: (quote from CH2M Hill)	0.20 PE	1,633,308	Industry
Insulation:	0.01 PE	81,665	OAQPS
Painting:	0.01 PE	81,665	OAQPS

[48] All costs from FDEP size-adjusted using six-tenths rule from 460 MMBtu/hr to 350 MMBtu/hr.

Description of Cost	Cost Factor	Cost	Source
Costs for Expansion of APC Building for SCR Components (quote Malcolm Pirnie)		366,665	FDEP
DI Total:		7,553,218	
Retrofit (Deconstruct existing building/structures, estimated equal to DI total)		7,553,218	District
Natural gas pipeline (replace fuel oil #2)		3,000,000	Industry
Site Preparation and Buildings			
DC Total = PE + DI + retrofit + pipeline:		26,272,974	
Indirect Costs (IC):			
Engineering:	0.10 PE	816,654	OAQPS
Construction and Field Expenses:	0.05 PE	408,327	OAQPS
Contractor Fees:	0.10 PE	816,654	OAQPS
Contingencies:	0.15 PE	1,224,981	FDEP
Start-up:	0.02 PE	163,331	OAQPS
Performance Testing:	0.01 PE	81,665	OAQPS
Retrofit Downtime (6 months minimum, electricity sales and tipping fees)		11,000,000	Industry
IC Total:		14,511,612	
Total Capital Investments (TCI = DC + IC):		40,794,586	
Direct Annual Costs (DAC): Assume SCR requires 0.5 hrs/shift			
Operating Costs (O): (≈ 1,095 shifts/year @ 3 shifts/day)			
Operator: 1.0 hr/shift	$50/hr	54,750	FDEP
Supervisor:	15% operator	8,213	OAQPS
Maintenance Costs (M):			
Labor: 1.0 hr/shift	$50/hr	54,750	FDEP
Material:	100% labor	54,750	FDEP
Utility Costs (U):			
Performance loss:	$0.08848/kW-hr	386,495	FDEP
Electricity Cost: (additional 818 kW[49])	$0.08848/kWhr	634,019	Industry
Catalyst Replace:		123,071	FDEP
Total DAC:		1,316,048	
Indirect Annual Costs (IAC):			
Overhead:	60% O & M	87,828	OAQPS
Insurance:	0.01 TCI	407,946	OAQPS
Property Tax:	0.01 TCI	407,946	OAQPS
Administrative:	0.02 TCI	815,892	OAQPS
Annualized Total Capital Investment: interest rate (%) 10			
Period (years): 10	0.1627 TCI	6,637,279	District Policy
Total IAC:		9,672,939	
Total Annual Cost (DAC + IAC):		**9,672,939**	

[49] Resized from industry estimate of 2 trains, 628 kW/train, for a 715 MMBtu/hr facility, resized to 350 MMBtu/hr

Table C-14 Summary of Cost Effectiveness for Installing SCR on a MSW Unit

Fuel Type	Baseline Emissions (tons/yr)	Controlled Emissions (tons/yr)	Emissions Reduced (tons/yr)	Adjusted Annualized Cost ($/yr)	Cost Effectiveness ($/ton)
MSW	438	124	314	9,672,939	$30,806/ton

The cost effectiveness for installing SCR on a MSW fired boiler is $30,806 per ton of NOx reduced. It is important to note that this calculation is based off of a new installation of SCR, not a retrofit as would be required by Valley facilities. While some retrofit expenses have been included, operators would potentially incur additional costs when retrofitting to incorporate SCR including expenses for additional ductwork, installation of a new natural gas pipeline to replace the existing fuel oil supply, and labor; therefore, District staff assumes the cost effectiveness is even higher than presented in this analysis.

Cost Effectiveness of SCR for Biomass Units

Currently, facilities are generally equipped with SNCR and although it appears that facilities could possibly achieve a lower NOx limit beyond the revised proposed rule amendments, additional NOx control technology such as SCR would be needed. In fact, the installations that are achieving lower NOx emissions are typically installed as new installations equipped with the SCR technology, with one exception. One facility in the Valley has installed SCR on a smaller existing boiler under an experimental research exemption approved in February 2008. In March 2009, the District approved the facility's application to replace the existing SNCR (which had become inoperable) with the SCR installed under the experimental research exemption. This modification did not result in any reduction in permitted emissions as the SCR-equipped boiler is only required to comply with the same emission limit the SNCR-equipped boiler was. This modification was incorporated into the Title V permit in September 2010. While this example may indicate that SCR is technologically feasible as a retrofit for smaller sized biomass-fired boilers, there are many other considerations unique to each facility that may inhibit the retrofit of a SCR system. Based on the following analysis, SCR is not cost effective at this time. It is important to note that this cost effectiveness analysis does not take into consideration the current economic struggles of the biomass industry, as previously described.

The District used the following methodology and assumptions for this cost effectiveness analysis:

Assumptions

- Baseline emission factor is 0.11 lb-NOx/MMBtu for Biomass(equivalent to 85ppmv @ 3% O2)
- SCR provides 80% control efficiency (from the provided cost estimates)
- Capital cost annualized at 10% interest for 10 years

Cost data was obtained from a preconstruction approval by the FDEP issued on December 23, 2010 as described above in the MSW section.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 700 MMBtu/hr unit is operating at full fire at 100% capacity factor year round is representative for the Valley biomass facilities. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Emissions are calculated in the following table:

Table C-15 Emissions Calculations for a Biomass Unit

Fuel Type	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (tons/yr)	Control Efficiency	Emissions Reduced (tons/yr)
Biomass	700	8,760	0.11	337.26	80%	269.8

The capital and operational costs are sized to the facility size using the six-tenths rule, as described in the MSW section above.

$$C_B = C_A \times (S_B \div S_A)^{0.6}$$

Therefore;

C_B = \$9,672,939/year x (700 MMBtu/hr ÷ 350 MMBtu/hr)$^{0.6}$

= \$14,661,434/year

It is standard District policy to use a 10 year life and 10% interest rate; therefore the capital recovery factor (CRF) of 0.1627 will be used to annualize the capital costs.

Table C-16 Cost Effectiveness for Installing SCR on a Biomass Unit

Fuel Type	Adjusted Annualized Cost ($/yr)	Emissions Reduced (tons/yr)	Cost Effectiveness ($/ton)
Biomass	14,661,434	269.8	\$54,342/ton

It is estimated based on the above data and assumptions that requiring the installation of SCR would provide a cost effectiveness of \$54,342/ton for a biomass-fired boiler. The cost effectiveness was evaluated without taking into account additional potential costs involved in a retrofit of the facility. It should also be noted that the District's cost effective analysis is very conservative since the installation of the SCR technology with an 80% control efficiency assumes a NOx emission level of approximately 17 ppmv @ 3% O2. This level is lower than established BACT levels and well beyond RACT thresholds. Therefore, even with these conservative assumptions, the installation of SCR is not cost effective for these types of installations.

Furthermore, the emission factors used above are short-term emission limits on a block 24-hour average basis and in all probability will not be representative of actual annual emission rates. Indeed, the post-SCR emission factors for biomass is 0.022 lb/MMBtu,

which is well below the short-term emission limits for recently issued biomass-fired boiler ATCs. If, as appears possible, the post-SCR emission rates are higher than assumed above, then the quantity of emission reductions will be lower and the cost of emission reductions greater. Finally, it is vital to remember that the 700 MMBtu/hr boiler assumed for biomass boilers above is an idealized hypothetical chosen to maximize the economies of scale in using the six-tenths rule to scale the cost estimate. For any actual plant within the population of solid fuel-fired boilers in the Valley, the boiler rating will be lower (as small as 171.2 MMBtu/hr) and the cost of emission reductions will be correspondingly higher.

Cost Effectiveness of SCR for Units Using Other Fuels

Currently, facilities are equipped with SNCR and although facilities may be able to achieve a lower NOx limit beyond the revised proposed rule amendments, additional NOx control technologies such as SCR would be needed. District staff conducted a cost effectiveness analysis to determine if installing SCR as a retrofit would be reasonable.

District staff used the following methodology and assumptions for this cost effectiveness analysis:

Assumptions

- Baseline emission factor is 0.10 lb-NOx/MMBtu (equivalent to 73 ppmv @ 3% O2)
- SCR provides 80% control efficiency (from the provided cost estimates)
- Capital cost annualized at 10% interest for 10 years

Cost data to install the SCR technology was obtained from a preconstruction approval the FDEP issued on December 23, 2010 as described above in the MSW section.

To maximize the emission reductions and economies of scale in estimating the retrofit costs, it is assumed that a 700 MMBtu/hr unit operating at full fire at 100% capacity factor year round is representative for boilers firing on “other” fuels. The purpose of these assumptions is to err on the conservative side throughout the analysis.

Emissions are calculated in the following table:

Table C-17 Emissions Calculations for Other Units

Fuel Type	Rating (MMBtu/hr)	Time (hr/yr)	EF (lb/MMBtu)	Emissions (tons/yr)	Control Efficiency	Emissions Reduced (tons/yr)
Other	700	8,760	0.10	306.6	80%	245.3

The capital and operational costs are sized to the facility size using the six-tenths rule, as described in the MSW section above.

$$C_B = C_A \times (S_B \div S_A)^{0.6}$$

Therefore;

$$C_B = \$9{,}672{,}939/\text{year} \times (700\ \text{MMBtu/hr} \div 350\ \text{MMBtu/hr})^{0.6}$$
$$= \$14{,}661{,}434/\text{year}$$

It is standard District policy to use a 10 year life and 10% interest rate; therefore the capital recovery factor (CRF) of 0.163 will be used to annualize the capital costs.

Table C-18 Cost Effectiveness for Installing SCR Other Unit

Fuel Type	Adjusted Annualized Cost ($/yr)	Emissions Reduced (tons/yr)	Cost Effectiveness ($/ton)
Other	14,661,434	245.3	$59,769/ton

It is estimated based on the above data and assumptions that requiring the installation of SCR would result in a cost effectiveness of $59,769/ton for an Other Fuel-fired boiler. The cost effectiveness was evaluated without taking into account additional potential costs involved in a retrofit of the facility. The District has determined that is not economically feasibility to require SCR based on this cost effectiveness analysis and did not further evaluate additional costs associated with a retrofit. It should also be noted that the District's cost effective analysis is very conservative since the installation of the SCR technology with an 80% control efficiency assumes a NOx emission level of approximately 15 ppmv @ 3% O2. This level is lower than established BACT levels and well beyond RACT thresholds. Therefore, even with these conservative assumptions, the installation of SCR is not cost effective.

Furthermore, the emission factors used above are short-term emission limits on a block 24-hour average basis and in all probability will not be representative of actual annual emission rates. Indeed, the post-SCR emission factors for "other" fuels is 0.020 lb/MMBtu, which is well below the short-term emission limits for recently issued ATCs. If, as appears possible, the post-SCR emission rates are higher than assumed above, then the quantity of emission reductions will be lower and the cost of emission reductions greater. Finally, it is vital to remember that the 700 MMBtu/hr boiler assumed for "other" fuels above is an idealized hypothetical chosen to maximize the economies of scale in using the six-tenths rule to scale the cost estimate. For any actual plant within the pollution of solid fuel-fired boilers in SJVAPCD, the boiler rating will be lower (as small as 171.2 MMBtu/hr) and the cost of emission reductions will be correspondingly higher. Based off of this information, it would not be cost effective to require Valley facilities to retrofit with additional NOx reduction technology beyond what is currently being used.

Controls for Direct PM2.5 Emissions

The District researched the potential opportunity of specifying required controls for direct PM2.5 emissions. Three technologies were recognized as being able to potentially reduce direct PM2.5 emissions: electrostatic precipitators (ESPs), baghouses, and cyclones.

An ESP is a particulate collection device that removes particles from a flowing gas using the force of an electrostatic charge with a 90- 99.9% control efficiency of PM2.5 for solid fuel fired boilers within the 100-500 MMBtu/hr size range of District units.[50] A baghouse, on the other hand, is a technology in which particulates are removed from a stream of exhaust gases as the stream passes through a large cloth bag. Baghouses have a PM2.5 removal effectiveness of 90-99.9% for solid fuel fired boilers in the size range of District units.[51] Coal and coke-fired units generally use baghouses, but biomass boilers usually use ESPs because of the health and safety risk of the burning embers causing a fire in the baghouse. However, when cyclones are combined with the use of a baghouse, the burning embers are extinguished and allow for the use of a baghouse in a biomass facility[52]. This also reduces acid gases and some PM2.5 compared to the use of a baghouse alone.

All of the facilities subject to Rule 4352 have installed either a baghouse or ESP particulate matter removal system due to permitting requirements. Since the control efficiency ranges for both technologies are equivalent, there are currently no other PM controls more effective than current practices.

Controls for SOx Emissions

Potential opportunities to reduce SOx emissions from this source category were also researched. Most facilities subject to Rule 4352 currently inject limestone into the combustion chamber to react with fuel sulfur and produce various sulfate compounds, which can then be removed by the ESP or baghouse. This control technology typically achieves around 50% control of SOx emissions[53]; however, the emissions reduced are less for a low sulfuric fuel due to the lower concentration of sulfur dioxide (SO2) initially in the combustion products.

Scrubbers are an add-on control technology that can achieve 70-95% control of SOx emissions for solid fuel fired boilers[54]. The only MSW facility in the Valley currently utilizes a semi-dry scrubber system to control SOx emissions. Therefore, the District calculated the average cost effectiveness of a scrubber system for biomass and coal/coke facilities.

The District conducted a SOx BACT evaluation for a local power generation facility that was installing a biomass boiler and determined the capital costs for a wet scrubber

[50] Senior, C., Afonso, R. (January 2009). *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Northeast States for Coordinated Air Use Management.
[51] Senior, C., Afonso, R. (January 2009). *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Northeast States for Coordinated Air Use Management.
[52] Roberts, C. (2009). *Information on Air Pollution Control Technology for Woody Biomass Boilers.* Northeast States for Coordinated Air Use Management and the EPA Office of Air Quality Planning and Standards.
[53] Alberta Research Council Inc. (2001). *Technical Advice on Air Pollution Control Technologies for Coal-fired Power Plants*.
[54] Senior, C., Afonso, R. (January 2009). *Applicability and Feasibility of NOx, SO2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers.* Northeast States for Coordinated Air Use Management.

system are approximately $5.8 million. The annualized capital equipment cost is calculated by multiplying the installed equipment cost by the capital recovery factor of 0.1627.

Annual Capital Costs ($AC_{capital}$)

$AC_{capital}$= $5,800,000 X 0.1627
$AC_{capital}$= $943,660/year

In addition, this system has additional costs for the sodium hydroxide reagent used in the scrubber which are estimated to be an additional $642,000 per year. Thus, the total annual cost would be:

Total Annual Costs (AC_{total})

AC_{total} = Capital Costs + Reagent Costs = ($943,660/year) + ($642,000/year)
AC_{total} = $1,585,660/year

Cost effectiveness is calculated by dividing the annual cost by the annual emissions reductions from District standard emissions. One cost effectiveness analysis was conducted for the biomass and coal/coke fired units in the Valley because the four coal/coke fired units are fired on biomass part of the time.

The average SOx emissions limit of these units, based on District Permits SOx emissions limits, is 0.044 lb/MMBtu and the average heat input is 341 MMBtu/hr. An emissions factor of 0.27 lb/MMbtu at 24 hours per year is assumed to reflect the time needed for the startup and shutdown period, when the exhaust temperature is not high enough for controls to be fully effective. Therefore, those numbers were utilized to calculate annual standard emissions as follows:

Annual Standard Emissions ($AE_{standard}$)

$AE_{standard}$ = [(0.044 lb/MMBtu) x (341 MMBtu/hour) x (8,760 hour/year)] + [(0.27 lb/MMBtu) x (24 hour/year) x (341 MMBtu/hr)]
$AE_{standard}$ = 133,644.7 lb/year

Potential emissions, using the technologically feasible emission limit of 0.012 lb/MMBtu that is achieved by the use of a wet scrubber system, can be calculated as follows:

Annual Emissions with Wet Scrubber System ($AE_{scrubber}$)

$AE_{scrubber}$ = [(0.012 lb/MMBtu) x (341 MMBtu/hour) x (8,760 hour/year)] + [(0.27 lb/MMBtu) x (24 hour/year) x (341 MMBtu/hour)]
$AE_{scrubber}$ = 38,055.6 lb/year

Therefore, the cost effectiveness would be:

Cost Effectiveness (CE)

CE= ($1,585,660/year) ÷ [(133,644.7 lb/year – 38,055.6 lb/year) x (1 ton/2,000 lb)]
CE = $33,177/ton

It is important to note that the cost effectiveness analysis above does not reflect the costs of additional electricity consumption, additional labor costs, additional solid waste disposal, and other operational changes or additions that would be required to comply with the lower limit. The option of scrubbers is not a cost effective option, and therefore, is not feasible.

There are no additional technologies available to reduce SOx emissions from solid fuel fired units.

Start-up Periods

The possibility of reducing the allowed start-up period of solid fuel fired boilers was considered, since facilities are exempt from emissions limits during this period. Facilities subject to Rule 4352 are currently subject to a start-up limit of 96 hours. Operators currently limit their start-up and shut-down times as much as possible since down time results in reduced productivity and profits. However, facilities periodically perform “cold repairs” on their solid fuel fired boilers for maintenance or trouble-shooting purposes. This requires operators to completely shut down the boilers, which in turn requires a longer start-up period to return to correct operating temperature. When the solid fuel fired boilers are starting up, the units are not operating with a full load which reduces emissions. Therefore, this is not a technologically feasible option for solid fuel fired facilities given the needs of current work practices.

Evaluation Findings

Even though solid fuel fired boilers, steam generators, and process heaters are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from solid fuel fired boilers, steam generators, and process heaters in the Valley.

C.14 RULE 4354 GLASS MELTING FURNACES

Discussion

The provisions of Rule 4354 are applicable to glass melting furnaces in the Valley. The purpose of this rule is to limit NOx, SOx, volatile organic compounds (VOC), carbon monoxide (CO), and PM emissions from glass melting furnaces.

Rule 4354 was adopted on September 14, 1994 and has been subsequently amended six times. Rule 4354 was amended September 16, 2010 to strengthen the NOx emission limits in the rule; EPA finalized approval for these amendments on August 29, 2011. Rule 4354 was subsequently amended again in May 19, 2011 to implement updated start-up requirements; EPA finalized approval of the 2011 amendments to Rule 4354 on January 31, 2013 and deemed this rule as being as stringent as, if not more stringent than, established RACT requirements. As a result of this stringent prohibitory rule and continuing efforts on behalf of this industry to reduce emissions, the Valley is home to glass-making facilities with glass melting furnaces that utilize the most advanced low-NOx firing technology.

Source Category

Industrial glass making is a continuous process with raw materials supplied to the furnace at the front end, and product taken off the line at the back end of the process. The raw materials for making glass are silica sand and soda ash. Melting these basic materials and forming them into the desired product geometry creates the final glass product. The different end products vary widely in raw material additives, processing equipment and conditions, and product quality requirements. The emission limits of Rule 4354 depend on the type of glass produced, furnace firing technology and the emission-averaging period.

Rule 4354 is among the most stringent rules in the nation for glass melting furnaces. The NOx emission limits contained within Rule 4354 require the installation of the best available NOx technology (i.e. oxy-fuel firing or SCR systems).

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.33	0.34	0.35	0.36	0.38	0.39	0.39	0.40	0.40
NOx	6.04	6.21	3.99	4.08	4.17	4.27	4.31	4.35	4.38
SOx	1.96	2.00	1.83	1.87	1.90	1.93	1.95	1.96	1.98
	Winter Average - Tons per day								
PM2.5	0.33	0.34	0.35	0.36	0.38	0.39	0.39	0.40	0.40
NOx	6.04	6.21	3.98	4.08	4.17	4.27	4.31	4.34	4.38
SOx	1.96	2.00	1.83	1.87	1.90	1.93	1.95	1.96	1.98

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per

day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, PM2.5 and NOx emissions from glass melting furnaces are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements for PM2.5 and NOx; however, the District has still conducted a full control measure evaluation for glass melting furnaces.

How does District Rule 4354 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG requirements for this source category.

ACT

- EPA-435/R-94-037 (Alternative Control Techniques Document—NOx Emissions from Glass Manufacturing)

The District evaluated the requirements contained within the above ACT and found no requirements that were more stringent than those already in Rule 4354.

NSPS

- 40 CFR 60 Subpart CC (Standards of Performance for Glass Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 60 Subpart CC and found no requirements that were more stringent than those already in Rule 4354.

- 40 CFR 60 Subpart PPP (Standards of Performance for Wool Fiberglass Insulation Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 60 Subpart PPP and found no requirements that were more stringent than those already in Rule 4354.

NESHAP/ MACT

- 40 CFR 61 Subpart N (National Emission Standard for Inorganic Arsenic Emissions from Glass Manufacturing Plants)

40 CFR 61 Subpart N was last amended February 27, 2014; however, this NESHAP only regulates inorganic arsenic emissions and therefore does not apply to this control measure evaluation.

- 40 CFR 63 Subpart NNN (National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing Plants)

The District evaluated the requirements contained within 40 CFR 63 Subpart NNN and found no requirements that were more stringent than those already in Rule 4354.

- 40 CFR 63 Subpart SSSSSS (National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources)

The District evaluated the requirements contained within 40 CFR 63 Subpart SSSSSS and found no requirements that were more stringent than those already in Rule 4354.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 4354 compare to rules in other air districts?

There are no analogous rules for this source category in VCAPCD and SMAQMD.

SCAQMD

- Rule 1117 (Emissions of Oxides of Nitrogen from Glass Melting Furnaces)

The District evaluated the requirements contained within SCAQMD's Rule 1117 and found no requirements that were more stringent than those already in Rule 4354.

BAAQMD

- BAAQMD Regulation 9 Rule 12 (Nitrogen Oxide Emissions from Glass Melting Furnaces)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 12 and found no requirements that were more stringent than those already in Rule 4354.

Additional Emission Reduction Opportunities

SOx Limits for Container Plants
The District evaluated the possibility of lowering the existing SOx limits for container plants from the current limits of 0.9 and 1.1 lbs of SOx per ton of glass, depending on cullet content, to the District BACT limit of 0.8 lbs/ton. The analysis below indicates that it is not technologically feasible to lower the SOx limits.

The glass container industry is mandated by the State of California to use a minimum quantity of recycled glass (cullet) as part of the production process. The quantity of clear glass cullet available to glass manufacturers is very limited; therefore, cullet with a large portion of colored glass is included in each batch. The continued use of mixed color cullet is critically important to meeting California's recycling goals. Due to the variable quality of mixed color cullet, SOx emissions produced by the melting of recycled cullet are also variable.

Container glass manufacturers control multiple furnaces as a single unit, meaning that the exhaust from multiple furnaces are ducted together and the total emissions are averaged over the total amount of glass pulled from all furnaces. Because emissions are averaged across furnaces, EPA requires that there be a 10% air quality benefit, meaning that the overall limit for multiple furnaces be 10% less than the limit for a single

furnace. This imposes the lowest SOx emission limit on container glass furnaces, but allows operators to install one control device per facility rather than one add-on control device per furnace. SOx emissions limits for container glass were adopted at 1.1 pounds per ton of glass produced if the operator uses at least 25% by weight of mixed color cullet and a limit of 0.9 pounds per ton of glass produced for all other container glass manufacturing. If the District were to lower the limits in the rule to 0.8 lbs/ton, then the 10% required air quality benefit for multiple furnaces extend beyond BACT, which is not feasible. The 0.8 lbs/ton BACT limit is equivalent to the 0.9 lbs/ton limit with the additional EPA required 10% air quality benefit.

Evaluation Findings

Even though glass melting furnaces are not a significant source of PM2.5 or NOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4354 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from glass melting furnaces in the Valley.

C.15 RULE 4550 CONSERVATION MANAGEMENT PRACTICES

Discussion

Rule 4550 is the District's Conservation Management Practices (CMP) rule. Rule 4550 was the first rule of its kind in the nation to reduce fugitive particulate emissions from agricultural operations through the reduction of passes of agricultural equipment and implementation of other conservation practices. Rule 4550 is unique because it is based upon a menu approach of control techniques to accommodate the variability of agricultural industries. The selected CMPs are listed on application forms that are submitted to the District for approval as a CMP Plan. Agricultural operations are required to maintain detailed records verifying use of the approved Conservation Management Practices. Approved CMP plans are enforced through onsite inspections and operators are required to submit applications and modify their plans when changing their conservation management practices. Through this rule, PM10 emissions have been reduced by 35.3 tons per day[55], which is approximately a 24% reduction for this source category.

The District worked extensively with stakeholders, growers, and the Agricultural Technical Committee for the San Joaquin Valley-wide Air Pollution Study Agency (AgTech) for two years prior to developing the Conservation Management Practices (CMP) Rule. Rule 4550 was adopted on August 19, 2004 to help bring the Valley into attainment of federal PM10 standards. Rule 4550 has served as a model for other regions seeking to reduce fugitive particulate emissions from agricultural sources.

Upon adoption of Rule 4550, the District embarked on an ambitious implementation strategy, working extensively with agricultural stakeholders to ensure that affected sources were assisted as much as possible in complying with the requirements, and consequently ensuring that the CMP Program was successful. To this end, the District created special CMP application forms, which were designed to allow growers to select approved practices from simplified checklists. A special web page was created that contains answers to frequently asked questions, application forms, and other forms of assistance for agricultural operations. The District hired additional staff, including additional Small Business Assistance (SBA) staff, and took part in over 40 workshops throughout the Valley to assist sources in completing and submitting the required CMP application forms. The workshops were coordinated with agricultural stakeholders, and tremendous outreach was performed to ensure that as many affected sources as possible would attend and receive assistance at the workshops. As a result of these efforts, the District's CMP Program realized the following notable achievements:

- Approximately 4,000 workshop participants, with many of the participants submitting CMP Plan applications during the workshops.
- The District received and processed over 6,000 CMP Plan applications during 2005.

[55] SJVAPCD. *Conservation Management Practices Program Report for 2005.* (2006, January 19). Retrieved from http://www.valleyair.org/farmpermits/updates/cmp_program_report_for_2005.pdf

- The practices used by valley agricultural sources encompass 3.2 million acres of farmland, and over 30,000 miles of unpaved roads.
- The PM10 reductions are quantifiable and enforceable through approved CMP plans and inspections.
- The collaborative effort responsible for the CMP program received US EPA Region IX's "2005 Environmental Award for Outstanding Achievement."

The District also conducted an additional 60 workshops throughout the Valley over the last 10 years for the purpose of assisting sources comply with the CMP and other ag-related rules.

EPA finalized approval of Rule 4550 on February 14, 2006 and determined that the rule met BACM requirements.[56] Subsequent to EPA's approval of Rule 4550, two separate lawsuits were filed challenging EPA's approval of the rule as satisfying BACM. The Ninth District Court of Appeals, in both cases, agreed with EPA's approval and reaffirmed EPA's finding that Rule 4550 meets BACM requirements.[57,58]

Source Category

This rule is applicable to on-field farming and agricultural operation sites located within the Valley. Rule 4550 limits fugitive dust emissions from farming operations by requiring CMP plans for farms with 100 acres or more, dairies with 500 or more mature cows, cattle feedlots with 190 or more cows, turkey ranches with 55,000 or more turkeys, chicken ranches with 125,000 or more chickens, and chicken egg ranches with 82,000 or more laying hens.

Rule 4550 specifies that agricultural operations must select at least one CMP from each of the identified applicable CMP categories. Animal feeding operation (AFO) sources subject to Rule 4550 that also grow field crops must select CMPs for their field crops, as well as their AFO. There are five CMP categories for the cropland source category, four CMP categories for the dairy source category, four CMP categories for the feedlot source category, and five CMP categories for the poultry source category. The selected CMPs must be noted on the applications provided and then submitted to the District for approval. Completed applications constitute a CMP Plan once approved by the District.

Emissions from agricultural operations vary by many factors, some beyond the control of the agricultural operations. PM10 emissions are generated during land preparation activities, harvest activities, and post-harvest activities. Emissions are caused by the mechanical disturbance of the soil by implements and the tractors pulling them,

[56] 71 Federal Register 30, 7683-7688. (2006, February 14). *Revisions to the California State Implementation Plan; San Joaquin Valley Unified Air Pollution Control District*. Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2006-02-14/pdf/06-1311.pdf

[57] U.S. Court of Appeals for the Ninth Circuit. *Latino Issues Forum v. EPA.* Retrieved from http://njlaw.rutgers.edu/collections/resource.org/fed_reporter/NEWcircs/cir9/0671907_cir9.html

[58] SJVAPCD. *Court rules in favor of Air District ag rule. Second decision this week affirms PM progress.* Retrieved from https://www.valleyair.org/recent_news/Media_releases/2009/PR%20Court%20decision%20favors%20District%20ag%20rule.pdf

resulting in the entrainment of soil or plant materials into the air. Wind blowing across exposed agricultural land also causes the entrainment of PM10 into the air. In addition, PM10 emissions can also become entrained from vehicular travel over unpaved roads and unpaved parking/equipment areas. Conservation management practices fall into several broad categories and are intended to reduce emissions as follows:

- The reduction of soil or manure disturbance;
- Soil protection from wind erosion;
- Equipment modifications to physically produce less PM10; and
- Application of water or dust suppressants on unpaved roads and other travel areas to reduce emissions entrained by moving vehicles and equipment.

Emissions Inventory

There are no NOx or SOx emissions attributable to the sources subject to CMP requirements. The following emissions inventory table represents PM2.5 emissions only.

Source	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
Tilling Dust	5.17	5.14	5.12	5.09	5.07	5.04	5.02	5.00	4.97
Harvest Operations – Dust	7.28	7.25	7.23	7.20	7.18	7.15	7.12	7.10	7.07
Dust from Agricultural Lands (non-pasture)	6.15	6.12	6.08	6.05	6.02	5.99	5.96	5.93	5.90
Dust from Pasture Lands	1.09	1.09	1.08	1.08	1.08	1.07	1.07	1.06	1.06
	Winter Average - Tons per day								
Tilling Dust	7.37	7.33	7.29	7.25	7.21	7.18	7.14	7.10	7.06
Harvest Operations – Dust	0.31	0.31	0.30	0.30	0.30	0.29	0.29	0.29	0.29
Dust from Agricultural Lands (non-pasture)	4.36	4.33	4.30	4.28	4.25	4.23	4.20	4.17	4.15
Dust from Pasture Lands	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22

As detailed in Chapter 5, the significance threshold for source categories for the purpose of evaluating the application of BACM and MSM requirements is 4.0 tons per day (tpd) for PM2.5 dust emissions. As identified in the above table, annual average emissions from pasture lands are lower than the BACM/MSM significance threshold. Therefore, the Clean Air Act does not require a control measure evaluation for that source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for CMPs for all emission categories.

Contribution of PM2.5 to PM10 Emissions from Agricultural Operations

While Rule 4550 has been successful in reducing both PM10 and PM2.5 emissions, recent studies have indicated that the PM2.5 fraction of emissions makes up a small portion of the total particulate emissions from agricultural operations. Additionally, particulate emissions from agricultural operations are geologic in nature. These geologic particulate emissions make up a relatively small portion of the overall PM2.5

concentrations during the winter season and have relatively low toxicity relative to the organic carbon fraction of PM2.5 and to re-suspended road dust.[59]

Accordingly, particulate emissions from agricultural sources do not play a significant role with regard to attainment of the PM2.5 standards addressed by this plan, and Rule 4550 is primarily a PM10 reduction strategy. For example, 2004-2006 speciation analyses of PM2.5 from the Speciated Trends Network in Fresno and Bakersfield found that the annual average geologic fraction was 4% and 6%, respectively.[60] Given that PM2.5 emissions from agricultural field operations are generally subject to deposition near their source, the predominant source of this geologic PM2.5 would be urban re-suspended road dust with relatively little contribution from agricultural activities.

PM2.5 emissions from agricultural field operations have been generally over-estimated in absolute terms due to species differences between the fine and coarse fractions of geologic emissions. Using Valley ambient measurements of trace elements, the PM2.5/PM10 ratios for the predominant trace elements found in fugitive dust have been estimated.[61] The average ratio for aluminum and silicon was 0.05 and ranged between 0.10 to 0.16 for calcium, titanium, and iron. Based on the relative abundances of these elements in fugitive dust, the overall PM2.5/PM10 ratio was estimated to be 0.06 (6%). This ratio estimate is substantially lower that the ratio of 0.20 reported previously for agricultural crops nationwide by MRI in 1996 based on limited supporting data and broad assumptions.[62] Further review of Valley research on PM2.5/PM10 ratios shows a consistent mid-point estimate of 0.10.[63] To summarize, PM2.5 comprises a small fraction of total PM10 emissions from field operations, approximately 10% in the Valley.

Historically, both grid models and PM2.5 monitors used in field studies have significantly over-estimated overall PM2.5 emissions from agricultural field operations as well as their contribution to ambient PM2.5 concentrations. In respect to grid modeling biases, there is an expert consensus regarding the sources of grid model overestimation: (1) faulty emission factor algorithms, (2) imprecise or difficult to obtain activity data to apply these algorithms (including inability to account for the effect of actual meteorological conditions on emissions), (3) the multiplier used to infer PM2.5 from PM10 emissions, and (4) modeling transport over-estimation (especially in the treatment of particles near their point of emissions).[64]

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[59] Rogge, W. F., Hildemann, L. M., Mazurek, M. A., Cass, G. R. and Simoneit, B. R. T. *Sources of Fine Organic Aerosol—3. Road Dust, Tire Debris, and Organometallic Brake Lining Dust—Roads as Sources and Sinks*. Environmental Science & Technology 27(9), 1892-1904. 1993.

[60] SJVAPCD. (2012). *2012 PM2.5 Plan*. Retrieved from http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/04%20Chapter%204%20Sci%20Foundation%20and%20Modeling.pdf

[61] Countess, R. *Reconciling Fugitive Dust Emission Inventories with Ambient Measurements.* 12th Annual EPA EI Mtg, San Diego, CA. April 29-May 1, 2003.

[62] Cowherd, C., and W. Kuykendal. (1996, June). *Paper No. WP96.04, Proceedings of the Annual Meeting of the Air and Waste Management Association*

[63] Pace, T.G, EPA. (2005, April). *Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10.* Retrieved from http://www.epa.gov/ttn/chief/conference/ei14/session5/pace.pdf.

[64] Pace, T.G, EPA. (2005). *Methodology to Estimate the Transportable Fraction (TF) of Fugitive Dust Emissions for Regional and Urban Scale Air Quality Analyses*.

In respect to over-estimation of PM2.5 transport, much of the ground level fugitive dust from soil disturbance is likely to be removed close to the source.[65,66,67] This is due to the low release height and turbulence which keeps particles temporarily close to the surface where they are subject to removal by impaction on nearby surfaces, including vegetation and structures. Equally significant in respect to over-estimation of PM10 and PM2.5, grid models ignore all removal processes in the grid cell where the emissions originate. Given that 4 kilometers is a typical grid dimension, a considerable fraction of PM2.5 emitted under normal field operations could and often would be deposited within that cell.

Wind-blown Dust in the Valley

The Valley experiences wind-blown dust events from time to time typically during the spring and fall seasons when weather disturbances are most common. These events are less likely to occur during the long stagnation periods of the summer and winter. When soil conditions are dry, strong wind events often entrain coarse particulate matter into the atmosphere, carrying the pollution long distances across the Valley. This phenomenon has the potential to create higher concentrations of PM10 in its path of impact.

Although these events primarily cause higher PM10 concentrations, there are rare instances where PM2.5 concentrations become elevated. In addition to the rarity of elevated PM2.5 concentrations, the PM2.5 values recorded during the strong stagnation periods of the winter season are usually much higher than those recorded during wind events. Because of this, the Valley's PM2.5 design values are driven primarily by high winter-time concentrations, mostly due to organic carbon and the secondary formation of ammonium nitrate. Comparatively, the geologic component of the Valley's peak PM2.5 concentrations is only a fraction of the mass formed through secondary processes and other sources. As a result, the wind events experienced in the Valley are not a significant contributor to the PM2.5 attainment challenges for the region, and placing further controls on this source would not make a substantial difference in the District's PM2.5 design values.

Continuous Evaluation of Potential CMPs

The District evaluates the effectiveness of CMPs on a regular basis, as illustrated on the District's web page under *Requirements for Agricultural Operations*.[68] Rule 4550 was adopted in August 2004, and during that same year the *Ag CMP Handbook*, the *Poultry CMP Handbook*, and a list of conservation management practices were posted to the same District site. In 2006, the District prepared and published a CMP Program Report

[65] Watson, J. G., J. Chow and contributors (2000, May). *Reconciling Urban Fugitive Dust Emissions Inventory and Ambient Source Contribution Estimates*. Desert Research Institute Report 6110.4F. Prepared for U.S. EPA. Retreieved from http://www.epa.gov/ttn/chief/efdocs/fugitivedust.pdf

[66] Slinn, W. "Predictions for Particle Depositions to Vegetative Canopies", Atmospheric Environment, 16: 1785-1794, 1982.

[67] Etyemezian, V. et al., Desert Research Institute (2003, January) *Field Testing and Evaluation of Dust Deposition and Removal Mechanisms – Final Report*. Retrieved from http://www.westar.org/Docs/Dust/Transportable_Dust_Final_Report_DRI_WESTAR.pdf

[68] SJVAPCD. *Requirements for Agricultural Operations.* http://www.valleyair.org/farmpermits/

for 2005,[69] in which the District provided an explanation of the key components of the CMP program and a detailed summary of the process of identifying and quantifying the emission reductions achieved through December 31, 2005.

The District also posted a guidance document entitled, *San Joaquin Valley Air Pollution Control District Approval of New Conservation Management Practices (CMPs),*[70] to the District web page in 2010. This document outlines procedures for the approval of new CMPs proposed by owners/operators to be used for compliance with the requirements of Rule 4550 conservation management practices. In addition, District Rule 4550 is brought up for discussion frequently in the AgTech Committee, which consists of various regulatory agencies, agricultural industry representatives, and university professors. The AgTech Committee has evaluated proposed CMPs for inclusion as part of the approved CMP list, including the promotion of conservation tillage at Valley farms, misting to reduce PM10 generated by disking, and almond harvesting techniques to reduce emissions.

- **Conservation Tillage/Combined Operations**
  Conservation tillage includes types of tillage that reduce loss of soil and water in comparison to conventional tillage. Benefits include the reduction of passes and soil disturbance and soil improvements because it retains plant residue and increases organic matter. Examples of conservation tillage include converting to no or low till operations, implementing reduced till activities, adding soil/water amendments to improve resources, and reducing tillage needs.

  In the spring of 2008, EPA and USDA Agricultural Research Service (ARS) in collaboration with the District, NRCS, and other agencies/stakeholders performed a study of conservation tillage/combined operations and demonstrated significant PM emission reductions from this practice. EPA completed the final report in June 2013. This report, including the merits of conservation tillage/combined operations were discussed in great detail in the AgTech meetings and amongst industry stakeholders. It was determined that the conservation tillage/combined operations management practice is already included in nine out of the eleven crop categories with the other two crop categories consisting of a "non-tillage/chemical tillage" option. Non-tillage requires no disturbance of soil and can achieve even more reductions than conservation tillage. In addition, Rule 4550 already allows the option to select an "other" mitigation measure, which needs to be approved on a case by case basis. Since "conservation tillage" is already an approved conservation management practice, if an operator chose this for the "other" mitigation measure it would likely be approved.

[69] SJVAPCD. (2006, January 19). *Conservation Management Practices Program Report for 2005.* Retrieved 2/2/2015 from http://www.valleyair.org/farmpermits/updates/cmp_program_report_for_2005.pdf.
[70] SJVAPCD. (2010, December 14). *San Joaquin Valley Air Pollution Control District Approval of New Conservation Management Practices (CMPs)*. Retrieved 2/2/2015 from http://www.valleyair.org/policies_per/Policies/SSP_3010.pdf.

- **CSUF Foundation Report: MISTING: A Conservation Management Practice for Reducing PM10 Generated by Disking**
  A study was performed between March 2008 and September 2011 to test if the addition of a Misting System Duct Control Unit manufactured by Diamond E. Manufacturing would reduce emissions from disking. The final report was published in December 2011. In January 2013, Diamond E. Manufacturing requested that the Diamond E. Manufacturing Dust Control Unit be added to the official CMP list. A District review of the report indicated that it did not provide sufficient information to demonstrate the minimum 10% reduction in PM10 emissions and therefore, was not added to the official CMP list. If sufficient information demonstrating that the dust control unit achieves the minimum PM10 reductions is provided in the future, this measure would be allowed to be selected under the existing CMP category: Cropland – Land Preparation/Cultivation, Equipment changes/Technological Improvements.

- **Harvesting Equipment to Reduce PM Emissions from Almond Harvest Operations**
  A study was performed in 2010 and 2011 by Texas A&M to evaluate a variety of improved almond harvesters and their ability to reduce PM emissions. A final report was published in January 2013, demonstrating that the newer harvesters achieved significant PM emissions compared to their predecessors. This specific measure was not added to the list of conservation practices because it was determined that using newer almond harvesters to reduce PM emissions would be allowed under the existing CMP Category: Cropland-Harvest, Equipment Changes/Technological Improvements.

How does District Rule 4550 compare with federal and state rules and regulations?

Federal requirements such as NSPS, NESHAP, MACT, CTGs, and ACTs and state regulations are not applicable to this source category.

How does District Rule 4550 compare to rules in other air districts and states?

The requirements and applicability of Rule 4550 were compared to analogous rules in other air districts and states to determine the stringency of Rule 4550 compared to those other rules. BAAQMD and VCAPCD do not have rules that are analogous to Rule 4550.

SMAQMD

- Rule 215 (Agricultural Permit Requirements and New Agricultural Permit Review): District Rule 4550 is at least as stringent as if not more stringent than the analogous rule in SMAQMD.

SCAQMD

- SCAQMD has adopted agricultural best management practices (BMP) programs, which were approved by EPA as Best Available Control Measures (BACMs); however, the District's CMP rule exceeds these standards.

Imperial County Air Pollution Control District (ICAPCD)

- Rule 806 (Conservation Management Practices)

Imperial County APCD (Imperial) first adopted their Regulation VIII rules in 2005 to implement requirements designed to reduce the amount of PM10 entrained in the ambient air as a result of emissions generated from anthropogenic fugitive dust sources. Rule 806 (Conservation Management Practices) is a part of this set of rules. EPA did not approve the Regulation VIII rules as amendments to the state implementation plan (SIP) in July 2010. After a public process and mediation between Imperial and EPA, on October 16, 2012, a revised rule was adopted with rule requirements effective on and after January 1, 2013.

Imperial Rule 806 requires one conservation practice from each of three categories (land preparation and cultivation, harvesting, and cropland-other), but the rule also specifies that if the owner or operator of an Agricultural operation site chooses to implement conservation tillage as a conservation practice, then that owner/operator does not need to select any additional conservation practices.

As stated earlier, the District's CMP rule includes conservation tillage as a conservation management practice for nine out of the eleven crop categories, listed as an option under Land Preparation/Cultivation and/or under the Harvest section. The option to select conservation tillage is also available to all crops by program design because each of the three sections includes an "Other (approved on a case-by-case basis)," thus allowing conservation tillage to be chosen as a conservation practice by any owner/operator. District Rule 4550 is more stringent than Imperial Rule 806 where a Valley operator selects "conservation tillage" in one category, but still has to select two additional measures, resulting in even more emission reductions. Therefore, requirements in Rule 4550 are equivalent, if not more stringent than Imperial Rule 806.

Arizona Department of Environmental Quality

- The Arizona Department of Environmental Quality adopted agricultural BMP programs.

The Arizona Agricultural Best Management Practices Committee was established in 1998 by Arizona Revised Statutes (A.R.S) §49-457 to research and adopt BMPs for agricultural operations that generate dust. The BMPs are designed to reduce emissions of PM10 in the Maricopa County Serious PM10 nonattainment area. In 2006, the Committee reconvened the Technical Workgroup to review the current use of BMPs in Maricopa County.

The Arizona rule is not applicable to dairies, cattle feedlots, turkey ranches, chicken ranches, or chicken egg ranches. District Rule 4550 is more stringent than the Arizona rule for these categories. With regards to measures specific to agricultural crops, the measures offered as conservation practices in Arizona are similar to the conservation practices offered within District Rule 4550 and would likely yield similar amounts of emission reductions.

Evaluation Findings

EPA's approval of Rule 4550 as BACM and the District's review of similar rules in other regions demonstrate that the District has adopted the most stringent rule of its kind. Rule 4550 is more stringent than the Imperial rule and the Arizona rule, as both rules are not applicable to dairies, cattle feedlots, turkey ranches, broiler ranches, or layer hen ranches. With regards to measures specific to agricultural crops, the measures allowed as conservation practices in Imperial County and Arizona are similar to the conservation practices allowed under Rule 4550 and yield similar amounts of emission reductions.

Given the relatively low contribution that emissions from this category make to the Valley's PM2.5 concentrations and current stringent requirements under Rule 4550, the District has not identified any additional rule amendment opportunities for further emission reductions from source categories subject to CMP requirements to include in this plan. As demonstrated above, Rule 4550 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category.

Although Rule 4550 already meets BACM and MSM requirements, the District is committing to further evaluate Rule 4550 for additional opportunities. See Chapter 8 (Commitment to Leave No Stone Unturned to Evaluate Additional Opportunities) for more information.

C.16 RULE 4692 COMMERCIAL CHARBROILING

Discussion

Rule 4692 applies to chain-driven charbroilers used to cook meat. The purpose of the rule is to limit volatile organic compound (VOC) and PM10 emissions from commercial charbroiling. The rule also specifies administrative, recordkeeping requirements, and test methods.

The original rule, adopted in March 2002, reduced PM2.5 emissions from chain-driven charbroilers by 84%. The September 2009 rule amendment expanded rule applicability to more chain-driven charbroilers, reducing 25% of the remaining PM2.5 chain-driven charbroiler emissions. EPA finalized approval for Rule 4692 on November 3, 2011. The District evaluated Rule 4692 in its *2009 Reasonably Available Control Technology Demonstration for Ozone State Implementation Plans (2009 RACT SIP)*; however, EPA noted in its Technical Support Document (TSD) for the approval of Rule 4692 that the rule is not subject to RACT because it is not subject to CTG requirements and it does not regulate major sources.

Source Category

There are two types of commercial charbroilers: chain-driven and under-fired. A chain-driven charbroiler is a semi-enclosed broiler that moves food mechanically through the device on a grated grill to cook the food for a specific amount of time. An under-fired charbroiler has a metal "grid," a heavy-duty grill like that of a home barbecue, with gas burners, electric heating elements, or wood under the grid to cook the food. The smoke and vapors generated by cooking on either type of charbroiler contain water, VOCs, and PM. Larger particles and grease are typically captured by the grease filter of the ventilation hood over the charbroiler. The remaining VOCs and PM2.5 are exhausted outside the restaurant, unless a secondary control is installed.

Currently, District Rule 4692 reduces emissions by requiring catalytic oxidizers for chain-driven charbroilers that meet rule applicability thresholds. Charbroiler exhaust is directed through the catalytic oxidizer with little loss of temperature. As high-temperature exhaust goes through the heated catalyst, PM and VOC are oxidized to carbon dioxide and water vapor. This chemical reaction releases energy that heats the catalyst and is transferred to a heat recovery system, so no additional fuel is needed for the unit. Controlling emissions from under-fired charbroilers has proven to be far more challenging. To date, no cost effective technologies have been demonstrated.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	2.84	2.87	2.92	2.97	3.04	3.11	3.18	3.24	3.31
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	2.84	2.87	2.92	2.97	3.04	3.11	3.18	3.24	3.31
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

How does Rule 4692 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations
There are no state regulations applicable to this source category.

How does Rule 4692 compare to rules in other air districts?

There are no analogous rules for this source category in SMAQMD.

SCAQMD

- Rule 1138 (Control of Emissions from Restaurant Operations)

The District evaluated the requirements contained within SCAQMD's Rule 1138 and found no requirements that were more stringent than those already in Rule 4692.

BAAQMD

- Regulation 6 Rule 2 (Commercial Cooking Equipment)

BAAQMD Regulation 6 Rule 2 regulates both chain-driven and under-fired units. Newly installed under-fired units with more than 10 square feet of cooking area are required to limit emissions to 1 lb of PM10 per 1,000 lbs of cooked beef. Effective January 2013, the same emissions requirements also apply to pre-existing units. However, as the BAAQMD rule is implemented, a significant portion of under-fired charbroilers are below the applicability thresholds for grill size or amount of food cooked, and are thus exempt from rule requirements. In addition, BAAQMD has been unable to enforce this rule because no control technologies have been certified.

The applicability thresholds for grill size in District Rule 4692 are lower than those in BAAQMD Regulation 6 Rule 2. Therefore, because BAAQMD Regulation 6 Rule 2 is not currently being enforced for under-fired charbroilers, District Rule 4692 is effectively more stringent. Additionally, the District committed in the *2012 PM2.5 Plan* to amend

Rule 4692 in 2016 to expand applicability to include under-fired charbroilers. During the rule development process for this amendment, the District will examine all potential opportunities for further emission reductions.

VCAPCD

- Rule 74.25 (Restaurant Cooking Operations)

The District evaluated the requirements contained within VCAPCD's Rule 74.25 and found no requirements that were more stringent than those already in Rule 4692.

Additional Emission Reduction Opportunities

Chain-Driven Charbroilers

Rule 4692 requires emission controls for chain-driven charbroilers that cook 400 pounds of meat or more per week. In 2009, the amended rule was estimated to apply to about 280 of the 427 chain-driven identified charbroilers of the Valley. This rule thus applies to about 65% of the units and a much greater percentage of the total emissions from chain-driven charbroilers since they are higher use. The applicability threshold for chain-driven charbroilers under Rule 4692 could be lowered to make smaller facilities subject to the rule. However, these currently-exempt chain-driven units are a very small portion of the total inventory for this category. Emissions reductions would be minimal and costly through this approach. Furthermore, the District's applicability threshold is already lower than that of other air districts.

Under-Fired Charbroilers

Rule 4692 does not currently require emissions controls for under-fired charbroilers. Catalytic oxidizers are not effective for reducing emissions from under-fired charbroilers because the exhaust from these devices loses too much heat as it is directed to the control device, and the reactions at the catalyst cannot take place under this lower temperature. The following control strategies are more effective for under-fired charbroilers:

- **High efficiency particulate-arresting (HEPA) filtration systems:** This system adds a HEPA filter to the appliance's existing grease filters to effectively eliminate particulates down to about 0.3 microns in diameter. System maintenance is relatively easy to perform, but filters need to be regularly changed (perhaps weekly, depending on the amount of food cooked).

- **Electrostatic precipitators (ESPs):** Exhaust particles become electrically charged as they pass through an electrically charged screen. These ionized particles are then collected by one of two oppositely-charged plates. ESP systems need filtration prior to the ESP itself to remove grease and larger particles from kitchen exhaust. These devices are cleaned daily with a clean-in-place system, and more thorough cleaning is required once or twice a year. Routine maintenance often requires hiring an outside company, since the ESP plates can weigh as much as 75 pounds.

- **Wet scrubbers:** A fine stream of water and detergent "washes" the particulates from the kitchen exhaust. The particulate/water/detergent mix is then filtered; the filtered water/detergent mix is recycled through to clean more exhaust, and the particulate-laden wash water is discharged to the sewer system. In addition to the cost of the system itself, associated water/sewer usage costs and detergent costs can be high, although recent improvements in design are improving system efficiencies.

These controls for under-fired charbroilers were unproven and extremely costly during the District's 2009 amendment of Rule 4692. The costs of these under-fired charbroiler controls, as analyzed in 2009, ranged from $37,500 to $104,000, with a cost effectiveness of up to $58,200 per ton of PM2.5 reduced. However, the control technology for under-fired units has continued to develop over the past few years, in part through the District, SCAQMD, and EPA technology demonstration efforts. Since under-fired charbroilers are a larger part of the total commercial charbroiling inventory, and since these units are currently unregulated in the Valley, there is potential to achieve emissions reductions from under-fired charbroilers.

In parallel with this plan, SCAQMD has also included a draft commitment in Chapter 4 of their *Draft 2012 AQMP* to achieve a 1 tpd PM2.5 reduction from under-fired charbroilers, though the details of their approach are yet to be determined.[71] SCAQMD would submit their approach into the SIP once technically feasible and cost effective options are confirmed.

The District created and implemented a pilot program in 2009, the Charbroiler Incentive Program (ChIP), to provide grant funding to cover a significant portion of the cost of installing particulate control devices on under-fired charbroilers. However, there was no stakeholder interest in this program and no projects were funded under ChIP. The District released a Request for Qualifications (RFQ) for its Restaurant Charbroiler Technology Partnership (RCTP) in 2014 and received several applications that were approved to move forward with the contracting process. Multiple projects are still in the contracting phase and the District expects to begin demonstration of some of the above described control technologies by mid-2015.

The District has also been tracking and involved with technology demonstration projects for under-fired charbroilers at other agencies, including testing of control technologies for under-fired charbroilers at University of California at Riverside's Center for Environmental Research and Technology (CE-CERT). This program began in early 2012 and several tests were completed in early 2014. Additional tests are ongoing.

According to estimates submitted by manufacturers for RCTP, the initial capital costs of feasible control technologies will range from $40,000 to over $100,000, and monthly operation and maintenance costs will range from a few thousand dollars to tens of thousands of dollars. As such, it is yet to be seen whether any cost effective and

[71] SCAQMD. (2012). *Draft 2012 AQMP*. Retrieved from http://aqmd.gov/aqmp/2012aqmp/draft/Chapters/Ch4.pdf

technologically feasible control technologies will be identified and demonstrated in the next few years. However, as part of the 2016 rule amendment process, the District will examine all potential opportunities for further emissions reductions.

Evaluation Findings

The District has evaluated all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4692 currently has in place the most stringent measures feasible to implement in the Valley at this time and therefore meets or exceeds both BACM and MSM requirements for this source category.

Rule 4692 achieves significant emissions reductions from chain-driven charbroilers; however, the rule does not require emissions controls for under-fired charbroilers. Analyses indicate that extending the applicability of the rule to include under-fired units could further reduce PM2.5 emissions by as much as 20% (0.4 tpd PM2.5) from the baseline inventory for under-fired charbroilers upon implementation in 2017, thus providing significant health benefits Valley-wide per the District's Health Risk Reduction Strategy. Research and demonstration projects are underway to evaluate emission control technologies for under-fired charbroilers in support of this measure. As included in the *2012 PM2.5 Plan*, the District will amend Rule 4692 in 2016 to add requirements for under-fired charbroilers, with an anticipated compliance date of 2017. The District will also consider development of a new incentive program to assist in the deployment of new technologies upon their development and commercial availability.

C.17 RULE 4702 INTERNAL COMBUSTION ENGINES

Discussion

Rule 4702 applies to any internal combustion (IC) engine rated at 25 brake horsepower (bhp) or greater. The purpose of this rule is to limit NOx, carbon monoxide (CO), volatile organic compounds (VOC), and SOx emissions from units subject to this rule.

The District's original IC engine rule, Rule 4701 (Internal Combustion Engines – Phase 1), was adopted on May 21, 1992, superseded by Rule 4702, adopted on August 21, 2003, and subsequently amended five times. The rule originally established NOx limits between 25-50 ppmv achieving 90-96% control for non-agricultural operations rich-burn engines and 65-75 ppmv achieving 85-90% control for non-agricultural operations lean-burn engines. In its continuous effort to improve air quality in the Valley, the District has adopted numerous amendments to Rule 4702 that have resulted in significant reductions of NOx and PM emissions.

Substantial emission reductions from agricultural IC engines have also been achieved through a combination of regulatory efforts and incentive actions. Rule 4702 has effectively reduced emissions from agricultural engines by 84% since the 2005 amendments to the rule, with substantial investments being made by the affected sources to comply with the rule. The rule was further strengthened in August 2011 when rule amendments implemented more stringent NOx limits as low as 11 ppmv for non-agricultural operations spark-ignited engines. Additional emission reductions are forthcoming under Rule 4702 as compliance dates for emission control requirements continue to approach over the coming years.

Source Category

An internal combustion engine is any engine that operates by burning its fuel inside the engine. Engines generate power by the combustion of an air/fuel mixture. The main types of engines are spark-ignited engines and compression-ignited (or diesel) engines. In the case of spark-ignited engines, a spark plug ignites the air/fuel mixture. Spark-ignited engines come in several designs such as: two-stroke and four-stroke, rich-burn and lean-burn, turbocharged and naturally aspirated. Spark-ignited engines may use one or more fuels, such as natural gas, propane, butane, liquefied petroleum gas, oil field gas, digester gas, landfill gas, methanol, ethanol, and gasoline.

Compression-ignited engines rely on heating of the inducted air during the compression stroke to ignite the injected diesel fuel. In addition to being classified into compression-ignited and spark-ignited, IC engines can be further divided into two-stroke and four-stroke engines. Most diesel engines are four-stroke, while larger diesel engines often are two-stroke. Natural gas fired spark-ignited engines are usually four-stroke, but some operators prefer two-stroke engines for their applications.

Engines are used by a variety of private businesses and public agencies throughout the Valley for a number of purposes, primarily for powering pumps, compressors, or electrical generators. Examples of businesses and industries that use engines include schools and universities, agriculture, oil and gas production and pipelines, petroleum

refining, manufacturing facilities, food processing, electrical power generation, landfill and waste water treatment facilities, and water districts. Many engines are limited or low use in nature, such as emergency standby engines that provide backup power when electric service is interrupted.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.49	0.49	0.48	0.40	0.31	0.30	0.29	0.28	0.27
NOx	13.06	12.85	12.50	9.21	7.22	6.82	6.57	6.37	6.09
SOx	0.12	0.12	0.12	0.09	0.08	0.08	0.08	0.08	0.08
	Winter Average - Tons per day								
PM2.5	0.36	0.36	0.35	0.30	0.24	0.23	0.23	0.22	0.21
NOx	9.44	9.29	9.03	6.82	5.51	5.24	5.07	4.93	4.72
SOx	0.10	0.10	0.09	0.08	0.07	0.07	0.07	0.07	0.07

As detailed in Chapter 5, the significance threshold for source categories for the purpose of evaluating the application of BACM and MSM requirements is 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from IC engines are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for IC engines.

How does District Rule 4702 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA Control Technique Guidelines (CTG) requirements for this source category. Rule 4702 is at least as stringent as the following applicable federal regulations:

ACT

- EPA – 453/R-93-032 (Alternative Control Techniques Document – NOx Emissions from Stationary Reciprocating Internal Combustion Engines)

The District evaluated the requirements contained within the EPA – 453/R-93-032 ACT document and found no requirements that were more stringent than those already in Rule 4702.

NSPS

- 40 CFR 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 60 Subpart IIII and found no requirements that were more stringent than those already in Rule 4702.

- 40 CFR 60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 60 Subpart JJJJ and found no requirements that were more stringent than those already in Rule 4702.

NESHAP/ MACT

- 40 CFR 63 Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 63 Subpart ZZZZ NESHAP and found no requirements that were more stringent than those already in Rule 4702.

State Regulations

The following state regulations apply to sources covered under Rule 4702:

- 17 CCR 93114 (ATCM to Reduce Particulate Emissions from Diesel-Fueled Engines—Standards for Nonvehicular Diesel Fuel)
- 17 CCR 93115 (ATCM for Stationary Compression Ignition Engines)

The District implements the requirements of 17 CCR 93114 and 17 CCR 93115 through Rule 4702 and the District's new source review permitting program (Rule 2201).

How does District Rule 4702 compare to rules in other air districts?

BAAQMD

- Regulation 9 Rule 8 (Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 8 and found no requirements that were more stringent than those already in Rule 4702.

SMAQMD

- Rule 412 (Stationary Internal Combustion Engines Located at Major Stationary Sources of NOx)

The District evaluated the requirements contained within SMAQMD's Rule 412 and found no requirements that were more stringent than those already in Rule 4702.

VCAPCD

- Rule 74.9 (Stationary Internal Combustion Engines)

The District evaluated the requirements contained within VCAPCD's Rule 74.9 and found no requirements that were more stringent than those already in Rule 4702.

SCAQMD

- Rule 1110.2 (Emissions from Gaseous- and Liquid-Fueled Engines)
- Rules 2000 – 2020 (RECLAIM program)

South Coast Air Quality Management District (SCAQMD) regulates the emissions from IC engines through a combination of control measures. SCAQMD 1110.2 is directly applicable to IC engines and includes emissions limitations for various applications. SCAQMD's RECLAIM program (Rules 2000 – 2020) allows most operators to purchase credits in lieu of instituting engine emissions controls otherwise required under SCAQMD 1110.2. Given these overlapping sets of requirements, Rule 4702 must be compared in context of both regulations. Additionally, many of the engine applications found in the San Joaquin Valley vary substantially from engine applications in SCAQMD; for example, engines used for agricultural irrigation pumping that exist in the Valley and are no longer found in SCAQMD. While not directly comparable, the following tables compare the emission limits between SCAQMD Rule 1110.2 and District Rule 4702.

Table C-19 Comparison of District and SCAQMD NOx Emission Limits for Non-Agricultural Operations (Non-AO) Spark-Ignited Waste Gas Engines Rated at >50 bhp (corrected to 15% oxygen on a dry basis)

Engine Type	District NOx Limit (ppmv)	SCAQMD NOx Limit (ppmv)
Waste Gas Fueled (Rich-Burn)	50	*Until 01-01-16* bhp ≥ 500: 36 x ECF[72] bhp < 500: 45 x ECF[1] *On and after 01-01-16* 11 ppmv
Waste Gas Fueled (Lean-Burn)	65 ppmv or 90% reduction	*Until 01-01-16* bhp ≥ 500: 36 x ECF[1] bhp <500: 45 x ECF[1] *On and after 01-01-16* 11 ppmv

[72] The efficiency correction factor (ECF) is 1.0 unless: 1) The engine operator has measured the engine's net specific energy consumption, in compliance with ASME Performance Test Code PTC 17 -1973, at the average load of the engine; and 2) the ECF-corrected emission limit is made a condition of the engine's permit to operate. The ECF is never less than 1.0 so in some cases the SCAQMD limits could potentially be less stringent than the District's NOx limits.

Table C-20 Comparison of District and SCAQMD NOx Emission Limits for Non-AO Spark-Ignited Engines Rated >50 bhp (corrected to 15% oxygen on a dry basis)

Engine Type	District NOx Limit (ppmv)	SCAQMD NOx Limit (ppmv)
1. Rich-Burn		
Rich-Burn Engine (except for below special applications)	11	11
Cyclic Loaded, Field Gas Fueled	50	11
Limited Use	25	11[73]
2. Lean-Burn Engines		
Lean-Burn Engine (except for below special applications)	11	11
Two-Stroke, Gaseous Fueled, >50 bhp and < 100 bhp	75	11
Limited Use	65	11[2]
Lean-Burn Engine used for gas compression	65 ppmv or 93% reduction	11

Table C-21 Comparison of District and SCAQMD NOx Emission Limits for Agricultural Operations (AO) Spark-Ignited Engines Rated >50 bhp (corrected to 15% oxygen on a dry basis)

Engine Type	District NOx Limit	SCAQMD NOx Limit
1. Rich-Burn	90 ppmv or 80% reduction	11
2. Lean-Burn	150 ppmv or 70% reduction	11
3. Certified and installed on or before June 16, 2005	Meet a Certified Spark-Ignited Engine Standard of HC + NOx < 0.6 g/bhp-hr	11

Medium and large operators in the South Coast Air Basin are most likely part of the South Coast RECLAIM program and are subsequently not required to meet the engine emission limitations included in Rule 1110.2. All facilities that emit over a certain threshold are required to participate in the RECLAIM program. As part of the RECLAIM program certain companies receive emission allocations every year and each allocation is good for 12 months. The portion of the allocation not needed to offset the operator's own emissions can be sold to other companies. If the operator does not receive an emission allocation, they must buy emission credits from operators with unused emission allocations. In this way, the RECLAIM program is similar to a cap-and-trade program. The District does not have a RECLAIM-type program for this source category and all operators are required to meet the stringent emission limitations included in Rule 4702.

[73] SCAQMD exempt units that operate less than 500 hours from this limit; District defines "limited use" units as those operating less than 4,000 hours and only exempts engines operating less than 200 hours.

Although the SCAQMD emission level of 11 ppm has not yet been proven as technologically feasible in agricultural settings and it is unclear what percentage of facilities are complying with the current SCAQMD NOx limits for non-ag categories, the District evaluated the cost-effectiveness and feasibility of implementing an 11 ppmv NOx emission limit for the following categories of IC engines:

- Non-Agricultural Operations (Non-AO) Waste Gas Engines
- Non-AO Spark-Ignited Engines
  - Cyclic Loaded, Field Gas Fueled
  - Limited Use Engines
    - Lean-Burn Engines
    - Rich-Burn Engines
  - Two-Stroke, Gaseous Fueled Engines 50-100 bhp
  - Lean-Burn Engines Used for Gas Compression
- Agricultural Operations (AO) Spark-Ignited Engines

The District also evaluated the cost-effectiveness and feasibility of implementing intermediate NOx emission limits for AO spark-ignited engines that more closely match the current NOx emission limits for non-AO limited use rich-burn and lean-burn engines. The following analyses were conducted:

- 25 ppmv NOx emission limit for AO Rich-Burn Spark-Ignited Engines
- 65 ppmv NOx emission limit for AO Lean-Burn Spark-Ignited Engines

To determine potential emissions reductions, the District used the following equations:

NOx = (BHP x HR x EF x LF) / (CF)

Where:

NOx = Current annual NOx emissions or potential annual NOx emissions in ton/year
BHP = engine power
HR = annual hours of operation
EF = NOx emission factor
LF = engine load factor
CF = conversion factor from grams to pounds

The estimated annual NOx emissions reduction was calculated using the following equation:

Potential Emissions Reduction = current annual NOx emissions – potential NOx annual NOx emissions

NOx Emission Limitation for Non-Agricultural Operations (Non-AO) Waste Gas Engines:

The District analyzed the technological feasibility of lowering the NOx emission limit for waste gas engines and determined that due to the variability of waste gas, additional levels of NOx control on existing waste gas engines can pose significant technical and feasibility challenges. Waste gas includes landfill gas, which is generated at landfills, and digester gas, which is generated from anaerobic digestion. Both landfill and digester gas result from the decomposition of organic matter by microorganisms in the absence of oxygen. Unlike pipeline natural gas, the composition of waste gas is not consistent or guaranteed. The heating value and composition of the gas (e.g. methane and oxygen contents) will vary with the type of materials that enter the landfill or digester and can also fluctuate seasonally or even daily. Both landfill and digester gases contain impurities, such as siloxanes, sulfur compounds, and halides. Landfill gas also contains entrained particulate matter, and both landfill and digester gas may contain particulate that results from combustion of the impurities in the gas. The contaminants in waste gas can coat and/or poison catalysts, rendering them ineffective. Because of its variable composition and contaminants, untreated waste gas is not interchangeable with pipeline-quality natural gas and extensive and costly cleanup would be necessary to allow the use of catalytic emission controls needed to achieve 11 ppmv. This is not a practical option for most existing waste gas-fired engines, which were not designed to include the required gas systems and catalytic controls.

In addition to the District's efforts to identify additional potential technology options for this category, SCAQMD has also been evaluating this issue. In February 2008, SCAQMD amended Rule 1110.2 to include an 11 ppmv limit for waste gas engines rated at >50 bhp. The original compliance date for this emissions limit was July 1, 2012, with the assumption that SCAQMD would complete a Technology Assessment to verify the feasibility of available control technologies for waste gas engines. However, SCAQMD had to amend Rule 1110.2 in September 2012 to extend the compliance deadline for waste gas engines from 2012 to 2016 in order to allow for more time to complete their Final Technology Assessment, which is currently still incomplete and has yet to identify feasible technology options. Additionally, these sources may also be in a position to avoid installing additional NOx control technologies through their participation in SCAQMD's RECLAIM program.

District Rule 4702 contains the most stringent limits feasible for existing waste gas-fueled engines based on the use of combustion processes that minimize emissions without the use of post-combustion catalytic controls. Therefore, Rule 4702 meets or exceeds BACM and MSM for non-AO waste gas fueled spark-ignited engines. Additionally, the District continues to investigate potential NOx and SOx control technologies for waste gas engines through its Technology Advancement Program, with projects currently approved for funding that will continue to demonstrate new technologies in this sector.

NOx Emission Limitation for Non-AO Spark-Ignited Engines:

Cyclic Loaded, Field Gas Fueled

Cyclic-loaded, field gas fueled engines can achieve some level of control, but not the stringent level of control that can be imposed on engines that operate in a narrow and more stable range of loads. The exhaust gas temperature of cyclic loaded engines varies as a function of the engine load; however, catalyst chemistry is dependent on a minimum temperature to be effective in reducing emissions. When the cyclic load engine is operating in a particular engine load range, the exhaust gas temperature can reach the catalyst's effective range and allow for emissions to be well-controlled; however, as the engine cycles out of this load range, the exhaust gas temperature becomes too low for effective emissions control. Since the exhaust temperature fluctuates frequently for this category of units, it is technologically infeasible to require a lower NOx limit for cyclic loaded field-gas fueled engines. The current emission limit for this category of engines meets or exceeds BACM and MSM for these sources.

Limited Use Engines

During the 2011 amendments to Rule 4702, the District created this category of engines based on the high costs and cost effectiveness associated with the installation of additional controls for these engines (> 4,000 hours of operation). As discussed in the staff report, the NOx emission reductions foregone from not lowering the existing NOx limits to 11 ppmv for limited use engines was insignificant (about 0.004 tons per day in 2011).[74]

However, since the evaluation was conducted in 2011, the District re-evaluated the cost effectiveness of lowering the NOx emission limits to 11 ppmv for limited use non-AO rich-burn and lean-burn engines. The costs in the analyses below were gathered from information in the District's Permits database, IC engine manufacturers, and operators.

Limited Use Lean-Burn Engines

When evaluating the ability to lower NOx emissions to 11 ppmv, an operator can either retrofit the existing lean-burn IC engine with a selective catalytic reduction (SCR) system or install a new lean-burn engine with an SCR system. In many cases, retrofitting an existing IC engine is technologically infeasible or may require substantial additional unanticipated costs (such as the incompatibility of an older engine with less sophisticated operating controls with additional control technology, additional labor/maintenance costs, etc.). However, for the purpose of evaluating all potential controls, the District has included both options in the below analysis.

[74] SJVAPCD. (2011, August 18). *Adopt Revised Proposed Amendments to Rule 4702 (Internal Combustion Engines).* Retrieved from http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2011/August/Agenda_Item_10_Aug_18_2011.pdf

Table C-22 Annual Costs for Retrofitting an Existing Limited Use Lean-Burn Engine and Installing a New Limited Use Lean-Burn Engine with SCR

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	1100 brake horsepower (bhp)	n/a
Annual Operation	2500 hours (hr)	n/a
Capital Costs		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$110,656
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$18,037**
SCR Equipment Costs		
SCR System	$73,000 per engine	$73,000
550 gallon double wall plastic urea tank and accessories	$5,270 per tank	$5,270
3 hp rotary screw air compressor with dryer and receiver tank	$5,875 per compressor package	$5,875
Total SCR Equipment Costs	Equipment costs x 20% profit/mark-up	$100,974
SCR Installation Costs		
Start-up and Commissioning Rate	$1,500/day; assume 1 day for each system	$1,500
Electrical upgrade to power compressor	n/a	$0
Total SCR Installation Costs		$1,500
Total SCR Capital Costs	SCR Equipment Costs + SCR Installation Costs	$102,474
Annualized SCR Capital Costs (10 years, 10%)	0.163 x Total SCR Capital Costs	**$16,703**
Annual Operating and Maintenance Costs		
Annual Reagent (urea) Cost	$3 per gallon; 1 gallon/hr Cost = $3 x 2500 hr	$7,500
Annual Increase in Fuel Cost (due to drop in fuel efficiency with SCR)	Fuel usage = 9,322.5 standard cubic feet per hour (scf/hr) Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (9,322.5 x $7.36) / 1000 Fuel cost (per year) = hourly cost x 2500 hr 2.5% drop in fuel efficiency Added Fuel Cost = Annual fuel cost x 2.5%	$4,288
Annual Electricity Cost (for compressor)	3 hp compressor = 2.24 kW power rating Electricity rate for industrial operations = $0.132/kW-hr Hourly electricity cost = 2.24 kW x $0.132/kW-hr Daily meter charge = $49.281 Annual electricity cost = hourly cost x 2500 hr Annual meter charge = daily meter charge x 365 days Total utility cost = Annual electricity cost + Annual meter charge	$18,728

Item	Assumptions/Methodology	Cost
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual cost = $0.02 x 1,100 bhp x 2500 hr	$55,000
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Reagent Cost+ Annual Increase in Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$87,147**
Annual Cost for Retrofit of LB Engine with SCR	Annualized SCR Capital Cost + Annual O&M Cost	**$103,850**
Annual Cost for New LB Engine with SCR	Annualized Engine Capital Cost + Annualized SCR Capital Cost + Annual O&M Cost	**$121,887**

The emissions reductions are calculated below:

BHP = 1,100 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 0.78 g-NOx/bhp-hr (equivalent to 65 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
LF = 0.8
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (1,100 bhp x 2500 hr/yr x 0.78 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 3,783 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (1,100 bhp x 2500 hr/yr x 0.132 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 640 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (3,783-640 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 1.57 tons/year

Cost Effectiveness

The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of retrofitting or replacing current limited use lean-burn spark-ignited engines is as follows:

- Retrofitted limited use lean-burn engine with SCR: $66,086/ton of NOx reduced
- New limited use lean-burn engine with SCR: $77,564/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to require the retrofit or replacement of limited use lean-burn engines to achieve 11 ppmv.

Limited Use Rich-Burn Engines

When evaluating the ability to lower NOx emissions to 11 ppmv, an operator will generally retrofit the existing rich-burn IC engine with a nonselective catalytic reduction (NSCR) system. In many cases, retrofitting an existing IC engine is technologically infeasible or may require substantial additional unanticipated costs (such as the incompatibility of an older engine with less sophisticated operating controls with additional control technology, additional labor/maintenance costs, etc.). However, for the purpose of evaluating potential controls in this category, the District has included the less costly, potentially feasible scenario of retrofitting an existing rich-burn engine with NSCR in the below analysis.

Table C-23 Annual Costs for Retrofitting an Existing Limited Use Rich-Burn Engine

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	500 bhp	n/a
Annual Operation	2500 hours (hr)	n/a
Capital Costs		
New Catalyst System	Includes: catalyst, air-to fuel ratio controller, ignition system, and installation	$75,000
Annualized Catalyst Capital Cost (10 years, 10%)	0.163 x New Catalyst System	**$12,225**
Annual Cost for Retrofit of RB Engine with New Catalyst	Annualized Catalyst Capital Cost	**$12,225**

The emissions reductions are calculated below:

BHP = 500 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 0.30 g-NOx/bhp-hr (equivalent to 25 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
LF = 0.8
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (500 bhp x 2500 hr/yr x 0.30 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 661 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (500 bhp x 2500 hr/yr x 0.132 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)

= 291 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (661 - 291 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.19 tons/year

Cost Effectiveness

The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of retrofitting or replacing current limited use rich-burn spark-ignited engines is as follows:

- Retrofitted limited use rich-burn non-AO engine with new catalyst: $66,015/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to require the retrofit or replacement of limited use rich-burn engines to achieve 11 ppmv, even without including additional substantial costs, such as annual operating and maintenance costs.

Two-Stroke, Gaseous Fueled Engines 50-100 bhp

There is no control technology compatible with two-stroke, gaseous fueled engines, including SCR, which will allow these units to achieve a NOx emission limit below 75 ppmv. An 11 ppmv NOx emission limit is not technologically feasible for these engines; the current limit implements BACM and MSM for two-stroke, gaseous fueled engines less than 100 bhp.

Lean-Burn Engines Used in Gas Compression

Similar to the "Limited Use" engine category, during the 2011 amendments to Rule 4702, the District created this category of engines based on the technological infeasibility to control these types of engines. Lean-burn engines used in gas compression in the Valley are used in natural gas distribution and storage service, and these engines frequently experience changing load conditions. As noted in EPA's Stationary IC Engine Technical Support Document[75], SCR use is problematic for these engines due to the fluctuations over a broad range of conditions. For this reason, EPA states that there is an insufficient basis to conclude that SCR is an appropriate technology for large lean-burn engines used for gas compression. The current emission limit is achievable through low-NOx combustion technology, which includes changes to the engine's timing, enhanced control of the air-fuel ratio, and other changes that lower NOx emissions. Due to the technological complexities associated with lean-burn engines used in gas compression, the current emissions limit implements BACM and MSM for these units.

[75] EPA. (2003, October). *Stationary Reciprocating Internal Combustion Engines Technical Support Document for NOx SIP Call*.

NOx Emission Limitation for AO Spark-Ignited Engines:

Potential methods for reducing NOx emissions from Agriculture Operation (AO) spark-ignited engines include retrofitting them with emission control technologies or replacing them. As the below analysis demonstrates, given the high costs and limited seasonal nature of operation of AO spark-ignited engines, requiring additional controls beyond the existing stringent requirements is not cost-effective and often technologically infeasible. Despite the technological feasibility issues associated with retrofitting or replacing existing AO spark-ignited engines, the District evaluated the cost effectiveness and feasibility of achieving an 11 ppmv NOx emission limit for the following scenarios:

- Installing a new IC lean-burn engine with SCR as a replacement for an existing unit
- Retrofitting an existing lean-burn IC engine with SCR
- Installing a new rich-burn engine with a three-way catalyst system as a replacement for an existing unit

The District also evaluated the cost effectiveness and feasibility of achieving intermediate NOx emission limits of 25 ppmv for AO rich-burn spark-ignited engines and a 65 ppmv for lean-burn spark-ignited engines, similar to the corresponding limited use engine limits for non-AO engines. The scenarios evaluated include:

- Installing a new IC lean-burn engine as a replacement for an existing unit to meet 65 ppmv
- Installing a new rich-burn engine with a three-way catalyst system as a replacement for an existing unit to meet 25 ppmv

The costs in the analyses below were gathered from information in the District's Permits database, IC engine manufacturers, and agricultural industry representatives.

AO Lean-Burn Engines (11 ppmv)

When evaluating the ability to lower NOx emissions to 11 ppmv, an agricultural operator can either retrofit the existing lean-burn IC engine with a selective catalytic reduction (SCR) system or install a new lean-burn engine with an SCR system.

Table C-24 Annual Costs for Retrofitting an Existing AO Lean-Burn Engine with SCR and Installing a New AO Lean-Burn Engine with SCR

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	241 brake horsepower (bhp)	n/a
Annual Operation	2500 hours (hr)	n/a
Capital Costs (Engine)		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$109,480
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$17,845**
SCR Equipment Costs		
SCR System	$73,000 per engine	$73,000
550 gallon double wall plastic urea tank and accessories	$5,270 per tank	$5,270
3 hp rotary screw air compressor with dryer and receiver tank	$5,875 per compressor package	$5,875
Total SCR Equipment Costs	Equipment costs x 20% profit/mark-up	$100,974
SCR Installation Costs		
Start-up and Commissioning Rate	$1,500/day; assume 1 day for each system	$1,500
Electrical upgrade to power compressor	$43.22/foot; avg. 1,020 feet to extend electrical line	$44,084
Total SCR Installation Costs		$45,584
Total SCR Capital Costs	SCR Equipment Costs + SCR Installation Costs	$146,558
Annualized SCR Capital Costs (10 years, 10%)	0.163 x Total SCR Capital Costs	**$23,889**
Annual Operating and Maintenance Costs (SCR)		
Annual Reagent (urea) Cost	$3 per gallon; 1 gallon/hr Cost = $3 x 2500 hr	$7,500
Annual Increase in Fuel Cost (due to drop in fuel efficiency with SCR)	Fuel usage = 1750.7 standard cubic feet per hour (scf/hr) Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (1,750.7 x $7.36) / 1000 Fuel cost (per year) = hourly cost x 2500 hr 2.5% drop in fuel efficiency Added Fuel Cost = Annual fuel cost x 2.5%	$805
Annual Electricity Cost (for compressor)	3 hp compressor = 2.24 kW power rating Electricity rate for AO = $0.136/kW-hr Hourly electricity cost = 2.24 kW x $0.136/kW-hr Annual electricity cost = hourly cost x 2500 hr	$761
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual cost = $0.02 x 241 bhp x 2500 hr	$12,050

Item	Assumptions/Methodology	Cost
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Reagent Cost+ Annual Increased Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$22,746**
Annual Cost for Retrofit of LB Engine with SCR	Annualized SCR Capital Cost + Annual O&M Cost	**$46,635**
Annual Cost for New LB Engine with SCR	Annualized Engine Capital Cost + Annualized SCR Capital Cost + Annual O&M Cost	**$64,480**

*The values within this table are rounded.

The emissions reductions are calculated below:

BHP = 241 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 2.092 g-NOx/bhp-hr (equivalent to 150 ppmv)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmv)
LF = 0.65
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (241 bhp x 2500 hr/yr x 2.092 g-NOx/bhp-hr x 0.65) / (453.6 g/lb)
= 1,806 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (241 bhp x 2500 hr/yr x 0.132 g-NOx/bhp-hr x 0.65) / 453.6
= 114 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1806-114 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.85 tons/year

Cost Effectiveness (AO Lean-Burn, 11 ppmv)

The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of retrofitting or replacing current AO lean-burn spark-ignited engines is as follows:

- Retrofitted lean-burn engine with SCR: $55,118/ton of NOx reduced
- New lean-burn engine with SCR: $76,209/ton of NOx reduced

In addition to the unique feasibility issues that AOs face with regards to the installation and maintenance of IC engines (see below), the cost effectiveness values above demonstrate that it is not cost effective to retrofit or replace existing AO lean-burn engines with new more controlled engines.

AO Lean-Burn Engines (65 ppmv)

When evaluating the ability to lower NOx emissions to 65 ppmv, an agricultural operator would have to replace the existing lean-burn IC engine with a new lean-burn engine certified to meet 65 ppmv.

Table C-25 Annual Costs for Installing a New AO Lean-Burn Engine

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	241 brake horsepower (bhp)	n/a
Annual Operation	2500 hours (hr)	n/a
Capital Costs (Engine)		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$109,480
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$17,845**
Annual Operating and Maintenance Costs		
Annual Maintenance Cost	Maintenance = $0.01 per bhp per hour of operation Annual cost = $0.01 x 241 bhp x 2500 hr	**$6,025**
Annual Cost for New LB Engine	Annualized Engine Capital Cost + Annual O&M Cost	**$23,870**

*The values within this table are rounded.

The emissions reductions are calculated below:

BHP = 241 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 2.092 g-NOx/bhp-hr (equivalent to 150 ppmv)
EF2 = 0.78 g-NOx/bhp-hr (equivalent to 65 ppmv)
LF = 0.65
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (241 bhp x 2500 hr/yr x 2.092 g-NOx/bhp-hr x 0.65) / (453.6 g/lb)
= 1,806 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (241 bhp x 2500 hr/yr x 0.78 g-NOx/bhp-hr x 0.65) / 453.6
= 673 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1806-673 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.57 tons/year

Cost Effectiveness (AO Lean-Burn, 65 ppmv)

The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO lean-burn spark-ignited engines is as follows:

- New lean-burn engine: $42,146/ton of NOx reduced

In addition to the unique feasibility issues that AOs face with regards to the installation and maintenance of IC engines (see below), the cost effectiveness value above demonstrates that it is not cost effective to replace existing AO lean-burn engines with newer less polluting engines.

AO Rich-Burn Engines (11 ppmv)

When evaluating the ability to lower NOx emissions to 11 ppmv, an agricultural operator can install a new rich-burn engine with 3-way catalyst.

Table C-26 Annual Cost for Installing a New AO Rich-Burn Engine with a 3-way Catalyst

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	256 bhp	n/a
Annual Operation	2500 hr	n/a
Total Capital Costs		
New Engine Cost	Includes: engine with 3-way catalyst, freight, installation, and tax	$95,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$15,485**
Annual Operating and Maintenance Costs (SCR)		
Annual Added Fuel Cost (due to drop in fuel efficiency with catalyst)	Fuel usage = 1,859.7 scf/hr Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (1,859.7 x $7.36) / 1000 Fuel cost (per year) = hourly cost x 2500 hr Assume 2.5% drop in fuel efficiency Added Fuel cost = Annual fuel cost x 2.5%	$855
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized Catalyst Cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual Maintenance Cost = $0.02 x 256 bhp x 2500 hr	$12,800
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Added Fuel Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$15,285**
Annual Cost for New RB Engine with 3-way	Annualized Engine Capital Cost + Annual O&M Cost	**$30,770**

*The values within the above table are rounded.

The emissions reductions are calculated below:

BHP = 256 bhp
HR = 2,500 hours/year
EF1 = 1.255 g-NOx/bhp-hr (equivalent to 90 ppmv)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmv)
LF = 0.65
CF = 453.6 grams/pound

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (256 bhp x 2500 hr/yr x 1.255 g-NOx/bhp-hr x 0.65) / 453.6
= 1,151 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (256 bhp x 2500 hr/yr x 0.132 g-NOx/bhp-hr x 0.65) / 453.6
= 121 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,151-121 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.52 tons/year

Cost Effectiveness (AO Rich-Burn, 11 ppmv)
The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO rich-burn engines is as follows:

- New rich-burn engine with a 3-way catalyst to meet 11 ppmv: $59,754/ton of NOx reduced

In addition to the unique feasibility issues that AOs face with regards to the installation and maintenance of IC engines (see below), the cost effectiveness value above demonstrates that it is not cost effective to replace existing AO spark-ignited engines with new controlled engines.

AO Rich-Burn Engines (25 ppmv)
In order to meet a 25 ppmv, an agricultural operator would have to install a new rich-burn engine with a slightly less expensive catalyst compared to the catalyst needed to meet 11 ppmv.

Table C-27 Annual Cost for Installing a New AO Rich-Burn Engine with a 3-way Catalyst

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	256 bhp	n/a
Annual Operation	2500 hr	n/a
Total Capital Costs		
New Engine Cost	Includes: engine with 3-way catalyst, freight, installation, and tax	$95,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$15,485**
Annual Operating and Maintenance Costs (SCR)		
Annual Added Fuel Cost (due to drop in fuel efficiency with catalyst)	Fuel usage = 1,859.7 scf/hr Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (1,859.7 x $7.36) / 1000 Fuel cost (per year) = hourly cost x 2500 hr Assume 2.5% drop in fuel efficiency Added Fuel cost = Annual fuel cost x 2.5%	$855
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $4,000 Catalyst costs for 10 years = $4,000 x 2 Annualized Catalyst Cost = $8,000 x 0.163	$1,304
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual Maintenance Cost = $0.02 x 256 bhp x 2500 hr	$12,800
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Added Fuel Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$14,959**
Annual Cost for New RB Engine with 3-way	Annualized Engine Capital Cost + Annual O&M Cost	**$30,444**

*The values within the above table are rounded.

The emissions reductions are calculated below:

BHP = 256 bhp
HR = 2,500 hours/year
EF1 = 1.255 g-NOx/bhp-hr (equivalent to 90 ppmv)
EF2 = 0.30 g-NOx/bhp-hr (equivalent to 25 ppmv)
LF = 0.65
CF = 453.6 grams/pound

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (256 bhp x 2500 hr/yr x 1.255 g-NOx/bhp-hr x 0.65) / 453.6
= 1,151 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (256 bhp x 2500 hr/yr x 0.30 g-NOx/bhp-hr x 0.65) / 453.6

= 275 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,151-275 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.44 tons/year

Cost Effectiveness (AO Rich-Burn, 25 ppmv)

The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO rich-burn engines is as follows:

- New rich-burn engine with a 3-way catalyst to meet 25 ppmv: $69,521/ton of NOx reduced

In addition to the unique feasibility issues that AOs face with regards to the installation and maintenance of IC engines (see below), the cost effectiveness values above demonstrate that it is not cost effective to replace existing AO spark-ignited engines with new controlled engines.

Other Feasibility Considerations AO Spark-Ignited Engines

In addition to the high cost-effectiveness and potential infeasibility associated with retrofitting or replacing existing AO spark-ignited engines currently regulated under Rule 4702, requiring additional costly controls on AO engines is economically challenging and potentially infeasible. Unlike most other industries, AOs cannot pass increased production costs on to consumers, thereby forcing AOs to absorb the compliance costs associated with costly additional retrofits and replacements. Over the past decade, AOs have invested significant capital to retrofit and replace thousands of irrigation pump and other engines reducing emissions by over 80% in this category, and continue to do so as emission limitations and associated compliance deadlines materialize under Rule 4702.

Additionally, AO spark-ignited engines are generally located in rural, hard to access areas with minimal oversight due to limited resources and staffing. With seasonal labor and minimal year-round staffing, it is difficult for AOs to provide the frequent and complex maintenance required for retrofitted or new engines equipped with advanced emission controls. The oil production industry is the only other major industry in the Valley that has IC engines located in remote locations; however, with the highly technical nature of oil production and refining as compared to agricultural production and additional economic resources, it is feasible for the oil and gas production industry to hire qualified staff dedicated to maintaining and operating IC engines and other equipment on-site.

Additional Emission Reduction Opportunities

SOx and PM limitations

Rule 4702 contains stringent requirements requiring the combustion of Public Utilities Commission (PUC) quality natural gas, or other equivalent ultra-low sulfur fuels, and diesel engines subject to Rule 4702 are required to be EPA Tier 3 or Tier 4 certified, depending on the size of the engine and the annual operating hours. EPA Tier 3 and 4 certifications require the units to meet low PM limits and Tier 4 engines are required to meet even lower PM emissions through the use of particulate filters. Given the low PM2.5 and SOx emissions from IC engines and existing rule requirements, the District determined that no further requirements were needed to address PM2.5 and SOx emissions.

Emission limitation exemptions for emergency standby engines and low-use engines

The existing requirements are consistent with Air Resources Board (ARB) RACT/BARCT Determination for Spark-Ignited Engines and ARB Airborne Toxics Control Measures (ATCM). Since these units are used only for emergencies or in very limited capacities, emissions from these units are relatively minor, and requiring additional emissions controls would likely not be cost effective.

Non-Regulatory Actions

The District implements a stationary agricultural irrigation pump engine program as a component of the *Heavy-Duty Engine Program*. This program provides incentives for both the conversion of Tier 1 and Tier 2 engines to lower NOx and PM-emitting Tier 4 engines and for the electrification of diesel engines, as the District highly prioritizes electrification efforts to achieve zero and near-zero emissions from engines. The District's legislative platform[76] includes support for incentive funding through the Carl Moyer Program. Continued support of this funding stream will continue to provide incentives for accelerated reductions from IC engines.

Meeting air quality standards requires transformative measures and technologies to achieve near zero emissions. In order to further develop technology to close the gap in required emissions reductions, the District operates a Technology Advancement Program (TAP). Along with its own resources, the District seeks state and federal assistance through its legislative platform to advance technologies to reduce emissions in the Valley. District TAP projects seek innovations in several areas of technology including IC engines. While no technologies to reduce emissions from IC engines have been achieved in practice yet, these projects may provide the basis for future feasible, SIP-creditable emission reductions.

[76] SJVAPCD. (January 2015). *Legislative Platform 2015.* http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2015/January/final/10.pdf

Evaluation Findings

Even though IC engines are not a significant source of PM2.5 or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4702 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce NOx emissions from IC engines in the Valley.

C.18 RULE 4703 STATIONARY GAS TURBINES

Discussion

The provisions of this rule are applicable to all stationary gas turbine systems, which are subject to District permitting requirements, and with electrical generation ratings equal to or greater than 0.3 megawatt (MW) or a maximum heat input rating of more than 3 million British Thermal Units per hour (MMBtu/hr), and that are used for the generation of electrical power. The purpose of this rule is to limit NOx emissions from these stationary gas turbines.

Rule 4703 was adopted on August 18, 1994. Since its adoption, the rule has been amended six times. The latest rule amendment in September 2007 strengthened the rule by establishing more stringent NOx limits for existing stationary gas turbines. EPA finalized approval for Rule 4703 on October 21, 2009 and deemed this rule as being at least as stringent as established RACT requirements. NOx emissions have been controlled by over 86% for this source category.

Source Category

The requirements of Rule 4703 affect owners and operators of stationary gas turbine systems used to pump, compress, generate electricity, or perform other tasks. The four major industry groups are oil and gas production, utilities, manufacturing, and government.

In complying with the rule, all affected entities are required to control NOx and CO emissions by installing approved emissions control devices. Early in the rule development process, the District identified five different emissions control technologies that could be used to achieve proposed limits for stationary gas turbines. Of the five options, four mainly control NOx emissions, while the other one controls CO emissions. The four NOx control technologies are:

- Dilutant (water or steam) injection systems,
- Dry, low-NOx,
- Selective catalytic reduction, and
- SCONOx

Costs associated with different compliance options vary a great deal depending on technologies and available products. Depending on the size of the existing turbine systems, engine model and make, type of existing emissions control equipment, and many other factors, owners and operators of stationary gas turbine systems face different compliance costs. The impacts of Rule 4703 have been concentrated in the oil and gas production sector and utilities sector of the Valley, as they own and operate the vast majority of stationary gas turbines subject to the rule.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	1.22	1.28	1.14	1.09	1.11	1.14	1.14	1.14	1.10
NOx	3.09	3.23	2.89	2.77	2.83	2.89	2.90	2.92	2.81
SOx	0.22	0.23	0.20	0.19	0.19	0.20	0.20	0.20	0.19
	Winter Average - Tons per day								
PM2.5	1.21	1.27	1.13	1.08	1.10	1.13	1.13	1.14	1.09
NOx	3.00	3.14	2.82	2.70	2.76	2.82	2.83	2.84	2.74
SOx	0.21	0.23	0.20	0.19	0.19	0.20	0.20	0.20	0.19

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from stationary gas turbines are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for stationary gas turbines.

How does District Rule 4703 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG requirements for this source category.

ACT

- EPA–435/R-93-007 (Alternative Control Techniques Document—NOx Emissions from Stationary Gas Turbines)

The District evaluated the requirements contained within the ACT for NOx Emissions from Stationary Gas Turbines and found no requirements that were more stringent than those already in Rule 4703.

NSPS

- 40 CFR 60 Subpart GG (Standards of Performance for Stationary Gas Turbines)

The District evaluated the requirements contained within 40 CFR 60 Subpart GG and found no requirements that were more stringent than those already in Rule 4703.

- 40 CFR 60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines)

The District evaluated the requirements contained within above NSPS and found no requirements that were more stringent than those already in Rule 4703.

NESHAP/ MACT

- 40 CFR 63 Subpart YYYY (NESHAP for Stationary Combustion Turbines)

The District evaluated the requirements contained within 40 CFR 63 Subpart YYYY and found no requirements that were more stringent than those already in Rule 4703.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4703 compare to rules in other air districts?

SCAQMD

- Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines)

The District evaluated the requirements contained within SCAQMD's Rule 1134 and found no requirements that were more stringent than those already in Rule 4703.

BAAQMD

- Regulation 9 Rule 9 (Nitrogen Oxides from Stationary Gas Turbines)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 9 and found no requirements that were more stringent than those already in Rule 4703.

SMAQMD

- Rule 413 (Stationary Gas Turbines)

The District evaluated the requirements contained within SMAQMD's Rule 413 and found no requirements that were more stringent than those already in Rule 4703.

VCAPCD

- Rule 74.23 (Stationary Gas Turbines)

The District evaluated the requirements contained within VCAPCD's Rule 74.23 and found no requirements that were more stringent than those already in Rule 4703.

Additional Emission Reduction Opportunities

The District has adopted numerous rule amendments to the turbine rule that have successfully and significantly reduced emissions from this source category. The emissions inventory for NOx from turbines has been reduced from 31.9 tpd in 1994 to 2.77 tpd in 2015. Significant emission reductions have been achieved through the implementation of the most stringent regulations in the nation for this source category and significant investments by stakeholders to implement effective and innovative emission control technologies. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining feasible opportunities for obtaining additional emissions reductions.

BACT Comparisons

Comparisons of this rule with the District, BAAQMD, and SCAQMD BACT requirements showed that some BACT emissions limits are more stringent than Rule 4703 limits. For units greater than 3 MW, some of the District's NOx limits ranged from 3-5 ppmv, whereas the BACT limits ranged from 2-3 ppmv. For units less than 3 MW, the District's NOx limit was 9 ppmv, whereas the BACT limit was 5 ppmv. The BACT guidelines list SCR and SCONOx as the emissions control technologies used to achieve emission limits in the range of 2-5 ppmv. Although lower emission limits are potentially achievable for this source category, BACT requirements are imposed on new or modified turbine installations where ultra-low NOx controls can be installed and the equipment and the facility can be designed to function with this new technology. Rule 4703 is a prohibitory rule that has undergone several generations of NOx limits for existing units in the Valley; facilities comply with these limits by retrofitting their existing equipment. Requiring the installation of entirely new turbine systems is extremely expensive and not cost effective, and therefore not required of facilities.

Selective Catalytic Reduction

Many of the larger units (> 3MW) have already employed SCR to achieve the 5 ppmv limits in place. Therefore, the District evaluated the potential opportunity to employ SCR for units less than 3 MW.

A SCR system reduces NOx emissions by converting the emissions to water and elemental nitrogen. Ammonia is generally injected into the exhaust stream and reacts with the nitrogen. Due to the high cost of SCR systems, they are typically used for controlling emissions from larger units, greater than 3 MW that generally create more emissions. The cost effectiveness of an SCR system for a 1 MW unit was calculated based on the cost effectiveness methodologies in the 2007 Staff Report for Rule 4703 and some of the newer methodologies used to calculate the cost effectiveness of SCR in the August 2011 Staff Report for Rule 4702. The tables below present the total annual costs for a new SCR system and a retrofit system.

Table C-28 SCR Annual Costs for a New Installation on a 1 MW Turbine

Item		Source	Cost
Turbine Rating	1 MW		
SCR Cost/KW	$125/KW	Mid-point between high and low estimate from R4703 analysis	
Operating Hours	7884 hrs/year		
Direct Capital Costs			
Total Purchased Equip Cost	$125/KW x 1000 KW		$125,000
Freight	5% Purchased Equip. Cost (PEC)	Rule 4702	$6,250
Sales Tax	8.25% PEC	Rule 4702	$10,313
Direct Installation Costs	25% PEC	Rule 4702	$31,250
Total Direct Capital Costs			**$172,813**
Indirect Capital Costs			
Facilities	5% PEC	Rule 4702	$6,250
Engineering	10% PEC	Rule 4702	$12,500
Process Contingency	5% PEC	Rule 4702	$6,250
Total Indirect Capital Costs			**$25,000**
Project Contingency	20% PEC	Rule 4702	$25,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency	Rule 4702	$222,813
Annualized Capital Costs (10 years @ 10%)	0.1627*TCC	Rule 4702	**$36,252**
Direct Annual Costs			
Operating Costs			
Operator	0.5 hr/shift, $25/hr	OAQPS	$13,688
Supervisor	15% of operator	OAQPS	$2,053
Maintenance Costs			
Labor	0.5 hr/shift, $25/hr	OAQPS	$13,688
Material	100% of labor cost	OAQPS	$13,688
Utility Costs			
Electricity Costs		Variable	$5,747
Cat. Replacement		MHIA	$5,621
Cat. Disposal		OAQPS	$211
Ammonia		Variable	$1,008
NH3 Inject Skid		MHIA	$2,916
Total Direct Annual Costs			**$58,620**
Indirect Annual Costs			
Overhead	60% of Operating and Maintenance	OAQPS	$25,870
Administrative	0.02 x PEC	OAQPS	$2,500
Insurance	0.01 x PEC	OAQPS	$1,250
Property Tax	0.01 x PEC	OAQPS	$1,250
Capital Recovery	0.13 x PEC (10% int. rate, 15 yr period)	OAQPS	$16,250
Total Indirect Annual Costs			$47,120
Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		**$141,992**

Table C-29 SCR Annual Costs for a Retrofit on a 1 MW Turbine

Item		Source	Cost
Turbine Rating	1 MW		
SCR Cost/KW	$325/KW	Middle point between high and low estimate from R4703 analysis	
Operating Hours	7884 hrs/year		
Direct Capital Costs			
Total Purchased Equip Cost	$325/KW x 1000 KW		$325,000
Freight	5% Purchased Equip. Cost (PEC)	Rule 4702	$16,250
Sales Tax	8.25% PEC	Rule 4702	$26,813
Direct Installation Costs	25% PEC	Rule 4702	$81,250
Total Direct Capital Costs			**$449,313**
Indirect Capital Costs			
Facilities	5% PEC	Rule 4702	$16,250
Engineering	10% PEC	Rule 4702	$32,500
Process Contingency	5% PEC	Rule 4702	$16,250
Total Indirect Capital Costs			**$65,000**
Project Contingency	20% PEC	Rule 4702	$65,000
Total Capital Costs (TCC)	Direct Capital + Indirect Capital + Project Contingency	Rule 4702	$579,313
Annualized Capital Costs (10 years @ 10%)	0.1627*TCC	Rule 4702	**$94,254**
Direct Annual Costs			
Operating Costs			
Operator	0.5 hr/shift, $25/hr	OAQPS	$13,688
Supervisor	15% of operator	OAQPS	$2,053
Maintenance Costs			
Labor	0.5 hr/shift, $25/hr	OAQPS	$13,688
Material	100% of labor cost	OAQPS	$13,688
Utility Costs			
Electricity Costs		Variable	$5,747
Cat. Replacement		MHIA	$5,621
Cat. Disposal		OAQPS	$211
Ammonia		Variable	$1,008
NH3 Inject Skid		MHIA	$2,916
Total Direct Annual Costs			**$58,620**
Indirect Annual Costs			
Overhead	60% of Operating and Maintenance	OAQPS	$25,870
Administrative	0.02 x PEC	OAQPS	$6,500
Insurance	0.01 x PEC	OAQPS	$3,250
Property Tax	0.01 x PEC	OAQPS	$3,250
Capital Recovery	0.13 x PEC (10% int. rate, 15 yr period)	OAQPS	$42,250
Total Indirect Annual Costs			$81,120
Total Annual Costs	Annualized capital + Direct Annual + Indirect Annual		**$233,994**

Potential Emissions Reduction Methodology

The estimated current annual NOx emissions and the estimated potential annual NOx emissions were calculated using the following equation:

NOx = LF x MMBtu/hr x HR x EF/ 2,000 lb/ton

Where:
NOx = Current annual NOx emissions or potential annual NOx emissions (tpy)
LF = turbine load factor
MMBtu/HR= heat input rating
HR = annual hours of operation
EF = NOx emission factor in pounds per MMBtu

Where:
EF = NOx emission factor in ppmv x 0.00366
ppmv = NOx emissions in parts per million corrected to 15% oxygen
0.00366 = Conversion factor used: 0.00366 lb/MMBtu per ppmv NOx

The estimated annual NOx emissions reduction was calculated using the following equation:

NOx Emissions Reduction = Current NOx emissions - Potential NOx emissions

Potential Emissions Reduction Calculation

The emissions reduction calculations below utilized the following information:

Loading factor = 0.75
Heat input rating for a 1 MW unit = 15 MMBtu/hr
Annual Hours of Operation = 7884 hours
Current Emission Factor in Rule 4703 = 9 ppmv
Potential Emissions Factor through the use of SCR = 5 ppmv

Current NOx = LF x MMBtu/hr x HR x EF / 2,000 lb/ton
= 0.75 x 15 x 7884 x (9 x 0.00366) / 2000
= 1.46 tons/year

Potential NOx = LF x MMBtu/hr x HR x EF / 2,000 lb/ton
= 0.75 x 15 x 7884 x (5 x 0.00366) / 2000
= 0.81 tons/year

Emissions Reductions = Current NOx emissions - Potential NOx emissions
= 0.65 tons/year

Table C-30 SCR Cost Effectiveness

Type of Installation	MW	MMBtu/hr	Current NOx Emission Factor (EF), ppmv	Potential NOx EF, ppmv	NOx Reduction (Tons/Year)	Total Annual Cost ($)	Cost Effectiveness ($/ton)
New	1	15	9	5	0.65	$141,992	$218,449
Retrofit	1	15	9	5	0.65	$233,994	$359,991

As demonstrated above, SCR is not a cost effective option as a retrofit or replacement for units less than 3 MW.

EMx

Certain BACT limits for simple cycle plants were achieved through the use of SCONOx. This multifaceted technology reduces NOx, SOx, carbon monoxide (CO), and volatile organic compound (VOC) emissions and is stated as achieving NOx levels less than 1.5 ppmv by its manufacturer. One issue with the use of SCONOx is that it requires steam to operate and simple cycle plants do not generate steam. Therefore, a simple cycle facility would have to add a boiler to their facility to generate steam for the SCONOx system, making the addition of this technology more costly. The District is not aware of any SCONOx applications on simple cycle plants.[77] While SCONOx is better suited for combined cycle turbines, this technology has not been achieved in practice (AIP) yet in the District.

BAAQMD evaluated SCONOx, now known as the EMx system, for turbines in a recent Final Determination of Compliance (FDOC) for the Oakley Generating Station. The FDOC states that EMx could potentially be an improvement over SCR as an add-on control device for achieving NOx reductions – assuming it can achieve the same level of NOx control – because it does not use ammonia. Ammonia has the potential, under certain atmospheric conditions, to react with nitric acid in the atmosphere to form ammonium nitrate, which can be a form of PM2.5. However, based on the implementation of EMx at a facility in Shasta County, BAAQMD voiced some concerns for its use.

EMx has never been used on a large utility-scale turbine and so there is no data on which to make a direct evaluation of how well the technology would work on larger turbines. EMx has been used on a smaller aeroderivitive turbine at the Redding Power Plant Unit No. 5, a 45-MW combined-cycle facility in Shasta County, CA. The Shasta County Air Quality Management District evaluated EMx at the Redding facility under a demonstration NOx limit of 2.0 ppm, which SCR can consistently achieve. After three years of operation, the Shasta County AQMD evaluated whether the facility was meeting this demonstration limit with EMx, and concluded that "*Redding Power is not*

[77] Brian K. Lusher, Bay Area Air Quality Management District. (June 2010). *Final Determination of Compliance: Marsh Landing Generating Station.*

able to reliably and continuously operate while maintaining the NOx demonstration limit of 2.0 ppmvd @ 15% O2."[78]

The FDOC states that although the EMx manufacturer maintains that such problems have been overcome, concerns remain about how consistently the technology would be able to perform. Communications between BAAQMD and Shasta County Air District confirmed that the earlier conclusions about the achievability of a lower limit remain valid.[79] In addition, monthly reports of Continuous Emissions Monitoring System (CEMS) data submitted by Redding Power Plant to Shasta County Air District during 2007 and 2008 indicated that emissions have often been substantially higher.[80] Furthermore, the data from Redding is from a smaller aeroderivitive turbine, and there is no guarantee that if it were scaled up for uses on utility-size turbines that it would even be able to achieve the performance required from larger turbines. For these reasons, BAAQMD concluded that EMx is not as developed as SCR and cannot achieve the same level of emissions performance that SCR is capable of.

SCAQMD is funding a research project that will study and demonstrate the feasibility of control technologies to reduce PM2.5 and ultrafine particulate emissions from natural gas-fired turbine power plants. EMx is one of the two technologies that were selected for demonstration. The findings of this report could potentially be beneficial for evaluating the feasibility of EMx applications for turbines in the future.

SOx

The District considered implementing sulfur dioxide (SO2) limits at least as stringent as the requirements in 40 CFR 60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines). Fuel treatment sulfur removal systems were recognized as being able to reduce SOx emissions from turbines, other than those fired on Public Utilities Commission (PUC) quality natural gas. One Valley facility installed SCR onto their digester gas-fired turbine to meet the Rule 4703 limit. To do this, they installed a fuel pretreatment system that removes H2S and siloxanes, as they can damage the SCR catalyst if not removed. Other landfill and digester-gas turbines outside the District are also using these systems.

There are only seven units at six facilities in the Valley that utilize a fuel other than natural gas. Four units are fired on diesel gas, while the other three units utilize digester gas. However, the facilities with diesel-fired units utilize natural gas the majority of the time and utilize diesel fuel only during emergencies. Due to California Diesel Fuel requirements, the diesel facilities in the Valley are limited to a sulfur content of 0.0016 lb-SO2/MMBtu. PUC-quality natural gas typically has a sulfur content of 0.00285 lb-SO2/MMBtu and digester turbines are limited to 0.016 lb-SO2/MMBtu per

[78] Letter from R. Bell, Air Quality District Manager, Shasta County Air Quality Management District, to R. Bennett, Safety & Environmental Coordinator, Redding Electric Utility, June 23, 2005.
[79] Kathleen Truesdell, Bay Area Air Quality Management District. (January 2011). *Final Determination of Compliance: Oakley Generating Station.*
[80] Kathleen Truesdell, Bay Area Air Quality Management District. (January 2011). *Final Determination of Compliance: Oakley Generating Station.*

District permits' requirements. By comparison, the Subpart KKKK limit is much higher at 0.060 lb-SO2/MMBtu and all of the units in the Valley are achieving much lower SO2 limits. Adding a SO2 limit similar to Subpart KKKK to the rule will not foster additional emissions reductions for Valley facilities.

PM2.5

PM2.5 reduction technologies for turbines were also researched. Post-combustion controls, including baghouses, electrostatic precipitators, and scrubbers were examined since these technologies can be used to remove PM2.5 emissions from exhaust gas streams.

As previously mentioned, every unit in the Valley subject to Rule 4703 operates on strictly natural gas, with the exception of seven facilities that operated on an alternate fuel part-time or during emergencies. Based on District Permits records and information in the BAAQMD FDOC for the Oakley Generating Station, electrostatic precipitators, baghouses, and scrubbers have not been achieved-in-practice for natural gas-fired turbines. These devices are normally used on solid fuel fired sources or others with high PM emissions, and are not used in natural gas-fired applications, which have inherently low PM emissions. The District is not aware of any gas turbine that has ever been required to use add-on controls such as these. BAAQMD reviewed the EPA BACT/LAER Clearinghouse and confirmed that EPA has no record of any post-combustion particulate controls that have been required for natural gas-fired gas turbines.[81]

Furthermore, these devices would not be technologically feasible to implement for certain facilities. As noted in the BAAQMD FDOC, if add-on control equipment were installed, it would create significant backpressure that would significantly reduce the efficiency of a power plant and would cause more emissions per unit power produced. Moreover, these devices are designed to be applied to emissions streams with far higher particulate emissions, and they would have very little effect on the low-PM emissions streams from natural gas-fired facilities in further reducing PM emissions.[82] It takes an emissions stream with a much higher grain loading for these types of abatement devices to operate efficiently. This low level of abatement efficiency (if any) also means that these types of control devices would not be cost effective, even if they could feasibly be applied to this type of source. For these reasons, post-combustion particulate control equipment is not technologically feasible for units subject to Rule 4703.

As previously mentioned, SCAQMD is funding a research project that will study and demonstrate the feasibility of control technologies to reduce PM2.5 and ultrafine particulate emissions from natural gas-fired turbine power plants. Sulfur removal and the EMx multi-pollutant control system are the two technologies which were selected for

[81] Kathleen Truesdell, Bay Area Air Quality Management District. (January 2011). *Final Determination of Compliance: Oakley Generating Station.*

[82] Kathleen Truesdell, Bay Area Air Quality Management District. (January 2011). *Final Determination of Compliance: Oakley Generating Station.*

demonstration. The findings of this report could potentially be beneficial for evaluating the cost effectiveness and feasibility of applying these emerging technologies to turbines in the future.

Evaluation Findings

Even though stationary gas turbines are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4703 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from stationary gas turbines in the Valley.

C.19 RULE 4802 SULFURIC ACID MIST

Discussion

The purpose of Rule 4802 is to limit sulfuric acid emissions from any sulfuric acid production unit that was constructed or modified before August 17, 1971. The rule was adopted on May 21, 1992 to limit sulfuric acid mist to 0.30 pounds per short ton of acid produced and only applies to one facility in the Valley. EPA approved Rule 4802 into the SIP on June 8, 1999.

Source Category

A sulfuric acid production unit is any facility producing sulfuric acid by the contact process by burning elemental sulfur, alkylation acid, hydrogen sulfide, organic sulfides, or acid sludge. It does not include acid plants used as sulfur dioxide (SO2) control systems, chamber process plants, acid concentrators, or petroleum storage and transfer facilities.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.83	0.85
	Winter Average - Tons per day								
PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.83	0.85

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from sulfuric acid mist are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for sulfuric acid mist.

How does District Rule 4802 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NESHAP, or MACT requirements for this source category.

NSPS

- 40 CFR 60 Subpart Cd (Emissions Guidelines and Compliance Times for Sulfuric Acid Production Units)

The District evaluated the requirements contained within 40 CFR 60 Subpart Cd and found no requirements that were more stringent than those already in Rule 4802.

- 40 CFR 60 Subpart H (Standards of Performance for Sulfuric Acid Plants)—last amended on February 27, 2014, but the revisions only included corrections for source testing procedures.

The District evaluated the requirements contained within 40 CFR 60 Subpart H and found no requirements that were more stringent than those already in Rule 4802.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4802 compare to rules in other air districts?

There are no analogous rules for this source category in SMAQMD or VCAPCD.

SCAQMD

- Rule 469 (Sulfuric Acid Units)

The District evaluated the requirements contained within SCAQMD Rule 469 and found no requirements that were more stringent than those already in Rule 4802.

BAAQMD

- Regulation 9, Rule 1 (Sulfur Dioxide)

The District evaluated the requirements contained within BAAQMD Regulation 9 Rule 1 and found no requirements that were more stringent than those already in Rule 4802.

- Regulation 12, Rule 6 (Acid Mist from Sulfuric Acid Plants)

The District evaluated the requirements contained within BAAQMD Regulation 12 Rule 6 and found no requirements that were more stringent than those already in Rule 4802.

Additional Emission Reduction Opportunities

Only one facility in the Valley—a sulfuric acid plant—is subject to Rule 4802 (Sulfuric Acid Mist). This facility was in operation before 1971 and is limited by this rule to 0.30 pounds of acid mist per ton of acid produced. The facility uses a mist eliminator to remove fine particles from the acid gas stream, which has been determined to meet BACT requirements. By definition of Rule 4802, no new facility within the Valley will be subject to this rule. Instead, all new facilities would be subject to Rule 2201 (New and Modified Stationary Source Review Rule) and would be required to implement BACT level controls.

The District evaluated the potential opportunity to reduce emissions from this source category by lowering the limit for sulfur emissions from 0.30 pounds per ton produced to 0.1 pound per ton produced, consistent with EPA's BACT determination. Source tests conducted in 2010 and 2011 at the single facility permitted under Rule 4802, showed an actual sulfuric acid mist emission rate of 0.09 pound per ton using existing technology. Hence, the facility is meeting the current national BACT standard with the most advanced technology currently available and enforced through existing permit requirements, despite the fact that their current permit and Rule 4802 do not set that requirement. Therefore, the District has determined that there are no potential opportunities to further reduce emissions from this source category.

Evaluation Findings

Even though sulfuric acid mist is not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4802 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from sulfuric acid mist in the Valley.

C.20 RULE 4901 WOOD BURNING FIREPLACES AND WOOD BURNING HEATERS

Discussion

Rule 4901 limits emissions from wood burning fireplaces, wood burning heaters, and outdoor wood burning devices through wood burning curtailments in areas with natural gas service. Rule 4901 also restricts the sale and transfers of non-compliant wood burning devices, and limits the installation of wood burning devices in new residential developments.

Through the Check Before You Burn program, which is based on Rule 4901, the District has declared and enforced episodic wood burning curtailments, also called "No Burn" days, since 2003. Check Before You Burn and District Rule 4901 reduce harmful species of PM2.5 when and where those reductions are most needed: in impacted urbanized areas when the local weather is forecast to hamper PM dispersion.

Rule 4901 was first adopted in 1993 and has been subsequently amended three times. The 1993 adoption of Rule 4901 established a public education program on techniques to reduce wood burning emissions. It also enforced EPA Phase II requirements for new wood burning heaters, prohibited the sale of used wood burning heaters, established a list of prohibited fuel types, and required the District to request voluntary curtailment of wood burning on days when the ambient air quality was unhealthy.

The 2003 rule amendments added episodic wood burning curtailments when air quality was forecast to be at 150 or higher on the air quality index (AQI), which is equivalent to a PM2.5 concentration of 65 µg/m³, and added restrictions on the installation of wood burning devices in new residential developments, based on housing density. The 2008 rule amendments lowered the mandatory curtailment level to a PM2.5 concentration of 30 µg/m³, and added a contingency measure to lower the wood burning curtailment level to 20 µg/m³ in the event that EPA finds that the Valley does not attain the 1997 PM2.5 air quality standard in 2014.

The 2014 amendments to Rule 4901 lowered the No Burn threshold for high polluting wood burning heaters and fireplaces from 30 µg/m^3 to 20 µg/m^3. The amendments doubled the number of No Burn days for high polluting units that are the source of over 95% of the wintertime residential wood smoke emissions. By contrast, under the newly amended rule, clean certified units are subject to a minimal number of No Burn days ranging from zero to six days depending on the location in the Valley during the winter season because the No Burn thresholds for these units were raised to 65 µg/m^3.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	4.48	4.38	4.28	4.28	4.28	4.28	4.28	4.28	4.28
NOx	0.50	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48
SOx	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	Winter Average - Tons per day								
PM2.5	8.73	8.54	8.35	8.35	8.35	8.35	8.35	8.35	8.35
NOx	0.98	0.96	0.94	0.94	0.94	0.94	0.94	0.94	0.94
SOx	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from wood burning fireplaces and wood burning heaters are lower than the BACM/MSM significance thresholds for NOx and SOx. Therefore, the Clean Air Act does not require a NOx and SOx control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for wood burning fireplaces and wood burning heaters.

How does District Rule 4901 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTGs, ACTs, NESHAPs, or MACT guidelines for this source category.

NSPS

- 40 CFR Part 60 Subpart AAA (Standards of Performance for New Residential Wood Heaters)

On February 3, 2014, EPA published proposed amendments to 40 CFR Part 60 Subpart AAA.[83] The proposed rule was finalized by EPA on February 3, 2015. District Rule 4901 points to the NSPS for emission limits and is therefore as stringent as the newly promulgated NSPS.

1988 NSPS

Under the 1988 NSPS, only those wood or pellet-burning units meeting the following criteria require certification and all other units are not required to obtain certification and are therefore considered exempt:

[83] 40 CFR Part 60 Subpart AAA, *Standards of Performance for New Residential Wood Heaters* (FR 79 6330–6416)

1. Units that have an air-to-fuel ratio averaging less than 35-to-1;
2. Units with a usable firebox volume less than 20 cubic feet;
3. Units with a minimum burn rate less than 5 kilograms per hour (11 pounds per hour); and
4. Units that weigh 1,760 pounds or less.

For wood heaters meeting these requirements, the current certification emissions limits are 4.1 grams per hour (g/hr) of PM for units equipped with a catalytic combustor and 7.5 g/hr for units without a catalytic combustor. Units certified to these emission limits are said to be *Phase-II Certified* and will maintain that certification until the certification expires, which is up to 5 years from the issuance date.

Under the current NSPS, pellet stoves are not explicitly exempt from required certification; however, most models currently sold fall outside the regulation because they operate on an air-to-fuel ratio greater than 35-to-1. Single burn rate wood heaters are also not explicitly exempt from the current NSPS, but are not regulated by it because they operate below the burn rate criteria of 5 kilograms per hour.

2015 NSPS

The 2015 NSPS significantly lowers the certification emission limits for wood-burning heaters that are currently required to be certified and sets certification limits for a broader range of wood-burning heaters by removing the existing certification criteria (1 through 4 above). New standards will apply not only to adjustable burn rate wood heaters (the focus of the original regulation), but also to single burn rate wood heaters/stoves, pellet heaters/stoves, and any other affected appliance as defined in revised Subpart AAA as a “room heater.”

Although they do not require EPA certification under the 1988 NSPS, 96% of pellet heaters meet the proposed Step 1 PM emissions limit of 4.5 grams per hour. Single burn rate wood heaters are incapable of operating at the lowest burn rates, and it is the lower burn rates that result in the highest level of PM emissions; therefore, most single burn rate wood heaters will also meet the proposed Step 1 PM emissions limit. Manufacturers of such units will not initially be required to modify their design if they already meet the emissions standard and will automatically be deemed as certified to meet the Step 1 emission limits.

EPA promulgated a two-step compliance approach that applies to all new adjustable burn rate wood heaters, single burn rate wood heaters and pellet heaters/stoves. Under this approach, Step 1 emission limits for these sources will apply to each source manufactured on or after the effective date of the final rule or sold at retail on or after December 31, 2015. Step 2 emission limits for these sources will apply to each heater manufactured or sold at retail on or after the date five years after the effective date of the final rule. EPA is allowing an alternative compliance option for manufacturers who choose to certify using cord wood (rather than crib wood) to meet the Step 2 limits.

Table C-31 Subpart AAA PM Emissions Limits

2-Step, 5-Year Phase-In		
Step	**PM limit**	**Compliance deadline**
1	4.5 g/hr	Upon the effective date of the final rule
2	2.0 g/hr	5 years after effective date of final rule
	2.5 g/hr (Cord wood alternative compliance option)	

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4901 compare to rules in other air districts?

There are no analogous rules for this source category in VCAPCD.

SCAQMD

- Rule 445 (Wood Burning Devices)

Rule 445 was last amended on May 3, 2013 to lower the curtailment threshold from 35 to 30 µg/m3. District Rule 4901 is more stringent than Rule 445, as the District lowered the No Burn threshold for high polluting wood burning heaters and fireplaces from the 30 µg/m^3 to 20 µg/m^3 in 2014. The District evaluated the requirements contained within SCAQMD Rule 445 and found no requirements that were more stringent than those already in Rule 4901.

BAAQMD

- Regulation 6 Rule 3 (Wood-Burning Devices)

The District evaluated the requirements contained within BAAQMD Regulation 6 Rule 3 and found no requirements that were more stringent than those already in Rule 4901.

SMAQMD

- Rule 417 (Wood Burning Appliances)

The District evaluated the requirements contained within SMAQMD Rule 417 and found no requirements that were more stringent than those already in Rule 4901.

- Rule 421 (Mandatory Episodic Curtailment of Wood and other Solid Fuel Burning)

The District evaluated the requirements contained within SMAQMD Rule 421 and found no requirements that were more stringent than those already in Rule 4901.

Other Analogous Rules

- Washington State's Department of Ecology Regulation Chapter 173-433 WAC (Solid Fuel Burning Devices)

The District evaluated the requirements contained within the above regulation and found no requirements that were more stringent than those already in Rule 4901.

- Colorado Air Quality Control Commissions Regulation No. 4

The District evaluated the requirements contained within Colorado's rule and found no requirements that were more stringent than those already in Rule 4901.

- Spokane Regional Clean Air Agency Regulation I Article VIII

The District evaluated the requirements contained within the Spokane rule and found no requirements that were more stringent than those already in Rule 4901.

- Oregon Department of Environmental Quality Division 262 (Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices)

The District evaluated the requirements contained within Oregon's rule and found no requirements that were more stringent than those already in Rule 4901.

- Yolo-Solano AQMD Rule 2.40 (Wood Burning Appliances)

The District evaluated the requirements contained within Rule 2.40 and found no requirements that were more stringent than those already in Rule 4901.

Additional Emission Reduction Opportunities

2014 Amendments to the District's Residential Wood Burning Program

The District takes a multidimensional and proactive approach to reducing emissions in the Valley. This philosophy is especially true for reducing emissions from residential wood burning with a combination of regulatory controls through Rule 4901, public outreach and education, and the District's Burn Cleaner Wood Stove Change-out Program (Burn Cleaner Program). The District's approach to reducing emissions from residential wood burning empowers Valley residents to play a major role in reducing emissions at almost no cost, and, in many cases, with savings in heating-related energy costs. Valley residents are encouraged to transition from older more polluting wood burning heaters and wood burning fireplaces (also commonly called open hearth fireplaces) to cleaner alternatives, by decreasing the number of allowable burn days for high polluting wood burning heaters and fireplaces while at the same time increasing the number of burn days allowed for registered clean wood burning heaters through a tiered episodic wood burning curtailment program. Emissions reduced through the 2014 amendments to the program are significantly greater than those achieved by reducing the curtailment threshold alone.

Curtailment Level

A potential opportunity for further emissions reductions was to lower the curtailment level, which would reduce emissions by increasing the number of "No Burn" days. Lowering the curtailment level below the 30 $\mu g/m^3$ level has reduced the build-up of emissions during the long stagnation periods experienced in the Valley during the 2014-15 winter season, and helped avoid exceedances of the PM2.5 standard.

During the September 2014 rule amendment project, the District estimated the average number of additional No Burn days likely to occur in future years as a result of lowering the curtailment level from the previous threshold level of 30 µg/m³ to the threshold level of 20 µg/m³. The average increase in No Burn days in future years in each county was calculated by averaging the historical data from the past five wood burning seasons of the number of days P M2.5 concentrations were forecasted to be equal to or exceed 30 µg/m³ versus 20 µg/m³. This analysis is summarized in the table below. The estimated average increase in No Burn days in future years was determined to be 34 days per county (an average of the last column in the table below) per wood burning season. However, the estimation of 34 additional No Burn days per wood burning season in the future will vary. No Burn days are called based on the air quality forecast for each day and are dependent on several variables. As a result of this analysis, the District amended Rule 4901 to lower the curtailment threshold to 20 µg/m^3 in September 2014.

Table C-32 Average Number of Days Forecast Above Curtailment Thresholds*

County	Previous Threshold (≥30 µg/m³)	2014 Adopted Threshold (≥20 µg/m³)	Additional No Burn days
San Joaquin	24	53	29
Stanislaus	36	72	36
Merced	19	55	36
Madera	29	67	38
Fresno	49	85	36
Kings	39	70	31
Tulare	36	69	33
Kern	44	79	35

*Based on Forecast values from the 2009-10, 2010-11, 2011-12, 2012-13, 2013-14 wood-burning seasons

Although a No Burn day can potentially increase a resident's natural gas costs from using a central heating system in lieu of a wood burning heater, this potential cost is offset by the central heating system since a central heating system more efficiently heats the whole home, resulting in less money being spent on firewood based on the increase in No Burn days. Compared to other District rules, curtailing residential wood burning under Rule 4901 is the most cost effective rule for reducing directly emitted PM2.5 emissions.

Wood Burning Season

During the 2014 amendment, the District evaluated the potential opportunity for further reducing emissions from the residential wood burning source category by extending the wood burning curtailment season. The current wood-burning season runs from the beginning of November until the end of February. Expanding the wood-burning season to include October and/or March could have potentially increased the number of No Burn days in each wood-burning season.

Measured Valley concentrations of levoglucosan, a primary indicator for wood burning, are not nearly as high in October or March as found to be during the current wood

burning season of November through February. Additionally, a six-year average was calculated for the number of No Burn days in each county from 2008 through 2013 for the months of October and March as illustrated in the following table. The resulting estimated number of increased No Burn days based on historical data is in the range of less than one day up to six days. Extending the wood burning season would not significantly benefit air quality in the Valley due to the combination of less extensive burning activity and the minute number of additional No Burn days.

Table C-33 Days with PM2.5 ≥ 30µg/m^3

County	Month	2008	2009	2010	2011	2012	2013	Average
Fresno	March	3	0	0	0	0	0	0.5
Kern	March	2	0	0	1	0	2	0.8
Kings	March	1	0	1	0	0	4	1
Madera	March	NA	NA	NA	0	0	0	0
Merced	March	0	0	0	0	0	0	0
San Joaquin	March	0	0	0	0	0	0	0
Stanislaus	March	0	0	0	0	0	0	0
Tulare	March	2	0	0	0	0	3	0.8
Fresno	October	6	2	2	7	1	1	3.2
Kern	October	6	6	3	3	2	NA	4
Kings	October	10	9	7	10	2	1	6.5
Madera	October	NA	NA	NA	3	0	0	1
Merced	October	3	0	2	0	0	0	0.8
San Joaquin	October	2	0	0	0	0	0	0.3
Stanislaus	October	5	1	2	5	0	0	2.2
Tulare	October	4	5	1	6	0	3	3.2

New Residential Developments

The District also considered further limiting the installation of wood burning fireplaces and heaters in new residential developments by strengthening Section 5.3 of Rule 4901, which sets limits for the quantity of wood burning fireplaces or wood burning heaters that can be installed in new residential developments. South Coast Rule 445 prohibits the installation of wood burning devices in any development that has natural gas service. However, since most of the Valley's new developments are already subject to restrictions based on their housing densities, the emissions reduction potential is minimal.

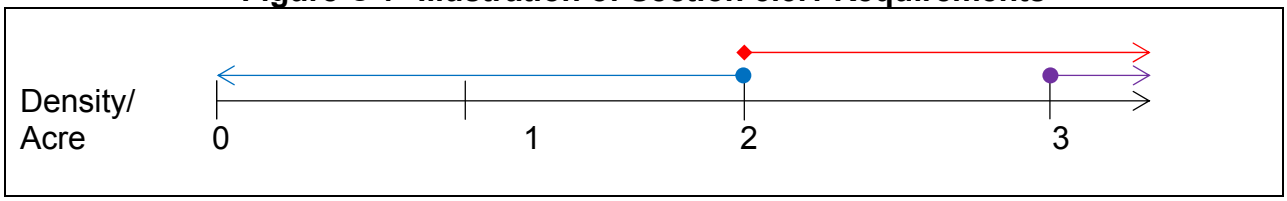
As a part of the 2014 amendments to Rule 4901, the District amended Section 5.3. Previous rule language was not completely clear as to the number of heaters allowed to be installed if that number falls between two whole numbers. The rule language was strengthened by clarifying the number of heaters allowed for installation in a given area, in addition to the language being clarified with regards to the applicability of the density requirements by the removal of the term "new" from rule language.

Section 5.3.1 (Effective until December 31, 2014)

Previous language provided for:

- 5.3.1.1: >2 dwellings/acre: no wood burning fireplaces
- 5.3.1.2: ≥3 dwellings/acre: max of two certified units
- 5.3.1.3: ≤2 dwellings/acre: max of one wood burning fireplace or wood burning heater per dwelling

Figure C-7 Illustration of Section 5.3.1 Requirements

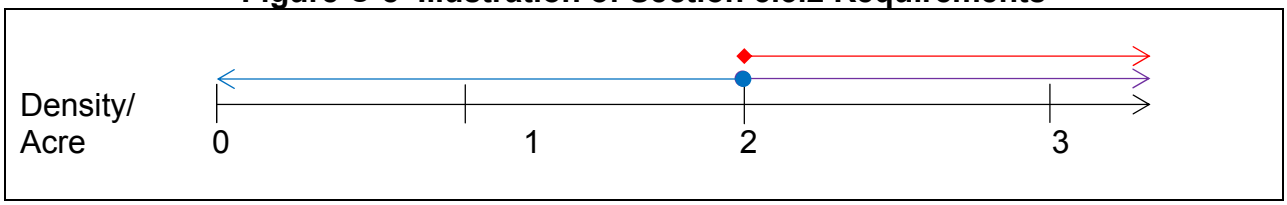


Section 5.3.2 (Effective on and after January 1, 2015)

Amended language provides for:

- 5.3.2.1: >2 dwellings/acre: no wood burning fireplaces
- 5.3.2.2: >2 dwellings/acre: max of two certified units
- 5.3.2.3: ≤2 dwellings/acre: max of one wood burning fireplace or certified wood burning heater per dwelling

Figure C-8 Illustration of Section 5.3.2 Requirements



Section 5.3.2.1 prohibits the installation of a wood burning fireplace in a residential development with a density greater than two dwelling units per acre. While this could be misinterpreted as being less stringent than a similar requirement in SCAQMD Rule 445, in reality it is more stringent because Rule 4901 does not afford the same flexibilities as the SCAQMD rule does. While SCAQMD Rule 445 has language prohibiting the installation of a permanently installed wood burning device into any new development, this requirement is not applicable to new developments where there is no existing infrastructure for natural gas service within 150 feet of the property line or those 3,000 or more feet above mean sea level. District Rule 4901 is more stringent in that for the extremely limited cases where wood burning devices are allowed to be installed, the number of units allowed is limited to no more than two per acre. Additionally, Rule 4901 does not exempt any homes from any aspect of rule requirements based on elevation.

Encouraging the Transition to Clean Burning Heaters through Non-Regulatory Measures

Upgrading a home's wood burning device reduces air pollutant emissions on days when wood burning is allowed. By operating more efficiently, these devices can also lower

the overall home heating cost. District Rule 4901 neither prohibits nor requires wood burning device upgrades. However, the District encourages such upgrades through its public outreach and through its Burn Cleaner Program, which provides funding to Valley residents to upgrade their current wood-burning devices and open fireplaces to natural gas or propane gas devices, to certified wood stoves or inserts, or to pellet devices. The District's webpage[84] has more information on program eligibility and qualified devices.

There are several types of wood burning devices and device inserts available. Wood stoves, especially newer models, are generally safe and efficient devices for home heating. There are two types of wood stoves: catalytic and non-catalytic. EPA's Phase II certified wood stoves produce only 2 to 7 grams of smoke per hour, compared to 15 to 30 grams of smoke per hour from older, uncertified devices, and in future years the EPA certified devices will emit even less.

Pellet stoves are similar in appearance to wood stoves, but burn compressed pellets made of ground, dried wood and other biomass wastes. Pellet stoves are generally more expensive than wood stoves and require electricity for operation; however, they are typically more efficient than wood stoves due to the better fuel-to-air ratio in the combustion chamber.

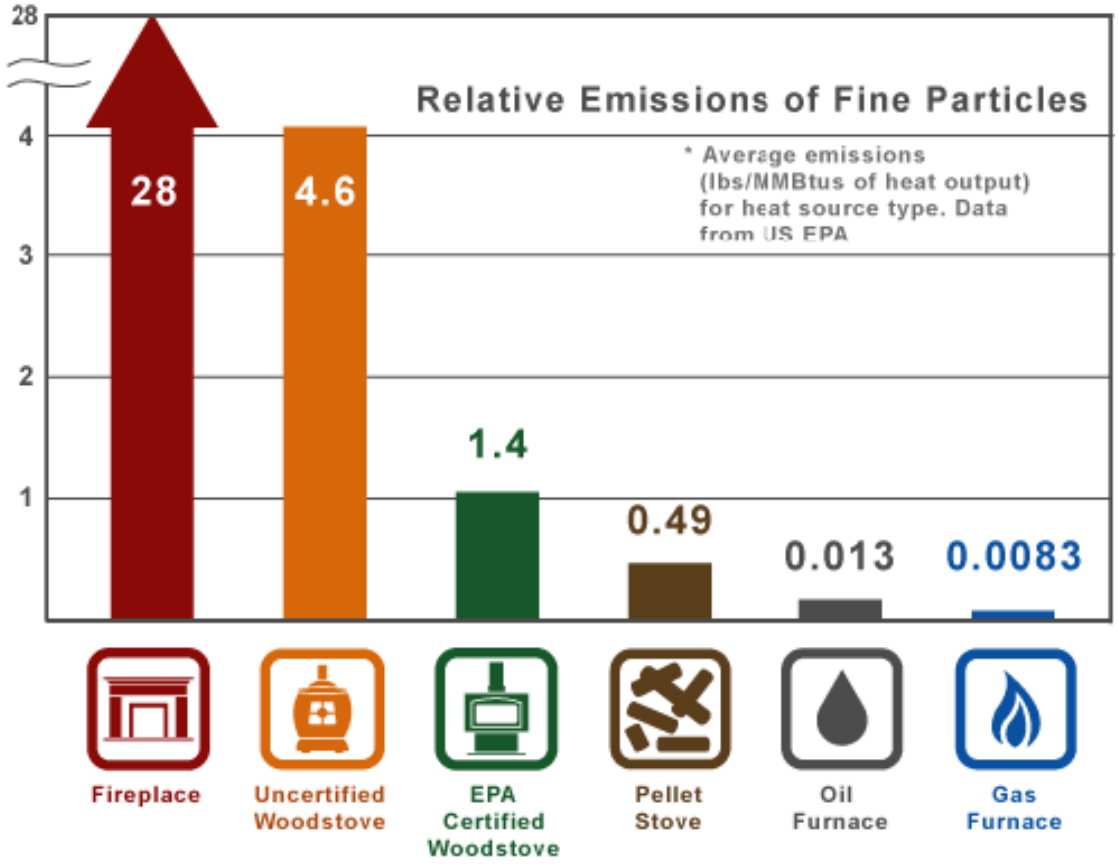
Wood burning fireplaces include traditional masonry fireplaces built into brick or stone, constructed in the home, and "low mass" fireplaces that are pre-fabricated prior to installation. Most fireplaces are not used as a primary source of heat, but serve as a secondary heating source or for ambiance. Fireplaces generate much more emissions than wood stoves or pellet stoves, but fireplace inserts are available to reduce emissions. EPA does not certify fireplaces or fireplace inserts, but does have a voluntary program for devices that meet qualifications to be considered cleaner burning than typical fireplaces and fireplace inserts. While these devices reduce emissions relative to uncontrolled fireplaces, their emissions are still relatively higher than certified wood stoves and pellet stoves.

Gas stoves and gas fireplaces burn natural gas or propane, emit very little air pollution, and require little maintenance. Gas devices are not subject to the requirements of Rule 4901, so they can be used on "No Burn" days. For more information about the various types of wood burning devices available, see EPA's Burn Wise program webpages[85].

The following figure illustrates the average PM2.5 emissions based on various heat sources.

[84] www.valleyair.org/Grant_Programs/GrantPrograms.htm#WoodStoveChangeOut
[85] www.epa.gov/burnwise

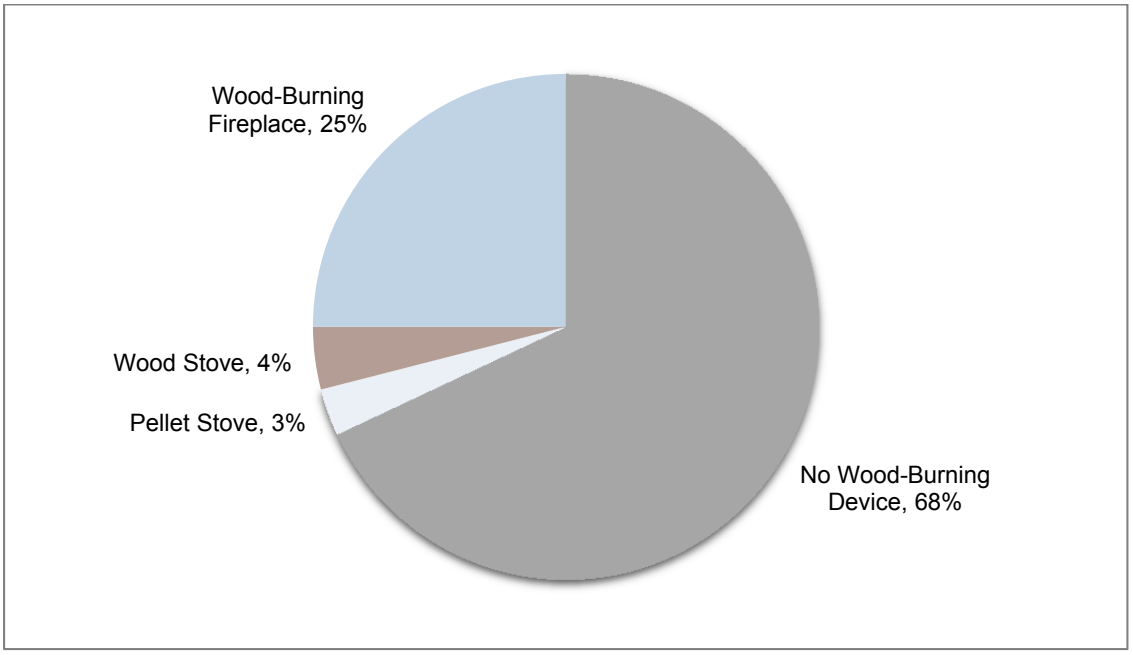
Figure C-9 Average PM2.5 Emissions Based on Wood Burning Heater Type[86]



A third party survey of Valley residents (see Appendix E) revealed that the majority of Valley residents do not have wood burning heaters or wood burning fireplaces. However, of those that do have wood burning heaters and wood burning fireplaces, the majority have wood burning fireplaces, refer to Figure C-10 (Proportion of Residents with a Wood-Burning Fireplace, Wood Stove or Pellet Stove) for a graphical representation of the proportion of Valley residents with wood burning heaters, pellet-fueled wood burning heaters, and wood burning fireplaces.

[86]EPA. (2012, November 14). *Consumers – Energy Efficiency and Wood-Burning Stoves and Fireplaces*. Retrieved from http://www.epa.gov/burnwise/energyefficiency.html.

Figure C-10 Proportion of Residents with a Wood-Burning Fireplace, Wood Stove or Pellet Stove



EPA reports that 75% of wood stoves (also called wood burning heaters) in the United States are non EPA-certified stoves. EPA certified wood burning heaters produce 70% less particle pollution then their older dirtier counterparts.

Survey results indicate the most effective ways to encourage transition to clean burning heaters is to allow more wood burning days for less polluting wood burning heaters and update the District's Burn Cleaner Program to increase incentive amounts. By encouraging Valley residents to transition to clean wood burning heaters, emissions will not only be reduced on No Burn days but also on days when burning is allowed. This health and air quality benefit will occur because cleaner alternatives such as EPA Phase II Certified wood burning heaters and pellet-fueled wood burning heaters, and gaseous-fueled heaters will be in use instead of the older more polluting wood burning heaters and wood burning fireplaces.

Many Valley residents have upgraded their homes with these newer devices, including through programs such as the *District's Burn Cleaner Program* and federal tax incentives. Given their much lower relative emissions, allowed use of these devices during a lower curtailment level still achieves the goal of significantly reducing the overall emissions that ultimately lead to violations of the standard. Enforcing this added flexibility is difficult given the challenge in distinguishing wood smoke emissions from various wood burning devices, and the District explored various options during the rule development process for ensuring that this issue is addressed. Along with this allowance, the District will continue to provide incentives to encourage the replacement of existing older devices with newer clean devices.

Burn Cleaner Incentive Program

The District's Burn Cleaner Wood Stove Change-out Program (Burn Cleaner Program) plays a key role in the success of the transition from older more polluting wood burning heaters and fireplaces to cleaner wood burning heaters. Since 2006, the Burn Cleaner Program has been helping residents overcome some of the financial obstacles in purchasing cleaner alternatives. There are currently more than 30 hearth retailers in the Valley that have partnered with the District to successfully implement the Burn Cleaner Program.

The Burn Cleaner Program offers multiple levels of incentive funding, increased as of the 2014-2015 wood burning season:

- Up to $1,000 to replace a qualifying unit with a certified wood insert/freestanding stove, certified pellet insert/freestanding stove, or natural gas insert/freestanding stove
- Up to $2,500 of any eligible device if the applicant is eligible for Low-Income
- Up to $500 as an additional incentive towards gas devices (for both standard and low-income)

The District continuously reevaluates the Burn Cleaner Program and implements enhancements to the program. In addition to increased incentive amounts, the District has also recently implemented the following enhancements:

- Reducing a substantial portion of the upfront, out-of-pocket cost of a new qualifying unit for low-income qualified applicants. The District has partnered with contracted hearth retailers to allow low-income qualified applicants to make the purchase at a reduced price by deducting the incentive amount from the invoice at the point of purchase. Allowing the incentive funding to be directly applied when purchase is made makes it more feasible for additional low-income applicants to take advantage of the program.
- Refining the low-income eligibility form to streamline the determination process and identifying the hearth retailers that provide the reduced upfront cost option.
- Program documents are now available in Spanish to further extend the outreach efforts to the local community.
- Updates to program documents to make them more user-friendly and to improve the process during the application, installation, and claim for payment request phases.
- The document submittal process has been updated to allow applications and claim for payment requests to now be emailed to the District for faster processing. Also, supplemental forms have been developed further streamline the review process and help keep the retailers and applicants informed on the status of projects.

The upgrades to processing, applications, and incentive amounts, combined with effective and proactive public outreach and education campaign and the assistance of District retail partners, the initial funding for the Burn Cleaner Program was quickly

exhausted. At the November 13, 2014 Governing Board meeting, the District Governing Board approved an additional $2 million in funding to meet the increased demand for this highly successful program. Immediately after the November Board meeting, District staff worked expeditiously to ensure that the additional funding was allocated quickly and efficiently to the residents in the Valley. Given this program's critical role in supporting the District's efforts to reduce the impact of residential wood burning and continued high demand in the program the District went back to the Governing Board at the December 18, 2014 public hearing to request additional funding and other amendments to the program, and an additional $3.6 million in funding was allocated along with programmatic changes proposed by staff including lowering the voucher incentive amount for non-low income applicants from the then $1,500 to $1,000, limiting the number of vouchers per household, and directing funding based upon demand for any surplus remaining in each county.

Collaboration with participating hearth retailers

The District has renewed its contracts with the hearth retailers and hosted informational meetings to discuss program changes in order to ensure a smooth roll out of the enhancements. As part of the District's initiative to increase the effectiveness of the program, District staff has worked closely with the participating hearth retailers on outreach efforts and provided them with promotional tools, such as flyers and quick screens with information about the Burn Cleaner Program.

Public Outreach and Education

The District has an extremely successful outreach and education program with regards to residential wood burning and educating Valley residents about air quality, the effects of air pollution on the population's health, and on options they can take to reduce emissions. In the 2013-14 wood-burning season the District took part in 51 media interviews about extreme weather and wood burning.

The District's informational *Check Before You Burn* program minimizes elevated PM2.5 concentrations throughout the winter. The PM2.5 air quality improvements that the Valley has experienced since the adoption of Rule 4901 have been assisted by strong multimedia outreach by the District and a resultant increase in public awareness and participation in winter District programs.

During the wood-burning season of 2013-14, the District Outreach staff received hundreds of public calls and emails specific to residential wood burning. An interesting new trend has surfaced regarding public opinion, an increased number of the phone calls were in support of an outright ban on residential wood burning year-round (with the exception of residents for whom wood burning is the sole source of heat). This is attributed to heightened awareness among the general population of the deleterious effects of wood burning on public health.

Since the inception of *Check Before You Burn*, the District's complementary tools, such as the Real-time Air Advisory Network (RAAN) and the "Valley Air" smart phone app, have continued to gain in popularity. Annual public call and website "hit" statistics, plus growth in the District's Facebook page activity, also illustrate continued growth in wood-

burning awareness. Survey results also showed an increased public awareness with eight out of ten respondents being aware of the District's *Check Before You Burn* program, 78% of whom confirmed reduced wood-burning activities as a direct result of the program.

The District also incorporates wood-burning messaging into other public outreach products, including Healthy Air Living Schools materials, "Blue Sky, Brown Sky … It's Up to You!" elementary curriculum and other materials.

Multimedia Advertising Campaign

The District's seasonal public outreach advertising campaign is retooled each year to include timely and relevant messaging. In the past few seasons, this messaging has been delivered by the District's Governing Board members, with billboards in English and Spanish strategically placed throughout the Valley, radio and TV spots, and value-added messaging delivered through media throughout the Valley.

Expanding New Media Outreach

The most significant evolution of *Check Before You Burn* messaging has occurred with the expanded and accelerated use of new media: Facebook and Twitter posts. Facebook "likes" have nearly doubled from the 2012-13 season, to more than 1,100 at the end of the 2013-14 season. This has proven to be a valuable way to deliver immediate messaging regarding wood-burning statuses, in addition to providing a platform for direct, two-way interaction with the public.

Strengthening Media Partnerships

The District maintains partnerships with television, newspaper, radio, outdoor and print, as well as more non-traditional media, such as on-screen messaging in local movie theaters, internet advertising and video loops in medical offices. During seasonal *Check Before You Burn* campaigns, the District runs media on 11 broadcast television stations in the Fresno and Bakersfield markets, including four Spanish stations, as well as 10 cable networks in four cable markets including zoned cable in Stockton, Modesto, Turlock and Manteca. In the Sacramento market, which includes the District's northern counties, the wood-burning message runs on two English language broadcast television stations and one Spanish language broadcast television station.

The District also typically runs messaging on 42 radio stations and 18 newspapers (six of them Spanish) throughout the eight-county area. *Check Before You Burn* outdoor messaging appears on more than 100 outdoor billboards (including large-format vinyl billboards) and smaller "one-sheets" in Environmental Justice communities throughout the Valley. With these purchases come added value in the form of bonus spots, news sponsorships, and extra billboards and overages in outdoor messaging. Outdoor messaging is strategically placed in high-traffic areas as well as neighborhood and rural communities to ensure a wide reach in those areas where residential wood burning might be common.

The District's print campaign includes major papers such as the *Bakersfield Californian*, *Fresno* and *Modesto Bees* and *Stockton Record*, but also rural newspapers such as the

Arvin Tiller, *Manteca Bulletin* and *Shafter Press*. The District also appears in each issue of the Bakersfield Business Journal, which offers the opportunity to promote seasonal campaigns. Media buys allow leveraging buying power that typically returns an additional $100,000+ in media placement. The related Cinemedia campaign is also regularly featured on 100 movie screens from Stockton to Bakersfield, with more than 25,000 spots that reach more than 475,000 people.

Evaluation Findings

Even though wood burning fireplaces and wood burning heaters are not a significant source of NOx or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4901 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from wood burning fireplaces and wood burning heaters in the Valley.

C.21 RULE 4902 RESIDENTIAL WATER HEATERS

Discussion

Rule 4902 is a point-of-sale rule, adopted on July 17, 1993, to limit NOx emissions from natural gas-fired residential water heaters with heat input rates less than or equal to 75,000 Btu/hr. The original rule enforced a NOx emissions limit of 40 nanograms of NOx per Joule of heat output (ng/J). Since its adoption, the rule has been amended once. The March 2009 amendments strengthened the rule by enforcing a limit of 10 ng/J for new or replacement water heaters and a limit of 14 ng/J for instantaneous water heaters. NOx emissions have been controlled by approximately 88% for this source category. EPA finalized approval for Rule 4902 on May 5, 2010.

Source Category

As a point-of-sale rule, Rule 4902 affects water heater manufacturers, plumbing wholesalers, retail home supply stores, plumbers and contractors, and homeowners.

This source category encompasses several types of water heaters, including conventional storage water heaters, demand water heaters, heat pump water heaters, solar water heaters, and tankless coil and indirect water heaters. Water heater options also vary by fuel type which includes electricity, fuel oil, geothermal energy, natural gas, propane, and solar energy.

Conventional storage water heaters are the most common. They have an insulated tank sized from 20 to 80 gallons and natural gas fired units have a gas burner under the tank regulated by a thermostat. Demand water heaters, also known as instantaneous water heaters, heat water as it is required and do not use a storage tank. As soon as there is a demand for hot water, a gas burner heats cold water as it travels through a pipe in the unit. Natural gas fired units provide hot water at a rate upwards of 5 gallons per minute.

A tankless coil water heater heats water flowing through a heat exchanger installed in a furnace or boiler. Similar to the tankless coil water heater an indirect water heater uses a furnace or boiler. Fluid heated by the furnace or boiler is circulated through a heat exchanger in a storage tank.

Manufacturers have focused on combustion modification to meet the lower NO_x limit as required in other California air districts. Combustion modification systems are designed to reduce thermal NO_x formation by changing the flame characteristics to reduce peak flame temperature. Combustion modification for residential water heaters is achieved by different burner designs such as low NOx and ultra-low NOx burners. Some of the design principles used in low NOx and ultra-low NOx burners include staged air burners, staged fuel burners, pre-mix burners, internal recirculation, and radiant burners.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.23	0.23
NOx	2.21	2.19	2.17	2.16	2.14	2.12	2.11	2.09	2.08
SOx	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Winter Average - Tons per day								
PM2.5	0.28	0.28	0.29	0.29	0.29	0.30	0.30	0.31	0.28
NOx	2.91	2.89	2.87	2.84	2.82	2.80	2.78	2.77	2.91
SOx	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.08

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from residential water heaters are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for residential water heaters.

How does District Rule 4902 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4902 compare to rules in other air districts?

SCAQMD

- Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters)

The District evaluated the requirements contained within SCAQMD Rule 1121 and found no requirements that were more stringent than those already in Rule 4902.

BAAQMD

- Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters)

The District evaluated the requirements contained within BAAQMD Regulation 9 Rule 6 and found no requirements that were more stringent than those already in Rule 4902.

SMAQMD

- Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU Per Hour)

The District evaluated the requirements contained within SMAQMD Rule 414 and found no requirements that were more stringent than those already in Rule 4902.

VCAPCD

- Rule 74.11 (Natural Gas-Fired Water Heaters)

The District evaluated the requirements contained within VCAPCD Rule 74.11 and found no requirements that were more stringent than those already in Rule 4902.

Additional Emission Reduction Opportunities

Units subject to Rule 4902 are fired on PUC quality natural gas, and are inherently low-emitters of SOx and PM2.5 emissions. Given the significant efforts and investments already made to reduce emissions from this source category, there are little remaining opportunities for obtaining additional emissions reductions.

Electric Water Heaters

The District evaluated the potential opportunity to replace natural gas and propane water heaters with electric units. A comparison of three water heaters that utilize the different fuel types with an emissions reductions and cost effectiveness analysis for these units is summarized below.

Table C-34 Emissions Reductions and Cost Effectiveness of Water Heaters by Fuel Type

Fuel Type	Low NOx Natural Gas	Propane	Electricity
Capacity[1]	50 gallons	50 gallons	50 gallons
Shipping Weight[1]	180 lbs	151 lbs	109 lbs
Energy Factor[1]	0.62	0.59	0.91
Purchase Price[1]	$902.00	$899.00	$473.25
Estimated Life Expectancy[2]	13 years	13 years	13 years
Lifetime Energy Use[2]	3,133 therms	2,867 gallons of LP	62,439 kWh
Lifetime Energy Costs[3]	$3,568	$7,176	$9,834
Lifetime NOx Emissions[4]	30.60 lbs	48.09 lbs	0.00 lbs
Annual NOx Emissions	2.35 lbs	3.70 lbs	0.00 lbs
Comparing Natural Gas and Propane to Electricity			N/A
Annualized capital cost[5]	$76.99	$76.99	

Fuel Type	Low NOx Natural Gas	Propane	Electricity
Annual Operating Cost Savings Compared to Electric	$482.00	$204.46	
Cost per pound NOx	$237.87	$76.07	
Cost per ton NOx	**$475,736**	**$152,135**	

[1] Unit specifications and prices acquired from Grainger Industrial Supply as of August 7, 2012
[2] Data from US Department of Energy – Energy Cost Calculator for Electric and Gas Water Heaters http://www1.eere.energy.gov/femp/technologies/eep_waterheaters_calc.html
[3] Cost data based on the average cost of units of energy in 2010 according to the US Energy Information Administration. http://www.eia.gov/
[4] Emissions factors derived from Appendix EA-1 of US Department of Energy's Energy Assessment for Proposed Energy Conservation Standards for Residential Clothes Washers
[5] The annualized capital equipment cost is calculated by multiplying the installed equipment cost by the capital recovery factor of 0.1627.

The operating cost for electric water heaters is higher than for propane and natural gas units, due to the higher cost of electricity compared to propane and natural gas. However, the initial purchase price is lower for electric units. Converting to an electric water heater also may require modifications to the residence and have associated costs.

Evaluation Findings

Although residential water heaters are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4902 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from residential water heaters in the Valley.

C.22 RULE 4905 NATURAL GAS-FIRED, FAN-TYPE CENTRAL FURNACES

Discussion

Rule 4905 is a point-of-sale rule that applies to any person who sells, offers for sale, installs or solicits the installation of natural-gas-fired, fan-type central furnaces, for use within the Valley with a rated heat input capacity of less than 175,000 Btu/hour, and for combination heating and cooling units with a rated cooling capacity of less than 65,000 Btu/hour.

The rule was adopted on October 20, 2005 to establish NOx limits for residential central furnaces supplied, sold, or installed in the Valley. The rule set a NOx emission limit of 0.093 pounds per million Btu of heat output (lb/MMBtu). EPA finalized approval for Rule 4905 on May 30, 2007. Rule 4905 was amended on January 22, 2015 to:

- Lower the NOx emission limit for residential units from 40 ng/J (0.093 lb/MMBtu) to 14 ng/J
- Expand the rule applicability to include non-residential units with a NOx emission limit of 14 ng/J and units installed in manufactured homes with a NOx limit of 40 ng/J, to be lowered to 14 ng/J in 2018
- Additional labeling requirements

The January 2015 amendments exceeded SCAQMD Rule 1111 requirements and made Rule 4905 the most stringent rule in the nation for this source category.

Source Category

Affected parties include furnace manufacturers, residential heating wholesalers, supply stores, contractors and end-users. The point-of-sale approach has allowed the District to achieve NOx reductions without placing an undue financial burden on the residents, operators and businesses that sell these units in the Valley.

Applicable units are used in approximately 71% of Valley residences and are not labeled for retail as “residential” or “commercial” furnaces. Units used in commercial buildings, which are subject to the requirements of Rule 4905 as of the January 2015 amendments, are essentially the same as residential units with the exception of possible differences in usage patterns and indoor/outdoor location. Research for the analyses in the January 2015 amendments estimated 1,252,190 residential and commercial units will be operating in the Valley in 2017. Replacement will occur gradually as these units reach the end of the 20-year useful life.

The most common residential and commercial heat sources are boilers and furnaces; other heating options include heat pumps, active solar heating, electric heating, wood or pellet stoves, portable and direct vent wall heaters, and fireplaces.[87] Heat distribution systems are either central heating, where heat is generated in a central location and

[87] Department of Energy. (2013, December 16). *Energy Saver 101: Everything You Need to Know About Home Heating*. Retrieved 12/17/13 from http://energy.gov/articles/energy-saver-101-infographic-home-heating.

distributed throughout the building, or point-of-use or space heating, meaning supplemental heat is provided to a specific room. Types of central heating systems include forced air, steam radiant, radiant, hot water baseboards, and electric baseboards. Types of space heaters include wood or pellet stoves, portable and direct vent wall heaters, and fireplaces. Fuel types include natural gas, propane, heating oil, electricity, and solid fuels such as wood or pellets.

All heating systems have three basic components: a heat source, a heat distribution system, and a control system. The control system is usually a programmable thermostat. The heat source, which generally determines the type of distribution system used, is selected based on many factors. The most important factor is geographical location, which determines the climate and types of available fuel. Most commercial and residential buildings in the Valley have access to natural gas, which is typically the cheapest and most convenient fuel source in areas where it is available.

Rule 4905 applies to furnaces fueled by natural gas that use forced air distribution, the most common type of heating system for residential and commercial buildings. Central furnaces are controlled by a thermostat, which sends signals to turn the device on or off when the building temperature does not match a chosen set point. A valve then opens to send natural gas to the burners, which combust the gas directly into the heat exchangers. A blower pulls air from outside the building through a filter, across the heat exchanger, and through a series of ducts and vents to different areas of the building. Exhaust from the combustion exits the building through a separate duct. Condensing units use an additional heat exchanger to extract the latent heat in the flue (exhaust) gas by cooling the combustion gasses to near ambient temperature and thereby increase the heating efficiency by up to 10%. The water vapor in the flue gas is condensed, collected, and drained.

Units installed in manufactured homes utilize the same types of materials and operating principles as commercial and residential units; however, significant differences exist. Furnaces installed in manufactured homes use sealed combustion, meaning all of the combustion air is taken from outside the building. These units also pre-heat the air, typically to 50-60°F, using a concentric vent where the combustion air is drawn in through the outer ring, while exhaust gases are vented through the inside core of the vent pipe. The air is pre-heated because the cold outside air does not mix well with the fuel, while pre-heated air blends well and allows for quieter ignition and combustion. Furnaces installed in manufactured homes also have to comply with strict space restrictions.[88]

[88] U.S. Department of Energy. (2014, July 7). *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans.* Retrieved 9/23/14 from https://www.federalregister.gov/articles/2014/07/03/2014-15387/energy-conservation-program-for-consumer-products-energy-conservation-standards-for-residential.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.22	0.22
NOx	2.46	2.49	2.52	2.55	2.58	2.61	2.64	2.68	2.72
SOx	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Winter Average - Tons per day								
PM2.5	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.29	0.27
NOx	3.28	3.31	3.35	3.39	3.43	3.47	3.51	3.56	3.28
SOx	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from natural gas-fired, fan-type central furnaces are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for natural gas-fired, fan-type central furnaces.

How does District Rule 4905 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 4905 compare to rules in other air districts?

SCAQMD

- Rule 1111 (Reduction of NOx Emissions from Natural Gas-Fired, Fan-Type Central Furnaces)

The District evaluated the requirements contained within SCAQMD Rule 1111 and found no requirements that were more stringent than those already in Rule 4905.

BAAQMD

- Regulation 9 Rule 4 (Nitrogen Oxides from Fan Type Residential Central Furnaces)

The District evaluated the requirements contained within BAAQMD Regulation 9 Rule 4 and found no requirements that were more stringent than those already in Rule 4905.

SMAQMD

- Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU Per Hour)

The District evaluated the requirements contained within SMAQMD Rule 414 and found no requirements that were more stringent than those already in Rule 4905.

VCAPCD

- Rule 74.22 (Natural Gas-Fired, Fan-Type Central Furnaces)

The District evaluated the requirements contained within VCAPCD Rule 74.22 and found no requirements that were more stringent than those already in Rule 4905.

Evaluation Findings

Even though natural gas-fired, fan-type central furnaces are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 4905 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from natural gas-fired, fan-type central furnaces in the Valley.

C.23 RULE 8011 GENERAL REQUIREMENTS

Discussion

The provisions of Rule 8011 are applicable to specified outdoor fugitive dust sources. The definitions, exemptions, requirements, administrative requirements, recordkeeping requirements, and test methods set forth in this rule are applicable to all rules under District Regulation VIII (Fugitive PM10 Prohibitions). The Regulation VIII series was adopted in November 2001, and subsequently amended in 2004. The rules were developed pursuant to EPA guidelines for serious PM10 nonattainment areas. In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas.

Emissions Inventory

There is no specific emissions inventory associated with Rule 8011.

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Winter Average - Tons per day								
PM2.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

How does District Rule 8011 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT guidelines for this source category. The following federal regulations apply to sources covered under Rule 8011:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8011.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (BACM))

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8011.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 8011 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8011.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD 1157 and found no requirements that were more stringent than those already in Rule 8011.

SMAQMD
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8011.

VCAPCD
- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8011.

Clark County Department of Air Quality (CCDAQ)
- Section 41 (Fugitive Dust)

The District evaluated the requirements contained within CCDAQ Section 41 and found no requirements that were more stringent than those already in Rule 8011.

Additional Emission Reduction Opportunities
This rule is administrative in nature, and is intended to be a supplementary rule to the other District Regulation VIII rules. Opportunities for emission reductions would be found with each of the other Regulation VIII rules and would not be identified as a possibility for this rule. As such, there are no emission reduction opportunities for Rule 8011.

Evaluation Findings

The District has evaluated all potential requirements achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8011 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from outdoor fugitive dust sources in the Valley.

C.24 RULE 8021 CONSTRUCTION, DEMOLITION, EXCAVATION, EXTRACTION, AND OTHER EARTHMOVING ACTIVITIES

Discussion

Rule 8021 applies to construction or demolition related disturbances of soil, including land clearing, grubbing, scraping, excavation, extraction, land leveling, grading, cut and fill operations, travel on the site, travel access roads to and from the site, and demolition activities. The rule also applies to construction of new landfill disposal sites or modifications to existing landfill disposal sites prior to commencement of landfilling activities.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8021 was amended to add dust suppression requirements, and to require submittal of Dust Control Plans on residential construction sites 10.0 acres or more in size and on non-residential construction sites 5.0 acres or more in size.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	1.46	1.47	1.48	1.48	1.49	1.50	1.51	1.52	1.53
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	1.34	1.34	1.35	1.36	1.37	1.38	1.39	1.39	1.40
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from construction, demolition, excavation, extraction, and other earthmoving activities are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for construction, demolition, excavation, extraction, and other earthmoving activities.

While District Regulation VIII was critical in the District's attainment of the PM10 standards, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8021 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if PM10 controls are

effective for reducing PM2.5 for earthmoving activities. Modeling results show that the geologic fraction of PM2.5 found in the Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

How does District Rule 8021 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under Rule 8021:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8021.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8021.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 8021 compare to rules in other air districts?

There are no analogous rules for this source category in BAAQMD.

SCAQMD

- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8021.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8021.

SMAQMD

- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8021.

VCAPCD

- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8021.

Clark County Department of Air Quality (CCDAQ)

- Section 94 (Permitting and Dust Control for Construction Activities)

The District evaluated the requirements contained within CCDAQ Section 94 and found no requirements that were more stringent than those already in Rule 8021.

Additional Emission Reduction Opportunities

District analysis identified one potential opportunity for this source category; to require signs to be posted at certain size work sites, asking the public to contact the District if the work site is producing significant dust emissions. While this potential opportunity would increase the awareness of the workers and the public, there is no conclusion that it would result in reduced emissions. If emissions are reduced, it is not likely to result in quantifiable emission reductions.

Evaluation Findings

Even though construction, demolition, excavation, extraction, and other earthmoving activities are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8021 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from construction, demolition, excavation, extraction, and other earthmoving activities in the Valley.

C.25 RULE 8031 BULK MATERIALS

Source Category

Rule 8031 applies to the outside storage and handling of any unpackaged material, which emits or has the potential to emit dust when stored or handled. Rule 8031 requires bulk handling and storage facilities to restrict dust from material transfer, and reduce emissions from transport material and storage piles that emit dust. Facilities subject to Rule 8031 are required use control measures to ensure that visible dust emissions are limited to 20% opacity or less. These control measures can include application of water or other dust stabilizers, covering of bulk materials, construction of wind barriers, covering of haul trucks, and other measures.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8031 was amended to require construction and maintenance of wind barriers when handling bulk materials.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from bulk materials are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for bulk materials.

Also, while District Regulation VIII was critical in the District's attainment of the PM10 standards, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8031 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if PM10 controls are effective for reducing PM2.5 for bulk materials. Modeling results show that the geologic

fraction of PM2.5 found in the Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has a relatively low toxicity.

How does District Rule 8031 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under Rule 8031:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8031.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8031.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 8031 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8031.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8031.

SMAQMD
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8031.

VCAPCD

- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8031.

Clark County Department of Air Quality (CCDAQ)

- Section 41 (Fugitive Dust)

The District evaluated the requirements contained within CCDAQ Section 41 and found no requirements that were more stringent than those already in Rule 8031.

Additional Emission Reduction Opportunities

Rule 8031 currently employs the best dust mitigation techniques; there are no additional potential opportunities for further emissions reductions from this source category. Rule 8031's requirement of limiting opacity to 20% is as or more stringent than any other district's rule and compliance with the standard requires significant mitigation efforts from sites that store bulk materials.

Evaluation Findings

Even though storage and handling of bulk materials are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8031 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from bulk materials handling in the Valley.

C.26 RULE 8041 CARRYOUT AND TRACKOUT

Source Category

Rule 8041 applies to the prevention and cleanup of mud and dirt whenever it is deposited (carryout and trackout) onto public paved roads from activities subject to the requirements of Rules 8021, 8031, 8061, and 8071. The rule contains requirements for: removing carryout and trackout at the end of each workday; thresholds for any site with 150 daily vehicle trips; addressing carryout and trackout in Dust Control Plans; removing carryout and trackout in urban areas; paved interior roads; and prevention of carryout and trackout.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8041 was amended to require a threshold for vehicles with three or more axles to takes actions for carryout/trackout. Amendments included a threshold for projects located in rural areas, a provision requiring actions within half an hour if specified measures are insufficient to prevent carryout/trackout, and specifications for dust collectors, gravel pads, and paved surfaces.

Emissions Inventory

The emissions from this source category are included in Rule 8061 (Paved and Unpaved Roads).

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Winter Average - Tons per day								
PM2.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SOx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

While District Regulation VIII was critical in the District's attainment of the PM10 standard, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8041 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if PM10 controls are effective for reducing PM2.5 for carryout and trackout. Modeling results show that the geologic fraction of PM2.5 found in the Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

How does District Rule 8041 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under Rule 8041:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8041:

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8041.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 8041 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8041.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8041.

SMAQMD
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8041.

VCAPCD
- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8041.

Clark County Department of Air Quality (CCDAQ)

- Section 94 (Permitting and Dust Control for Construction Activities)

The District evaluated the requirements contained within CCDAQ Section 94 and found no requirements that were more stringent than those already in Rule 8041.

Additional Emission Reduction Opportunities

Two potential opportunities to reduce emissions were identified, evaluated, and determined to not be feasible.

The first potential emission reduction opportunity would be to reduce the threshold for daily trips per worksite that requires a carryout and trackout prevention system (currently 150 trips). Reducing this threshold would require smaller worksites to install costly trackout prevention equipment like wheel washers, metal grates, and gravel pads. At these smaller worksites the emission reductions that would be achieved would be minimal and not cost effective because of the small size of the sites.

The second potential opportunity would be to shorten the distance from the nearest unpaved exit point of a site at which trackout must be immediately cleaned (currently 50 feet). Lowering this threshold would significantly increase the use of street sweepers and their associated emissions, which are more toxic to human health (see Chapter 3). Therefore, this opportunity has been determined to not be feasible.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8041 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from carryout and trackout of mud and dirt onto public paved roads in the Valley.

C.27 RULE 8051 OPEN AREAS

Source Category

Rule 8051 applies to any open area 0.5 acres or more within urban areas, or 3.0 acres or more within rural areas that contains at least 1,000 square feet of disturbed surface area. The rule has requirements for limiting visible dust emissions (VDE) to 20% opacity, to comply with the conditions of a stabilized surface, and to install barriers to prevent unauthorized vehicles from accessing the stabilized areas.

In 2004, the District adopted amendments to Regulation VIII that upgraded existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8051 was amended to add applicability thresholds for rural and urban areas.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from open areas are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for open areas.

Also, while District Regulation VIII was critical in the District's attainment of the PM10 standard, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8051 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if PM10 controls are effective for reducing PM2.5 for open areas. Modeling results show that the geologic fraction of PM2.5 found in the San Joaquin Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

How does District Rule 8051 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under Rule 8051:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8051.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8051.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 8051 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8051.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8051.

SMAQMD
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8051.

VCAPCD
- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8051.

Clark County Department of Air Quality* (*CCDAQ)

- Section 90 (Fugitive Dust from Open Areas and Vacant Lots)

The District evaluated the requirements contained within CCDAQ Section 90 and found no requirements that were more stringent than those already in Rule 8051.

Additional Emission Reduction Opportunities

The District's analysis did not identify any potential opportunities to further reduce emissions from this source category beyond those emissions that are already being reduced by rule requirements. As a part of due diligence efforts in seeking addition emission reduction opportunities, the following two potential opportunities have been identified to improve rule clarity. Language could be added to the rule to clarify that it applies to off-road recreational vehicle use areas. Also, the rule provides an exemption for weed abatement activity utilizing mowing and/or cutting. Adding language to specify that weed abatement by tilling is not exempt would also add clarity to the rule. While these opportunities could clarify rule language, neither would likely generate emissions reductions from this source category.

Evaluation Findings

Even though open areas are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8051 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from open areas in the Valley.

C.28 RULE 8061 PAVED AND UNPAVED ROADS

Source Category

Rule 8061 establishes standards for the construction of new and modified paved roads in accordance with published guidelines by the American Association of State Highway and Transportation Officials for road construction and applies to any paved, unpaved, or modified public or private road, street highway, freeway, alley way, access drive, access easement, or driveway. The rule also allows alternative means of achieving the same level of dust reduction. Rule 8061 also establishes thresholds that when exceeded require that roads are treated to reduce visible dust emissions.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8061 was amended to replace the existing 75 maximum daily vehicle trip threshold with a 26 annual average daily vehicle trips (AADT) threshold on unpaved roads, and require all new unpaved roads within urban areas be paved.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	7.59	7.71	7.83	7.98	8.13	8.28	8.41	8.55	8.69
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	6.63	6.75	6.87	7.00	7.14	7.28	7.41	7.55	7.67
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

While District Regulation VIII was critical in the District's attainment of the PM10 standard, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8061 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if PM10 controls are effective for reducing PM2.5 for paved and unpaved roads. Modeling results show that the geologic fraction of PM2.5 found in the San Joaquin Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

How does District Rule 8061 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source

category. The following federal regulations apply to sources covered under Rule 8061:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8061.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8061.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 8061 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8061.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8061.

SMAQMD
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8061.

VCAPCD
- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8061.

Clark County Department of Air Quality (CCDAQ)

- Section 91 (Fugitive Dust from Unpaved Roads, Unpaved Alleys, and Unpaved Easement Roads)

The District evaluated the requirements contained within CCDAQ Section 91 and found no requirements that were more stringent than those already in Rule 8061.

- Section 93 (Fugitive Dust from Paved Roads and Street Sweeping Equipment)

The District evaluated the requirements contained within CCDAQ Section 93 and found no requirements that were more stringent than those already in Rule 8061.

Additional Emission Reduction Opportunities

The following potential opportunity to reduce emissions from paved and unpaved roads was determined to be infeasible. Section 5.2.1 of the rule requires dust control measures for any unpaved road segments with 26 or more annual average daily trips. A potential opportunity to reduce emissions would be to lower this threshold. This would require more owners/operators to implement at least one control measure to reduce fugitive emissions.

Analysis of the emission inventory indicates that the majority of the particulate emissions attributable to unpaved roads are generated from unpaved roads already subject to the mitigation requirements of Rule 8061. Therefore, the remaining portion of emissions associated with unpaved roads (less than 26 AADT) does not provide an opportunity for additional emissions reductions.

Additionally, emissions from unpaved roads are lowest in the winter months, when the District's PM2.5 24-hour exceedances occur. District staff believes the winter average PM2.5 emission inventory is overestimated for the following reasons:

- ARB methodology assumes that rainfall of at least 0.01 inch on any day mitigates unpaved road dust for 24 hours
- 71% of the days with precipitation occur during the winter months.
- Many US Forest and Park Roads are inaccessible during winter months due to increased amounts of rain and snow, yet emissions from these roads make up a larger percentage of the total unpaved road emissions in winter (42.8%) than in the annual average (40.7%)

For these reasons, lowering the trip threshold is not a viable emission reduction opportunity.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8061 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new

attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from paved and unpaved roads in the Valley.

C.29 RULE 8071 UNPAVED VEHICLE/EQUIPMENT TRAFFIC AREAS

Source Category

Rule 8071 is applicable to unpaved vehicle/equipment areas, parking, fueling and service areas, and shipping, receiving, and transfer areas. The rule contains requirements for when vehicle traffic reaches or exceeds specified thresholds, limitations on visible dust emissions (VDE), compliance requirements with the conditions of a stabilized surface, and lists control techniques, which could be implemented to limit VDE and to comply with the conditions of a stabilized surface.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. Rule 8071 was amended to remove the 1.0 acre or larger threshold; change the vehicle threshold from 75 vehicle daily trips to 50 annual average daily trips; add a single day peak threshold of 150 VDT or require control for sources that exceed the 150 VDT threshold limit on at least 30 days per year; and add a requirement whenever 25 or more three-axle vehicle trips will occur on an unpaved vehicle/equipment traffic area.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from unpaved vehicle/equipment traffic areas are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for unpaved vehicle/equipment traffic areas.

Also, while District Regulation VIII was critical in the District's attainment of the PM10 standard, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8071 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5

emission control factors are not well defined and it is not known if PM10 controls are effective for reducing PM2.5 for unpaved vehicle/equipment traffic areas. Modeling results show that the geologic fraction of PM2.5 found in the San Joaquin Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

How does District Rule 8071 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under Rule 8071:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8071.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8071.

State Regulations
There are no state regulations applicable to this source category.

How does District Rule 8071 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD.

SCAQMD
- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8071.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8071.

SMAQMD
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8071.

VCAPCD

- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8071.

Clark County Department of Air Quality (CCDAQ)

- Section 92 (Fugitive Dust from Unpaved Parking Lots and Storage Areas)

The District evaluated the requirements contained within CCDAQ Section 92 and found no requirements that were more stringent than those already in Rule 8071.

Additional Emission Reduction Opportunities

Section 5.2.1 of current rule language requires dust control measures for any unpaved traffic area with 50 or more annual average daily trips. Analysis of lowering this threshold to determine if it is a feasible option to reduce emissions determined that this is not a cost effective opportunity. Lowering the trip threshold of Rule 8071 would result in direct PM emission reductions, but would also result in the requirement that owners and/or operators implement a dust control measure. The most common control measures are watering and covering with gravel. Local cost estimates indicate that installing a 2 inch gravel base with another 2 inches of top gravel would cost approximately $1.90 per square foot, or around $83,000 per acre. Based on the small size of the emissions from this source category, and the estimated mitigation costs, requiring control measures for areas with such minimal activity is not a cost effective option.

Evaluation Findings

Even though unpaved vehicle/equipment traffic areas are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8071 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from unpaved vehicle/equipment traffic areas in the Valley.

C.30 RULE 8081 AGRICULTURAL SOURCES

Source Category

Rule 8081 applies to "off-field" agricultural sources including, but not limited to, unpaved roads, unpaved vehicle/equipment traffic areas, and bulk materials. The rule contains requirements to limit visible dust emissions (VDE) and/or to comply with the conditions of a stabilized surface, and lists control techniques which could be implemented to limit VDE and to comply with the conditions of a stabilized surface.

In 2004, the District adopted amendments to Regulation VIII to upgrade existing RACM level rules to meet the more stringent BACM level required in serious PM10 nonattainment areas. The amendments added an exemption to the rule for vehicle/equipment traffic areas if they are less than one acre in size and more than one mile from an urban area; expanded rule applicability by updating the vehicle threshold from 75 vehicle daily trips to 50 annual average vehicle trips; and added a requirement specific to whenever 26 or more three-axle vehicle trips will occur on an unpaved vehicle/equipment traffic area.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	1.21	1.21	1.20	1.20	1.19	1.19	1.18	1.18	1.17
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Winter Average - Tons per day								
PM2.5	0.75	0.75	0.75	0.74	0.74	0.74	0.73	0.73	0.73
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from agricultural sources are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for agricultural sources.

Also, while District Regulation VIII was critical in the District's attainment of the PM10 standard, a variety of studies have been conducted which may indicate that the PM2.5 fraction of the PM emissions from this source category may not be as significant as the PM coarse fraction. A better quantification of the PM2.5 fraction is required to develop a more accurate emissions inventory for the various activities under Rule 8081 and to indicate the level of significance of those PM2.5 emissions. At this time, PM2.5 emission control factors are not well defined and it is not known if PM10 controls are

effective for reducing PM2.5 for agricultural sources. Modeling results show that the geologic fraction of PM2.5 found in the San Joaquin Valley makes a relatively small contribution to overall PM2.5 mass. In addition, studies have shown that geologic dust alone has relatively low toxicity.

How does District Rule 8081 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under Rule 8081:

- Rule 57 FR 13498 (General Preamble for Title I of CAA)

The District evaluated the requirements contained within the General Preamble and found no requirements that were more stringent than those already in Rule 8081.

- EPA-450/2-92-004 (Fugitive Dust Background Document and Technical Information Document for BACM)

The District evaluated the requirements contained within the Fugitive Dust Background Document and Technical Information Document for BACM and found no requirements that were more stringent than those already in Rule 8081.

State Regulations

There are no state regulations applicable to this source category.

How does District Rule 8081 compare to rules in other air districts?

There are no analogous rules for this source category in BAAQMD.

SCAQMD

- Rule 1156 (Further Reductions of Particulate Emissions from Cement Manufacturing Facilities)

The District evaluated the requirements contained within SCAQMD Rule 1156 and found no requirements that were more stringent than those already in Rule 8081.

- Rule 1157 (PM10 Emission Reductions form Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in Rule 8081.

SMAQMD

- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SMAQMD Rule 403 and found no requirements that were more stringent than those already in Rule 8081.

VCAPCD

- Rule 55 (Fugitive Dust)

The District evaluated the requirements contained within VCAPCD Rule 55 and found no requirements that were more stringent than those already in Rule 8081.

Clark County Department of Air Quality (CCDAQ)

- Section 91 (Fugitive Dust from Unpaved Roads, Unpaved Alleys, and Unpaved Easement Roads)

The District evaluated the requirements contained within CCDAQ Section 91 and found no requirements that were more stringent than those already in Rule 8081.

Additional Emission Reduction Opportunities

The District's analysis did not identify any potential opportunities to further reduce emissions from this source category. However, a potential opportunity to improve enforceability of this for this source category has been identified. Section 5.4 of the rule references California Vehicle Code section 23112-23113 for prevention of carryout and trackout. This section could be removed and replaced with specific language from the vehicle code, however, as previously stated, this amendment would not result in emissions reductions.

Evaluation Findings

Even though off-field agricultural sources are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rule 8081 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from off-field agricultural sources in the Valley.

C.31 SC 001 LAWN AND GARDEN EQUIPMENT

Source Category

This source category includes the commercial and residential lawn and garden sectors. The commercial sector includes larger businesses that employ licensed contractors, public agencies and organizations that maintain their own properties or provide landscape services, and small businesses serving residential properties. The residential sector of lawn and garden equipment includes equipment purchased by the public for personal use. A survey conducted in 2003 by the California Air Resources Board (ARB) estimated that there are approximately 13 million pieces of lawn and garden equipment statewide: 12% in the commercial sector and 88% in the residential sector. Although there are more pieces of equipment used by the residential sector, the survey showed that the commercial sector accounts for 68% of annual use of all lawn care equipment.

Lawn and garden equipment includes the following: chainsaws, chippers, commercial turf equipment, front mowers, lawn and garden tractors, lawn mowers, leaf blowers and vacuums, rear-engine riding mowers, shredders, snow blowers, tillers, trimmers, edgers, brush cutters, wood splitters, and other lawn and garden equipment.

Handheld lawn and garden tools (such as leaf blowers) typically use two-stroke engines, while larger machines (such as lawn and garden tractors) use four-stroke engines. Lawn mowers are available with either type of engine. Two-stroke engines rely on oil mixed with the gasoline to lubricate the engine components. Much of this oil is not completely combusted by the engine thus creating high exhaust emissions. The major pollutants from a two-stroke engine, for example, are oil-based particulates, PM2.5, NOx, and a mixture of hydrocarbons, which combine with other gases in the atmosphere to form ozone, carbon monoxide, and other toxic air contaminants. Overall, four-stroke engines emit significantly lower emissions than their two-stroke counterparts, with significantly lower levels of hydrocarbons and particulate matter. Lawn care equipment, particularly leaf blowers, can also cause a significant amount of fugitive dust depending on the work practices employed such as blowing on bare dirt or very dusty paved surfaces. These types of activities would increase fugitive emissions including PM, toxic air contaminants (TAC) and ultrafine particles (UFP) resulting in a negative health impact on those in proximity to the activity.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
NOx	0.58	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.53
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
NOx	0.54	0.53	0.53	0.52	0.51	0.50	0.50	0.49	0.49
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from lawn care equipment are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for lawn care equipment.

How would District SC 001 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category. The following federal regulations apply to sources covered under SC 001:

- EPA Rule 40 CFR Part 90 (Small Non-Road Spark-Ignition Engine Rule)

The EPA regulation required exhaust emission standards by 2011 and 2012, depending on the class of the engine.

State Regulations

The following state regulations apply to sources covered under SC 001:
(Small Off-Road Engines)

- 13 CCR 2403 (Exhaust Emission Standards)
- 13 CCR 2404 (Emission Control Labels)
- 13 CCR 2405 (New Engine Compliance)

How would District SC 001 compare to rules in other air districts?

There are no analogous rules for this source category in BAAQMD, SMAQMD, or VCAPCD.

SCAQMD

- Rule 1623 (Credits for Clean Lawn and Garden Equipment)

The District evaluated the requirements contained within SCAQMD's Rule 1623 and found it was not approved by EPA and is not currently being implemented.

Additional Emission Reduction Opportunities

ARB and EPA have regulatory authority over engine standards. ARB and EPA rules rely on natural turnover and do not push zero emissions technology; therefore, there are still opportunities to reduce emissions by closing the emissions gap and accelerating the use of zero emissions technology. While the District cannot establish new engine standards, it could regulate the use of lawn and garden equipment. Given the Valley's air quality challenges and the potential benefits, the District may explore in-use regulatory options as a long-term strategy. The District's analysis of potential opportunities to reduce emissions includes evaluations of emerging technologies and potential control strategies such as an in-use rule, best management practices, episodic controls, and zoning.

Emerging Technologies

There have been recent improvements in the availability and applications of zero emissions lawn care technology. Manufacturers are producing more electric lawn care equipment options and are developing ways to allow for this equipment to be used in the commercial sector, such as carrying additional battery packs. Examples of more recent advances in new electric options include the following:

- Lawn mowers
  - Riding mowers
  - Robotic mowers
  - Self-propelled walk behind mowers
  - Cordless electric lawn mowers
- Battery powered leaf blowers
- Electric sweepers and backpack vacuums
- Battery powered chainsaws
- Electric line trimmers/edgers
- Electric hedge trimmers
- Stronger batteries and battery chargers

Though zero-emitting or battery operated lawn equipment has significantly improved in recent years, the viability of cordless electric technology has not been proven in the commercial sector. This is largely due to the need for a longer battery life and durability to allow for more frequent and prolonged equipment use. On March 21, 2012, the District hosted a conference on lawn care, landscaping, and air quality. The conference highlighted challenges operators face when using lower emitting equipment and commercial viability. Local operators expressed concerns about the cost and reliability of cordless electric equipment, and how this equipment might affect productivity and competition with other operators.

In 2013, the District completed the *Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program*. The program was funded with State Air Quality Improvement Program and District program funds and provided eligible cordless zero-emission commercial lawn and garden equipment to commercial landscape professionals who conduct business within the boundaries of the San Joaquin Valley. The final report was submitted to ARB in 2013 with plans to allocate future incentive funds for cordless zero-emission lawn and garden equipment.

Potential Strategies to Reduce Emissions

In evaluating potential control strategies, the District's analysis identified a number of potential regulatory and outreach opportunities. However, there are no recommended regulatory actions at this time due to the need to revise the emissions inventory. The District will continue evaluating which of the following regulatory approaches are feasible from a regulatory standpoint as well as from a public health standpoint.

In-Use Rule

One potential control strategy would be to require the use of the cleanest available equipment by prohibiting the use of gas combustion equipment. This could be achieved through a point-of-sale rule implementing a tiered approach or by phasing in restrictions as lower or zero-emissions technology becomes more available in the future. This type of control measure could potentially eliminate the portion of emissions resulting from the combustion of fuel. There might also be a need to bifurcate this type of regulation due to the varying availability of low or zero-emitting equipment in the residential sector versus commercial sector.

Best Management Practices

Another potential control strategy would be to require operators to implement Best Management Practices (BMPs) using a menu approach for the use of lawn and garden equipment in the commercial sector. Some examples of potential BMPs include:

- Restrictions near schools and other heavily populated areas
- Courtesy practices (e.g. don't point at people or open windows, don't blow material onto public roads, sidewalks, or neighboring properties)
- Particulate prevention practices (e.g. no leaf blower use on bare dirt surfaces or very dusty paved surfaces, etc.)

This BMP option would focus on providing education on safety and more efficient use of equipment. Enforcing this type of rule could be challenging due to the large number of operators, variation in size of businesses, and the widespread distribution of operator activities. Operators could be required to complete a certification course so that they can be educated on proper work practices. The District could also require operators to show a certificate of completion to purchase gas equipment after a certain date, to ensure contractors operating gas equipment are using the most effective work practices to protect public health and decrease emissions.

Episodic Control

Episodic control provides another potential control strategy where use of gas equipment could be limited or prohibited during high-pollution days. There has also been precedence set throughout California with numerous cities and counties adopting ordinances banning or prohibiting the use of leaf blowers on specified days, times, distances from residential areas, or noise levels. The District could create a model ordinance for cities and counties to adopt throughout the Valley to limit or prohibit the use of gas equipment and/or leaf blowers. One example was found where the City of Menlo Park prohibited the use of gas equipment on Spare the Air days in the BAAQMD. This could be an option for future regulatory control in the Valley to reduce emissions, especially on high pollution days.

Table C-35 City Bans of Leaf Blowers

Cities	Ban Type
Dana Point San Diego	Decibel and hours of operations restrictions
Foster City Los Angeles Palo Alto	Restrictions on distance from residential unit and hours allowed to operate
Sacramento Sunnyvale	Restrictions on decibels, hours of operations, and distance from residential areas
Berkeley Beverly Hills Claremont Lawndale Los Altos Santa Barbara	Bans gas blowers
Burlingame	Restrict commercial use to one day per week dependent on determined city districts; Residential areas restricted by days and hours of operation
Menlo Park	Prohibited on Sundays, observed federal holidays, and on "Spare the Air" days as declared by the BAAQMD
Laguna Beach Santa Monica	Bans all blowers

Zoning

Another potential opportunity to reduce emissions could be through the promotion of “zones,” where gas equipment would be prohibited or limited in designated zones, such as those close to schools, parks, etc. This approach, known as “greenzoning,” is currently being pioneered in Los Angeles County. Greenzoning could potentially be included as a part of the Healthy Air Living outreach program to individual businesses, schools, cities, and counties. A related option could be limiting gas powered equipment use in certain zones to designated days of the week, similar to days allowed to water residential yards. This approach was recently adopted by the city of Burlingame for leaf blower use only. Cleaner electric equipment would have an advantage by still being able to be operated on the days or areas that gas powered equipment is limited. This strategy would also be a win-win by reducing noise nuisances in neighborhoods and

near schools. The District could provide model ordinances to cities and counties to adopt to assist them in implementing this type of measure.

Non-Regulatory Actions

There are no recommendations for new incentive or technology advancement programs at this time. The recommendation is to continue to run the *Clean Green Yard Machine Residential Lawn Mower Incentive Program,* as well as evaluate the commercial lawn care equipment technologies capable of reducing emissions in the Valley that were demonstrated as a part of the *Cordless Zero-Emission Commercial Lawn and Garden Equipment Demonstration Program*. The District, along with the technology demonstrators, submitted their Cordless Zero-Emission Commercial Lawn and Garden Equipment evaluation to ARB in June 2013.

Evaluation Findings

Even though lawn and garden equipment are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. The District cannot establish new engine standards; therefore, it is recommended the District continue current incentive programs in order to close the emissions gap and accelerate the use of zero emissions technology, ultimately exceeding both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from lawn and garden equipment in the Valley.

C.32 SC 002 ENERGY EFFICIENCY

Source Category

This category does not include specific emissions inventory sources in the Valley, but rather the opportunity to reduce emissions from all Valley sectors through the promotion of energy efficiency and conservation measures. Generally, emissions reductions could be obtained from reductions in electrical power generation or fuel through the implementation of such measures. Potential areas of focus include residential and commercial buildings, manufacturing and industrial facilities, agricultural operations, and oil/gas production and processing facilities.

Additional Emission Reduction Opportunities

Energy use is not a regulated activity; however, emissions from the generation of electricity are regulated at power plants. Overall, electricity generation in California is relatively clean when compared to emission factors (criteria pollutants and greenhouse gases (GHG)) from other states. California has been on the forefront of developing renewable energy sources, and has implemented regulations to ensure cleaner non-renewable energy. Whereas coal-fired electricity generation provides a significant percentage of electricity in other parts of the country, especially the eastern states, California relies more heavily on natural gas-fired power plants, which have lower emission rates for criteria pollutants and GHGs.

California imports 30% of its electricity from surrounding states (2010 data from California Energy Commission (CEC)). The state's four major utility companies use this electricity, as well as resources from around the state to supply continuous, reliable electricity to its customers. The inter-related nature of California's electricity transmission leads to a complex relationship between local energy efficiency programs and emissions reductions. Energy dispatch for needed demand is time and market dependent; the closest plant does not necessarily supply energy to the closest demand. In some cases, peak energy demand is met for areas outside the Valley, including Los Angeles and San Diego, with marginal (peaker) power plants within the Valley. Likewise, Valley demand may be met with electricity from marginal power plants outside the Valley. To complicate matters, which marginal plant is used can depend on the time of day, the minute-by-minute energy market, or other highly variable factors.

In 2010, the CEC commissioned an evaluation of energy usage and potential reductions from energy efficiency and renewable energy measures. Using sophisticated dispatch modeling, Synapse Energy Economics Inc. (Synapse) was able to estimate NOx emissions reductions for renewable energy and energy efficiency projects within California and within each of the four major utility companies.[89] In preliminary model runs, Synapse showed that approximately 45 pounds of NOx could be reduced for each gigawatt of displaced base load electricity. Likewise, 76 pounds of NOx could be

[89] Synapse Energy Economics, Inc. for CEC Public Interest Energy Research (PIER) Program. CEC-500-2011-XXX. (2011, May). *Emission Reductions from Renewable Energy and Energy Efficiency in California Air Quality Management Districts: Final Project Report* (Draft).

reduced for each gigawatt of displaced peak load electricity displaced by targeted energy efficiency efforts during peak demand hours.

In 2012, EPA released a roadmap manual[90] to assist state, tribal, and local air agencies with quantifying and including emissions reductions from energy efficiency and renewable energy in State Implementation Plans (SIPs). The document focuses on emission benefits from energy policies and programs in the electric power sector. The complex nature of electricity transmission and dispatch, combined with import and export of electricity into and out of the District and California, will require sophisticated energy modeling to pinpoint emissions reductions attributable to potential energy efficiency and renewable energy control measures.

The District's involvement in energy efficiency and renewable energy is guided by its Regional Energy Efficiency Strategy (REES), which was adopted in January 2010.[91] This policy document identifies the District's commitment to fostering energy efficiency and clean energy alternatives as opportunities for emissions reductions. The District has initiated several projects that exemplify this policy guidance.

Non-Regulatory Actions

The District currently has incentive and technology advancement programs aimed at reduced energy use in the Valley. To date, the projects include the following:

- The administration of approximately $4 million in federal and state Energy Efficiency and Conservation Block Grant funds made available to 37 small jurisdictions in the Valley. The majority of the funding was used to retrofit municipal facilities with lighting and other cost effective energy efficiency retrofits, resulting in about 1.8 MkWh of electricity savings per year.
- The funding of an innovative pilot program to assess the potential to operate more efficiently, thus saving money and using less energy.
- The funding of an outreach program showing governmental and service organizations the benefits of "going green." This program started in Stockton through the Stockton Chamber of Commerce, and with the District's help has expanded to the central and southern San Joaquin Valley.
- The allocation of $4 million for the District's Technology Advancement Program. Two of the three focus areas for FY 2014–2015 are renewable energy and waste solutions, which take into account energy efficiency.

While there are no recommendations for new incentive programs at this time, the District will continue supporting existing incentive and technology advancement programs.

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[90] EPA. (2012) *Incorporating Energy Efficiency/Renewable Energy in State and Tribal Implementation Plans*. Retrieved July 10, 2012 from http://www.epa.gov/airquality/eere/.

[91] SJVAPCD. (2010). *Approval of the District's Regional Energy Efficiency Strategy*. Memorandum to the SJVAPCD Governing Board. Public Hearing, January 21, 2010. Retrieved from http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2010/January/Agenda_Item_7_Jan_21_2010.pdf.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. The District cannot regulate energy use; therefore, it is recommended the District continue current incentives and technology advancement programs in order to close the emissions gap and accelerate the use of energy efficient technologies. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities for improving energy efficiency to reduce emissions in the Valley.

C.33 SC 003 FIREWORKS

Source Category
This category consists of fireworks sold and/or used in the Valley. This includes consumer fireworks for home displays, as well as professional products for use by licensed operators in public displays.

Emissions Inventory
The emissions inventory for this category has not been quantified.

How would District SC 003 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations
The following state regulations apply to sources covered under SC 003:

- California Health and Safety Code, Section 12500 – 12759 (Law)
- Title 19, California Code of Regulations, Chapter 6 (Regulation)

How would District SC 003 compare to rules in other air districts?
There are no references to the use of fireworks or pyrotechnics for entertainment purposes in BAAQMD, SMAQMD, or VCAPCD.

SCAQMD
- Rule 219 (Equipment not Requiring a Written Permit Pursuant to Regulation II)

Rule 219 exempts pyrotechnic equipment, special effects, or fireworks paraphernalia equipment used for entertainment purposes from permit requirements.

- Rule 444 (Open Burning)

Fireworks and fireworks displays and pyrotechnics used for creation of special effects at theme parks are excluded from the open burning requirements of Rule 444.

- Rule 401 (Visible Emissions)
- Rule 402 (Nuisance)

Rules 401 and 402 do not explicitly exempt fireworks displays.

Additional Emission Reduction Opportunities
Fireworks usage in the Valley is limited to occasional displays at a small number of entertainment venues (minor league sporting events, for example) and Independence Day (July 4th). On July 4th, with widespread consumer fireworks use, the Valley's air

monitors typically show peak PM2.5 concentrations for several hours on the evening of July 4th and into July 5th. These hourly PM2.5 concentrations are much higher than normal PM2.5 concentrations during the summer, although 24-hour average PM2.5 concentrations on July 4th and 5th do not always go above the level of EPA's standard. In addition, exceedances of the air quality standard due to fireworks qualify as an exceptional event under federal regulations and, with proper documentation and EPA concurrence, do not count against an area's attainment status.[92] However, the clear relationship between fireworks activity and ambient PM2.5 levels; the location of emissions in populated areas; and the fact that the PM2.5 species associated with fireworks are health-impacting metals and carbons all demonstrate the value of reducing emissions from fireworks as part of the District's Health-Risk Reduction Strategy. Fireworks emissions are reduced by limiting the use of fireworks. For several years, the District has utilized public education to inform residents of the risks associated with firework emissions, and the dangers to sensitive populations. Enhancements to future outreach efforts may include partnering with other state and local agencies' outreach efforts.

Despite the strong public affinity for July 4th fireworks, many parts of the country are moving away from pyrotechnic fireworks displays and towards laser light-based shows – particularly in regions with severe drought conditions and extreme fire danger. According to the International Laser Display Association, laser-light-based shows are gaining popularity steadily as more and more communities are moving in this direction. Several companies in California and throughout the country are engaged in the business of incorporating laser-light based shows into 4th of July celebrations.

Some fireworks are lower-emitting than others. Disneyland Theme Park started using a patented air launch pyrotechnics system in 2004 to reduce noise and pollution. Use of such a system appears to be limited, and is likely most effective in situations where fireworks displays are frequent enough to justify the cost and permanent installation.

Non-Regulatory Action

In 2012, the District launched an incentive program for municipal laser-light shows to replace fireworks displays. Due to timing, the District was unable to fund shows that year, and has yet to reevaluate the program for implementation in future years.

On August 16, 2012, the District's Governing Board voted to adopt a position in opposition of California Senate Bill (SB) 1468 (Calderon), which would have allowed for the sale of safe and sane fireworks during the period of December 6th to January 2nd for two years, as a pilot for considering whether such an expanded use of fireworks should continue. This legislation would have thus expanded the use of fireworks to winter months when the Valley experiences stagnant conditions that trap particulates for extended periods of time. Given the potential for extreme adverse impact to public health, the District opposed SB 1468. Ultimately, the bill was not enacted, likely for

[92] 40 CFR 50.14 (b)(2), (2011). *Treatment of Air Quality Monitoring Data Influenced by Exceptional Events*.

financial reasons associated with the data collection and analysis associated with the bill.

Evaluation Findings

The District has evaluated all potential emission reduction opportunities for fireworks achieved in practice in other areas or included in other SIPs. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from fireworks in the Valley.

C.34 SC 004 SAND AND GRAVEL OPERATIONS

Source Category

Particulate matter emissions from sand and gravel operations occur as excavated aggregate material is conveyed, screened, crushed, and stored.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from sand and gravel operations are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for sand and gravel operations.

How would District SC 004 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NESHAP, and MACT requirements for this source category.

NSPS

- 40 CFR Part 60, Section 111 of the Clean Air Act (40 FR 58416)

State Regulations

There are no state regulations applicable to this source category.

How would District SC 004 compare to rules in other air districts?

There are no analogous rules for this source category in in BAAQMD, SMAQMD, or VCAPCD.

SCAQMD

- Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations)
- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SCAQMD's Rules 1157 and 403 and found no requirements that were more stringent than those already in District Rules 8011, 2201, and 4101.

Additional Emission Reduction Opportunities

Generally, sand and aggregate materials are wet or moist when handled and emissions are often negligible. For processes where water is not an appropriate method for minimizing emissions, baghouse and filter technology and achieved-in-practice controls are generally sufficient to limit visible dust emissions to less than 20 percent opacity, as required by District Rule 8011 (General Requirements for Regulation VIII) and District Rule 4101 (Visible Emissions).

While other districts have specific rules for aggregate and related operations (SCAQMD Rule 1157), the ultimate limits for dust emissions is the same as opacity and visible emissions standards used for District operations. SCAQMD provides guidance for specific activities (e.g. loading, conveying, crushing, screening, and storage), but the emissions limits are the same as the District's limits. The District reviews any new or modified stationary source under Rule 2201 (New and Modified Stationary Source Review), which in most cases will trigger BACT requirements, thus requiring operators to apply the best controls to reduce emissions during operational activities including crushing, screening, and conveying.

Evaluation Findings

Even though sand and gravel operations are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rules 2201, 8011 and 4101 currently have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from sand and gravel operations in the Valley.

C.35 SC 005 ASPHALT/CONCRETE OPERATIONS

Source Category

This source category includes emissions from asphalt and concrete production operations. Cement concrete production includes cement manufacturing and concrete production. There are only a few cement plants in California, but none within the Valley. However, many operations contribute to potential emissions associated with concrete production, which include the blending of cement powder, water, sand, and coarse aggregate. Similarly, there are operations producing asphalt concrete, which is primarily used for paving parking lots and on-road surfaces and is commonly made by hot-mixing asphalt with size-graded aggregate in drums or batches. If a cement production plant were to be built within the Valley, it would be reviewed and evaluated under District Rule 2201 (New and Modified Stationary Source Review) and would trigger BACT requirements for equipment and processes associated with the production of cement.

Emissions Inventory

Source	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
Mineral Processes – PM2.5	0.82	0.84	0.86	0.89	0.92	0.94	0.97	0.99	1.01
Mineral Processes – NOx	0.20	0.20	0.21	0.22	0.22	0.23	0.24	0.24	0.25
Mineral Processes – SOx	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.44	0.45
Mineral Processes – VOC	0.22	0.22	0.23	0.24	0.24	0.25	0.26	0.26	0.27
Asphalt Mixing and Application – VOC only	0.76	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.78
	Winter Average - Tons per day								
Mineral Processes – PM2.5	0.79	0.81	0.84	0.86	0.89	0.91	0.94	0.96	0.98
Mineral Processes – NOx	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.21	0.22
Mineral Processes – SOx	0.35	0.36	0.37	0.38	0.39	0.40	0.42	0.42	0.43
Mineral Processes – VOC	0.20	0.20	0.21	0.21	0.22	0.23	0.23	0.24	0.24
Asphalt Mixing and Application – VOC only	0.76	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.77

The emissions inventory table above illustrates that the PM2.5, NOx, and SOx emissions from asphalt/concrete operations occur during the mineral processes for asphalt/concrete production. Asphalt mixing and application processes only generate VOC emissions, which occur via off-gassing. There would be NOx emissions from the combustion equipment used for asphalt mixing and application; however, those emissions are accounted for in District Rule 4309 (Dryers, Dehydrators, and Ovens) and off-road equipment.

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 1.4 tons per day (tpd) for PM2.5 combustion, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from asphalt/concrete operations are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a

control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for asphalt/concrete operations.

How would SC 005 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, or MACT requirements for this source category.

NSPS
- 40 CFR 60 Subpart OOO (Standards of Performance for Nonmetallic Mineral Processing Plants)
- 40 CFR 60 Subpart I (Standards of Performance for Hot Mix Asphalt Facilities)
- 40 CFR 60 Subpart UU (Standards of Performance for Asphalt Processing and Asphalt Roofing Manufacturing)

The District evaluated the requirements contained within the above NSPSs and found no requirements that were more stringent than those already in Rules 4101 (Visible Emissions), 2201 (New and Modified Stationary Source Review), and 4309 (Dryers, Dehydrators, and Ovens).

NESHAP
- 40 CFR 63 Subpart LLLLL (Asphalt Processing and Asphalt Roofing Manufacturing for Major Sources)
- 40 CFR 63 Subpart AAAAAAA (Asphalt Processing and Asphalt Roofing Manufacturing for Area Sources)

The District evaluated the requirements contained within the above NESHAPs and found no requirements that were more stringent than those already in Rule 4101 (Visible Emissions), Rule 2201 (New and Modified Stationary Source Review), and Rule 4309 (Dryers, Dehydrators, and Ovens).

State Regulations
There are no state regulations applicable to this source category.

How would SC 005 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD, SMAQMD, and VCAPCD.

SCAQMD
- Rule 1157 (PM10 Emission Reductions from Aggregate and Related Operations)

The District evaluated the requirements contained within SCAQMD Rule 1157 and found no requirements that were more stringent than those already in District Rule 4101 (Visible Emissions), Rule 2201 (New and Modified Stationary Source Review), and Rule 4309 (Dryers, Dehydrators, and Ovens).

- Rule 403 (Fugitive Dust)

The District evaluated the requirements contained within SCAQMD Rule 403 and found no requirements that were more stringent than those already in District Rules 4101 (Visible Emissions), 2201 (New and Modified Stationary Source Review), and 4309 (Dryers, Dehydrators, and Ovens).

Additional Emission Reduction Opportunities

Liquid asphalt is unworkable at ambient temperatures, so most asphalt mixtures are manufactured, spread, and compacted at temperatures higher than 300°F (>150°C) to temporarily reduce the viscosity, thereby making the mixture workable. Working at these high temperatures produces greenhouse gases and other criteria and hazardous air pollutant emissions, in addition to creating an undesirable working environment. These emissions are minimized by achieved-in-practice controls meeting the opacity requirements of District Rule 4101 (Visible Emissions) and Rule 2201 (New and Modified Stationary Source Review). Additionally, new technologies allowing for warm-mix asphalt techniques provide better emissions control at lower temperatures.

Achieved-in-Practice Controls for Concrete and Asphalt Processes

For concrete production operations, achieved-in-practice controls include baghouses for screens, crushers, and concrete weight batchers; bin vent filters for concrete and fly ash silos; and water spray for other emissions points. For asphalt operations, achieved-in-practice controls include oil mist collectors and "blue smoke" control with electrostatic precipitators or filter packs. Dryers used for drying aggregate in the asphalt production process are regulated under District Rule 4309 (Dryers, Dehydrators, and Ovens), which limits NOx and CO to 4.3 and 42 ppmv, respectively, for gaseous-fuel fired units.

Warm-mix Asphalt (WMA)

Asphaltic concrete, or pavement, is used worldwide for road construction. An asphaltic concrete mix consists of aggregate and liquid asphalt. Liquid asphalt, also termed asphalt cement, is a natural hydrocarbon substance primarily derived from the heaviest part of petroleum crude oil. The aggregate, which is basically rocks of different size, angularity, and hardness, is bound with the liquid asphalt to make the strongest and most durable pavement combination for expected road conditions.

The performance of liquid asphalt depends on the chemistry of the crude oil source and how it was refined. The physical properties of the liquid asphalt can also be adjusted with various additives, such as polymers or hydrated lime. The performance of the aggregate depends on the physical chemistry of the rock as well as its shape and size. The performance of the final asphalt mixture depends on the quality and proportions of the components and the quality of the construction. Asphalt pavements are typically 95% by weight aggregate and 5% asphalt binder.[93]

[93] MyAsphaltPavingProject.Com. (2011). "What are the Specifications?" Retrieved from http://www.myasphaltpavingproject.com/whatisasphalt/what-are-the-specifications/.

The high viscosity[94] inherent to liquid asphalt makes it suitable for paving projects, but requires added heat during mixing and application. Liquid asphalt is unworkable at ambient temperatures, so most asphalt mixtures are manufactured, spread, and compacted at temperatures higher than 300°F (>150°C) to temporarily reduce the viscosity, thereby making the mixture workable. Working at these high temperatures produces greenhouse gases and other criteria and hazardous air pollutant emissions, in addition to creating an undesirable working environment.[95]

Heating and mixing takes place at a batch or drum plant where dry, and sometimes heated, aggregate is mixed with heated liquid asphalt. Once mixed, the asphalt is loaded into trucks and transported to a job site where a paver lays the asphalt mix. The laid asphalt mix is then compacted with rollers to reduce air voids.

European and American companies have developed several techniques, collectively known as warm-mix asphalt (WMA), to increase the workability of asphalt by lowering the viscosity at temperatures as much as 100°F below that of hot-mix asphalt (HMA). WMA was introduced in Europe in 1997 and in the United States (U.S.) in 2002. Techniques for WMA include the use of mechanical methods, specifically foaming and water injection, and the use of organic or chemical additives. Mechanical methods may require some plant modifications, but the use of additives can, in most cases, be accommodated using existing plant and production technology. In all cases however, WMA technologies may require more finesse in controlling moisture in the aggregate and in the overall system operation, such as tuning of the burner to run efficiently at lower temperatures. Improper burner adjustment can cause the burner to not add enough air to burn all the fuel and may cause mix contamination.

Mechanical methods for WMA have been shown to reduce the production temperature by 25-90°F. These methods include, but are not limited to, adding water-containing products, water-based foaming processes, and using hot coarse aggregate mixed with wet sand. Chemical additives for WMA have been shown to reduce the production temperature by 59-86°F. The additives include, but are not limited to, organic wax, chemical packages, cationic surfactants, surface-active agents, processing aids, and polymers. Additive dosages range from 0.2% to 3% by mass or weight.[96]

WMA has shown potential for reducing emissions associated with the production of asphalt for paving projects when compared to HMA. Lower temperatures required for production, storage, transport, and application translates to lower fuel consumption, which in turn reduces the criteria air pollutant emissions associated with combustion. In a 2013 California Department of Transportation (Caltrans) report[97], WMA was

[94] Viscosity is a material's resistance to gradual deformation when stress is applied.
[95] Rubio et al. (2013). "Comparative Analysis of Emissions from the Manufacture and Use of Hot and Half-Warm Mix Asphalt." *Journal of Cleaner Production, 41*, 1-6.
[96] Rubio et. al. (2012). "Warm-mix Asphalt: An Overview". *Journal of Cleaner Production, 24*, 76-84.
[97] Caltrans. (2013, April). *Caltrans Activities to Address Climate Change: Reducing Greenhouse Gas Emissions and Adapting to Impacts. Retrieved from:* http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/documents/Caltrans_ClimateChangeRprt-Final_April_2013.pdf

recognized as potentially yielding 25–35% fuel savings and thus contributing to a significant level of emissions reductions from manufacturing, mixing, and laying the asphalt.

Asphaltic concrete production plants are regulated by District Rule 2201 (New and Modified Stationary Source Review Rule), Rule 4301 (Fuel Burning Equipment), Rule 4309 (Dryers, Dehydrators, and Ovens), and Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations), which have all been approved by EPA to meet or exceed RACT requirements.

Benefits of WMA

The use of WMA was initially promoted as a means of reducing emissions from road projects, especially in nonattainment areas[98]. However, after extensive research and numerous case studies, the potential benefits of WMA have expanded beyond reduced emissions. Benefits include, but are not limited to the following:

- **Improved performance**: WMA improves workability and ease of compaction, which is critical to long-term performance of the mixture. [99]
- **Energy Savings**: By lowering the production, storage, transport, and application temperatures, manufacturers require less energy to heat aggregate and liquid asphalt. Energy savings could potentially offset the added cost of additives or needed modifications to plants, especially where energy costs are high. Reduced plant temperatures may also cause less wear on plant equipment, thus reducing plant maintenance costs. [100]
- **Increased Capacity for Reclaimed Asphalt Pavement**: WMA allows for higher percentages of reclaimed asphalt pavement (RAP) to be used in the mixture with no effect on ultimate pavement performance. The use of RAP is less expensive than producing an asphalt mixture from raw materials, and additional savings can be generated from avoiding landfill disposal or recycling fees.
- **Potential Cost Savings**: Fuel savings, increase in reclaimed asphalt pavement content, and reductions in fuel and labor during the process of installing WMA translate to reduced costs for WMA projects. One cost assessment indicated $3,000-$6,000 in savings per lane mile.[101] Life cycle assessments have shown reduced agency costs, user costs, and environmental costs.

[98] St. Martin P.E., J., California Asphalt Pavement Association. (2013, March 28). "Warm-mix Asphalt. Presentation to the League of California Cities Public Works Officers Institute. Sacramento, California." Retrieved from http://www.cacities.org/UploadedFiles/LeagueInternet/f2/f257a42c-2d27-47d1-a641-068a32289b71.pdf.

[99] MyAsphaltPavingProject.Com. (2011). "What are the Specifications?" Retrieved from http://www.myasphaltpavingproject.com/whatisasphalt/what-are-the-specifications/.

[100] Caltrans. (2013, April). *Caltrans Activities to Address Climate Change: Reducing Greenhouse Gas Emissions and Adapting to Impacts. Retrieved from:* http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/documents/Caltrans_ClimateChangeRprt-Final_April_2013.pdf

[101] Leng & Al-Qadi. Illinois Center for Transportation, University of Illinois at Urbana-Champaign, Champaign, Illinois. (2011). "Comparative Life Cycle Assessment between Warm SMA and Conventional SMA."

- **Extended paving season**: A smaller difference between the asphalt temperature and ambient temperature reduces the rate of cooling, which means paving can take place during colder weather.
- **Longer transport time**: Lower temperatures required for storage allow the asphalt to be transported to more remote locations and introduces more flexibility in transportation schedules.
- **Shorter cooling time**: The lower temperature allows cooling to take place in a shorter time, increasing the project completion rate and opening roads to traffic more quickly.
- **Safer working conditions**: VOC and other hazardous emissions are significantly reduced with WMA, as is a potential burn hazard.

Potential Emissions Reductions from WMA

As previously mentioned, WMA production has the potential to reduce combustion emissions by reducing the amount of energy (fuel) needed to heat aggregate and liquid asphalt. While fuel savings have been reported to be from 20% to over 50% for some WMA technologies, U.S. studies have reported burner fuel savings of zero to 30%, with 15% to 25% being typical.[102] These fuel savings translate into reductions in criteria pollutants, such as NOx.

European studies have documented the reduction of NOx emissions associated with the use of WMA. The table below summarizes the range of NOx emission reductions expected from the use of WMA; however, actual emissions reductions for U.S. production of WMA will vary depending on the fuel used for combustion, control technology, and local regulations.

Table C-36 NOx Emission Reductions for Warm-mix Asphalt

	Vaitkus et al.[103,104]	Larsen, O.R.[105]	D'Angelo et al.[106]	Evotherm[107]
NO_x Reduction	60–70%	62%	60–70%	58%

The emissions inventory for asphaltic concrete production in the Valley includes emissions from asphalt plants, dryers, storage piles, and vehicle traffic. As evidenced by the emissions inventory table for this source category, the NOx emissions from this source category are extremely small. In addition, only 88% of these NOx emissions are

[102] California Asphalt Pavement Association. (2013, March 28). "Warm-mix Asphalt. Presentation to the League of California Cities Public Works Officers Institute. Sacramento, California." Retrieved from http://www.cacities.org/UploadedFiles/LeagueInternet/f2/f257a42c-2d27-47d1-a641-068a32289b71.pdf.
[103] Vaitkus, A., Cygas, A., Laurinavicius, A. Perveneckas, Z. (2009a). Analysis and Evaluation of possibilities for the use of Warm Mix Asphalt in Lithuania. The Baltic Journal of Road and Bridge Engineering, 4(2), 80–86.
[104] Vaitkus, A., Vorobjovas, V. Ziliut, L. (2009b). The Research on the Use of Warm Mix Asphalt for Asphalt Pavement Structures. Road Department, Vilnius Gediminas Technical University, Vilnius, Lithuania.
[105] Larson, O.R. (2001). Warm Asphalt Mix with Foam—WAM™FOAM. International Road Federation, 2001 Partie B: Themes Techniques, S.00469. Kolo Veidekke, Norway.
[106] Vaitkus et al., 2009a,b.
[107] Evotherm® (2010, March). Stack Emissions & Jobsite Fumes Reductions using Evotherm® Warm Mix Asphalt. Available at: http://www.meadwestvaco.com/mwv/groups/content/documents/document/mwv017395.pdf

from production processes, as about 12% of these emissions account for associated vehicle traffic.[108]

Feasibility of WMA

As more tests and case studies are run in the U.S., WMA is proving to perform as effective as or better than HMA. Caltrans and the University of California Pavement Research Center have been evaluating WMA technology and its performance by testing rutting and cracking performance, moisture sensitivity, durability, aging, emissions, and stability of multiple types of WMA production.[109] WMA has so far been shown to have equal or better overall performance compared to HMA, less smoke and odor, and increased workability. [110]

The use of WMA in the U.S. has been growing steadily since the first test section was completed in 2004. Caltrans use of WMA has grown from laying about 67,000 tons of WMA between 2006 and 2009, to just over 2 million tons by 2012.[111] To further encourage the use of WMA, in June 2012 Caltrans issued a directive that provided guidance for implementing a contractor-requested option to use an approved WMA technology to encourage the use of WMA by contractors.[112] On a national scale, there are estimates that while 19.2 million tons of WMA had been placed by 2009 that value has increased to an estimated 500 million tons per year in 2013.[113] WMA is even being used in situations where safety is looked at closely, such as airport runways for Boston Logan and Chicago O'Hare airports.

WMA is on the uptake and will become more widely used over time. The U.S. Department of Transportation Federal Highway Administration (FHWA) has chosen WMA for rapid deployment under its *Every Day Counts* (EDC) initiative. In 2013, 30% of paving in the U.S. was WMA, and FHWA has a goal that by 2015, half of all the asphalt used in the U.S. will be WMA.[114] As a result of these efforts, the use of WMA is continuing to grow in the Valley with the current backing from state and national transportation agencies.

Despite the technological feasibility of using WMA as a substitute for HMA, the cost of converting equipment to produce WMA remains a potential barrier to adoption. Certain facilities would incur more costs than others to employ this technology. More research into the capital costs of converting production equipment is needed to determine

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[108] EPA, 2000,Table 1; excludes mobile source emissions; average for batch and drum plants

[109] St. Martin P.E., J., California Asphalt Pavement Association. (2013, March 28). "Warm-mix Asphalt. Presentation to the League of California Cities Public Works Officers Institute. Sacramento, California." Retrieved from http://www.cacities.org/UploadedFiles/LeagueInternet/f2/f257a42c-2d27-47d1-a641-068a32289b71.pdf.

[110] Rubio, M.C., Martínez, G., Baena, L. & Moreno, F. (2012). Warm Mix Asphalt: An Overview. Journal of Cleaner Production, 24, 76–84. doi:10.1016/j.jclepro.2011.11.053

[111] St. Martin, 2013.

[112] California Department of Transportation (Caltrans). (2012, June 7). Contractor Option for Use of Warm Mix Asphalt Technologies in Hot Mix Asphalt. Available at: http://www.dot.ca.gov/hq/construc/CPDirectives/CPD12-2.pdf

[113] St. Martin, 2013.

[114] St. Martin P.E., J., California Asphalt Pavement Association. (2013, March 28). Warm Mix Asphalt. Presentation to the League of California Cities Public Works Officers Institute. Sacramento, California. Available at: http://www.cacities.org/UploadedFiles/LeagueInternet/f2/f257a42c-2d27-47d1-a641-068a32289b71.pdf

whether WMA is cost effective for asphalt production facilities in the Valley. In addition, some applications may not be suitable for WMA. Just as with HMA use and application, WMA use is not a one-size-fits-all product. Continued studies and field tests are showing which product, mix, and application are best for specific uses and conditions.

While the benefits of WMA are far-reaching, more research into the capital costs associated with converting production equipment to handle WMA and other feasibility issues is still needed to fully determine whether WMA would be feasible and cost effective to require for all Valley asphalt production facilities. Therefore, as discussed in Chapter 8 (Commitment to Leave No Stone Unturned to Evaluate Additional Opportunities), the District is committing to further evaluate warm mix asphalt for additional opportunities.

Cutback Asphalt

District Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations) contains an exemption for the use of cutback (medium cure) asphalt where the National Weather Service official forecast of the high temperature for the 24-hour period following application is below 50°F. The use of cutback asphalt results in VOC emissions, which do not contribute significantly to the formation of PM2.5. As such, this is not a potential emission reduction opportunity for this *2015 PM2.5 Plan*. Although the use of cutback asphalt has declined in recent years, Rule 4641 maintains the exemption based on the following:

- The exemption for cutback asphalt during colder ambient temperatures, which occurs during winter (non-ozone) season, is analogous to EPA's Blue Book on Cutback and Emulsified Asphalt recommended seasonal exemptions (i.e. outside of the ozone season).
- During colder ambient temperatures, VOCs do not evaporate rapidly, especially from medium cure asphalt that is limited by Rule 4641 to no more than 5% organic compounds that evaporate at 500°F.
- Road construction and road repairs using asphalt are very minimal during the colder winter months, except for emergency road repairs. In addition, during winter months, the Valley experiences the majority of rainfall, including long periods of fog. In these conditions, asphalt will not properly cure or harden due to the increased moisture on the surfaces or areas where asphalt is applied and therefore, this type of activity is minimal.

Evaluation Findings

Although asphalt/concrete operations are not a significant source of PM2.5, NOx, or SOx in the Valley, the District evaluated the feasibility of all potential emissions reductions measures for this source category. As demonstrated in the above control measure evaluation, existing District regulations for this source category (Rules 4309 and 4641) currently implement BACM and MSM for these sources.

In addition, as discussed above, WMA is potentially a viable alternative to HMA and the benefits obtained by switching from HMA to WMA have contributed to the fast growing use of WMA throughout California and the Valley. FHWA's goal of achieving 50% of

WMA paving by 2015 has further accelerated the widespread adoption of this technology throughout the country and will likely further increase the use of WMA in the Valley in future years.

Although current District rules already meet BACM and MSM requirements for this source category, as previously mentioned, the District is committing to further evaluate warm mix asphalt for additional opportunities. See Chapter 8 for more information.

C.36 SC 006 ALMOND HULLING/SHELLING OPERATIONS

Source Category

This control measure source category would apply to almond hulling and shelling operations. Almonds are harvested from orchards and transported to almond processing facilities, where the almonds are hulled and shelled leaving the nut, or meat. Orchard debris, soil, and pebbles represent 10-25% of the field weight of material brought to the almond processing facility. Clean almond meats are obtained as about 20% of the field weight. Processes for removing the debris and almond hulls and shells are potential sources of air emissions. The Valley harvests 86% of the almonds produced in California. Production has roughly doubled in the last decade, with the 2010/2011 crop year reaching 1.4 billion pounds.[115]

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.38	0.39	0.40	0.40	0.41	0.42	0.42	0.43	0.44
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.24	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from almond hulling/shelling operations are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for almond hulling/shelling operations.

How would District SC 006 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, and MACT for this source category.

State Regulations

There are no state regulations applicable to this source category.

[115] The Tioga Group. (2012). *SJV Nut Industry Profile Preliminary Draft.* Retrieved from http://www.sjvcogs.org/pdfs/2012/Nut%20Industry%20030612.pdf.

How would SC 006 compare to rules in other air districts?

There are no analogous rules for this source category in SCAQMD, BAAQMD, VCAPCD, or SMAQMD.

Additional Emission Reduction Opportunities

Evaluation of emission reduction opportunities for almond hulling and shelling operations included a review of ongoing research efforts, and the technologicial feasibility and cost effectiveness of polytetrafloroethylene (PTFE) bags.

Ongoing Research Efforts

Research is currently being conducted by Texas A&M University in partnership with almond harvesting equipment manufacturers, almond farmers, United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), and the District to compare "low dust" almond harvesters and an exhaust abatement devices to conventional harvesters in the harvesting of almonds at a Valley farm. No differences were detected in the particle size distribution (PSD) characteristics of PM emitted from each harvester, with the exception of the exhaust abatement device, where large particles were efficiently captured by the cyclone. Emissions of total suspended particulates (TSP) and PM10 trended lower for all new harvesters and were significantly lower for most harvesters. There were significant reductions of PM2.5 ranging from 61-69% observed from the harvesters and a 95% reduction in PM2.5 from the Clean Air Concept cyclone. The results of these tests imply that new harvest technologies are able to reduce PM emissions without affecting product quality.

Polytetrafloroethylene Bags

District BACT guidelines for almond hullers and shellers require the use of a baghouse, which controls PM by moving the contaminated flow of air through bag type filters. The technology has been achieved in practice in the District. Standard polyester bags are the most commonly used type of bag for baghouses in the almond hulling/shelling industry. A layer of dust (dust cake) collects on the upstream side of these bags and filtering efficiency increases as the layer grows; however, they are not designed to provide high PM2.5 control. On the other hand, membrane type bags treated with polytetrafloroethlyene (PTFE) contain extremely small pores and filtering occurs on the bag surface instead of in a dust cake. These types of filters are capable of controlling 99.9%[116] of PM2.5 emissions, whereas baghouses with polyester bags control PM2.5 emissions by 95-99%.[117]

The costs of using baghouses with PTFE bags rather than standard polyester bags were calculated. The pressure drop across polyester and PTFE bags is about the same so there should not be a significant increase in electrical costs by using one bag over another. Additionally, existing baghouses would not require modifications to accommodate PTFE bags so the increased cost lies solely in the cost of the bags. A

[116] EPA, Control Technology Center, Verified Technologies. (2012) *Baghouse: PTFE Filters*. Retrieved February 19, 2015 from http://www.baghouse.com/products/dust-collector-filters/baghouse-filter/ptfe-filters/.
[117] Roberts, C. (2009). *Information on Air Pollution Control Technology for Woody Biomass Boilers.* Northeast States for Coordinated Air Use Management and the EPA Office of Air Quality Planning and Standards.

PTFE bag typically costs $23, whereas a polyester bag costs $12. The lifetime of both bags is approximately 2 years. The following cost differential was calculated, with knowledge that some facilities in the Valley have up to 2-3 baghouses, each with 500 bags. District permits also require facilities to have replacement bags accounting for 10% of the total number of bags; therefore 550 bags will be used for the following calculations.

Additional Costs for Using PTFE Bags

550 bags x ($23/ PTFE bag - $12/ polyester bag) / 2 years = **$3,025/ year** (per baghouse)

3 baghouses x $3,025/ year = **$9,075/ year** (for 3 baghouses)

Potential PM2.5 Emission Reductions from Using PTFE Bags

The control efficiency for PM2.5 for polyester bags is assumed to be equivalent to the control efficiency for PM10.
(99.9% control efficiency from PTFE bags – 99% control efficiency of polyester bags) = 0.9% additional control efficiency

2015 emission inventory is 0.40 tons/day
(0.40 tons/day PM2.5) x (0.9% additional control from using PTFE bags)
= **0.0036 tons/day reduced**

(0.0036 tons/day reduced from using PTFE bags) x (365 days/year)
=**1.314 tons/year reduced**

Potential Cost Effectiveness of Using PTFE Bags

101 baghouses in the Valley

(101 baghouses) x (PTFE bag costs $3,025/ year) = **$305,525/year**

($305,525/year) / (1.314 tons/year reduced) = **$232,515.22/ton**

The cost effectiveness of replacing polyester bags was also calculated at the lower end of the emission control efficiency scale (95%) with the PTFE bags to determine what a more conservative cost effectiveness analysis would reveal; the cost effectiveness from 95% polyester bags to 99.9% PTFE bags is $42,706.88/ton PM2.5 reduced.

Although the initial annual capital cost may seem relatively low; in terms of cost effectiveness, PTFE bags are not a cost effective alternative to standard bags. The additional control efficiency gains are in the fractions of tons of incremental emissions reductions. Additionally, as mentioned above, the emission inventory used in these calculations (0.40 tons/day PM2.5) includes the emissions of both almond hulling and

pistachio hulling, meaning the actual inventory is smaller, and making the actual cost effectiveness even higher than calculated.

The cyclone is another technology in common use at Valley facilities for PM control in almond hulling/shelling; however, like baghouses with polyester bags, the technology primarily provides PM10 control. Additionally, cyclones typically achieve 80-85% control efficiency. Approximately 37 facilities in the Valley use cyclones to control PM emissions. Therefore, if these facilities were required to replace cyclones with baghouses, the cost effectiveness would be as follows:

Potential PM2.5 Emission Reductions for Replacing Cyclones with Baghouses with PTFE Bags

The PM2.5 control efficiency for cyclones is assumed to be equivalent to the control efficiency for PM10
(99.9% control efficiency of baghouse – 85% control efficiency of cyclone)
= 14.9% additional control efficiency

2015 emission inventory is 0.40 tons/day
(0.40 tons/day PM2.5) x (14.9% control with use of baghouse)
= **0.0596 tons/day reduced**

(0.0596 tons/day reduced) x (365 days/year)
= **21.754 tons/year reduced**

Potential Cost Effectiveness for Replacing Cyclones with Baghouses with PTFE Bags

37 facilities to install baghouses at a minimum of $150,000 each

With a 10 year amortization factor and 10% interest, the annualized cost for a $150,000 baghouse would be:

(0.1627 CRF) x ($150,000) = **$24,405/year**

(37 facilities) x (capital cost of baghouse $24,405/year) = **$902,985/year**

($902,985/year) / (21.754 tons/year reduced) = **$41,508.92/ton**

Replacing the existing cyclones with baghouses with PTFE bags would cost $41,508.92/ton, which does not include additional costs of installation, electrical system upgrades, ductwork, demolition or disposal of the cyclone. Therefore, replacing cyclones with baghouses is not a cost effective control option. As previously stated, the emissions inventory used in these calculations (0.40 tons/day PM2.5) includes the emissions of both almond hulling and pistachio hulling, meaning the actual inventory is smaller, and making the actual cost effectiveness even higher than stated.

Evaluation Findings

Even though almond hulling/shelling operations are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, current control techniques have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from almond hulling/shelling operations in the Valley.

C.37 SC 007 PISTACHIO HULLING/SHELLING OPERATIONS

Source Category

This control measure source category would apply to pistachio hulling and shelling operations within the Valley. Pistachio hulling operations are permitted under the same permit with the pistachio receiving and pre-cleaning portions of the operation. These operations use 1D-3D cyclones to control PM emissions from the pre-cleaning portion of the process, which is the Best Available Control Technology (BACT) standard. Typically pistachio processing equipment, located after the pre-cleaning section and prior to the pistachio dryers, is of a wet-process design; PM emissions from this portion of the operation are assumed to be negligible. California produces 98.5% of U.S. pistachios and production has expanded greatly in the last decade. Pistachio acreage doubled between 1997 and 2010, and production looks like it will continue to increase in the near future.[118] In the interest of identifying every possible strategy to reduce PM2.5 emissions, pistachio hulling and shelling operations were evaluated for potential opportunities to reduce emissions; see the discussion below.

Emissions Inventory

The emissions inventory for this category is included as a part of the emissions inventory for the control measure source category for almond hulling. Refer to the emission inventory table presented in SC 006 for this combined inventory.

How would District SC 007 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

How would SC 007 compare to rules in other air districts?

There are no analogous rules for this source category in SCAQMD, BAAQMD, SMAQMD, or VCAPCD.

Additional Emission Reduction Opportunities

Pistachio shelling operations are served by a baghouse, which is the industry standard for shelling operations. While there is no specific BACT guideline for shelling operations, baghouses are typically attributed to a PM2.5 control efficiency of 95-99%. As discussed above in SC 006 (Almond Hulling/Shelling Operations), polytetrafloroethylene (PTFE) bags have the potential to provide additional PM2.5 control when used in baghouses but are not cost effective due to the already high

[118] The Tioga Group. (2012). *SJV Nut Industry Profile Preliminary Draft.* Retrieved from http://www.sjvcogs.org/pdfs/2012/Nut%20Industry%20030612.pdf.

control efficiency of existing practices. Refer to SC 006 (Almond Hulling/Shelling Operations) for the cost effectiveness analysis.

Unlike almonds which are shaken on the ground and vacuumed off the soil during harvesting, pistachios are caught with a canvas catcher before they hit the ground, which allows for a very small amount of dust and debris in addition to the pistachios. Much of the PM emissions associated with the processing of pistachios occur during the pre-cleaning stage, which is controlled by cyclones. The hulling stage is a wet process as the nuts are floated on water; PM emissions from this portion of the operation are assumed to be negligible. At this time, the District's analysis indicates that there are no feasible opportunities for additional emission reduction regulatory strategies for this source category.

Evaluation Findings

Even though pistachio shelling operations are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. While there is no specific rule or guideline for pistachio shelling, the industry-standard baghouse operation described above meets or exceeds both BACM and MSM requirements. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from pistachio shelling operations in the Valley.

C.38 SC 008 AGRICULTURAL MATERIAL SCREENING/SHAKING OPERATIONS

Source Category
This control measure source category would be applicable to the handling and processing of agricultural materials in biomass, composting, and other agricultural material handling facilities.

Emissions Inventory
The emissions inventory for this category is accounted for in other control measure source categories. Refer to Appendix B for the emissions inventory.

How would District SC 008 compare with federal and state rules and regulations?

Federal Regulations
There are no EPA CTG, ACT, NSPS, NESHAP, and MACT requirements for this source category.

State Regulations
There are no state regulations applicable to this source category.

How would District SC 008 compare to rules in other air districts?
There are no analogous rules for this source category in BAAQMD, SMAQMD, or VCAPCD.

SCAQMD
- Rule 1131.1 (Chipping and Grinding Activities)

The District evaluated the requirements contained within SCAQMD 1131.1 and found no requirements that were more stringent than those already in New Source Review Rule 2201.

Additional Emission Reduction Opportunities
District analysis of potential emission reduction opportunities includes an evaluation of the efficacy of wet suppression systems and enclosing conveyors and transfer points.

Wet Suppression System
A wet suppression system can achieve between 40-65% control of PM2.5.[119] In a wet suppression system, water is generally applied to all emissions units, transfer points, and raw material stockpiles to ensure that adequate moisture is provided to the operation to successfully reduce PM emissions. No emissions would be reduced by requiring a wet suppression system because this control is currently in use at all identified facilities in the Valley and would be required at any new facility triggering BACT under the New Source Review Rule 2201.

[119] Environmental Protection Agency [EPA]. (1995). *Compilation of Air Pollutant Emission Factors, Table B.2-3.*

Enclosed Conveyors and Transfer Points

Enclosing conveyors and transfer points to limit the emissions of PM is a practice used in addition to water spray at seven facilities in the Valley. This control option would potentially reduce emissions at the drop or transfer points on the conveyors. However, in addition to the control efficiency of enclosed conveyors being unknown, conveyors are already operated so that they move very slowly to avoid entraining dust and limit visible emissions. Therefore, the potential to reduce emissions is minimal and reduced emissions would not be quantifiable.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, current business practices have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from agricultural material screening/shaking operations in the Valley.

C.39 SC 009 TUB GRINDING

Source Category

This control measure source category would apply to operations using a tub grinder for agricultural material processing. Tub grinders are used to grind organic materials such as wood and agricultural materials for biomass fuel processing facilities, composting facilities, landscape material manufacturing (e.g. wood bark, mulch, etc.), or agricultural waste grinding (e.g. orchard removal, land clearing, etc.). These units are typically powered by diesel-fired internal combustion engines (ranging from 100 horse power (hp) to 1,600 hp) and mounted on wheels to be transportable, which allows the units to be towed to the jobsite where the piles of material are to be ground. In addition, these units may also be self-propelled and track-mounted; in this case the diesel engine powering the equipment is also used for motive power and is exempt from District permits since it is considered to be mobile equipment. The diesel engines powering the transportable units are subject to District Rule 4702 (Internal Combustion Engines) and Best Available Control Technology (BACT) Guideline 3.2.11. This control measure source category discussion addresses the particulate matter (PM) emissions from the loading, grinding, and conveying of the process materials.

Emissions Inventory

Emissions generated by the engines of the tub grinders are accounted for as a part of the inventory for District Rule 4702 (Internal Combustion Engines). The fugitive particulate emissions from these units are accounted for as a part of the stationary and area source emissions inventory. See Appendix B.

How would District SC 009 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, and MACT requirements for this source category.

State Regulations

There are no state regulations applicable to this source category.

How would SC 009 compare to rules in other air districts?

There are no analogous rules for this source category in BAAQMD, SMAQMD, or VCAPCD.

SCAQMD

- Rule 1131.1 (Chipping and Grinding Activities)

The District evaluated the requirements contained within SCAQMD Rule 1131.1 and found no requirements that were more stringent than those already in District Rules 2201 (New Source Review) and 4101 (Visible Emissions) and BACT guideline 6.4.2.

Additional Emission Reduction Opportunities

Currently, fugitive particulate emissions from transportable and self-propelled tub grinders are controlled with a water sprinkler system during loading, grinding, and unloading of the process materials to prevent visible emissions in excess of 5% opacity per Rule 2201 (New Source Review) and BACT guideline 6.4.2. Water sprinkler systems achieve between 40-65% control of PM2.5.[120] It is standard practice to use water spray on this type of equipment to meet the visible emission requirements of Rule 4101 (Visible Emissions); therefore, requiring water control for tub grinding operations would not result in additional emission reductions from this source category. A potential control option considered would be to require a baghouse to be installed onto the trailer of the equipment to capture fugitive PM emissions. Due to the large size of the additional equipment required to be installed onto the trailer and the limited space available, a baghouse is not technologically feasible for a transportable unit.
No technologically feasible or alternative basic equipment were identified in the District's BACT guidelines.

Evaluation Findings

The District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, Rules 2201, 4101, and District BACT guideline 6.4.2 currently have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from tub grinding in the Valley.

[120] Environmental Protection Agency [EPA]. (1995). *Compilation of Air Pollutant Emission Factors, Table B.2-3.*

C.40 SC 010 ABRASIVE BLASTING

Source Category

Abrasive blasting involves the cleaning or preparing of a surface by forcibly propelling a stream of abrasive material against such surface. Abrasive blasting can occur in a confined or an unconfined area, depending on the type of surface or application. Abrasive materials commonly used are walnut shells, various mineral or metal products, garnet, sand or aggregate, slag, steel grit abrasive, or steel shot.

Emissions Inventory

Pollutant	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Annual Average - Tons per day								
PM2.5	0.33	0.34	0.35	0.36	0.37	0.38	0.40	0.40	0.41
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM2.5	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As detailed in Chapter 5, the significance thresholds for source categories for the purpose of evaluating the application of BACM and MSM requirements are 4.0 tons per day (tpd) for PM2.5 dust, 13.1 tpd for NOx, and 1.0 tpd for SOx. As identified in the above table, emissions from abrasive blasting are lower than the BACM/MSM significance thresholds. Therefore, the Clean Air Act does not require a control measure evaluation for this source category for the purpose of satisfying BACM/MSM requirements; however, the District has still conducted a full control measure evaluation for abrasive blasting.

How would District SC 010 compare with federal and state rules and regulations?

Federal Regulations

There are no EPA CTG, ACT, NSPS, NESHAP, or MACT requirements for this source category.

NESHAP/ MACT

- 40 CFR 63, Subpart XXXXXX (National Emission Standards for Hazardous Air Pollutants Area Source Standards for Nine Metal Fabrication and Finishing Source Categories)

The District evaluated the requirements contained within 40 CFR 63, Subpart XXXXXX and found no requirements that were more stringent than those already in District Rule 4102 (Nuisance) and 17 CCR 6 92200 (Opacity) through 92500 (Performance Standards).

State Regulations
The following state regulations apply to sources covered under SC 010:

- 17 CCR 6, Sections 92000-92530 (Abrasive Blasting).

How would District SC 010 compare to rules in other air districts?
No rule from another air district has requirements beyond what is already required in state standards. BAAQMD Regulation 12, Rule 4 (Sandblasting), SCAQMD Rule 1140 (Abrasive Blasting), and VCAPCD Rule 74.1 (Abrasive Blasting) regulate abrasive blasting operations and activities, but all simply conform to the state standards.

Additional Emission Reduction Opportunities
Achieved-in-practice BACT controls for sandblasting include baghouses, filters, or cartridge dust collectors. With such technologies, 99% control efficiency can be achieved. As emissions sources, sandblasting operations within the District are subject to District Rule 4102 (Nuisance) and the standards of 17 California Code of Regulations (CCR) Section 92200 (opacity) and 17 CCR Section 92500 (performance standards such as CARB-certified abrasives).

Opportunities for further emissions reductions are limited because of the CH&SC stipulation that air districts cannot impose stricter rules on sandblasting operations. The District's analysis has determined that there are no feasible opportunities for additional emissions reductions for this source category.

Evaluation Findings
Even though abrasive blasting operations are not a significant source of PM2.5, NOx, or SOx in the Valley, the District has evaluated all potential control technologies and all control technologies achieved in practice in other areas or included in other state implementation plans. As demonstrated above, the California Code of Regulations and District Rule 4102 currently provide the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for this source category. As the District continues to develop new attainment plans that address more stringent National Ambient Air Quality Standards, the District will continue to evaluate potential opportunities to reduce emissions from abrasive blasting operations in the Valley.

C.41 AMMONIA CONTROLS

Under Subpart 4 of the CAA, regions are required to address ammonia as a precursor in BACM/MSM analyses and other areas of the plan unless EPA determines that ammonia sources do not contribute significantly to PM concentrations. To improve public health while also ensuring effective use of resources, additional ammonia controls should only be required when there is clear scientific evidence that reasonable measures to reduce ammonia emissions would be effective in significantly reducing ambient PM2.5 concentrations.

Extensive scientific research and technical analyses (see Appendix A) demonstrate that ammonia reductions do not contribute to the Valley's PM2.5 attainment; as such, ammonia does not need to be addressed in this BACM/MSM analysis for the 1997 PM2.5 standard. Even though ammonia is an insignificant PM2.5 precursor in the Valley, the following analysis shows that the Valley's ammonia emissions have been significantly reduced through stringent regulations, that additional ammonia control measures are infeasible, and that Valley sources currently implement BACM and MSM.

As demonstrated in Appendix B of this *2015 PM2.5 Plan*, the three main sources of ammonia emissions in the Valley from stationary and area sources that account for 95% of the Valley's ammonia emissions are as follows (based on 2015 estimates):

- Farming Operations with 198.0 tons per day (tpd),
- Solvent evaporation from Agricultural Fertilizers at 116.3 tpd, and
- Composting Solid Waste Operations at 9.0 tpd.

The following discussion evaluates:

- Confined Animal Facilities (District Rule 4570)
- Agricultural Fertilizers
- Organic Material Composting (District Rule 4566)
- Biosolids, Animal Manure, and Poultry Litter Operations (District Rule 4565)
- Major Sources of Ammonia

Confined Animal Facilities (District Rule 4570)

I. District Rule Description

District Rule 4570, was originally adopted on June 15, 2006 and was most recently amended on October 21, 2010. The purpose of this rule is to limit emissions of volatile organic compounds (VOC) from Confined Animal Facilities (CAF). District Rule 4570 applies to facilities where animals are corralled, penned, or otherwise caused to remain in restricted areas and primarily fed by a means other than grazing for at least 45 days in any twelve-month period. In addition to limiting VOC emissions, District Rule 4570 also includes measures that limit ammonia (NH3) emissions from these operations; the

required measures have reduced ammonia emissions by over 100 tpd[121] (this reduction is reflected in the emissions inventory data above). The analysis below focuses on how District Rule 4570 limits NH3 emissions in comparison to other rules and regulations.

A. Types of Confined Animal Facilities

Confined Animal Facilities are used for the raising of animals including, but not limited to, cattle, calves, chickens, ducks, goats, horses, sheep, swine, rabbits, and turkeys, which are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and fed by a means other than grazing. (CH&SC §39011.5 (a)(1)). The major categories of Confined Animal Facilities are listed below.

- Dairy Operations - Dairy operations are those operations producing milk or animals for facilities that produce milk.
- Poultry Operations - Poultry facilities operate either as layer ranches for egg production or as broiler ranches where birds are grown for the fresh meat market.
- Beef Cattle Feeding Operations – Beef cattle facilities are facilities that raise beef cattle (heifers and steers) for their meat.
- Swine Operations – These operations raise pigs for their meat. The production cycle for hogs has three (3) phases: farrowing (giving birth), nursing, and finishing.

B. Rule 4570 Applicability Thresholds

The thresholds for a facility to be classified as a large CAF in the Valley and the thresholds for a facility to be subject to District Rule 4570 are shown in the following table. The large CAF thresholds are based on the definition of a large CAF adopted by ARB as required by California Senate Bill (SB) 700. District Rule 4570 applies to confined animal facilities that have the capacity to house a number of animals equal to or exceeding the Rule 4570 regulatory thresholds, which are lower than the large CAF thresholds for certain facilities.

[121] Appendix F of the Staff Report for the June 2009 re-adoption of Rule 4570, starting on the 329th page of the pdf available here http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2009/June/Agenda%20Item_10_June_18_2009.pdf

Rule 4570 Thresholds for Regulation		
Livestock Category	SJVAPCD Large CAF Thresholds	Rule 4570 Regulatory Thresholds
Dairy	1,000 milking cows	500 milking cows
Beef Feedlots	3,500 beef cattle	3,500 beef cattle
Other Cattle Facility	7,500 calves, heifers, or other cattle	7,500 calves, heifers, or other cattle
Poultry Facilities		
Chicken	650,000 head	400,000 head
Duck	650,000 head	400,000 head
Turkey	100,000 head	100,000 head
Swine Facility	3,000 head	3,000 head
Horses Facility	3,000 head	3,000 head
Sheep and Goat Facilities	15,000 head of sheep, goats, or any combination of the two	15,000 head of sheep, goats, or any combination of the two
Any livestock facility not listed above	30,000 head	30,000 head

C. Emission Control Requirements of District Rule 4570

District Rule 4570 requires multiple mitigation measures from the following CAF categories: Dairy, Beef Feedlots, Other Cattle Facilities, Swine Facilities, Poultry facilities, and various other smaller operations. Each of these facilities consists of multiple sources of emissions within the facility. Since these facilities generally cover a large area and have different processes, a single mitigation measure or technology is generally not sufficient to control overall emissions from the facility. Mitigation measures required by Rule 4570 have been tailored for each source of emissions, thereby ensuring that the overall emissions from a facility are reduced. The current methodology in Rule 4570 allows for the greatest overall control from the entire facility.

District Rule 4570 recognized the following five emission sources for all of the CAFs: Feed, Housing, Solid Waste, Liquid Waste, and Land Application of Manure. Rule 4570 requires each CAF to implement a certain number of mitigation measures for each of these sources. District Rule 4570 also distinguishes between the different types of housing configurations (freestall vs open corrals) for cattle and, as such, requires specific mitigation measures for each type of housing. By requiring mitigation measure(s) for each source of emissions at a facility, District Rule 4570 ensures that reductions are achieved throughout the facility.

The following describes some of the mitigation measures and the ways in which these measures reduce ammonia emissions:

- Nutritional management: Ammonia emissions result from the decomposition of undigested nitrogen compounds in animal waste. Proper nutritional management, with diets formulated to feed proper amounts of protein, improves nitrogen utilization by the animal, reducing production of ammonia from animal waste.

- Increased cleaning and removal of manure and litter from animal housing areas: Because animal waste is the primary source of ammonia emissions, increased removal of waste from animal housing areas will reduce emissions by reducing the exposed area. Proper management of the waste will stabilize the nitrogen compounds in the waste, which will reduce the rate that these compounds are converted to ammonia that can be lost to the atmosphere. In addition, ammonia is highly soluble in water; therefore, when a flush system is used, ammonia emissions will be reduced because much of the ammonia will dissolve in the water rather than volatilize to the air.
- Incorporation of manure into fields: Incorporation of manure in fields reduces volatilization of gaseous pollutants by minimizing the amount of time that the manure is exposed to the atmosphere. Once the waste has been incorporated into the soil, VOCs and ammonia are absorbed onto soil particles, providing the opportunity for these soil microbes to oxidize these compounds into carbon dioxide, water, and nitrates.

One area to which some of these rules may apply is silage and silage-based total mixed ration (TMR) used as feed for cattle. Research has demonstrated that silage and TMR are one of the largest sources of VOC emissions at cattle facilities but are not significant sources of NH3 emissions, which primarily results from the animal waste at CAFs; therefore, the measures that specifically apply to management of silage and TMR will not be discussed in detail in this analysis.

II. How does District Rule 4570 compare with federal rules and regulations?

A. EPA-Control Technique Guidelines (CTG)

There is no EPA CTG guidance document for confined animal facilities.

B. EPA - Alternative Control Technology (ACT)

There is no EPA ACT guidance document for confined animal facilities.

C. Standards of Performance for New Stationary Sources (NSPS)

There is no NSPS guidance document for guidance document for confined animal facilities.

D. National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

There is no NESHAP guidance document for confined animal facilities.

III. How does District Rule 4570 compare to rules in other air districts?

As the largest agricultural area in California, the District took the lead in devising a list of mitigation measures for the various emission sources during the initial development of

District Rule 4570. This list of mitigation measures was essentially utilized, almost identically, by all air districts in their rules. However, during the last amendments to District Rule 4570, all of the mitigation measures were reevaluated in light of the latest available science. In comparison to the previous version of the rule, the current rule lowered threshold limits to bring in additional CAFs, requires additional mitigation measures, clarified previous mitigation measures, and added additional monitoring, testing, and recordkeeping to improve enforceability.

The following California air district rules were compared to District Rule 4570:

- SCAQMD Rule 223, adopted June 2, 2006
- SCAQMD Rule 1127, adopted August 6, 2004
- BAAQMD Regulation 2 Rule 10, adopted July 19, 2006
- VCAPCD Rule 23 (Exemptions), amended April 8, 2008
- SMAQMD Rule 496, adopted August, 24, 2006
- Imperial County APCD (ICAPCD) Rule 217 and Policy Number 38, adopted October 10, 2006
- Butte County AQMD (BCAQMD) Rule 450, adopted December 21, 2006

Idaho Administrative Procedure Act (IDAPA) 58.01.01 Sections 760-764 was also compared with District Rule 4570 and the analysis is shown below.

It is important to note that only District Rule 4570, SMAQMD Rule 496, and SCAQMD Rule 1127 are prohibitory rules. For this reason, these rules include detailed recordkeeping as well as monitoring and testing requirements. Generally, the level of detail in a prohibitory rule is absent from permits rules because the purpose of a permit rule is different from the purpose of a prohibitory rule.

A. SCAQMD Rule 223

Applicability/Exemption/Large CAF Definition

SCAQMD Rule 223 was adopted on June 2, 2006 and has not been amended.

SCAQMD Rule 223 applies to large CAFs as defined by ARB. District Rule 4570 defines large CAFs the same way except for large CAFs for horses. District Rule 4570 defines a large CAF for horses as having at least 3,000 head, whereas SCAQMD Rule 223 defines a large CAF for horses as having at least 2,500 head. There are currently no CAFs in the Valley with the capacity to house at least 2,500 horses and no CAFs for horses in the Valley are expected to exceed this threshold in the foreseeable future.

In addition to applying to large CAFs, District Rule 4570 lowers the applicability thresholds for the following CAFs:

- Dairies – from 1,000 milk cows to 500 milk cows
- Broilers/Ducks and Layers – from 650,000 birds to 400,000 birds

Therefore, Rule 4570 is more stringent regarding applicability.

Requirements for Dairy CAFs

Feed Mitigation Measures

District Rule 4570 has seven mitigation measures for feed and two mitigation measures for silage. Operators must implement four mandatory feed mitigation measures and chose another one from a list of three, for a total of five mitigation measures required for feed. In the SCAQMD rule, there are nine feed mitigation measures, from which the operator must implement five. Both rules require selection of five mitigation measures for feed, excluding silage, but four of the five feed mitigation measures are mandatory in District Rule 4570. Therefore, overall District Rule 4570 is more stringent.

Milk Parlor Mitigation Measures

The milk parlor mitigation measures for SCAQMD includes one Class One and one Class Two mitigation measure. District Rule 4570 contains the same mitigation measures included in the SCAQMD rule as Class One and has removed the Class Two mitigation measures due to infeasibility; see the Staff Report for the October 21, 2010 amendments to Rule 4570 for more detail. Therefore, both rules will be considered identical in this category.

Freestall Mitigation Measures

District Rule 4570 has five mitigation measures, two of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. SCAQMD Rule 223 has eight Class One mitigations measures, from which facilities are required to implement at least two. District Rule 4570 requires one additional mitigation measure; therefore, District Rule 4570 is more stringent.

SCAQMD Rule 223 has three Class One mitigation measures that require increased frequency in comparison to the corresponding District Rule 4570 measures: (*inspect water pipes and troughs and repair leaks; remove animal waste that is not dry from individual cow freestall beds; and rake, harrow, scrape, or grade bedding in freestalls*). The South Coast rule requires pipes and troughs to be inspected daily, and manure from freestall beds to be removed daily, whereas District Rule 4570 does not require inspection of pipes and troughs in freestall barns. In the Valley, the majority of freestall barns use flush systems for manure management and may also use misters or water sprays to keep animals cool; therefore, inspection of the pipes and troughs in the freestall barns was determined to be irrelevant since this is already a wet system. SCAQMD Rule 223 requires freestall beds to be raked/harrowed/graded at least twice every seven days, whereas District Rule 4570 requires this measure to be carried out once every 7 days for large dairies and once every 14 days for medium dairies.

Although, SCAQMD Rule 223 has a higher frequency for these measures, the emissions generated from these sources are not significant, including the reductions achieved from the overall dairy. In addition, the CAF stakeholders have questioned the cost effectiveness of a daily frequency.

Corral Mitigation Measures

District Rule 4570 has nine mitigation measures, six of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. SCAQMD Rule 223 has 14 Class One mitigation measures and two Class Two mitigation measures, from which facilities are required to choose at least six. District Rule 4570 requires one additional mitigation measure; therefore, District Rule 4570 is more stringent.

SCAQMD Rule 223 has one Class One mitigation measure (*inspect water pipes and troughs and repair leaks*) that require increased frequency in comparison to the corresponding District Rule 4570 measure. SCAQMD Rule 223 requires this measure to be carried out daily, whereas District Rule 4570 requires it to be carried out only once every seven days. Although, SCAQMD Rule 223 has a higher frequency for this measure, the difference in the emissions reductions from the two frequencies is not expected to be significant.

Solid Waste and Separated Solids Mitigation Measures

District Rule 4570 contains only two mitigation measures, from which operators are required to choose at least one. SCAQMD Rule 223 has three Class One mitigation measures and three Class Two mitigation measures, from which facilities are required to choose at least two.

Available studies have indicated that NH3 emissions from stored solid waste and separated solids pile to be a very small fraction of total NH3 emissions at dairies. Since the NH3 emissions from solid manure account for a very small fraction of emissions from the overall dairy, there would not be a significant increase in NH3 emission reductions if more measures are required from this category.

Liquid Waste Mitigation Measures

District Rule 4570 has four mitigation measures, from which operators are required to choose at least one. SCAQMD Rule 223 has five Class One mitigation measures and five Class Two mitigation measures, from which operators are required to choose at least one. Since only one measure is required by both rules, the rules are similar in stringency.

Manure Land Application Mitigation Measures

District Rule 4570 has two mitigation measures required out of six optional measures. SCAQMD Rule 223 has four mitigation measures, from which

facilities are required to choose at least two. All the mitigation measures are similar in stringency.

Requirements for Poultry CAFs

There is a large degree of variability in the manure management practices, housing techniques, and potential feeding practices for the different type of poultry operations in the Valley. Due to these differences, District Rule 4570 separates poultry CAFs into the following categories: 1) layers and 2) broilers, ducks, and turkeys.

Although on the surface the poultry requirements results in fewer mitigation measures compared to the other rules, the segregating of the types of poultry has allowed the mitigation measures to be tailored specifically to the type of poultry operation. In addition, all measures for poultry in District Rule 4570 are now mandated rather than left as options. Due to this reconfiguration and taking into consideration the latest science, the District Rule 4570 requirements for poultry are more stringent than SCAQMD Rule 223.

Requirements for Other CAF Categories

In addition to dairy and poultry CAF mitigation measures discussed above, District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle, and swine CAFs. SCAQMD Rule 223 does not address mitigation measures for these additional CAF categories. For these types of large CAFs, District Rule 4570 is more stringent.

Requirements – Suspension and Substitution of Mitigation Measures

Both rules allow the temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. In addition, both rules allow for substitution of one mitigation measure with an equivalent or more stringent one with the submission of the appropriate information. Therefore, the suspension and substitution requirements of both rules are equally stringent.

Conclusion – Comparison with South Coast AQMD Rule 223

Based on the analysis of the CAF categories in District Rule 4570 and SCAQMD Rule 223, it is clear that District Rule 4570 is more stringent than SCAQMD Rule 223. There are differences in the frequency with which some mitigation measures are to be implemented. However, as stated earlier, many of these sources are a small portion of a dairy's overall emissions. The amended version of District Rule requires facilities to choose more mitigation measures and makes several mitigation measures mandatory.

District Rule 4570 also provides mitigation for more CAF categories (beef feedlots, other cattle, and swine) that are not addressed by SCAQMD Rule 223, and also has much more detailed recordkeeping requirements to demonstrate implementation of selected mitigation measures. In addition, SCAQMD recently identified District Rule 4570 as the most stringent rule for this source category in their ozone Reasonably Available Control Technology (RACT) Demonstration.[122]

B. SCAQMD Rule 1127

Applicability/Exemption/Large CAF Definition

SCAQMD Rule 1127 was adopted on August 4, 2004 and has not been amended.

SCAQMD Rule 1127 applies to dairies with 50 or more cows, heifers, and/or calves. The rule applies to dairy farms and related operations such as heifer and calf farms and the manure produced on them. By comparison, District Rule 4570 applies to dairy CAFs with at least 500 milking cows, but applies to more than just manure-handling operations. Although the SCAQMD Rule has a lower applicability threshold, the overall control effectiveness of Rule 1127 when compared to District Rule 4570, is far less stringent.

Requirements for Dairy CAFs

Milking Parlor and Freestall Mitigation Measures

For the milking parlor, the District rule has one mandatory mitigation measure. District Rule 4570 has five mitigation measures for freestalls, two of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three to implement. SCAQMD Rule 1127 does not address these operations. Therefore, overall District Rule 4570 is more stringent than SCAQMD Rule 1127.

Corral Mitigation Measures

District Rule 4570 has nine mitigation measures, six of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. SCAQMD Rule 1127 has eight mitigation measures, from which facilities are required to choose at least six. The mitigation measures required by SCAQMD Rule 1127 specify the removal of manure from the corrals, the minimization of water in the corrals, and the cleaning schedule and cleaning strategy for the corrals. While the mitigation measures in the two rules are not

[122] South Coast Air Quality Management District (June 6, 2014). Reasonably Available Control Technology Demonstration. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2014/2014-jun6-031.pdf?sfvrsn=2

phrased the same way, they cover similar requirements. District Rule 4570 requires one additional measure; therefore, Rule 4570 is more stringent.

Solid Waste, Separated Solids, and Liquid Waste, and Manure Land Application Mitigation Measures

District Rule 4570 has two mitigation measures for solid waste/separated solids, from which operators are required to choose at least one. For liquid waste, District Rule 4570 has four mitigation measures for liquid waste, from which operators are required to choose at least one. District Rule 4570 has two mitigation measures for land application of manure required out of six optional measures. SCAQMD Rule 1127 states that manure removed must be either treated at an approved manure processing operation, or applied on agricultural land with local approval. SCAQMD Rule 1127 does not specify different mitigation measures for solid waste, separated solids, or liquid waste. District Rule 4570 has specific mitigation measures for each of these operations; therefore, it is able to better target the reduction of emissions from these the different operations. District Rule 4570 is therefore as stringent as or more stringent than SCAQMD Rule 1127.

Requirements for Other CAFs

District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle facilities, poultry facilities, and swine facilities. SCAQMD Rule 1127 does not address mitigation measures for these additional CAF categories. Therefore, District Rule 4570 is more stringent for this category.

Requirements – Suspension and Substitution of Mitigation Measures

SCAQMD Rule 1127 provides one exemption per year from one of the corral clearings required every 90 days if the moisture content in the corrals is greater than 50%. The operator is required to notify SCAQMD 30 days before the required cleaning, and test moisture content weekly. If moisture content is still above 50% when the cleaning is due, the operator may claim the exemption.

In comparison, District Rule 4570 allows an operator to temporarily suspend any mitigation measure as long as the suspension is recommended by a licensed veterinarian of animal nutritionist on the basis of animal health. The operator must notify the District within 48 hours prior to the suspension. If the suspension is expected to last longer than 30 days, then the operator must submit a new mitigation plan that identifies a new mitigation measure to be implemented in place of the suspended one.

District Rule 4570's exemption under this category is much more stringent because it is only a temporary suspension that cannot exceed 30 days, whereas SCAQMD Rule 1127's exemption may be permanent, without any requirement to substitute another measure.

Therefore, in this category of mitigation measure suspensions/substitutions, District Rule 4570 is more stringent than SCAQMD Rule 1127.

Testing, Monitoring, Recordkeeping Requirements

Both SCAQMD Rule 1127 and District Rule 4570 require monitoring, record keeping and source testing as appropriate and sufficient to provide evidence of each mitigation measure being implemented.

In addition to recordkeeping, Rule 1127 requires an annual report of manure being shipped out from the dairy. No annual reporting is required by Rule 4570. Rule 1127 requires records be retained for 3 years for minor sources and 5 years for major sources, whereas Rule 4570 requires records be retained for five years for all sources.

Overall, the monitoring, testing and recordkeeping requirements are similar for both rules.

Conclusion – Comparison with SCAQMD Rule 1127

For dairy CAFs, District Rule 4570 is more stringent than SCAQMD Rule 1127. District Rule 4570 requires emission reductions from additional emission categories - milk parlors, freestall barns, and liquid manure - that are not addressed by SCAQMD Rule 1127 as well as requiring emission reductions from CAFs from other animal species. As mentioned above, the current version of District Rule 4570 requires facilities to choose more mitigation measures and makes several mitigation measures mandatory. District Rule 4570 also provides specific mitigation measures for beef cattle feedlots, other cattle, poultry, and swine CAFs, while SCAQMD Rule 1127 does not. District Rule 4570 is therefore more stringent than SCAQMD Rule 1127.

C. BAAQMD Regulation 2 Rule 10 (Rule 2-10)

BAAQMD Rule 2-10 is a permit rule. As such, it has fewer specifics about large CAFs than District Rule 4570, which is a prohibitory rule.

Applicability/Exemption/Large CAF Definition

BAAQMD Rule 2-10 was adopted on July 19, 2006 and has not been amended.

BAAQMD Rule 2-10 applies to large CAFs as defined by ARB. District Rule 4570 defines large CAFs the same way except for large CAFs for horses. District Rule 4570 defines a large CAF for horses as having at least 3,000 head, whereas BAAQMD Rule 2-10 defines a large CAF for horses as having at least 2,500 head. There are currently no CAFs in the Valley with the capacity to house at least 2,500 horses and no CAFs for horses in the Valley are expected to exceed this threshold in the foreseeable future.

In addition to applying to large CAFs, District Rule 4570 lowers the applicability thresholds for the following CAFs:

- Dairies – from 1,000 milk cows to 500 milk cows
- Broilers/Ducks and Layers – from 650,000 birds to 400,000 birds

Therefore, Rule 4570 is more stringent regarding applicability.

Requirements for CAFs

The BAAQMD permit conditions must implement control measures that represent Reasonably Available Control Technology (RACT) to reduce emissions of VOC, NOx and PM from the facility. BAAQMD Rule 2-10 requires RACT mitigation measures rather than the more stringent BARCT controls required by District Rule 4570 as specifically noted in the BAAQMD staff report for their rule. District staff previously contacted BAAQMD staff and verified that there is no list of RACT mitigation measures in place should a large CAF apply for a permit. In this respect, District Rule 4570 is more stringent than BAAQMD Rule 2-10.

Testing, Monitoring, Recordkeeping Requirements

District Rule 4570 requires records to be maintained and retained for at least five years, whereas BAAQMD Rule 2-10 requires records to be retained for three years. District Rule 4570 therefore has a more stringent record retention requirement.

District Rule 4570 requires facilities not subject to the mitigation measure requirements to maintain sufficient records to demonstrate their exemption status. Facilities subject to the mitigation measure requirements must maintain sufficient records to demonstrate implementation of each mitigation measure selected. Facilities must also maintain animal population records. BAAQMD Rule 2-10 requires the maintenance of animal population records but does not require specific records needed to demonstrate implementation of each mitigation measure selected. District Rule 4570 is therefore more stringent in the type of records that must be maintained.

Conclusion – Comparison with Bay Area AQMD Regulation 2 Rule 10

District Rule 4570 requires facilities to choose specific mitigation measures and makes several mitigation measures mandatory. In addition, District Rule 4570 has lower applicability thresholds for dairies, chickens, and ducks. Based on this information and the discussion above, District Rule 4570 is far more stringent than BAAQMD Rule 2-10.

D. VCAPCD Rule 23 – Exemptions from Permit

In response to California Senate Bill (SB) 700, VCAPCD revised its "Exemptions from Permit" rule to remove an exemption for agricultural operations, including CAFs. VCAPCD does not have a specific rule for CAFs. In its staff report for the rule revision, VCAPCD staff noted that no facilities in their jurisdiction would meet the "large CAF" definition and there was no expectation that a large CAF would move into the area in the foreseeable future; therefore, no separate CAF rule was necessary.

Applicability/Exemption/Large CAF Definition

VCAPCD Rule 23 adopted ARB's definition of large CAFs. District Rule 4570 defines large CAFs the same way except for large CAFs for horses. District Rule 4570 defines a large CAF for horses as having at least 3,000 head, whereas VCAPCD Rule 23 defines a large CAF for horses as having at least 2,500 head. There are currently no CAFs in the Valley with the capacity to house at least 2,500 horses and no CAFs for horses in the Valley are expected to exceed this threshold in the foreseeable future.

In addition to applying to large CAFs, District Rule 4570 lowers the applicability thresholds for the following CAFs:

- Dairies – from 1,000 milk cows to 500 milk cows
- Broilers/Ducks and Layers – from 650,000 birds to 400,000 birds

Therefore, Rule 4570 is more stringent regarding applicability.

Requirements for CAFs

There are no facilities that would trigger the large CAF threshold within Ventura County, as stated in the VCAPCD staff report for amending Rule 23. The VCAPCD New Source Review Rule does not list mitigation measures for large CAFs. Instead, BACT would be triggered by a new CAF that met the "large CAF" definition or BACT would be triggered if an existing CAF expanded operations enough to meet the "large CAF" definition. At that point, VCAPCD staff would determine BACT for the CAF.

Conclusion – VCAPCD Rule 23

VCAPCD does not have a specific rule for CAFs; therefore, District Rule 4570 is more stringent.

E. SMAQMD Rule 496

Like District Rule 4570, SMAQMD Rule 496 is a prohibitory rule, meaning that there are detailed requirements for operators.

Applicability/Exemption/Large CAF Definition

SMAQMD Rule 496 was adopted on August 24, 2006 and has not been amended.

SMAQMD Rule 496 applies to large CAFs as defined by ARB. District Rule 4570 defines large CAFs the same way except for large CAFs for horses. District Rule 4570 defines a large CAF for horses as having at least 3,000 head, whereas SMAQMD Rule 496 defines a large CAF for horses as having at least 2,500 head. There are currently no CAFs in the Valley with the capacity to house at least 2,500 horses and no CAFs for horses in the Valley are expected to exceed this threshold in the foreseeable future.

In addition to applying to large CAFs, District Rule 4570 lowers the applicability thresholds for the following CAFs:

- Dairies - 1,000 milk cows to 500 milk cows
- Broilers/ducks and Layers – 650,000 – 400,000

Therefore, Rule 4570 is more stringent regarding applicability.

Requirements for Dairy CAFs

Feed Mitigation Measures

District Rule 4570 has seven mitigation measures for feed and two mitigation measures for silage. Operators must implement four mandatory feed mitigation measures and chose another one from a list of three, for a total of five mitigation measures required for feed.

SMAQMD Rule 496 has seven Class One mitigation measures for feed and two Class One mitigation measures for silage. Operators must implement four feed mitigation measures and one silage mitigation measure.

District Rule 4570 requires a total of five feed mitigation measures, excluding silage, which is greater than the four feed mitigation measures required by SMAQMD Rule 496. In addition, four of the five feed mitigation measures are mandatory in District Rule 4570. Therefore, District Rule 4570 is more stringent.

Milk Parlor Mitigation Measures

District Rule 4570 has one required milk parlor mitigation measure. SMAQMD Rule 496 also only requires one mitigation measure for milk parlors. Since both rules only require the use of one mitigation measure, both rules will be considered identical for this category.

Freestall Mitigation Measures

District Rule 4570 has five freestall mitigation measures, two of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. SMAQMD Rule 496 has eight Class One mitigations measures and one Class Two mitigation measure from which facilities are required to implement at least two.

Rule 4570 is more stringent since it requires more mitigation measures.

Corral Mitigation Measures

District Rule 4570 has nine corral mitigation measures, six of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. SMAQMD Rule 496 has 15 Class One mitigation measures, which are all optional, and three Class Two mitigation measures, from which facilities are required to choose at least six. District Rule 4570 requires one additional mitigation measure; therefore in this respect District Rule 4570 is more stringent.

SMAQMD Rule 496 has one Class One mitigation measure (*inspect water pipes and troughs and repair leaks*) that requires increased frequency in comparison to the corresponding District Rule 4570 measure. SMAQMD Rule 496 requires this measure to be carried out daily, whereas District Rule 4570 requires it to be carried out only once every seven days. Although, SMAQMD Rule 496 has a higher frequency for this measure, the difference in the emissions reductions from the two frequencies is not expected to be significant. Overall, District Rule 4570 is more stringent.

Solid Waste and Separated Solids Mitigation Measures

District Rule 4570 contains only two mitigation measures, from which operators are required to choose at least one. SMAQMD Rule 496 has five Class One mitigation measures and three Class Two mitigation measures, from which facilities are required to choose at least two.

Available studies have indicated that NH3 emissions from stored solid waste and separated solids pile to be a very small fraction of total NH3 emissions at dairies. Since the NH3 emissions from solid manure account for a very small fraction of emissions from the overall dairy, there would not be a significant increase in NH3 emission reductions if more measures are required from this category.

Liquid Waste Mitigation Measures

District Rule 4570 has four mitigation measures mitigation measures, from which operators are required to choose at least one. SMAQMD Rule 496 has four Class One mitigation measures and four Class Two mitigation measures, from

which facilities are required to choose at least one. Since only one measure is required, both rules are equivalent in this respect.

Manure Land Application Mitigation Measures

District Rule 4570 has two mitigation measures required out of six measures. SMAQMD Rule 496 has six Class One mitigation measures, from which facilities are required to choose at least two. Since two mitigation measures are required, both rules are equivalent in this respect.

Requirements for Poultry Large CAFs

There is a large degree of variability in the manure management practices, housing techniques, and potential feeding practices for the different type of poultry operations in the Valley. Due to these differences, District Rule 4570 separates poultry CAFs into the following categories: 1) layers and 2) broilers, ducks, and turkeys.

Although on the surface the poultry requirements results in fewer mitigation measures compared to the other rules, the segregating of the types of poultry has allowed the mitigation measures to be tailored specifically to the type of poultry operation. In addition, all measures for poultry in District Rule 4570 are now mandated rather than left as options. Due to this reconfiguration and taking into consideration the latest science, District Rule 4570 requirements for poultry are more stringent than SMAQMD Rule 496.

Other CAFs

In addition to dairy and poultry CAF mitigation measures discussed above, District Rule 4570 provides specific mitigation measure option tables for beef cattle feedlots, other cattle facilities, and swine facilities. SMAQMD Rule 496 does not address mitigation measures for these additional CAF categories. For these types of large CAFs, District Rule 4570 is more stringent.

Requirements – Suspension and Substitution of Mitigation Measures

Both rules allow for substitution of one mitigation measure with an equivalent or more stringent measure with the submission of the appropriate application. District Rule 4570 also allows the temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. SMAQMD Rule 496 does not have a specific provision for temporary suspension of mitigation measures. As discussed above, District Rule 4570 is as stringent as SMAQMD Rule 496.

Testing, Monitoring, Recordkeeping Requirements

The testing, monitoring, and recordkeeping provisions of District Rule 4570 and SMAQMD Rule 496 are nearly identical and are of equal stringency.

Conclusion – Comparison with Sac Metro AQMD Rule 496

For dairy CAFs, District Rule 4570 is more stringent than SMAQMD Rule 496. District Rule 4570 requires emission reductions from four additional emission categories - milk parlors, feed, freestall barns, and liquid manure - that are not addressed by SMAQMD Rule 496 as well as having specific requirements for other types of CAFs. District Rule 4570 also requires facilities to choose more mitigation measures and mandates several mitigation measures. In addition, Rule 4570 applies to dairies with greater than 500 milk cows and 400,000 layers and broilers while SMAQMD Rule 496 applies to dairies with 1,000 milk cows or more and broiler and layer operations with more than 650,000 birds. As shown in the discussion above, District Rule 4570 is more stringent than SMAQMD Rule 496.

F. ICAPCD Rule 217 – Large Confined Animal Facilities Permits Required and ICAPCD Policy Number 38 – Recommended Mitigation Measures for Large Confined Animal Facilities

ICAPCD Rule 217 is a permits rule. ICAPCD Rule 217 requires that owners or operators of large CAFs submit an emissions mitigation plan that demonstrates that the facility will use RACT to reduce emissions of pollutants that contribute to the non-attainment of any ambient air quality standard and are within the ICAPCD's regulatory authority.

ICAPCD Rule 217 requires operators of large CAFs to implement the control measures identified in their emissions mitigation plan, which may be selected from the ICAPCD Policy Number 38, Recommended Mitigation Measures for Large Confined Animal Facilities. ICAPCD Policy Number 38 specifies the number of mitigation measures the operator should implement for each operation within the CAF. The following discussion compares the recommended mitigation measures in ICAPCD Policy Number 38 to the measures in District Rule 4570. However, since the mitigation measures in ICAPCD Policy Number 38 are only recommended by ICAPCD Rule 217 rather than being explicitly required, it is clear that District Rule 4570 is more stringent.

Applicability/Exemption/Large CAF Definition

ICAPCD Rule 217 was adopted on October 10, 2006 and has since not been amended.

ICAPCD adopted ARB's definition of large CAF. District Rule 4570 defines large CAFs the same way except for large CAFs for horses. District Rule 4570 defines

a large CAF for horses as having at least 3,000 head, whereas ICAPCD Rule 217 defines a large CAF for horses as having at least 2,500 head. There are currently no CAFs in the Valley with the capacity to house at least 2,500 horses and no CAFs for horses in the Valley are expected to exceed this threshold in the foreseeable future.

In addition to applying to large CAFs, District Rule 4570 lowers the applicability thresholds for the following CAFs:

- Dairies – from 1,000 milk cows to 500 milk cows
- Broilers/Ducks and Layers – from 650,000 birds to 400,000 birds

ICAPCD Policy Number 38 only lists mitigation measures for dairy operations and beef feedlot operations while District Rule 4570 covers additional CAFs (swine, chicken layer, chicken broiler, duck and turkey, and other CAFs). Therefore, more CAFs are subject to the requirements of District Rule 4570 than ICAPCD Rule 217 and Policy Number 38.

Therefore, Rule 4570 is more stringent regarding applicability.

Requirements for Dairy CAFs

Milk Parlor Mitigation Measures

ICAPCD Policy Number 38 has only one mitigation measure for the milk parlor. The District rule also only has one mitigation measure. Since the mitigation measure is identical, both rules are identical under this section.

Freestall Mitigation Measures

District Rule 4570 has five freestall mitigation measures, two of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. ICAPCD Policy Number 38 has eight mitigation measures, from which operators are required to choose at least two. Since District Rule 4570, requires three mitigation measures and mandates two out of the three, District Rule 4570 is more stringent than ICAPCD Policy Number 38.

Corral Mitigation Measures

District Rule 4570 has nine mitigation measures, six of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. ICAPCD Policy Number 38 has eight mitigation measures, from which facilities are required to choose at least four.

For three of the mitigation measures, the compliance times differ between the District rule and ICAPCD Policy Number 38. For these measures, ICAPCD Policy Number 38 allows longer time periods between repeated performance of

the measures than District Rule 4570. For these three mitigation measures, District Rule 4570 is more stringent because District Rule 4570 requires repeated performance of the otherwise identical mitigation measures in shorter time periods.

For two of the mitigation measures, the maximum depth of manure differs significantly between the District Rule 4570 and ICAPCD Policy Number 38. For these measures, ICAPCD Policy Number 38 allows manure depths that are deeper than allowed by District Rule 4570. For these two mitigation measures, District Rule 4570 rule is more stringent because the District Rule 4570 requires shallower manure depths for otherwise identical mitigation measures.

Therefore, District Rule 4570 is far more stringent than the ICAPCD Policy Number 38.

Solid Waste and Separated Solids Mitigation Measures

District Rule 4570 has two solid waste and separated solids mitigation measures, from which operators are required to choose at least one. ICAPCD Policy Number 38 has four mitigation measures from which facilities are required to choose at least one. Therefore, both rules are identical in this category.

There are a few differences in ICAPCD Policy Number 38 mitigation measures when compared to District Rule 4570. ICAPCD Policy Number 38 policy requires that manure piles are covered year round whereas District Rule 4570 requires that the piles be covered from October through May – the months in the Valley in which rainfall is most likely. However, because of the greater depth of manure allowed in corrals and increased duration (up to two years) for removal of manure from the corrals allowed by ICAPCD Policy Number 38, CAFs in the ICAPCD are able to allow manure to accumulate in the corrals until it can be hauled offsite. Few, if any, CAFs in the ICAPCD are expected to actually store manure onsite outside of corrals, so it is likely that no facilities in ICAPCD are actually choosing and implementing this measure. Separated solids piles are not specifically addressed in ICAPCD Policy Number 38. Overall District Rule 4570 is as stringent as ICAPCD Policy Number 38.

Liquid Waste Mitigation Measures

District Rule 4570 has four liquid waste mitigation measures, from which operators are required to choose at least one. ICAPCD Policy Number 38 has four mitigation measures, from which operators are required to choose at least one. ICAPCD Policy Number 38 contains an option to manage the facility so that lagoons only contain waste from milking parlor and storm water as a mitigation measure. District Rule 4570 does not contain this option. This difference, although worth noting, is not expected to influence the overall effectiveness of District Rule 4570; District Rule 4570 is as stringent as ICAPCD Policy Number 38.

Manure Land Application Mitigation Measures

District Rule 4570 has two mitigation measures that are mandatory if applicable. ICAPCD policy has a menu of five mitigation measures from which operators are required to choose two. Since two measures are required by both ICAPCD Policy Number 38 and District Rule 4570, they will be considered identical under this category.

Requirements for Beef Feedlot CAFs

Animal Housing Mitigation Measures

District Rule 4570 has nine mitigation measures, six of which are mandatory. The facility is also required to choose one additional mitigation measure from the remaining three. ICAPCD Policy Number 38 has nine mitigation measures, from which facilities are required to choose at least four. Since operators in Imperial County are required to implement fewer mitigation measures, District Rule 4570 is more stringent.

For three of the mitigation measures, the compliance times differ between the District rule and ICAPCD Policy Number 38. For these measures, ICAPCD Policy Number 38 allows longer time periods between repeated performances of the measures than District Rule 4570. For these three mitigation measures, the District rule is more stringent because the District Rule 4570 requires repeated performance of the otherwise identical mitigation measures in shorter time periods.

For two of the mitigation measures, the maximum depth of manure differs significantly between the District Rule 4570 and ICAPCD Policy Number 38. For these measures, ICAPCD Policy Number 38 allows manure depths that are deeper than allowed by District Rule 4570. For these two mitigation measures, District Rule 4570 rule is more stringent because the District Rule 4570 requires shallower manure depths for otherwise identical mitigation measures.

Solid Waste and Separated Solids Mitigation Measures

District Rule 4570 has two solid waste and separated solids mitigation measures, from which operators are required to choose at least one. ICAPCD Policy Number 38 has four mitigation measures from which facilities are required to choose at least one. Therefore, both rules are identical in this category.

ICAPCD Policy Number 38 policy requires that manure piles are covered year round whereas District Rule 4570 requires that the piles be covered from October through May – the months in the Valley in which rainfall is most likely. However, because of the greater depth of manure allowed in corrals and increased duration (up to two years) for removal of manure from the corrals allowed by ICAPCD Policy Number 38, CAFs in the ICAPCD are able to allow manure to

accumulate in the corrals until it can be hauled offsite. Few, if any, CAFs in the ICAPCD are expected to actually store manure onsite outside of corrals, so it is likely than no facilities in ICAPCD are actually choosing and implementing this measure. Overall District Rule 4570 is as stringent as ICAPCD Policy Number 38.

Liquid Manure Handling

ICAPCD Policy Number 38 does not address liquid manure handling for beef feedlot operations. This is likely because beef feedlot facilities in ICAPCD do not generally use liquid manure management systems. District Rule 4570 requires one measure to be selected out of a menu of options, if applicable. Therefore, Rule 4570 is more stringent in this category.

Manure Land Application Mitigation Measures

District Rule 4570 has two mitigation measures that are mandatory if applicable. ICAPCD Policy Number 38 has a menu of five mitigation measures from which operators are required to choose two. Since two measures are required by both ICAPCD Policy Number 38 and District Rule 4570, they will be considered identical under this category.

Requirements for Other CAFs

In the same manner as for dairy and beef feedlot operations, District Rule 4570 specifies mitigation methods for confined animal facilities other than dairies and beef feedlots. ICAPCD Policy Number 38 only has mitigation measures for dairy and beef feedlot operations. In comparing the two documents, District Rule 4570 is therefore more comprehensive and stringent.

Requirements – Suspension and Substitution of Mitigation Measures

District Rule 4570 and ICAPCD Policy Number 38 allow for substitution of one mitigation measure with an equivalent or more stringent one with the submission of the appropriate application. District Rule 4570 also allows the temporary suspension of a mitigation measure upon the determination by a certified veterinarian or nutritionist that such a suspension is necessary for animal health purposes. The District must be notified within 48 hours, and a new measure must be implemented if the suspension is expected to last longer than 30 days. ICAPCD Policy Number 38 allows for temporary suspension of mitigation measures under circumstances similar to District Rule 4570. Based on the discussion, Rule 4570 is as stringent as ICAPCD Policy Number 38.

Testing, Monitoring, Recordkeeping Requirements

District Rule 4570 requires records to be maintained and retained for at least five years, whereas ICAPCD Rule 217 requires records to be retained for two years. District Rule 4570 therefore has a more stringent record retention requirement.

District Rule 4570 requires facilities not subject to the mitigation measure requirements to maintain sufficient records to demonstrate their exemption status. Facilities subject to the mitigation measure requirements must maintain sufficient records to demonstrate implementation of each mitigation measure selected. Facilities must also maintain animal population records. ICAPCD Rule 217 requires the maintenance of animal population records but does not require specific records needed to demonstrate implementation of each mitigation measure selected. District Rule 4570 is therefore more stringent in the type of records required to be maintained.

Conclusion- Comparison with ICAPCD Rule 217 and ICAPCD Policy Number 38

ICAPCD Rule 217 requires operators of large CAFs to implement the control measures identified in their emissions mitigation plan, which may be selected from the ICAPCD Policy Number 38, Recommended Mitigation Measures for Large Confined Animal Facilities; however, compliance with ICAPCD Policy Number 38 is not explicitly required by the rule. District Rule 4570 contains several mandatory mitigation measures, unlike the optional nature of the mitigation measures in ICAPCD Rule 217. District Rule 4570 also has a lower applicability threshold for dairies (500 milk cows). In addition, ICAPCD Policy Number 38 only lists mitigation measures for dairy operations and beef feedlot operations while District Rule 4570 covers additional CAFs (swine, chicken layer, chicken broiler, duck and turkey, and other CAFs). As shown the discussion above, District Rule 4570 is far more stringent than ICAPCD Rule 217 and ICAPCD Policy Number 38.

G. BCAQMD Rule 450 – Large Confined Animal Facilities

BCAQMD Rule 450 is a permits rule. It outlines, in general terms, the requirements for a complete permit application and how the staff would evaluate and approve/disapprove the permit application.

Applicability/Exemption/Large CAF Definition

BCAQMD Rule 450 was adopted on December 21, 2006 and has since not been amended.

BCAQMD adopted ARB's definition of large CAF. District Rule 4570 defines large CAFs the same way except for large CAFs for horses. District Rule 4570 defines a large CAF for horses as having at least 3,000 head, whereas BCAQMD Rule 450 defines a large CAF for horses as having at least 2,500 head. There

are currently no CAFs in the Valley with the capacity to house at least 2,500 horses and no CAFs for horses in the Valley are expected to exceed this threshold in the foreseeable future.

In addition to applying to large CAFs, District Rule 4570 lowers the applicability thresholds for the following CAFs:

- Dairies – from 1,000 milk cows to 500 milk cows
- Broilers/Ducks and Layers – from 650,000 birds to 400,000 birds

Therefore, Rule 4570 is more stringent regarding applicability.

CAF Requirements

BCAQMD Rule 450 requires large CAFs to obtain a permit and to submit and implement a mitigation plan; however, the rule does not list mitigation measures or specify the number of mitigation measures required. District Rule 4570 has a menu of specific mitigation measures and stipulates the number of mitigation measures an operator is required to implement. In this regard, District Rule 4570 is more stringent than BCAQMD Rule 450.

Testing, Records, and Reporting Requirements

BCAQMD Rule 450 requires that all CAFs record the daily number of animals on-site. These records are to be kept on-site for two years and presented if requested. District Rule 4570 requires testing and records be kept to demonstrate compliance with the operator's selected mitigation measures. The records are to be kept for five years and presented upon the request of EPA or the District. Because District Rule 4570 covers testing, as well as having a longer record retention time, it is more stringent than BCAQMD Rule 450.

Conclusion – Comparison with Butte County AQMD Rule 450

District Rule 4570 contains specifies the actual mitigation measures that facilities are required to implement. In addition, District Rule 4570 has lower applicability thresholds for dairies, chicken facilities, and duck facilities. As shown in the discussion above, District Rule 4570 is more stringent than BCAQMD Rule 450.

H. IDAPA 58.01.01 Sections 760-764: Rules for the Control of Ammonia from Dairy Farms

Applicability/Exemption

IDAPA 58.01.01 Sections 760-763 was adopted on March 30, 2007 and IDAPA 58.01.01 Subsection 764.02: Table – Ammonia Control Practices for Idaho Dairies was last amended on May 8, 2009.

Pursuant to IDAPA 58.01.01 Section 761, Sections 760-764 apply to dairies of the following sizes. The thresholds are based on estimating the number of cattle required to produce 100 tons of ammonia emissions annually. Different thresholds are given for drylot dairies, dairies with scraped freestalls, and dairies with flushed freestalls. The thresholds are given on the basis of Animal Units (AU) (1,000 lbs of live weight) and on a mature cow equivalent basis (1,400 lbs of live weight).

SUMMARY: Animal Unit (AU) or mature cow threshold to produce 100 tons NH3/year

Animal Unit (AU) Basis	Drylot	Free Stall/Scrape	Free Stall/Flush
	AU (100 t NH3) Threshold		
No land app	7,089	3,893	2,293
27% volatilization[1]	6,842	3,827	
80% volatilization[2]	6,397	3,700	
	Total Cows (100 t NH3) Threshold		
Cow Basis (1,400 lb)	**Drylot**	**Free Stall/Scrape**	**Free Stall/Flush**
No land app	5,063	2,781	1,638
27% volatilization[1]	4,887	2,733	
80% volatilization[2]	4,589	2,643	
No land app	5,063	2,781	

1 Assumes expected level of N->NH3 volatilization for drop-hose or ground level liquid manure application.
2 Assumes expected level of N->NH3 volatilization for center pivot or other conventional sprinkler irrigation liquid manure application

The smallest dairy to which IDAPA 58.01.01 Sections 760-764 applies would have the equivalent of at least 1,638 mature cows in flushed freestalls and a larger number of animals in scraped freestalls or corrals. In comparison, District Rule 4570 applies to dairy CAFs with at least 500 milking cows (at least 700 AU or 500 mature cows). In addition, District Rule 4570 applies to other types of confined animal facilities, including beef cattle feedlots, other cattle facilities, poultry facilities, and swine facilities. Therefore, District Rule 4570 is more stringent regarding applicability.

Requirements for Dairies

Each dairy farm subject to IDAPA 58.01.01 Sections 760 - 764 must employ Best Management Practices (BMPs) for the control of ammonia. The BMPs are applied to the following systems at a dairy: Waste Storage and Treatment Systems, General Practices, Freestall Barns, Open Lots and Corrals, Animal Nutrition, Composting Practices, and Land Application. A total of twenty-seven (27) points must be achieved for the BMPs employed. The table located in Subsection 764.02 lists the approved BMPs and their associated point values. During development of the regulation, a point system with a maximum of 20 points was assigned to each practice. A practice receiving 20 points equates to

a system or practice that is considered to result in major reduction in ammonia emissions for that specific process. However, according to the supporting documentation, this point system is "arbitrary".[123] Therefore, there is no direct correlation from the points required and the amount of emission reductions achieved. In fact, due to the flexibility allowed in this rule, even if all points have been met by the rule and depending on which mitigation measures are selected, the overall ammonia emission reductions may not be substantial. The Idaho Department of Environmental Quality (IDEQ) may also determine a practice not listed in the table constitutes a BMP and assign a point value. Points may also be obtained through third party export with sufficient documentation.

The paper Commentary *Ammonia-Based Air Quality Permits for Idaho Dairies*[124] indicated that, "Solid separation of manure, corral harrowing, low-pressure irrigation, composting, and rapid manure removal from outdoor lots were found to be the most common BMPs."

Solids Separation

In the Idaho regulation, solids separation refers to "gravity or mechanical separation system to remove manure solids from liquid waste stream." This practice has been implemented by almost all dairies in the Valley subject to District Rule 4570 to comply with the liquid manure mitigation measure requirements of District Rule 4570.

Corral Harrowing/Cleaning

In the Idaho regulation corral harrowing refers to harrowing to distribute deposited manure, reshaping corral surface, and/or removing manure from corral surface and rapid manure removal from outdoor lots refers to the removal of winter time manure and corral bedding from an open lot surface in spring or as quickly as practicable. District Rule 4570 has much more stringent requirements for corral cleaning and maintenance at dairies. For corrals, District Rule 4570 requires dairies to implement the following measures: a) Cleaning manure from corrals at least four times per year with at least 60 days between cleaning, or b) Cleaning corrals at least once between April and July and at least once between September and December; a) Scraping, vacuuming, or flushing concrete lanes in corrals at least once every day for mature cows and every seven days for support stock, or b) Cleaning concrete lanes such that the depth of manure does not exceed twelve inches at any point or time; inspection of water pipes and troughs and repairing leaks at least once every seven days; and a) Sloping the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less and Sloping the surface of the corrals at least 1.5%

[123] Idaho Department of Environmental Quality (2006). Scientific Basis for the Control of Ammonia from Dairy Farms Best Management Practices 7/18/2006 by Ron E. Sheffield, Waste Management Engineer, University of Idaho and Bruce Louks, Air Quality Division, Idaho Department of Environmental Quality. http://www.deq.idaho.gov/media/635665-58_0101_0502_scientific_basis_final.pdf

[124] Sheffield, R. E. and Louks, B. (2008). COMMENTARY: Ammonia-Based Air Quality Permits for Idaho Dairies. Environmental Practice, 10, pp 13-19. doi:10.1017/S1466046608080046. http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=1888928

where the available space for each animal is more than 400 square feet per animal, b) Maintaining corrals to ensure proper drainage preventing water from standing more than forty-eight (48) hours, or c) Harrowing, raking, or scraping corrals sufficiently to maintain a dry surface. In addition, District Rule 4570 requires dairies to choose an additional corral mitigation measure, requiring corrals to be managed such that the manure depth in the corral does not exceed twelve inches at any time or point, except for in-corral mounding. Therefore, the corral cleaning and maintenance requirements of District Rule 4570 are far more stringent than IDAPA 58.01.01 Sections 760 – 764.

Previous emission studies conducted in the Valley have demonstrated that the corrals and pens are the sources with the greatest potential for NH3 emissions in Valley dairies[125] and, therefore, the much more stringent corral cleaning and maintenance measures required by District Rule 4570 have the potential for far greater NH3 reductions.

Liquid Manure Application

In the Idaho regulation, Low Energy/Pressure Application Systems refers to use of center pivot and liner-move irrigation strategy that applies liquids at low pressures using drop nozzles. The guidance for the regulation states that larger droplets result in lower emissions but may cause infiltration problems on some soils. The use of center pivot and liner-move irrigation to apply liquid manure is very uncommon in the Valley and may be prohibited in the use permits for many dairies. In the Valley it is much more common to apply liquid manure to cropland through flood or furrow irrigation after it has been diluted with fresh irrigation water as generally required by either the Water Quality Board or the local County and as a means to avoid damage to growing crops. Because of the reduced surface area, flood and furrow irrigation have even lower emissions than low pressure sprinkler irrigation systems. Dilution of the liquid manure with fresh irrigation water further reduces NH3 emissions and is also listed as a BMP in the Idaho regulation. Therefore, the liquid manure practices utilized in the Valley are more stringent than the Idaho regulation.

Composting

In the Idaho regulation "composting" refers to stacking and drying of separated manure solids or corral manure. Almost all dairies in the Valley utilize this practice to prepare solid manure and/or separated solids for bedding and/or for use on cropland. In addition, District Rule 4570 requires that dairies implement one of the following measures for solid manure or separated solids: 1) within 72 hours of removal from housing, either: a) Remove dry manure from the facility, or b) Cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering,

[125] See: Schmidt, C. and Card, T. (2006) Dairy Air Emissions Report: Summary of Dairy Emission Estimation Procedures (May 2006). Final Report to California Air Resource Board (ARB).
http://www.arb.ca.gov/ag/caf/SchmidtDairyEmissions2005.pdf
http://www.arb.ca.gov/ag/caf/SchmidtDairyTestData2005.pdf

not to exceed 24 hours per event; or 2) Within seventy-two hours of removal from the drying process, either: a) Remove separated solids from the facility, or b) Cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event. Therefore, the general management practices conducted on dairies in the Valley and the requirements of District Rule 4570 are far more stringent than the Idaho regulation.

For dairy corrals, which are the largest source of NH3 emissions at dairies in the Valley, District Rule 4570 requires more stringent mitigation measures and a greater number of these measures. District Rule 4570 is also more specific in regards to mitigation measures required from other processes at dairies and the number of mitigation measures that must be implemented for each process; as a result, District Rule 4570 is able to better target the reduction of emissions from these different operations. Therefore, District Rule 4570 is more stringent than IDAPA 58.01.01 Sections 760- 764.

Requirements for Other Confined Animal Facilities

As stated above, District Rule 4570 provides specific mitigation measures for beef cattle feedlots, other cattle facilities, poultry facilities, and swine facilities. IDAPA 58.01.01 Sections 760-764 does not address mitigation measures for these additional categories. Therefore, District Rule 4570 is more stringent for this category.

Requirements – Suspension and Substitution of Mitigation Measures

IDAPA 58.01.01 Subsection 762.03 provides that if a dairy farm not subject to Sections 760-764 becomes subject to these regulations as a result of an emergency (for example if a dairy farmer takes additional cows due to unforeseen circumstances), the dairy farm must notify the IDEQ in writing within 14 days explaining the emergency circumstances. The dairy farm would be exempt from these requirements for up to one year as long as the consequences of the emergency continue. In the event of unforeseen equipment upsets and breakdowns, so long as corrective action is taken within a reasonable time, the event does not reduce the BMP point value.

In comparison, District Rule 4570 allows an operator to temporarily suspend any mitigation measure as long as the suspension is recommended by a licensed veterinarian or animal nutritionist on the basis of animal health. The operator must notify the District within 48 hours prior to the suspension. If the suspension is expected to last longer than 30 days, then the operator must submit a new mitigation plan that identifies a new mitigation measure to be implemented in place of the suspended one.

District Rule 4570's exemption under this category is much more stringent because it is a temporary suspension that cannot exceed 30 days, whereas the

IDAPA 58.01.01 Sections 760-764 exemption may last much longer, without any requirement to substitute another measure.

Therefore, in this category of mitigation measure suspensions/substitutions, District Rule 4570 is more stringent than IDAPA 58.01.01 Sections 760-764.

Testing, Monitoring, Recordkeeping Requirements

Compliance with the requirements of IDAPA 58.01.01 Sections 760-764 is primarily determined by inspections by the Idaho State Department of Agriculture. The Idaho regulations do not specify what records must be kept or have any requirement that the records be maintained for a certain period of time.

District Rule 4570 includes specific requirements for monitoring, source testing as appropriate and recordkeeping to ensure mitigation measure are being implemented. Facilities must also maintain animal population records. District Rule 4570 also requires facilities not subject to the mitigation measure requirements to maintain sufficient records to demonstrate their exemption status. District Rule 4570 requires records be retained for five years for all sources. District Rule 4570 is therefore more stringent in this area.

Conclusion – Comparison with IDAPA 58.01.01 Sections 760-764

For dairy facilities, District Rule 4570 is far more stringent than IDAPA 58.01.01 Sections 760-764. Unlike IDAPA 58.01.01 Sections 760-764, District Rule 4570 requires specific practices for the various operations at dairies. District Rule 4570 also provides specific mitigation measures for beef cattle feedlots, other cattle facilities, poultry facilities, and swine facilities, while IDAPA 58.01.01 Sections 760-764 does not. The measures required by the Idaho regulation are also based on an arbitrary point system and as such do not guarantee a specific degree of control. District Rule 4570 is, therefore, more stringent than IDAPA 58.01.01 Sections 760-764.

IV. Evaluation of Additional Control Measures

Recent studies have cited the episodic application of sodium bisulfate (SBS) onto manure at dairies as a potential control strategy to reduce ammonia emissions. SCAQMD included a potential control measure within their 2012 Air Quality Management Plan (AQMP) to evaluate the use of SBS at dairies to determine the technical and economic feasibility of its application in reducing ammonia emissions as well as potential impacts to groundwater. The District did not find any agency requiring the use of SBS. The District has evaluated SBS as a potential control measure and determined that for a variety of reasons that this control strategy is infeasible and ineffective for reducing PM2.5 concentrations in the Valley.

SBS is an acid salt that has been used to reduce pH and bacterial levels in the bedding for dairy cattle. Application of SBS on fresh manure or corral surfaces has the potential to reduce ammonia emissions by reducing the pH of the manure or corral surface. With a lower pH, a greater fraction of the ammonia is converted to non-volatile ammonium (NH4+). The ammonium combines with sulfate to form ammonium sulfate, which is retained in the manure or on the surface of the corral.

There are a number of potential issues that need to be considered related to the application of SBS at dairies including, but not limited to, the health and safety of dairy workers and dairy cattle, impacts on water quality, and overall cost and effectiveness. The SCAQMD 2012 AQMP states: that potential use of SBS would be specific to dairies in the SCAQMD and may be unique to localized operations, that "the requirements may not be applicable to dairies elsewhere where a site-specific assessment would need to be made relative to those particular conditions", and that it is likely that each air district would need to conduct an assessment as to the feasibility of SBS application in their jurisdiction.

The SCAQMD AQMP focuses on episodic controls to reduce ammonia emissions during periods of high PM2.5 concentrations. PM concentrations in the Valley are highest during the winter season (November – February). Unlike the SCAQMD where the majority of dairies are open corral facilities, most dairies in the Valley utilize a freestall design and generally restrict the cows' access to corrals during the winter months since the corrals are wet and muddy. As a result, there would be very little to no fresh manure excreted in corrals during the winter period. In addition, once wet conditions set in, it is not feasible to utilize tractors in the corrals to apply SBS since the tractors tend to get stuck in mud. Application by hand at large dairies would be very labor intensive, time consuming, be extremely costly, and would potentially pose health and safety risks to the workers.

Although SBS is generally considered to be safe in small quantities, excessive loading of salts is a major water quality concern in the central and southern regions of the Valley where many dairies are located. In addition, applying SBS to corrals, which for many dairies can be greater than several acres in size, is not practical or feasible. Applying SBS to large areas also requires significant amounts of SBS to be applied, which as discussed below can be quite cost-prohibitive. The application of SBS will also be short lived and conflict with requirements from Rule 4550 which requires dairies to scrape their corrals on a frequent basis at least once every two weeks, making the application of SBS ineffective and even more costly due to the constant need to reapply.

A dairy would also need to work with the Regional Water Quality Control Board to determine if the application of SBS is allowed and if a dairy's nutrient management plan would need to be revised since the water quality surrounding dairies is a major concern and any additional impacts would need to be

thoroughly reviewed. This may require hauling manure significant distances to areas that would not be adversely affected by the increased salinity, which would result in increased emissions and costs related to hauling.

There are significant costs associated with the application of SBS. Iowa State University Extension estimates the costs of SBS to be $660/ton. District estimates show that 1,304 lb-1,955 lb/cow-yr of SBS would be needed for application to one entire corral area, costing $430-$645/cow-yr. Using the District's corral ammonia emission factor for milk cows and assuming a conservatively high estimate of 50% reduction in overall ammonia emissions, the cost of the ammonia reductions would be at least $41,067/ton to $61,601/ton or higher depending on corral size. Information from Iowa State shows reduced costs of $129-$193/cow-yr for only treating heavy use areas, such as feed bunks and water troughs. It is not clear how much manure is excreted in heavy use areas, but even if the resulting cost per ton of reduction was cut in half, the costs would still be significant.

Also, because flush dairies are common in the Valley (both freestall and open corral), the heavy use areas will generally be paved, and frequent flushing of the freestall or corral lanes (as required by Rule 4570) already significantly reduces ammonia emissions; therefore, application of SBS to only these areas would not provide significant additional reductions in ammonia emissions. By design, SBS will be flushed to a lagoon or pond where the high buffering capacity would render it ineffective and possibly increase H2S emissions.

Overall, given the insignificant PM2.5 reduction achieved per ton of ammonia reduction (as demonstrated in this plan), the cost effectiveness associated with implementing SBS translates to a much higher relative cost effectiveness when compared to other, more effective strategies, such as NOx reductions.

V. Conclusion

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that District Rule 4570 meets BACM and MSM requirements for ammonia emissions from CAFs. The District evaluated the feasibility of additional ammonia emissions reductions and did not identify any additional feasible measures. In fact, the SCAQMD recently identified District Rule 4570 as the most stringent rule for this source category.[126]

Agricultural Fertilizers

Farms have continued to improve methods of fertilizer application over the years to maximize nitrogen use efficiency and minimize environmental impacts. Best

[126] South Coast Air Quality Management District (June 6, 2014). Reasonably Available Control Technology Demonstration. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2014/2014-jun6-031.pdf?sfvrsn=2

management practices are being implemented to minimize nitrate leaching in irrigated crop production. Researchers at UC Cooperative Extension have been studying the nitrogen use efficiency for various crop types and have begun identifying the point at which the application of additional nitrogen no longer significantly increases crop quality and yields. This will allow growers to apply fertilizer with more precision to reduce the amount of nitrogen left in the soil.

Agricultural operations in California are regulated by the State Water Resources Control Board, which is charged by the state Legislature in enforcing state and federal water quality protection laws. The State Water Resources Control Board consists of Regional Water Quality Control Boards (Regional Boards) that develop objectives and plans to protect the beneficial uses of water, recognizing local differences in climate, topography, geology and hydrology. All dairy farms in California's Central Valley are regulated by the Central Valley Regional Water Quality Control Board ("Regional Board"). The vast majority of dairies—about 1,200 dairies—are regulated under a Regional Board General Order[127] and the remainder are regulated via individual orders that ensure compliance with the same requirements. These requirements include:

- A Nutrient Management Plan (NMP), prepared by a certified professional crop advisor or equivalent, designed to control nutrient losses for protection of surface water and groundwater;
- A Waste Management Plan (WMP), prepared by a licensed engineer;
- Environmental sampling and monitoring of soil, manure, water and plant tissue for compliance;
- Routine site inspections, recordkeeping, and reporting; and
- Additional groundwater monitoring to assess ongoing water quality protection

A major purpose of these regulations is to ensure responsible storage and use of manure as an important crop fertilizer and soil builder, thus preventing unnecessary runoff or leaching of nitrogen compounds to the environment, where they can impact water quality. The NMP is designed to assure that the amount of nitrogen excreted by milking cows and support stock is in reasonable balance with the needs of crops grown at the dairy farm. Manure nitrogen in excess of crop needs should be exported off the farm to where it can be used by other farmers. Nitrogen used on the farm is required to be stored safely until it is used (the major purpose of the WMP) and then only applied to agricultural fields when needed for crop growth and in the amounts needed. Over-application or mistimed application of nitrogen fertilizers can result in unnecessary losses of nitrogen to the environment, both as seepage below the root zone (in the form of nitrate or other nitrogen compounds)[128] or as air emissions of ammonia gas, ammonium, and oxides of nitrogen.
The University of California suggested in 2005 that "…optimal N loading rates of 1.4 to 1.65 times the crop N harvest removal are practical and, based on field observations,

[127] http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2013-0122.pdf
[128] See "Managing Dairy Manure in the Central Valley of California," published by the University of California Committee of Experts on Dairy Manure Management, 2005. http://groundwater.ucdavis.edu/files/136450.pdf

achievable if the production field is properly managed."[129] The UC assessment was the ultimate basis for performance standards set by the Regional Board in the General Order, which was adopted in 2007 and revised and reissued in 2013. Research suggests that to achieve the more stringent targets in the General Order, many dairies had to greatly increase the precision of their manure and fertilizer applications, while also reducing the overall amount of nitrogen applied to their crops compared to plant uptake.[130] On a group of Valley dairy farms, it was estimated that prior to adoption of the General Order in 2007, losses of nitrogen to groundwater alone ranged from 370 to 570 pounds per acre compared to 500 pounds of uptake by crops.[131] Similar or larger amounts of nitrogen are expected to volatilize to the atmosphere as ammonia and other compounds following excretion of manure from animals, during storage of manure in ponds or corrals, and in the process of applying manure to soil as a crop nutrient.[132] Thus, as a result of full implementation of the General Order, losses of nitrates to groundwater on dairies may be reduced by up to 85 percent compared to pre-General Order conditions, though this number will be smaller for dairies where manure was managed more precisely prior to the General Order's adoption.

Increasing crop nutrient uptake is also expected to reduce air emissions by providing for application of less excess fertilizer to crops, and therefore, less opportunity for volatilization in the fields. Some research already conducted found lower emissions with moderate nitrogen applications and suggested, "…synchronizing N applications with crop N demand. Once the N requirement for each crop stage is known, the N applications can be adjusted accordingly. This strategy should lead to improved N use efficiency and likely lower N2O emissions."[133]

Other nitrogen compounds such as ammonia can also volatilize to air during application to fields. The University of California Committee of Experts on Dairy Manure Management has suggested that during application of manure water to crops, significant ammonia emissions can occur when manure water is not properly diluted (to below 100 ppm NH3/N) or applied during early growth of the crop. However, "in systems with frequent, but well diluted manure water applications, ammonia losses from the ground surface will commonly be minimal during the irrigation (10% or less)."[134]

Although additional research will be helpful in quantifying the environmental benefits of improved waste management and nutrient applications, the weight of evidence suggests that managing nutrient applications to fields as prescribed in the General Order, especially compared to pre-General Order management on some dairy farms, has significantly reduced losses of nitrogen compounds to the environment, including

[129] Ibid., p. 47
[130] "Cow Numbers and Water Quality – is there a magic limit?" (Harter, Menke 2005), http://groundwater.ucdavis.edu/files/136451.pdf
[131] Ibid., Harter.
[132] Ibid., "Managing Dairy Manure in the Central Valley of California."
[133] "Assessment of Nitrous Oxide Emissions in California's Dairy Systems, DRAFT FINAL REPORT, California Air Resources Board, Contract No. 09-325, William R. Horwath, Martin Burger, Stuart Pettygrove, http://www.arb.ca.gov/research/rsc/10-18-13/item6dfr09-325.pdf
[134] Ibid., "Managing Dairy Manure in the Central Valley of California," p. 41.

leaching of nitrogen compounds to groundwater and air emissions such as ammonia and nitrous oxide.

Organic Material Composting (District Rule 4566)

I. District Rule Description:

District Rule 4566 (Organic Material Composting) is the most stringent rule in the nation for controlling emissions from composting operations; additional controls are infeasible. Additionally, as discussed in Appendix E of this *2015 PM2.5 Plan,* one of the technology focus areas for the District's Technology Advancement Program is for waste solutions that focus on waste systems or technologies that minimize or eliminate emissions from existing waste management systems and processes, including waste-to-fuel systems, such as dairy digesters and other bio-fuel applications. The District has taken every regulatory action feasible to reduce emissions from this source and continues to seek additional methods to reduce emissions through innovative strategies such as the support of research and technology demonstrations with potential to reduce emissions further.

District Rule 4566, was adopted on August 18, 2011, to limit VOC emissions from composting facilities whose feedstock consists of greenwaste and/or foodwaste. District Rule 4566 applies to operations that stockpile and compost greenwaste and foodwaste. In addition to limiting VOC emissions, District Rule 4566 also limits NH3 emissions from these operations. The analysis below focuses on how District Rule 4566 limits NH3 emissions in comparison to other rules and regulations.

II. How does District Rule 4566 compare with federal rules and regulations?

A. EPA-Control Technique Guidelines (CTG)

There is no EPA CTG guidance document for greenwaste or foodwaste composting operations.

B. EPA - Alternative Control Technology (ACT)

There is no EPA ACT guidance document for greenwaste or foodwaste composting operations.

C. Standards of Performance for New Stationary Sources (NSPS)

There is no NSPS guidance document for greenwaste or foodwaste composting operations.

D. National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

There is no NESHAP or MACT guidance document for greenwaste or foodwaste composting operations.

III. How does District Rule 4566 compare to rules in other air districts?

District staff compared District Rule 4566 with the rules for greenwaste and foodwaste composting operations from other California air districts. The results of the analysis are discussed below. District staff only located one other air district rule that applied to similar sources: SCAQMD Rule 1133.3. No other air district rules that applied to greenwaste or similar sources were found.

A. SCAQMD Rule 1133.3 - Emission Reductions from Greenwaste Composting Operations (Adopted July 8, 2011)

The purpose of SCAQMD Rule 1133.3 is to reduce emissions of VOCs and NH3 from greenwaste and foodwaste composting operations. The table below compares the significant similarities and differences between SJVAPCD Rule 4566 and SCAQMD Rule 1133.3. For purposes of this analysis, the ammonia control efficiencies achieved by the requirements of SJVAPCD Rule 4566 are assumed to be the same as the VOC control efficiencies since the same control measures will reduce both VOC and NH3 from these operations. It is worth noting that greenwaste/foodwaste composting produces about 16% of the ammonia emissions on a per ton basis compared to co-composting.[135]

[135] SCAQMD Rule 1133.3, baseline NH_3 emissions from greenwaste/foodwaste composting = 0.46 lb-NH3/ton-throughput. SCAQMD Rule 1133.2, baseline NH_3 emissions from co-composting = 2.93 lb-NH3/ton-throughput.

Rule Section	SCAQMD Rule 1133.3	District Rule 4566	Explanation of Differences
Applicability	New and existing greenwaste and foodwaste composting operations.	New and existing organic material composting and stockpiling facilities. (Organic material is defined as green material, food material, or mixtures of the two, with <100 ton/yr biosolids or manure.)	SCAQMD Rule 1133.3 limits foodwaste stockpiling time (48 hr), whereas District Rule 4566 limits organic material stockpiling time (3 or 10 days, depending on throughput).
Exemptions	Applicability/exemptions based on facility type, not throughput.	Applicability/exemptions based on facility type, not throughput.	The same types of facilities are exempt in both rules: facilities subject to a co-composting rule (SCAQMD Rule 1133.2 or District Rule 4565), nursery, household, recreational, and community composting facilities. District Rule 4566 also exempts agricultural facilities which are subject to District Rules 4204, 4550, or 4570.
Composting Control Requirements	• ≤5,000 ton/yr foodwaste or ≤20% manure (watering and finished compost cover or ≥20% control for NH3) • >5,000 ton/yr foodwaste, (emission control device with ≥80% control for NH3)	• <200,000 ton/yr organic material (watering system or ≥19% control for NH3) • ≥200,000 and <750,000 ton/yr organic material (watering system and finished compost cover or ≥60% control for NH3) • ≥750,000 ton/yr organic material (emission control device with ≥80% control for NH3)	The throughput/control levels in Rule 4566 are based on cost effectiveness and socioeconomic studies conducted by the District as part its Final Staff Report for the Revised Proposed New Rule 4566 (Appendices C and D, August 18, 2011). Rule 4566 requires the same management practices and control requirements as Rule 1133.3; however, the throughput levels at which the stricter control requirements in Rule 4566 become triggered are much higher than in Rule 1133.3. Thus, on paper, Rule 1133.3 appears to be more stringent than Rule 4566. However, SCAQMD does not have any greenwaste composting facilities (that are not under an experimental research permit) subject to the 80% control requirements of Rule 1133.3.

As shown in the table above, based on discussions with SCAQMD permitting and rule development staff, SCAQMD does not have any greenwaste composting production facilities subject to the 80% ammonia reduction requirement of Rule 1133.3. SCAQMD has recently issued Authority to Construct permits for two experimental research greenwaste composting facilities located in Fontana and Riverside operated by Burrtec. The permits authorize Burrtec to perform greenwaste composting for one year (with the possibility of an extension) in order to evaluate the feasibility of three different compost emissions control technologies and conduct emissions testing for each technology. If at

the end of the permitted experimental research period, Burrtec wanted to convert one or both facilities into a regular greenwaste composting production facility, they would need to obtain new ATC permits. The Burrtec facilities then are not representative of a commercial production greenwaste composting facility.

Because SCAQMD has no existing production greenwaste composting facilities that are subject to the 80% ammonia control requirement of Rule 1133.3, and the new facilities are permitted under experimental research exemptions, then Rule 1133.3 cannot be used to establish BACM or MSM as 80% for that category/throughput level of greenwaste composting.

B. No rules that apply to organic materials composting operations were located for the air districts listed below:

- Amador County Air Pollution Control District (ACAPCD)
- Bay Area Air Quality Management District (BAAQMD)
- Eastern Kern County Air Pollution Control District (EKAPCD)
- El Dorado County Air Quality Management District
- Imperial County Air Pollution Control District (ICAPCD)
- Mojave Desert Air Quality Management District (MDAQMD)
- North Coast Unified Air Quality Management District (NCAQMD)
- Placer County Air Pollution Control District (PCAPCD)
- Sacramento Metropolitan Air Quality Management District (SMAQMD)
- San Diego County Air Pollution Control District (SDCAPCD)
- Ventura County Air Pollution Control District (VCAPCD)
- Yolo-Solano Air Quality Management District (YSAQMD)

C. IDAPA 58.01.01 Sections 760-764: Rules for the Control of Ammonia from Dairy Farms

The purpose of IDAPA 58.01.01 Sections 760-764 is to set forth requirements for the control of ammonia through best management practices for certain size dairy farms licensed by the Idaho State Department of Agriculture to sell milk for human consumption.

This regulation only applies to large dairies and does not apply to other agricultural facilities or facilities in which the primary activity is the production of compost. Therefore, it was determined that this regulation is not relevant to the current analysis since it does not specifically limit emissions from composting facilities.

IV. Conclusion

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that District Rule 4566 meets BACM and MSM requirements for ammonia emissions from greenwaste and foodwaste composting operations. The District evaluated the feasibility

of additional ammonia emissions reductions and did not identify any additional feasible measures.

Biosolids, Animal Manure, and Poultry Litter Operations (District Rule 4565)

I. District Rule Description:

District Rule 4565, was adopted on March 15, 2007, to limit VOC emissions from facilities whose throughput consists entirely or in part of biosolids, animal manure, or poultry litter. District Rule 4565 applies to operations that landfill, land apply, compost, or co-compost these materials. In addition to limiting VOC emissions, District Rule 4565 also limits NH3 emissions from these operations. The analysis below focuses on how District Rule 4565 limits NH3 emissions in comparison to other rules and regulations.

II. How does District Rule 4565 compare with federal rules and regulations?

A. EPA-Control Technique Guidelines (CTG)

There is no EPA CTG guidance document for biosolids, animal manure, and/or poultry litter operations.

B. EPA - Alternative Control Technology (ACT)

There is no EPA ACT guidance document for biosolids, animal manure, and/or poultry litter operations.

C. Standards of Performance for New Stationary Sources (NSPS)

There is no NSPS guidance document for biosolids, animal manure, and/or poultry litter operations.

D. National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

There is no NESHAP or MACT guidance document for biosolids, animal manure, and/or poultry litter operations.

III. How does District Rule 4565 compare to rules in other air districts?

District staff compared District Rule 4565 with the rules for biosolids, animal manure, and poultry litter operations from other California air districts. The results of the analysis are discussed below. District staff only located one other air district rule that applied to similar sources, which was SCAQMD Rule 1133.2. No other air district rules that applied to similar sources were found.

A. SCAQMD Rule 1133.2 - Emission Reductions from Co-Composting Operations (Adopted January 10, 2003)

SCAQMD adopted SCAQMD Rule 1133.2. This rule applies to new and existing co-composting operations in the SCAQMD.
Staff notes that there are some differences between District Rule 4565 and SCAQMD Rule 1133.2. This does not mean that one rule is more stringent than the other; rather the differences are due to the following factors:

1. Technology has changed significantly since SCAQMD Rule 1133.2 was adopted on January 10, 2003;
2. Additional research projects regarding mitigation measures have been completed since SCAQMD Rule 1133.2 was adopted; and
3. The socioeconomic climate of the SCAQMD is significantly different from that of the District.

The table below summarizes the significant differences between SCAQMD Rule 1133.2 and SJVAPCD Rule 4565. Below are the important differences between the two rules. For purposes of this analysis, the NH3 control efficiency for the requirements of District Rule 4565 are assumed to be the same as the VOC control efficiency for these requirements since the same measures will generally reduce both VOC and NH3 from these operations.

Category	SCAQMD Rule 1133.2	SJVUAPCD Rule 4565	Reason
Facilities Other Than Co-Composting (Landfilling, Land Applying)	Rule does not apply to these operations	Management practice requirements	Knowledge of control options has increased since Rule 1133.2 adoption and staff believes that cost effective methods of controlling VOC and NH3 emissions from these facilities exist.
Co-Composting Threshold for Applicability	Facilities with at least 1,000 tpy throughput	Facilities that handle 100 tpy or more of biosolids, animal manure, or poultry litter	Staff believes that there are reasonable options that are not exceedingly costly for facilities with throughputs of ≥100 tpy that would not impose an undue burden on operators.
Composting Control Requirements	In-vessel composting with 70% control efficiency for VOC and NH3 for existing facilities and 80% control efficiency for VOC and NH3 for new facilities	Control efficiency of 10%-80% for VOC (and NH3) depending on type of operation and facility throughput	Management practices (mitigation measures) are effective, reasonable, and have been achieved in practice for smaller facilities. In-vessel composting is not cost-effective for smaller or medium facilities and there are no known, unsubsidized facilities in the SCAQMD that would comply with such rule requirements.

It should also be noted that in practice, the facilities that are actually subject to SCAQMD Rule 1133.2 will have much larger throughputs than 1,000 ton per year

throughput threshold given in the rule. SCAQMD Rule 1133.2 includes the following exemptions for existing co-composting operations with a design capacity of less than 35,000 tons of throughput per year containing no more than 20 percent biosolids by volume and new and existing municipal facilities using aeration and processing less than 5,000 tons of biosolids or manure per year. In addition many operations in the SCAQMD have found it to be economical to transport these materials to other jurisdictions for processing. An example of this is the Synagro South Kern Compost Manufacturing Facility, which is a newer facility located in the Valley and processes biosolids transported from SCAQMD.

Because some mitigation measures are only cost-effective for larger facilities, District staff developed the concept of Class One and Class Two mitigation measures. Class One mitigation measures are cost effective options for all facilities, regardless of size. These measures are management practices found to be best practices for all composting operations.

Class Two mitigation measures are the technology options and achieve reductions greater than Class One mitigation measures; however, they were determined to not be cost effective for facilities with throughputs of less than 100,000 wet tons per year.

District Rule 4565 requires reductions from two additional categories (landfilling and land applying) when compared to SCAQMD Rule 1133.2. For the third category, composting, District staff determined it is not cost effective to require in-vessel (enclosed) composting.

B. No rules that apply to biosolids, animal manure, and/or poultry litter operations were located for the air districts listed below

- Amador County Air Pollution Control District (ACAPCD)
- Bay Area Air Quality Management District (BAAQMD)
- Eastern Kern County Air Pollution Control District (EKAPCD)
- El Dorado County Air Quality Management District
- Imperial County Air Pollution Control District (ICAPCD)
- Mojave Desert Air Quality Management District (MDAQMD)
- North Coast Unified Air Quality Management District (NCAQMD)
- Placer County Air Pollution Control District (PCAPCD)
- Sacramento Metropolitan Air Quality Management District (SMAQMD)
- San Diego County Air Pollution Control District (SDCAPCD)
- Ventura County Air Pollution Control District (VCAPCD)
- Yolo-Solano Air Quality Management District (YSAQMD)

C. IDAPA 58.01.01 Sections 760-764: Rules for the Control of Ammonia from Dairy Farms

The purpose of IDAPA 58.01.01 Sections 760-764 is to set forth requirements for the control of ammonia through best management practices (BMPs) for certain size dairy farms licensed by the Idaho State Department of Agriculture to sell milk for human consumption.

This regulation only applies to large dairies and does not apply to other agricultural facilities or facilities in which the primary activity is the production of compost. Therefore, it was determined that this regulation is not relevant to the current analysis since it does not specifically limit emissions from composting facilities.

IV. Conclusion

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that District Rule 4565 meets BACM and MSM requirements for ammonia emissions from biosolids, animal manure, and poultry litter operations. The District evaluated the feasibility of additional ammonia emissions reductions and did not identify any additional feasible measures.

Major Sources of Ammonia

The facilities listed below were identified as potential major sources of NH3 in the Valley. In all cases, the NH3 emissions from the facilities were entirely or primarily the direct result of the use of catalytic emission controls to reduce NOx emissions to acceptable levels as determined by regulatory agencies including, EPA, ARB, the District, and, in one case the California Energy Commission (CEC). Because the Valley is primarily a rural NOx-limited area, NOx reductions are the most critical element of District's plans to reach attainment with the federal ambient air quality standards for both PM2.5 and ozone. Therefore, controls that reduce NH3 while increasing NOx would increase the formation of PM2.5 and ozone in the Valley and would be detrimental to the goals of reaching attainment with the federal ambient air quality standards.

Facility Name: J.R. Simplot Company; District Facility #C-705
This facility produces fertilizers. The NH3 emissions from this facility are associated with the Nitric acid production plant at the facility. Although ammonia is used in the production of nitric acid, the vast majority of the ammonia introduced is consumed in the production of the nitric acid or recovered. The ammonia emissions from the nitric acid are the result of the use of a non-selective catalytic reduction (NSCR) system to reduce NOx emissions from the nitric acid plant. The tail gas from nitric acid plants contains large amounts of NOx and this plant uses NSCR to reduce NOx to comply with 40 CFR 60 Subpart G (Standards of Performance for Nitric Acid Plants) and federally-enforceable New and Modified Source Review (NSR) limits. The NSR permit for this facility includes conditions minimizing the allowable amount of NH3 slip with associated

emissions testing. Because the NH3 emissions are the direct result of the use of NSCR, which is required to comply with federal NSPS and NSR requirements, and reducing the amount of NH3 would increase NOx emissions, this facility is considered to satisfy BACM and MSM for NH3.

Facility Name: Covanta Delano Inc.; District Facility #S-75
This facility is a biomass power plant. The NH3 emissions from this facility are the result of the use of NH3 injection for Selective Non-Catalytic Reduction (SNCR) to control NOx from two biomass-fired boilers at the facility. Use of the SNCR to reduce NOx is required by the EPA-issued Prevention of Significant Deterioration (PSD) Permit PSD ATC SJ 90-01 and federally-enforceable NSR conditions and also required to comply with 40 CFR 60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units). The NSR permits state, "*Ammonia shall be injected into boiler at a rate, in pounds per ton of biomass fuel introduced into boiler, which results in compliance with the NOx emission limitation.*" Permit PSD ATC SJ 90-01 states "… *A SNCR system utilizing ammonia injection shall be incorporated within the boilers. Ammonia shall be injected continuously during all periods of operation at a rate which results in compliance with the NOx emission limits.*" Because a perfect reaction cannot be achieved, some excess NH3 must be injected in the boiler stacks to reduce NOx to acceptable levels and this excess unreacted NH3 escapes the stack as slip. The facility incurs a cost for all of the NH3 injected into the boiler stacks, so there is an incentive to minimize NH3 slip to reduce costs associated with compliance with the NOx limits. In addition, the NSR permits for the biomass-fired boilers include conditions limiting the allowable amount of NH3 slip.

The NH3 emissions from the biomass boilers are the direct result of the use of SNCR, which is required by NSR conditions and the EPA-issued PSD Permit PSD ATC SJ 90-01 and required to comply with the requirements of Federal NSPS. The NSR permits for the biomass-fired boilers include conditions limiting the allowable amount of NH3 slip with associated emissions testing, and further reducing the amount of NH3 could potentially increase NOx emissions; therefore, this facility is considered to satisfy BACM and MSM for NH3.

Facility Name: Northern California Power; District Facility #N-2697
This facility is a natural gas power plant. The NH3 emissions from this facility are the result of the use of NH3 injection for Selective Catalytic Reduction (SCR) to control NOx from two natural gas-fired turbines at the facility. Use of the SCR to reduce NOx is required by federally-enforceable NSR conditions and also required to comply with the federally-enforceable requirements of District Rule 4703 (Stationary Gas Turbines), which is included in the SIP. Because a perfect reaction cannot be achieved, some excess NH3 must be injected to reduce NOx to acceptable levels. The excess unreacted NH3 escapes the stack as slip. The facility incurs a cost for all of the NH3 injected into the stacks, so there is an incentive to minimize NH3 slip to reduce costs associated with the compliance with the NOx limits. In addition, the NSR permits for the natural gas-fired turbines include conditions limiting the allowable amount of NH3 slip.

The NH3 emissions from the natural gas-fired turbines are the direct result of the use SCR, which is required by NSR conditions and required to comply with the federally-enforceable requirements of District Rule 4703. The NSR permits for the natural gas-fired turbines include conditions limiting the allowable amount of NH3 slip and associated emissions testing, and further reducing the amount of NH3 could potentially increase NOx emissions; therefore, this facility is considered to satisfy BACM and MSM for NH3.

Conclusion

While BACM and MSM requirements do not apply to ammonia since it is not a significant precursor to PM2.5 formation in the Valley, District staff concludes that major sources of ammonia in the Valley satisfy BACM and MSM requirements for NH3. The District evaluated the feasibility of additional ammonia emissions reductions and did not identify any additional feasible measures.

Table C-37 Emission Inventory Codes

Control Measure	Emission Inventory Codes
Rule 4103 (Open Burning)	670-660-0262-9842; 670-660-0262-9862; 670-660-0262-9874; 670-660-0262-9884; 670-660-0262-9888; 670-660-0262-9892; 670-662-0262-9878; 670-668-0200-9858; 670-668-0200-9872; 670-668-0200-9886; 670-995-0240-9848
Rule 4104 (Reduction of Animal Matter)	420-995-6004-0000
Rule 4106 (Prescribed Burns)	670-666-0200-0000; 670-670-0200-0000
Rule 4203 (Particulate Matter Emissions from the Incineration of Combustible Refuse)	010-005-0243-0000
Rule 4204 (Cotton Gins)	420-418-6028-0000; 420-420-6028-0000
Rule 4301 (Fuel Burning Equipment)	
Rule 4307 (Boilers, Steam Generators and Process Heaters 2 – 5 MMBtu/hr)	010-005-0110-0000; 010-005-0124-0000; 010-005-0130-0000; 010-005-0300-0000; 010-005-1220-0000; 020-005-0110-0000; 030-005-0110-0000; 030-005-0124-0000; 030-005-0130-0000; 030-005-1220-0000; 030-005-1530-0000; 030-010-0110-0000; 030-010-0130-0000; 030-010-1220-0000; 030-010-1600-0000; 030-015-0110-0000; 030-015-0130-0000; 040-005-0110-0000; 040-005-1530-0000; 040-010-0100-0000; 040-010-0110-0000; 040-010-0120-0000; 040-010-0130-0000; 040-010-1000-0000; 050-005-0110-0000; 050-005-0122-0000; 050-005-0124-0000; 050-005-0130-0000; 050-005-0320-0000; 050-005-1100-0000; 050-005-1220-0000; 050-005-1510-0000; 050-005-1520-0000; 050-005-3220-0000; 050-010-0110-0000; 050-010-0120-0000; 050-010-0320-0000; 050-010-1220-0000; 050-010-1500-0000; 052-005-0110-0000; 052-005-0124-0000; 052-005-1220-0000; 052-010-0110-0000; 052-010-0120-0000; 052-010-1224-0000; 060-005-0110-0000; 060-005-0122-0000; 060-005-0124-0000; 060-005-0130-0000; 060-005-0142-0000; 060-005-0144-0000; 060-005-0320-0000; 060-005-1220-0000; 060-005-1510-0000; 060-005-1520-0000; 060-010-0100-0000; 060-010-0110-0000; 060-010-0120-0000; 060-010-0142-0000 The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories.
Rule 4308 (Boilers, Steam Generators and Process Heaters 0.075 to less than 2.0 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories. See Rule 4307 for the EICs.

Control Measure	Emission Inventory Codes
Rule 4309 (Dryers)	430-422-7078-0000; 430-424-7006-0000; 430-995-7000-0000; 499-995-0000-0000; 499-995-5630-0000
Rule 4311 (Flares)	110-132-0130-0000; 110-132-0146-0000; 120-132-0136-0000; 130-132-0110-0000; 130-132-0130-0000; 130-132-0136-0000; 310-320-0010-0000; 310-320-0110-0000; 310-320-0120-0000; 310-320-0130-0000; 310-320-0136-0000; 310-320-1600-0000; 320-320-0010-0000; 320-320-0110-0000; 320-320-0120-0000; 320-320-0130-0000
Rule 4313 (Lime Kilns)	Lime kilns are not included in the ARB emissions inventory. There are no lime kilns currently operating in the Valley.
Rule 4320 (AERO for Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories. See Rule 4307 for the EICs.
Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, and Process Heaters)	010-005-0214-0000; 010-005-0218-0000; 010-005-0220-0000; 010-005-0240-0000; 010-005-0243-0000; 010-005-0254-0000; 020-005-0218-0000; 020-005-0230-0000; 030-005-0214-0000; 050-005-0214-0000; 050-005-0240-0000; 050-005-0254-0000; 052-005-0240-0000; 060-005-0240-0000; 060-005-0264-0000
Rule 4354 (Glass Melting Furnaces)	460-460-7037-0000; 460-460-7038-0000; 460-460-7039-0000
Rule 4550 (Conservation Management Practices)	620-614-5400-0000; 620-615-5400-0000;650-650-5400-0000; 650-651-5400-0000
Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations)	540-560-0400-0000; 540-562-0400-0000; 540-564-0400-0000; 540-566-0400-0000
Rule 4692 (Commercial Charbroiling)	690-680-6000-0000
4693 (Bakery Ovens)	420-412-6012-0000; 420-412-6037-0000
Rule 4702 (Internal Combustion Engines)	010-040-0110-0000; 010-040-1200-0000; 020-040-0110-0000; 020-040-1200-0000; 030-040-0110-0000; 030-040-0124-0000; 030-040-1200-0000; 030-040-1210-0000; 040-040-0110-0000; 050-040-0012-0000; 050-040-0110-0000; 050-040-0124-0000; 050-040-1200-0000; 052-040-0110-0000; 052-040-1200-0000; 052-042-0110-0000; 052-042-1200-0000; 052-042-1200-0010; 052-042-1200-0011; 060-040-0110-0000; 060-040-0124-0000; 060-040-0142-0000; 060-040-0146-0000; 060-040-1100-0000; 060-040-1200-0000; 060-040-1210-0000; 060-995-1220-0000; 099-040-1200-0000
Rule 4703 (Stationary Gas Turbines)	010-045-0110-0000; 010-045-1200-0000; 020-045-0110-0000; 030-045-0110-0000; 040-045-0134-0000; 050-045-1200-0000; 060-045-0110-0000; 060-045-1200-0000
Rule 4802 (Sulfuric Acid Mist)	410-400-2058-0000

Control Measure	Emission Inventory Codes
Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters)	610-600-0230-0000; 610-602-0230-0000
Rule 4902 (Residential Water Heaters)	610-608-0110-0000
Rule 4905 (Natural Gas – Fired, Fan Type Residential Central Furnace)	610-606-0110-0000
Rule 8011 (General Requirements)	There is no specific emissions inventory associated with Rule 8011.
Rule 8021 (Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities)	630-622-5400-0000; 630-624-5400-0000; 630-626-5400-0000; 630-628-5400-0000; 630-634-5400-0000
Rule 8031 (Bulk Materials)	430-436-7006-0000; 430-436-7078-0000; 430-995-7064-0000
Rule 8041 (Carryout and Trackout)	The EICs are included in Rule 8061 (Paved and Unpaved Roads).
Rule 8051 (Open Areas)	650-652-5400-0000
Rule 8061 (Paved and Unpaved Roads)	640-635-5400-0000; 640-637-5400-0000; 640-639-5400-0000; 640-641-5400-0000; 640-643-5400-0000; 645-638-5400-0000; 645-640-5400-0000; 645-644-5400-0000; 645-648-5400-0000
Rule 8071 (Unpaved Vehicle Traffic)	645-645-5400-0000; 645-647-5400-0000. The ARB Emissions Inventory database does not contain emissions data on unpaved vehicle and equipment traffic areas.
Rule 8081 (Ag Sources)	645-646-5400-0000

Control Measure	Emission Inventory Codes
SC 001 (Source Category: Lawn Care Equipment)	860-902-1100-4065; 860-902-1100-4094; 860-902-1100-4095; 860-902-1100-4102; 860-902-1100-4103; 860-902-1100-4112; 860-902-1100-4113; 860-902-1100-4124; 860-902-1100-4125; 860-902-1100-5672; 860-902-1100-5673; 860-902-1100-5684; 860-902-1100-5685; 860-902-1100-5692; 860-902-1100-5693; 860-902-1100-5704; 860-902-1100-5705; 860-902-1100-5724; 860-902-1100-5725; 860-902-1100-7604; 860-902-1100-7605; 860-902-1100-7614; 860-902-1100-7615; 860-902-1100-8104; 860-902-1100-8105; 860-902-1100-8112; 860-902-1100-8113; 860-902-1100-8344; 860-902-1100-8345; 860-902-1100-8352; 860-902-1100-8353; 860-902-1100-8364; 860-902-1100-8365; 860-902-1100-8372; 860-902-1100-8373; 860-902-1100-8384; 860-902-1100-8385; 860-902-1100-9074; 860-902-1100-9075; 860-902-1100-9542; 860-902-1100-9543; 860-902-1100-9554; 860-902-1100-9555; 860-902-1100-9834; 860-902-1100-9835; 860-903-1100-1394; 860-903-1100-1395; 860-903-1100-1404; 860-903-1100-1405; 860-903-1100-4084; 860-903-1100-4085; 860-903-1100-5744; 860-903-1100-5745; 860-903-1100-5754; 860-903-1100-5755; 860-903-1210-1190; 860-903-1210-1200; 860-903-1210-1210; 860-903-1210-1220; 860-903-1210-1230; 860-903-1210-1240; 860-903-1210-1250; 860-903-1210-1350; 860-903-1210-1380; 860-903-1210-4050; 860-903-1210-4070; 860-903-1210-4130; 860-903-1210-4140; 860-903-1210-4150; 860-903-1210-5710; 860-903-1210-5730; 860-903-1210-8390; 860-903-1210-8400; 860-903-1210-8410
SC 002 (Energy Efficiency)	None
SC 003 (Fireworks)	None
SC 004 (Sand and Gravel Operations)	430-422-7078-0000; 430-426-0210-0000; 430-426-7078-0000; 430-426-7092-0000
SC 005 (Asphalt/Concrete Operations)	430-424-7006-0000; 430-424-7050-0000; 430-429-7016-0000; 430-430-7016-0000; 430-430-7018-0000; 430-436-7006-0000; 430-995-7006-0000; 430-995-7012-0000; 430-995-7016-0000; 430-995-7018-0000; 430-995-7050-0000; 430-995-7072-0000
SC 006 (Almond Hulling/Shelling Operations)	420-418-6003-0000
SC 007 (Pistachio Hulling/Shelling Operations)	The EIC is included in SC 006
SC 008 (Agricultural Material Screening/Shaking Operations)	None
SC 009 (Tub Grinding Operations)	None
SC 010 (Abrasive Blasting)	430-428-6084-0000; 430-428-7000-0000; 430-428-7036-0000; 430-428-7078-0000; 430-428-7084-0000; 430-428-7088-0000; 430-428-7090-0000
SC 011 (Bakery Ovens)	N/A

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Appendix C

Stationary and Area Source Control Strategy Evaluations

2016 PLAN FOR THE 2008 8-HOUR OZONE STANDARD

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Appendix C: Stationary and Area Source Control Strategy Evaluations

The San Joaquin Valley (Valley) faces significant challenges in meeting federal air quality standards (also called National Ambient Air Quality Standards, or NAAQS). The San Joaquin Valley Air Pollution Control District (District) has demonstrated leadership in developing and implementing groundbreaking regulatory strategies to reduce emissions. Tough and innovative rules, such as those for indirect source review, residential wood burning, glass manufacturing, and agricultural burning, have set benchmarks for California and the nation.

The District has adopted many regulatory control measures under the District's air quality attainment plans, including but not limited to the *2007 Ozone Plan, 2008 PM2.5 Plan, 2012 PM2.5 Plan, 2013 Plan for the Revoked 1-Hour Ozone Standard (2013 Ozone Plan)*, and the *2015 Plan for the 1997 PM2.5 Standard (2015 PM2.5 Plan).* District attainment plans contain commitments that serve as control measures to reduce emissions and attain the federal air quality standards. Under the U.S. Environmental Protection Agency (EPA) policy, there is a preference for reliance on control measures that have already been adopted. Table C-1 below identifies control measures the District has already adopted that are contributing to attainment of the 2008 8-hour ozone standard. These adopted District rules will continue to achieve new emissions reductions after 2012, the base year for this plan. However, it's important to note that even pre-2012 emissions reductions are contributing, and will continue to contribute, to the Valley's progress toward clean air.

Table C-1 District Rules Achieving New Emissions Reductions After 2012

District Rules		*Date Adopted or Last Amended*
4103	Open Burning	4/15/2010
4307	Boilers, Steam Generators, and Process Heaters 2 to 5 MMBtu/hr	5/19/2011
4308	Boilers, Steam Generators, and Process Heaters 0.075 to <2 MMBtu/hr	11/14/2013
4311	Flares	6/18/2009
4306/ 4320	Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr	10/16/2008
4352	Solid Fuel Fired Boilers, Steam Generators and Process Heaters	12/15/2011
4354	Glass Melting Furnaces	5/19/2011
4565	Biosolids, Animal Manure, and Poultry Litter Operations	3/15/2007
4566	Organic Material Composting Operations	8/18/2011
4601	Architectural Coatings	12/17/2009
4605	Aerospace Assembly and Component Coating Operations	9/20/2007
4653	Adhesives and Sealants	9/16/2010
4682	Polystyrene, Polyethylene, and Polypropylene Products Manufacturing	9/20/2007

District Rules		Date Adopted or Last Amended
4684	Polyester Resin Operations	9/20/2007
4702	Internal Combustion Engines	8/18/2011
4905	Natural Gas-Fired, Fan-Type Residential Central Furnaces	1/22/2015
9610	State Implementation Plan Credit for Emission Reductions Generated Through Incentive Programs	6/20/2013

The analyses summarized in this appendix are the result of a robust and exhaustive effort on the part of the District to identify potential emission reduction opportunities. District staff from multiple departments with expertise in the applicable sectors contributed to this effort. The evaluations in this appendix capture relevant background information, examine potential emission reduction opportunities for technological and economic feasibility, and make recommendations for appropriate District actions moving forward.

CONTROL MEASURE EVALUATION METHODOLOGY

Control Measure Evaluations

Each stationary and area source control measure evaluation summarized in this appendix is organized following a thorough and consistent analysis methodology. This methodology includes sections for the following discussions and analyses:

- Emissions inventory
- Rule Description
- Regulatory evaluation of Federal, State, and local regulations, including an assessment of Reasonably Available Control Technology (RACT)
- Summary potential emission reduction opportunities identified and the associated analysis of such opportunities
- Summary of the evaluation findings.

Although this methodology is followed for each individual stationary and area source control measure evaluation, additional sections may be added as appropriate to provide a more complete summary of the analysis performed. The following is a description of the sections in the control measure analyses.

Emissions Inventory

Each control measure evaluation contains an emission inventory table that identifies the summer average emissions of oxides of nitrogen (NOx) and volatile organic compound (VOC) for the respective control measure for multiple years between 2012, the baseline year for this plan, and 2031, the attainment year. As discussed in detail in Chapter 4, ozone is a product of atmospheric reactions involving VOCs, NOx, the hydroxyl radical (OH), other radicals, and sunlight. As such, although some District rules control multiple

emissions including oxides of sulfur (SOx) and particulate matter (PM), this appendix focuses on NOx and VOC emission inventories and emission reduction opportunities.

The emissions data provided in the emission inventory table is presented as a summer average in tons of emissions per day (tpd) since ozone exceedances occur in the summer months in the Valley. Consistent with the Districts Health Risk Reduction Strategy, to ensure the emissions reductions efforts of this plan contribute to improved air quality and progress toward attainment of the 2008 8-hour ozone standard, the focus is on emissions and activities in the summer months. The data is a compilation of the data sources identified in the emission inventory appendix (see Appendix B).

Rule Description

This section of each control measure will provide a general overview of the rule, including rule applicability, types of sources subject to rule requirements, rule adoption/ amendment history, and any other additional pertinent details, as relevant to the control measure evaluation.

How does the District rule compare with federal and regulations?

This section of the control measure evaluation includes a comparison of District rules to federal air quality regulations and standards. Research of federal regulations includes literature review of the following regulations and guidance documents:

- **CTG**: Control Techniques Guidelines[1]
- **ACT**: Alternative Control Techniques[2]
- **NSPS**: New Source Performance Standards[3]
- **NESHAP**: National Emission Standards for Hazardous Air Pollutants[4]
- **MACT**: Maximum Achievable Control Technology[5]

How does the District rule compare with California State regulations?

Generally, state regulations are specific to mobile sources and area sources such as consumer products. However, sometimes ARB will adopt a *Suggested Control Measure* (SCM) for area sources, such as the SCM for architectural coatings promulgated in September of 2007. Additionally, there are some California Health and Safety Code (CH&SC) requirements and ARB Airborne Toxic Control Measures (ATCM)[6] that apply to stationary and area sources. Most of the rules evaluated in this plan do not have an ARB regulation or SCM associated with their source category. The

[1] EPA. Control Techniques Guidelines. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[2] EPA. Alternative Control Techniques. Retrieved from http://www.epa.gov/groundlevelozone/SIPToolkit/ctgs.html
[3] EPA. 40 CFR 60 – Standards of Performance for New Stationary Sources (NSPS). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/60/60hmpg.html
[4] EPA. 40 CFR 61 – National Emission Standards for Hazardous Air Pollutants (NESHAPs). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/61/61hmpg.html
[5] EPA. 40 CFR 63 – Maximum Achievable Control Technology (MACT). Retrieved from http://www.tceq.state.tx.us/permitting/air/rules/federal/63/63hmpg.html
[6] California Air Resources Board (ARB). Airborne Toxic Control Measures (ATCMs). Retrieved from http://www.arb.ca.gov/toxics/atcm/atcm.htm

District has included and evaluated all relevant state guidelines identified within the applicable control measure evaluations.

How does the District rule compare to rules in other air districts?

Every control measure was compared to analogous regulations adopted by California's most progressive air districts. Investigation of control strategies and measures in other air districts and agencies includes, but is not limited to the following air districts:

- **BAAQMD**: Bay Area Air Quality Management District[7]
- **SCAQMD**: South Coast Air Quality Management District[8]
- **SMAQMD**: Sacramento Metropolitan Air Quality Management District[9]
- **VCAPCD**: Ventura County Air Pollution Control District[10]

In the cases where other air districts or air agencies in other states have been identified as having a more stringent analogous rule, those rules are also summarized and evaluated in this section of the control measure evaluation.

Potential Emission Reduction Opportunities

The District reviewed each control measure to identify potential opportunities for emissions reductions. The results of this review are summarized in this section of the control measure analysis. All potential emission reduction opportunities identified were evaluated for technological and economic feasibility:

- **Technological feasibility** – The technological feasibility analysis determines if a potential opportunity to reduce emissions is viable for existing facilities and operators in the Valley, given their current operating needs and restrictions. District analysis of technological feasibility includes a literature review of BACT guidelines; District permits; environmental and technological studies; EPA and ARB guideline documents; and other air districts' rules, regulations, and guidelines, to identify potential opportunities and determine the technological feasibility of any identified potential opportunities.

- **Economic feasibility** – To determine economic feasibility, a cost effectiveness analysis is conducted to evaluate the economic reasonableness of an air pollution control measure or technology as it applies to operators in the Valley. A cost effectiveness analysis examines the added cost, in dollars per year, of the control technology or technique, divided by the emissions reductions achieved, in tons per year.

[7] Bay Area Air Quality Management District (BAAQMD). Rules and Regulations. Retrieved from http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx
[8] South Coast Air Quality Management District (SCAQMD). Rules and Regulations. Retrieved from http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/table-of-contents
[9] Sacramento Metropolitan Air Quality Management District (SMAQMD). Rules and Regulations. Retrieved from http://www.airquality.org/rules/
[10] Ventura County Air Pollution Control District (VCAPCD). Rules and Regulation. Retrieved from http://www.vcapcd.org/Rulebook/RuleIndex.htm

The District reviewed staff reports and studies from other air districts, EPA technical guidance documents, and applicable study data from the scientific community to assist in evaluating the technological and economic feasibility of potential emission reduction opportunities.

Evaluation Findings

This section includes a summary of the District's findings from the full control measure evaluation and includes any recommendations, such as a new or amended rule or further study actions. See Chapter 5 for a summary of all proposed recommendations.

The *Evaluation Findings* section also includes a brief conclusion whether the District rule under evaluation satisfies, does not satisfy, or is not subject to federal Reasonably Available Control Technology (RACT) requirements. RACT is "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility" (44 FR 53762; September 17, 1979). Per Sections 182(b)(2) and 182(f) of the federal Clean Air Act, ozone nonattainment areas are required to implement RACT for sources that are subject to Control Techniques Guidelines (CTG) issued by EPA and for "major sources" of VOCs and NOx, which are ozone precursors.

RACT changes over time as new technologies become feasible and cost-effective, thus making them reasonable to require. The District has conducted comprehensive reviews of all NOx and VOC rules for compliance with federal RACT requirements. For these reviews, the District evaluates all District rules against federal rules, regulations, and technology guidelines, as well as any comparable rules and compliance methods from California's most technologically progressive air districts. In response to the District's *2009 RACT SIP* and related rule amending projects, EPA has issued federal actions documenting their approval of District rules and their concurrence that District rules are at least as stringent as RACT levels. In fact, these efforts show that many District rules are more stringent than established RACT standards. The District adopted its *2014 RACT Demonstration for the 8-Hour Ozone State Implementation Plan (2014 RACT SIP)* on June 19, 2014 to satisfy requirements for the 2008 8-hour ozone standard. The *2014 RACT SIP* analysis shows that the District continues to meet or exceed RACT for all applicable EPA source categories. The RACT evaluations in this appendix continue to build on the foundation established by these previous analyses.

C.1 RULE 4103 OPEN BURNING

C.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.77	0.76	0.76	0.75	0.75	0.74	0.74	0.74	0.73
VOC	0.91	0.91	0.90	0.89	0.89	0.88	0.88	0.87	0.87

C.1.2 District Rule 4103 Description

The provisions of Rule 4103 apply to open burning conducted in the Valley, with the exception of prescribed burning and hazard reduction burning, as defined in Rule 4106 (Prescribed Burning and Hazard Reduction Burning). The purpose of Rule 4103 is to permit, regulate, and coordinate the use of open burning while minimizing smoke impacts on the public.

Rule 4103 was originally adopted on June 18, 1992 and it has been amended several times to incorporate state law requirements. In 2003, California Senate Bill (SB) 705 (CH&SC Section (§) 41855.5 and 41855.6) established a schedule for specific types of agricultural material to no longer be openly burned in the field, but provided for a postponement of the phase-out where justified by technical and economic impediments. The air quality impacts from open burning in the Valley are of significant concern for the District and Valley growers; as such, Valley growers have reduced open burning through the use of sustainable agricultural practices. Those practices have contributed to a significant reduction in PM emissions since 1992.

The historical practice for disposing of agricultural materials, such as prunings and orchard removals, is to burn the materials. Burning agricultural materials provided an economically feasible method for the timely disposal of these materials, helped prevent the spread of plant diseases, and controlled weeds and pests. As part of implementing SB 705 and enhancing the effectiveness of the District's burn reduction efforts, in 2004 the District established the Smoke Management System (SMS), a more refined method of authorizing or prohibiting individual burns, based on modeled smoke impacts. Rule 4103 and the District's SMS have reduced the total acreage of agricultural materials burned in the Valley to date by more than 80% since 2002.

Agricultural Burn Reports

The most recent amendments to Rule 4103, in April 2010, incorporated the provisions of CH&SC §41855.5 and §41855.6 directly into the rule to more efficiently allow the District to consider the feasibility of non-burning alternatives for specific crops and materials. The amendments also require the District to prepare a Staff Report and Recommendations on Agricultural Burning and then to review and update once every five years to determine if there are feasible alternatives to open burning.

In 2010, the District prepared the *2010 Final Staff Report and Recommendations on Agricultural Burning (2010 Report)* which evaluated each crop category identified in CH&SC §41855.5 and provided recommendations for allowing or prohibiting the open burning of categories as outlined by the senate bill. Based upon the *2010 Report and* the lack of feasible alternatives to open burning, the ARB provided a two year concurrence on the District's recommended postponements. In 2012, the District prepared the *2012 Update: Recommendations on Agricultural Burning (2012 Report)* which re-evaluated the technological and economical impediments for the crop categories that had been postponed. Based upon the *2012 Report, and* the continued lack of feasible alternatives to open burning, the ARB provided an additional three year concurrence on the District's recommended postponements.

In 2015, the District prepared the *2015 Agricultural Burning Review (2015 Review),* which demonstrated that in the three years since the 2012 evaluation, the availability of technologically achievable and economically feasible alternatives to agricultural burning has significantly worsened due to the severe drought conditions in the Valley and the demise of the biomass industry that historically has provided an alternative to open burning for the considerable amount of agricultural material generated in the Valley. In the *2015 Review* the District requested continued ARB concurrence for the postponement of the remaining crop categories through 2020. In December 2015, ARB granted a five-year concurrence with the assessment for limited exemptions to the phase-out of agricultural burning, consistent with requirements in the CH&SC.[11]

Smoke Management System

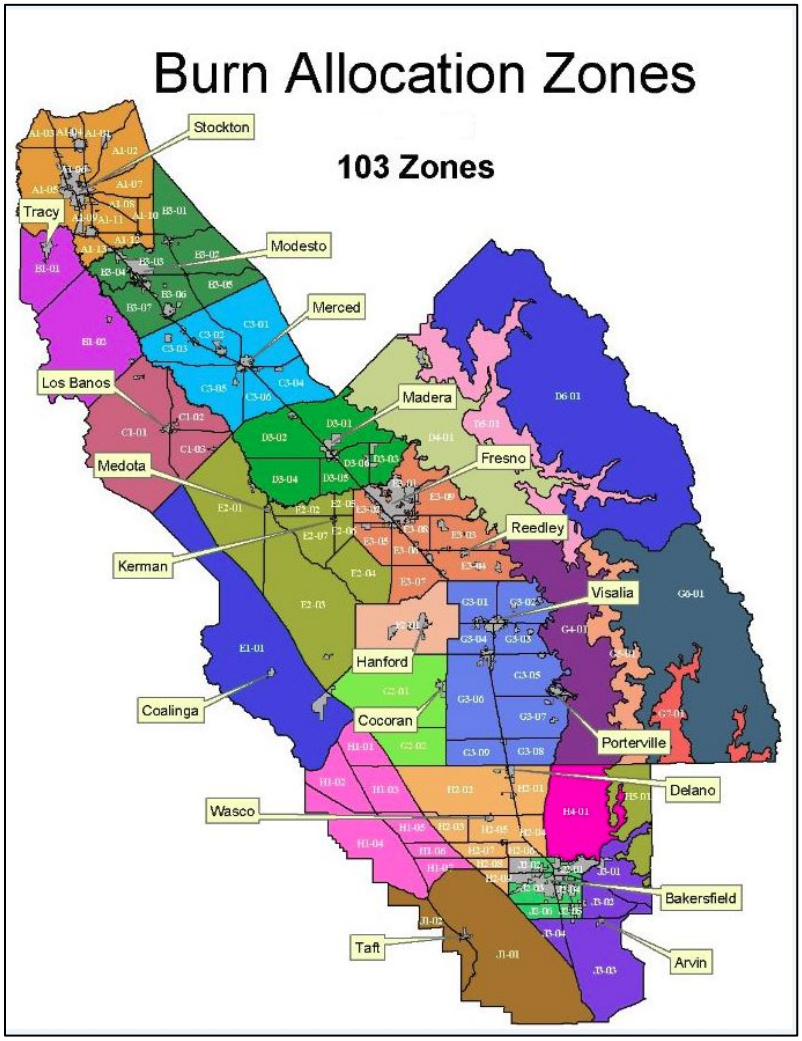
In 2004, the District established the Smoke Management System (SMS), a refined method of authorizing or prohibiting individual open burns based on modeling the air quality impacts of smoke. The entity requesting a burn permit must first provide the District with information about the acres and type of burn material, the specific location of the burn, and the date of the burn. This information is entered into the SMS, where acres are converted to tons of fuel burned using a fuel loading factor based on the specific crop to be burned. Emissions are calculated by multiplying the tons of fuel burned by a crop specific emission factor. A burn request will be authorized after analysis and review from the District Compliance staff, and only if sufficient emissions have been allocated to the burn zone.

The proper management of burning allocations under the SMS ensures that open burning of agricultural materials does not cause any violations of health-based ambient air quality standards, open burning has only been permitted under the District's comprehensive SMS, which uses real-time meteorological information to analyze the impact of burning on air quality and appropriately limit burn allocation by area.

[11] ARB concurrence with San Joaquin Valley Air Pollution Control District determination. Letter to Mr. Samir Sheikh from Kurt Karperos, Deputy Executive Officer of the ARB. (2015, December 23)

Under the District's SMS program, the Valley is divided into 103 zones, see figure C-1 below. The amount of burning allowed in a given zone on a specific day is based on factors such as the local meteorology, the air quality conditions, the atmospheric holding capacity, the amount of burning already approved or happening in a given area, and the potential impacts on downwind populations. In order to avoid violations of relevant air quality standards, District staff must reduce and balance the impacts of agricultural burning, wildfires, and prescribed burning. In some cases when the wildfire smoke impacts are severe, no agricultural burning is allowed. In the summer of 2015 when wildfire smoke impacted the Valley's air quality, the agricultural community had to be flexible to wait for the next burn window to appear. During this period, District staff worked hard to find burn windows under good to marginal dispersion conditions to allow agricultural burning to continue in the middle of the wildfire season.

Figure C-1 Agricultural Burn Zones Defined in the District SMS



Check Before You Burn Season

During the wood-burning season from November through February, the District implements even tighter open burning restrictions based on the daily residential wood-burning declarations issued for the Check Before You Burn program. With the recent amendment of Rule 4901, residential wood-burning with unregistered devices is no longer allowed when an area's forecasted PM2.5 concentration is expected to be greater than or equal to 20 µg/m^3. This threshold is now lower compared to past years when it was set at 30 µg/m^3. To be consistent with the residential wood-burning declaration, an area's burn zones in SMS are allocated zero emissions when residential wood-burning is prohibited in that area. Following similar procedures discussed above, zones directly adjacent to an area where residential wood-burning is restricted are also allocated zero emissions. Under this policy, agricultural burning is placed under tighter control during the winter season and burning is only allowed when air quality is expected to be below 20 µg/m^3. This happens when meteorological conditions are projected to be conducive for pollutant dispersion, which is well below the current federal 24-hour average PM2.5 standard of 35 µg/m^3.

Burn Prohibition Date Postponements

Through the *2010 Report,* the District made the determination, consistent with the CH&SC requirements, to postpone the burn prohibition dates and allow continued burning of certain crop categories (see table below).

Table C-2 Burn Permits Allowed for the Following Crops

Crop Category	Burn Permits Prohibited	Burn Permits Allowed
Field Crops	Alfalfa, asparagus, barley stubble, beans, corn, cotton, flower straw, hay, lemon grass, oat stubble, pea vines, peanuts, safflower, sugar cane, vegetable crops, and wheat stubble	Rice stubble up to 70% of the total acreage of rice farmed by the operator per year Residual rice stubble, spot burning of rice stubble, and burning of weeds and vegetative materials on rice field levees and banks
Prunings	Apricot crops, avocado crops, bushberry crops, cherry crops, Christmas trees, citrus crops, date crops, eucalyptus crops, kiwi crops, nectarine crops, nursery prunings, olive crops, pasture or corral trees, peach crops, persimmon crops, pistachio crops, plum crops, pluot crops, pomegranate crops, prune crops, rose crops, and fig crops	Apple crops, pear crops, and quince crops
Weed Abatement	Berms, fence rows, pasture, grass, and bermuda grass	Weed abatement activities affecting ponding and levee banks

Crop Category	Burn Permits Prohibited	Burn Permits Allowed
Orchard Removals	Orchard removal matter of more than 15 acres at a single location, per calendar year, citrus crops > 3,500 acres	Citrus crops < 3,500 acres, apple crops, pear crops, quince crops, and orchard removal matter from a total of 15 acres or less of orchard removal at a single location, per calendar year
Vineyard Removals	None at this time	Vineyard removal materials from grape and kiwi crops
Surface Harvested Prunings	Grape canes (defined as "vineyard materials"), grape vines, and prunings of almond, walnut, and pecan crops for each agricultural operation whose total nut acreage at all agricultural operation sites is 3,500 acres or more	Raisin trays (defined as "vineyard materials"), and up to 20 acres of prunings per year for almond, walnut, and pecan crops for agricultural operations whose total nut acreage at all agricultural operation sites is less than 3,500 acres with a case-by-case allowance of additional burn requests based on economic feasibility
Other Materials	Brooder paper and deceased goats	Diseased beehives

Effects of Drought on Agricultural Burning

California is currently suffering through the worst drought in recorded history. Despite improved atmospheric conditions during the winter of 2014-2015, precipitation remained well below average for most of the Valley. Snow pack levels during winter of 2014-2015 hit a record low at 6% of normal. Since January 2014, the Governor declared California to be in a state of Drought Emergency, and the entire Valley is under “exceptional” drought conditions. Federal and state surface water deliveries are at an all-time low of zero- to twenty-percent allocation, and cities and towns have implemented a mandatory 25% reduction in water usage.

The drought conditions described above have resulted in a significant increase in fallowed land, with far more expected to follow. To date hundreds of thousands of acres of orchards, vineyards and other agricultural crops have been fallowed in the San Joaquin Valley in response to the drought. Removal of agricultural material has increased significantly and is expected to continue increasing for several more years. With the biomass industry in jeopardy, the extra agricultural material has nowhere to go.

C.1.3 How does District Rule 4103 compare with federal rules and regulations?

C.1.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.1.3.2 EPA – Alternative Control Techniques (ACT) Document

EPA ACT requirements are not applicable to this source category.

C.1.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.1.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.1.4 How does District Rule 4103 compare to California State regulations?

California Health and Safety Code (CH&SC) Section (§) 41850-41866 (Agricultural Burning) is the California state regulation applicable to agricultural open burning activities.

The District has continued to work closely with the stakeholders to identify economically feasible alternatives to open burning of various agricultural materials and to meet its legal obligation under the CH&SC. To fulfill the state law requirements, the District has implemented the requirements for most crop categories identified in CH&SC §41855.5. In addition to those requirements, the state law authorizes the District to postpone the burn prohibition dates for specific types of agricultural material if the District makes three specific determinations and the Air Resources Board (ARB) concurs. The determinations are: (1) there are no economically feasible alternatives to open burning for that type of material; (2) open burning for that type of material will not cause or substantially contribute to a violation of an air quality standard; and (3) there is no long-term federal or state funding commitment for the continued operation of biomass facilities in the Valley or the development of alternatives to burning.

The District amended Rule 4103 in April 2010 to incorporate CH&SC requirements and committed the District to review its determinations for any postponed crops and materials at least once every five years. In 2010, the District also evaluated each crop category identified in CH&SC §41855.5 to determine any technologically and economically feasible alternatives to open burning. After working extensively with stakeholders to understand viable alternatives to open burning and the associated costs, the District provided recommendations for allowing or prohibiting the open burning of agricultural material categories in the District's *2010 Final Staff Report and Recommendations on Agricultural Burning*. ARB concurred with the District's determinations and recommendations; however, ARB made a one-time request that the District re-visit the 2010 findings after two years to determine if additional reductions in open burning were feasible.

The District revisited its 2010 analysis in 2012 and submitted those findings to ARB. The 2012 Report showed that in the two years since the 2010 Report, there had been no significant changes in the economic feasibility of various alternatives to agricultural burning. The amount of agricultural materials accepted at biomass facilities continued to fluctuate based on market conditions and there were no long-term federal or state funding commitments for the operation of biomass facilities or development of

alternatives to burning. EPA finalized approval for Rule 4103 on January 4, 2012 and deemed this rule as at least meeting RACT requirements.[12] The District reevaluated the availability of alternatives to open burning in the *2014 Reasonably Available Control Technology Demonstration for the 8-Hour Ozone State Implementation Plan* (*2014 RACT SIP*) and again in its *2015 Review*. Based on information provided in the *2015 Review*, ARB concurred that the limited exemptions are appropriate through 2020.

C.1.5 How does this rule compare to rules in other air districts?

C.1.5.1 Bay Area AQMD

C.1.5.1.1 Regulation 5 (Open Burning)

The requirements of Rule 4103 are more stringent than the requirements in Regulation 5. Regulation 5 was last amended on June 19, 2013 to add new fee requirements. The amendments did not implement any requirements more stringent than the current requirements in District Rule 4103.

C.1.5.2 Sacramento Metropolitan AQMD

C.1.5.2.1 Rule 407 (Open Burning)

The requirements of Rule 4103 are more stringent than the requirements in Rule 407.

C.1.5.3 South Coast AQMD

C.1.5.3.1 Rule 444 (Open Burning)

The requirements of Rule 4103 are more stringent than the requirements in Rule 444. Rule 444 was last amended on July 12, 2013 to address beach burning activities. The amendments apply to sources that do not exist within District's boundaries. Rule 444 also restricts burning on residential wood combustion curtailment days. As discussed in detail above, this is a practice that has already been implemented by the District within the Valley.

C.1.5.4 Ventura County APCD

C.1.5.4.1 Rule 56 (Open Burning)

The requirements of Rule 4103 are more stringent than the requirements in Rule 56.

[12] Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District, 75 Fed. Reg. 2, pp 214-217 (2012, January 4). (to be codified at 40 CFR Part 52)

C.1.6 Potential Emission Reduction Opportunities

A number of alternatives to open burning have been identified with potential to reduce emissions form this source category. Those alternatives are described in detail below and include the following:

- Biomass power plants
- Pyrolysis
- Bio-char
- Bio-oil
- High solids anaerobic digestion
- Composting
- Fiberboard
- Mulch/land application/soil incorporation
- Cellulosic ethanol production

C.1.6.1.1 Biomass Power Plants

Biomass power plants are a significant alternative to the open burning of agricultural material and the emissions associated with it. Biomass burning of agricultural material is preferable to open burning as it combusts the material more completely, results in fewer emissions, and provides an alternative source of energy in the Valley.

The biomass industry is primarily the product of the Public Utility Regulatory Policy Act (PURPA) which was enacted in 1978 at the height of the energy crisis to promote the use of alternative nonutility power generation. Today, these facilities are fully depreciated and have lost, or are nearing the ends of, their long-term contracts to sell their power to the utilities. In addition, biomass facilities are facing numerous obstacles to remain in operation including price disadvantage, demand for intermittent power instead of baseload power, and lack of federal and state funding.

Much has changed in the energy markets since PURPA was implemented. Natural gas has replaced oil for electricity generation, and supplies of natural gas have increased, driving down the wholesale cost of electricity. California has adopted a Renewable Portfolio Standard (RPS) that requires 33% of the power that is purchased by utilities be renewable. This has driven competition to fill the renewable energy needs of the state. Under the RPS, Investor Owned Utilities (IOUs) have tended to favor lower cost intermittent sources of renewable power, such as solar and wind. This has left the biomass industry in a position where the power that they produce is not desirable, since most biomass plants provide baseload power instead of intermittent power, and the current rate being paid for power does not allow them to remain viable.

Given the current energy policy, the biomass industry does not compete well under the current procurement policies of the state's IOUs. Historically, the biomass facilities have demanded 12-13 cents per kilowatt-hour, which has been necessary to retain economic viability. Pricewise, this places biomass facilities at a competitive disadvantage with other renewable fuels that can be procured at a much lower cost. Under the state's RPS, program pricing information is confidential, however, anecdotal

evidence is that currently the IOUs are purchasing power from solar and wind facilities at approximately 8 cents per kilowatt-hour.
Another factor that negatively impacts the competitive position of biomass generated power is due to the fact that such plants provide "baseload" power. As baseload generators, biomass facilities cannot produce power that can be turned on quickly, and therefore, cannot meet the power system's demand for "ramping services". The demand for ramping services is compounded by continued increase in the use of wind and solar renewable sources, which is partially triggered by the state's RPS goals. If current trends persist, this issue will worsen in the future. It is estimated that by 2020, solar and wind will account for three-quarters of the state's renewable power and 20% of the state's total electricity supply. The net effect of this is a further transition away from baseload generators to more flexible generators that can be turned-on and turned-off when needed. Under this scenario, not only do biomass facilities have difficulty competing directly on price, but they also do not provide the type of power that is desired. While under this scenario the state can meet its renewable power goals, the potential loss of biomass plants can impact the state's broader greenhouse gas reduction goals under AB 32 by increasing GHG emissions in sectors that currently rely on biomass plants for disposal of materials including the agricultural industry, landfills, and forests.

The biomass industry also struggles to provide consistent service to farmers needing timely removal of material to ensure the land is ready for the next planting season. In the past, lack of coordination and available storage for biomass fuels has caused uncertainty over the timing of material removal. The inability to guarantee consistent acceptance of agricultural biomass offers further confirmation that remaining crop categories should be allowed to continue open burning. A complete prohibition of open burning would result in a massive increase in agricultural material requiring disposal, placing an even greater strain on an already precarious situation.

As shown in Table C-3, since 2012, five Valley biomass facilities have shut down operations. In addition, the Valley's largest biomass plant (Covanta Delano) has stopped receiving new material as of November 1, 2015, and has informed the District that they plan to shut down operations at the end of the year because they have been unable to secure a viable Purchase Power Agreement.

Table C-3 Status of Biomass Facilities in the Valley

Facility Name	City	Capacity (MW)	Status
Rio Bravo Fresno	Fresno	28.5	
Covanta Mendota, LP	Mendota	30.0	CLOSED Dec. 2015
Madera Power, LLC	Madera	28.5	CLOSED Feb. 2012
Ampersand Chowchilla Biomass, LLC	Chowchilla	12.5	
Merced Power. LLC	Merced	13.0	
Thermal Energy Dev Partnership, LP	Tracy	20.5	CLOSED Oct. 2014
DTE Stockton, LLC	Stockton	54.0	
Covanta Delano, Inc.	Delano	56.5	DORMANT Dec. 2015
Sierra Power Corporation	Terra Bella	9.4	CLOSED Jan. 2014

Facility Name	City	Capacity (MW)	Status
Mt. Poso Cogeneration Company, LLC	Bakersfield	49.9	
CRES Inc. d/b/a Dinuba Energy	Dinuba	11.5	CLOSED Sept. 2015

The loss of these facilities has considerably reduced the available options to dispose of agricultural wood waste, especially material from large orchard removals. As a result, many agricultural growers have lost the primary economically feasible disposal option for their orchard removal material. This could not come at a worse time as there has been an increase in the number of large orchard removals over the past year due in large part to the effects of the extreme drought emergency currently facing the state.

The biomass industry has long relied on a combination of state and federal financial incentives to directly support their relatively higher production costs. These incentives have ranged from tax credits to monetary grants, but have all expired over the last decade. Examples of these programs include the federal Renewable Electricity Production Tax Credit, expired in 2013, state Existing Renewable Facilities Program, expired in 2011, and state Biomass-to-Energy incentive Grant Program, expired in 2003. Therefore, there are currently no long-term federal or state funding commitments for the operation of biomass facilities or development of alternatives to burning.

Potential Technologies to Provide Alternatives to Agricultural Open Burning

The District has found no breakthroughs in technologically achievable and economically feasible alternatives to open burning and traditional biomass power plants. While every effort should be taken to save this existing resource, the District believes that there is an urgent need to investigate other alternatives for the disposal of agricultural waste material. The following are potential technologies that the District may pursue through the District's Technology Advancement Program. Funding from the California Energy Commission, Department of Energy, and others will also be needed.

Pyrolysis – Gasification: Pyrolysis is a possible path to convert agricultural biomass to higher value products. Pyrolysis is the heating of an organic material, such as biomass, in the absence of oxygen. It is the first step of producing a flammable gas called synthetic gas (syngas). Burning syngas offers certain advantages over directly burning biomass because the gas can be cleaned and filtered to remove problematic chemical compounds. Using syngas is also potentially more efficient than direct combustion of biomass because the gas can be combusted at higher temperatures. Syngas can also be used to produce methanol and hydrogen, or converted into a liquid fuel; with lower emissions than existing biomass combustion power plants, this is a viable alternative for farm-scale or small-scale power production. There are currently a few operational units in California, including two in the Valley.

Bio-char: Bio-char is a name for charcoal when it is used for particular purposes, especially as a soil amendment. Like charcoal, bio-char is created by pyrolysis of biomass. Bio-char can increase soil fertility and agricultural productivity. Bio-char can also be processed into activated carbon that can be used for the removal of specific compounds from gaseous and liquid streams.

Bio-oil: Bio-oil, sometimes also known as bio-crude or pyrolysis oil is a mixture of organic compounds that is distilled from the products of fast pyrolysis of biomass at about 500°C. Bio-oil can be used as fuel in boilers and also used in power generation equipment. Bio-oil also can be upgraded to renewable transportation fuels, as well. However, bio-oil with high cellulosic materials such as orchard debris is not currently commercially viable.

High Solids Anaerobic Digestion: Anaerobic digestion is a viable process that can be used to convert woody biomass, agricultural wastes, and municipal solid wastes into methane gas. Anaerobic digesters that process large amounts of woody biomass will require the use of chemical treatment or enzymes to speed the breakdown of cellulose.

Composting Biomass: Composting is the process by which organic material is broken down aerobically by bacteria and other microorganisms to form a biologically stable organic substance suitable as a soil amendment and plant fertilizer. Organic waste decomposes naturally in the presence of water, warmth, and oxygen. Composting accelerates the process by adding moisture and maintaining an elevated temperature. Biomass is one of the sources of organic material for composting operations, but woody biomass must be well mixed with high nitrogen concentration materials to be an effective compost component.

Fiberboard: Biomass can be treated and processed to produce fiberboard that can be used in the manufacture of various products. Fiberboard is a type of engineered wood product that is made out of wood fibers that are bonded together with resin. Types of fiberboard include particleboard, medium-density fiberboard, and hardboard. Fiberboard is frequently used in many industries, such as furniture production, and is generally made with waste material from wood processing facilities.

Biomass Used as Mulch/Land Application/Soil Incorporation: Chipped or shredded agricultural biomass materials can be used to produce wood mulch. Wood mulch can be a mixture of shredded wood, bark, and compost. Wood mulch can be used in landscape projects or for erosion control. The material is primarily used to reduce erosion by protecting bare soil from rainfall impacts, increasing water infiltration, and reducing runoff. A significant portion of pruned orchard material is currently shredded in-row and used as mulch in the orchard. The shredded material can be left on the ground or can be incorporated into the soil when the field is tilled. Over time, the material decomposes into the soil, which adds valuable organic material to the soil and can lead to better water infiltration and soil quality.

Cellulosic Ethanol Production: Cellulosic ethanol is an advanced next-generation biofuel that can be made from agricultural wastes, wood chips, switch grass, corn stover, forest wastes, fast-growing trees, and other plant material. Currently, ethanol produced in the United States is most commonly produced from corn kernels. In the United States, corn ethanol is primarily used as an alternative or additive to gasoline. Advanced biofuels are those that do not rely on the starch in corn kernels. Production of large quantities of ethanol from woody biomass will likely require the use of chemical treatment or

enzymes to speed the breakdown of the cellulose in the biomass. Currently, the production of cellulosic ethanol is still predominately in the demonstration phase of development.

C.1.7 Evaluation Findings

Rule 4103 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.2 RULE 4106 PRESCRIBED BURNING AND HAZARD REDUCTION BURNING

C.2.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
VOC	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.58	0.58

C.2.2 District Rule 4106 Description

Adopted in June 2001 and approved by EPA as a SIP amendment in February 2002,[13] Rule 4106 is applicable to range improvement burning, forest management burning, wildland vegetation management burning, and hazard reduction burning within the Valley. Prescribed burning generally includes forest waste, fire hazard reduction, rangeland management, wildlife habitat improvement, and ecosystem (forest health) burning. The adoption of Rule 4106 incorporated provisions made necessary by the March 23, 2000 amendment of Title 17 of the California Code of Regulations.

Recognizing the importance of both prescribed burning and hazard reduction burning, the purpose of Rule 4106 is to permit, regulate, and coordinate the use of prescribed burning and hazard reduction burning while minimizing smoke impacts on the public. Through this rule, the District has expended considerable resources to ensure that the ignition of burn projects is only allowed when air quality and dispersion conditions are favorable, thus lessening the health impacts on Valley citizens and on air quality in the Valley.

C.2.3 How does District Rule 4106 compare with federal rules and regulations?

C.2.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.2.3.2 EPA – Alternative Control Techniques (ACT) Document

EPA ACT requirements are not applicable to this source category.

C.2.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

[13] 67 Federal Register 39, pp. 8894-8897 (to be codified at 40 CFR Part 52). (2002, February 27). *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District*. Retrieved from https://www.federalregister.gov/articles/2002/02/27/02-4526/revisions-to-the-california-state-implementation-plan-san-joaquin-valley-unified-air-pollution.

C.2.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.2.4 How does District Rule 4106 compare with California State regulations?

There are no state regulations applicable to this source category.

C.2.5 How does District Rule 4106 compare to rules in other air districts?

C.2.5.1 Bay Area AQMD

C.2.5.1.1 Regulation 5 (Open Burning)

The requirements in Rule 4106 are as stringent as or more stringent than those in Regulation 5.

C.2.5.2 Sacramento Metropolitan AQMD

C.2.5.2.1 Rule 501 (Agricultural Burning)

The requirements in Rule 4106 are as stringent as or more stringent than those in Rule 501.

C.2.5.3 South Coast AQMD

C.2.5.3.1 Rule 444 (Open Burning)

The requirements in Rule 4106 are as stringent as or more stringent than those in Rule 444.

C.2.5.4 Ventura County APCD

C.2.5.4.1 Rule 56 (Open Burning)

The requirements of Rule 4106 are as stringent as or more stringent than those in Rule 56.

C.2.5.5 Other Air Quality Control Agencies

C.2.5.5.1 Placer County APCD

Placer County APCD Rule 301 (Nonagricultural Burning Smoke Management)
The requirements of Rule 4106 are as stringent as or more stringent than those in Rule 301.

Placer County APCD Rule 303 (Prescribed Burning Smoke Management)
The requirements of Rule 4106 are as stringent as or more stringent than those in Rule 303.

C.2.6 Potential Emission Reduction Opportunities

In its *2015 Plan for the 1997 PM2.5 Standard* (*2015 PM2.5 Plan*) the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive evaluation included the evaluation of potential emission reduction opportunities such as the mechanical removal of materials; the use of firebox air curtain burners; reorganization of hazard reduction zones, chipping, and biomass removal programs. The District found that Rule 4106 currently has in place the most stringent measures feasible to implement in the Valley.[14] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.2.7 Evaluation Findings

According to the federal CAA §182(b)(2) and (f) this source category is not subject to federal RACT requirements because this source category has no sources subject to EPA CTGs and these sources are not "major sources" of VOCs and NOx, as confirmed by EPA in the Technical Support Document (TSD) for the partial approval of the Districts 2009 RACT SIP.[15] However, pursuant to the District's No Stone Left Unturned philosophy, Rule 4106 was evaluated as a part of this plan development effort.

Rule 4106 currently has in place the most stringent measures feasible to implement in the Valley and therefore would meet or exceed federal RACT requirements for this source category were they applicable. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[14] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

[15] U.S. EPA. Region IX Air Division. Technical Support Document for EPA's Notice of Proposed Rulemaking for the California State Implementation Plan. Prepared by Stanley Tong. (2011, August 29). https://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2011-0723-0006

C.3 RULE 4301 FUEL BURNING EQUIPMENT

C.3.1 *Emissions Inventory (Summer Average – Tons per day)**

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*The emission inventory is not specific to Rule 4301. See Rules 4306, 4307, 4308, 4309, 4352, and 4703 for the individual emissions inventories.

C.3.2 District Rule 4301 Description

Rule 4301 was last amended in 1992 and applies to all types of fuel burning equipment, except air pollution control equipment. The purpose of this rule is to limit emissions of air contaminants from fuel burning equipment by specifying maximum emission rates for SOx, NOx, and PM (identified in the rule as combustion contaminant emissions). EPA finalized approval of the 1992 amendments to Rule 4301 on May 18, 1999 and deemed this rule as being at least as stringent as established RACT requirements.

Rule 4301 has a very broad applicability, as it applies to all types of fuel burning equipment. Since its early adoption in 1992, it has largely been superseded by several District rules with more stringent NOx requirements for specific types of fuel burning equipment. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4352, and 4703 for more specific information about the individual fuel burning equipment source categories.

C.3.3 How does District Rule 4301 compare with federal rules and regulations?

C.3.3.1 EPA – Control Technique Guidelines (CTG)

Several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable federal rules are discussed within those control measure evaluations.

C.3.3.2 EPA – Alternative Control Techniques (ACT) Document

Several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable federal rules are discussed within those control measure evaluations.

C.3.3.3 Standards of Performance for New Stationary Sources (NSPS)

Several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable federal rules are discussed within those control measure evaluations.

C.3.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

Several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable federal rules are discussed within those control measure evaluations.

C.3.4 How Does District Rule 4301 compare with California State regulations?

Several District rules have superseded Rule 4301 with more stringent requirements. Comparisons of those District rules to the applicable state rules are discussed within those control measure evaluations.

C.3.5 How does District Rule 4301 compare to rules in other air districts?

C.3.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.3.5.2 Sacramento Metropolitan AQMD

There are no analogous rules in Sacramento Metro AQMD for this source category.

C.3.5.3 South Coast AQMD

C.3.5.3.1 Rule 474 (Fuel Burning Equipment—Oxides of Nitrogen)

The requirements of Rule 4301 are more stringent than the requirements in Rule 474.

C.3.5.4 Ventura County APCD

There are no analogous rules in Ventura County APCD.

C.3.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.3.7 Evaluation Findings

The NOx requirements of this rule have been superseded by the requirements of other District rules that satisfy RACT and go beyond RACT for fuel burning equipment. All units subject to Rule 4301 are subject to a more specific NOx rule discussed elsewhere in this appendix. See the control measure evaluations for Rules 4306, 4307, 4308, 4309, 4352, and 4703.

C.4 RULE 4302 INCINERATOR BURNING

C.4.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
VOC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

C.4.2 District Rule 4302 Description

This rule applies to any incinerator activity or equipment. The purpose of this rule is to limit air pollution by prohibiting the use of any incinerator except for multiple-chamber incinerators or one equally effective in controlling air pollution. EPA finalized approval of the 1993 amendments to Rule 4302 on August 19, 1999 and deemed this rule as being at least as stringent as established RACT requirements: 64 FR 45170, http://www.gpo.gov/fdsys/pkg/FR-1999-08-19/pdf/99-21164.pdf

C.4.3 How does District Rule 4302 compare with federal rules and regulations?

C.4.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.4.3.2 EPA – Alternative Control Techniques (ACT) Document

EPA ACT requirements are not applicable to this source category.

C.4.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.4.3.3.1 NSPS - 40 CFR 60 Subpart E (Standards of Performance for Incinerators)

Rule 4302 is more stringent than the requirements in the NSPS because the NSPS exempts all facilities with less than 50 tons per day charging rate. All facilities in the Valley produce less than 50 tons per day but are still subject to Rule 4302.

C.4.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.4.4 How Does District Rule 4302 compare with California State regulations?

There are no state regulations applicable to this source category.

C.4.5 How does District Rule 4302 compare to rules in other air districts?

C.4.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.4.5.2 Sacramento Metropolitan AQMD

C.4.5.2.1 Rule 408 (Incinerator Burning)

The requirements of Rule 4301 are as stringent as or more stringent than the requirements in Rule 408.

C.4.5.3 South Coast AQMD

C.4.5.3.1 Rule 473 (Disposal of Solid and Liquid Wastes)

The requirements of Rule 4302 are as stringent as or more stringent than the requirements in Rule 473.

C.4.5.4 Ventura County APCD

C.4.5.4.1 Rule 57 (Incinerators)

The requirements of Rule 4302 are more stringent than the requirements in Rule 57.

C.4.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.4.7 Evaluation Findings

Rule 4302 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.5 RULE 4306 AND RULE 4320 ADVANCED EMISSION REDUCTION OPTIONS FOR BOILERS, STEAM GENERATORS, AND PROCESS HEATERS GREATER THAN 5.0 MMBTU/HR

C.5.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	1.91	1.55	1.42	1.28	1.15	1.04	0.98	0.95	0.91
VOC	0.68	0.65	0.61	0.58	0.55	0.53	0.51	0.51	0.5

C.5.2 District Rule 4306/4320 Description

Rules 4306 and 4320 apply to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input greater than 5 million British thermal units per hour (MMBtu/hr). The purpose of these rules is to limit NOx and carbon monoxide (CO) emissions from boilers, steam generators, and process heaters of this size range.

Rule 4320 is the third generation rule for this source category. The first District rule for this source category, Rule 4305 (Boilers, Steam Generators, and Process Heaters), was adopted on December 16, 1993. Rule 4305 was superseded by Rule 4306 (Boilers, Steam Generators, and Process Heaters – Phase 3) on September 18, 2003 to implement a NOx control measure from the District's ozone and PM10 attainment plans, lowering the NOx emissions limits in Rule 4305. Since adoption, Rule 4306 has been amended twice.

The amendment of Rule 4306 in October 2008 was initially proposed to lower the NOx emission limit from 9 ppmv to 6 ppmv for units greater than 20 MMBtu/hr. It was determined that the proposed NOx limits could be accomplished by using selective catalytic reduction (SCR) or a combination of SCR and ultra-low NOx burners (ULNBs), thus making the lower limits technologically feasible. However, through the public workshop process and additional research it was also determined that most of the units subject to Rule 4306 have undergone several generations of NOx controls, and consequently, certain applications of SCR may not be cost effective and/or technological infeasible because of physical limitations. Therefore, the lower NOx limits were included in new Rule 4320 and an option was provided in the rule that allows for the payment of an annual emissions fee based on total actual emissions, rather than installation of additional NOx controls. These fees are used by the District to achieve cost effective NOx reductions through District incentive programs, the District's Technology Advancement Program, and other routes. The previous versions of Rule 4305 and 4306 combined with the implementation of Rule 4320 achieve approximately 96% control of NOx emissions from this source category.

The implementation of Rule 4320 does not substitute the requirements of Rule 4306, but enforces requirements supplementary to Rule 4306. As such, this evaluation is applicable to both Rule 4306 and Rule 4320.

Facilities with units subject to this rule represent a wide range of industries, including but not limited to electrical utilities, cogeneration, oil and gas production, petroleum refining, manufacturing and industrial processes, food and agricultural processing, and service and commercial facilities.

To recognize the operational and technical differences between different types of equipment subject to Rules 4306 and 4320, the different equipment types were separated into several major categories, with different requirements, including the following:

- Units with a total rated heat input greater than 5.0 MMBtu/hr to 20.0 MMBtu/hr
- Units with a total rated heat input greater than 20.0 MMBtu/hr
- Oilfield steam generators of all ratings and fuel types
- Refinery units of all ratings and fuel types
- Low-use units limited by a Permit to Operate to an annual heat input greater than 1.8 billion Btu/year but less than or equal to 30 billion Btu/year
- Units at a wastewater treatment facility using less than 50% PUC quality fuel
- Small specialty units operated by a small producer

C.5.3 How does District Rule 4306/4320 compare with federal rules and regulations?

C.5.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.5.3.2 EPA – Alternative Control Techniques (ACT) Document

C.5.3.2.1 ACT - EPA-453/R-93-034 (Alternative Control Techniques Document – NOx emissions from Process Heaters)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the ACT.

C.5.3.2.2 ACT - EPA-453/R-93-022 (Alternative Control Techniques Document – NOx Emissions from Industrial/Commercial/Institutional Boilers)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the ACT.

C.5.3.2.3 ACT - EPA-453/R-93-023 (Alternative Control Techniques Document – NOx Emissions from Utility Boilers)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the ACT.

C.5.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.5.3.3.1 NSPS - 40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel Fired Steam Generators for Which Construction Is Commenced After August 17, 1971)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the NSPS.

C.5.3.3.2 NSPS - 40 CFR 60 Subpart Db (Standards of Performance for Industrial- Commercial-Institutional Steam Generating Units)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the NSPS.

C.5.3.3.3 NSPS - 40 CFR 60 Subpart Dc (Standards of Performance for Small Industrial- Commercial-Institutional Steam Generating Units)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the NSPS.

C.5.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.5.3.4.1 NESHAP/MACT - 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

The requirements of Rules 4306/4320 are as stringent as or more stringent than the requirements in the NESHAP.

C.5.4 How Does District Rule 4306/4320 compare with California State regulations?

There are no state regulations applicable to this source category.

C.5.5 How does District Rule 4306/4320 compare to rules in other air districts?

C.5.5.1 Bay Area AQMD

C.5.5.1.1 Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters)

The requirements in Rules 4306/4320 are as stringent as or more stringent than those in Rule 9-7.

C.5.5.1.2 Regulation 9 Rule 10 (Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries)

The requirements in Rules 4306/4320 are as stringent as or more stringent than those in Rule 9-10.

C.5.5.2 Sacramento Metropolitan AQMD

C.5.5.2.1 Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)

The requirements in Rules 4306/4320 are as stringent as or more stringent than those in Rule 411.

C.5.5.3 South Coast AQMD

C.5.5.3.1 Rule 1146 (Emissions of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The requirements in Rules 4306/4320 are as stringent as or more stringent than those in Rule 1146.

C.5.5.4 Ventura County APCD

C.5.5.4.1 Rule 74.15 (Boilers, Steam Generators and Process Heaters)

The requirements in Rules 4306/4320 are as stringent as or more stringent than those in Rule 74.15.

C.5.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan,* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive evaluation included the evaluation of potential emission reduction opportunities such as low temperature oxidation; EMx; PM2.5 limits for alternative fuels; and PM potential emissions reductions from ESP and Scrubber technologies. The District evaluation determined that Rule

4306/4320 has the most stringent measures feasible to implement in the Valley.[16] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.5.7 Evaluation Findings

Rules 4306 and 4320 currently have in place the most stringent measures feasible to implement in the Valley and therefore meet or exceed federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[16] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.6 RULE 4307 BOILERS, STEAM GENERATORS AND PROCESS HEATERS–2.0 MMBTU/HR TO 5.0 MMBTU/HR

C.6.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.49	0.40	0.36	0.33	0.29	0.26	0.25	0.24	0.23
VOC	0.17	0.16	0.15	0.15	0.14	0.13	0.13	0.13	0.13

C.6.2 District Rule 4307 Description

This rule applies to any gaseous fuel or liquid fuel fired boiler, steam generator, or process heater with a total rated heat input of 2.0 million British thermal units per hour (MMBtu/hr) up to and including 5.0 MMBtu/hr. The purpose of this rule is to limit emissions of NOx, carbon monoxide (CO), sulfur dioxide (SO2), and particulates from units subject to this rule.

Rule 4307 was adopted on December 15, 2005 to establish emissions limits and control requirements for these units which were previously exempt because of their smaller size. Since its adoption, the rule has been amended three times. The October 2008 amendments strengthened the rule by removing some exemptions, imposing NOx limits of 9 or 12 ppmv for new and replacement units, and adding a menu-approach for particulate matter control that also encompasses SOx controls. The rule was amended again in 2011 to specifically incorporate tree nut pasteurizers as a separate type of unit. EPA published a direct final approval of the 2011 amendments to Rule 4307 on February 12, 2015 and deemed this rule as being at least as stringent as established RACT requirements. NOx emissions have been controlled by over 84% for units in this source category.

Based on District permits information, there are currently 540 permitted and Permit-Exempt Equipment Registration (PEER) units subject to Rule 4307 requirements. Facilities with units subject to this rule represent a wide range of industries, including but not limited to, medical facilities, educational institutions, office buildings, prisons, military facilities, hotels, and industrial facilities.

C.6.3 How does District Rule 4307 compare with federal rules and regulations?

C.6.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.6.3.2 EPA – Alternative Control Techniques (ACT) Document

C.6.3.2.1 ACT - EPA–453/R-93-034 (Alternative Control Techniques Document–NOx Emissions from Process Heaters)

The requirements of Rule 4307 are as stringent as or more stringent than the requirements in the ACT.

C.6.3.2.2 ACT - EPA–453/R-94-022 (Alternative Control Techniques Document–NOx Emissions from Industrial/Commercial/Institutional Boilers)

The requirements of Rule 4307 are as stringent as or more stringent than the requirements in the ACT.

C.6.3.2.3 ACT - EPA–453/R-94-023 (Alternative Control Techniques Document–NOx Emissions from Utility Boilers)

The requirements of Rule 4307 are as stringent as or more stringent than the requirements in the ACT.

C.6.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.6.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.6.3.4.1 NESHAP/MACT - 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

The requirements of Rule 4307 are as stringent as or more stringent than the requirements in the NESHAP.

C.6.4 How Does District Rule 4307 compare with California State regulations?

There are no state regulations applicable to this source category.

C.6.5 How does District Rule 4307 compare to rules in other air districts?

C.6.5.1 Bay Area AQMD

C.6.5.1.1 Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The requirements in Rule 4307 are as stringent as or more stringent than those in Rule 9-7.

C.6.5.1.2 Regulation 9 Rule 10 (Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries)

The requirements in Rule 4307 are as stringent as or more stringent than those in Rule 9-10.

C.6.5.2 Sacramento Metropolitan AQMD

C.6.5.2.1 Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)

The requirements in Rule 4307 are as stringent as or more stringent than those in Rule 411.

C.6.5.3 South Coast AQMD

C.6.5.3.1 Rule 1146.1 (Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The requirements in Rule 4307 are as stringent as or more stringent than those in Rule 1146.1.

C.6.5.4 Ventura County APCD

C.6.5.4.1 Rule 74.15.1 (Boilers, Steam Generators, and Process Heaters)

The requirements in Rule 4307 are as stringent as or more stringent than those in Rule 74.15.1.

C.6.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan,* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive evaluation included the evaluation of potential emission reduction opportunities such as EMx; PM2.5 limits for alternative fuels; and potential emissions reductions for an ESP and scrubber. The District evaluation determined that Rule 4307 has the most stringent measures feasible to implement in the Valley.[17] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

[17] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.6.7 *Evaluation Findings*

Rule 4307 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.7 RULE 4308 BOILERS, STEAM GENERATORS AND PROCESS HEATERS–0.075 MMBTU/HR TO LESS THAN 2.0 MMBTU/HR

C.7.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.91	0.74	0.67	0.61	0.55	0.5	0.47	0.45	0.43
VOC	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.24	0.24

C.7.2 District Rule 4308 Description

This rule applies to any person who supplies, sells, offers for sale, installs, or solicits the installation of any boiler, steam generator, process heater or water heater with a rated heat input capacity greater than or equal to 0.075 MMBtu/hr and less than 2.0 MMBtu/hr. The purpose of this rule is to limit NOx and carbon monoxide (CO) emissions from units within this source category. As a point of sale rule, Rule 4308 achieves emissions reductions as units subject to the rule are replaced over time. This rule has resulted in more than 93% control of emissions from this source category.

Rule 4308 was adopted on October 20, 2005 to establish NOx emissions limits for these units which were previously exempt from District regulations because of their small size. The rule was amended in December 2009 to lower the NOx emissions limits to 20 ppmv for units fired on natural gas, with the exception of instantaneous water heaters and pool heaters greater than or equal to 0.075 MMBtu/hr but less than or equal to 0.4 MMBtu/hr. In 2013, the District determined that a 20 ppmv limit was now technologically feasible and cost effective for instantaneous water heaters 0.075 MMBtu/hr to 0.4 MMBtu/hr; as such, that emission limit was lowered during the November 2013 amendment of Rule 4308. EPA published a direct final approval the 2013 amendments to Rule 4308 on February 12, 2015.

Units subject to Rule 4308 are used in settings including, but not limited to, apartment buildings, large homes, small businesses, commercial buildings, manufacturing facilities, government facilities, restaurants, hotels, hospitals, educational institutions, and religious organizations. Affected persons include water heater manufacturers, plumbing wholesalers, supply stores, plumbers, contractors, and end-users. This point-of-sale approach allows the District to achieve NOx emission reductions without forcing immediate replacement of existing units to comply with rule requirements and thus placing an undo financial burden on the consumer.

C.7.3 How does District Rule 4308 compare with federal rules and regulations?

C.7.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.7.3.2 EPA – Alternative Control Techniques (ACT) Document

C.7.3.2.1 ACT - EPA–453/R-93-034 (Alternative Control Techniques Document—NOx Emissions from Process Heaters)

The requirements of Rule 4308 are as stringent as or more stringent than the requirements in the ACT.

C.7.3.2.2 ACT - EPA–453/R-94-022 (Alternative Control Techniques Document—NOx Emissions from Industrial/Commercial/ Institutional Boilers)

The requirements of Rule 4308 are as stringent as or more stringent than the requirements in the ACT.

C.7.3.2.3 ACT - EPA–453/R-94-023 (Alternative Control Techniques Document—NOx Emissions from Utility Boilers)

The requirements of Rule 4308 are as stringent as or more stringent than the requirements in the ACT.

C.7.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.7.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.7.4 How Does District Rule 4308 compare with California State regulations?

There are no state regulations that apply to this source category.

C.7.5 How does District Rule 4308 compare to rules in other air districts?

C.7.5.1 Bay Area AQMD

C.7.5.1.1 Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 9-6.

C.7.5.1.2 Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 9-7.

C.7.5.2 Sacramento Metropolitan AQMD

C.7.5.2.1 Rule 411 (NOx from Boilers, Process Heaters and Steam Generators)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 411.

C.7.5.2.2 Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 Btu per Hour)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 414.

C.7.5.3 South Coast AQMD

C.7.5.3.1 Rule 1146.2 (Emissions of Oxides of Nitrogen From Large Water Heaters and Small Boilers and Process Heaters)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 1146.2.

C.7.5.4 Ventura County APCD

C.7.5.4.1 Rule 74.11.1 (Large Water Heaters and Small Boilers)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 74.11.1.

C.7.5.4.2 Rule 74.15.1 (Boilers, Steam Generators, and Process Heaters)

VCAPCD Rule 74.15.1 was amended on June 23, 2015 to implement new NOx emission limits for new and replacement units outside of the applicability of this rule. The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 74.15.1.

C.7.5.5 Other Air Quality Control Agencies

C.7.5.5.1 Placer County APCD (PCAPCD) – Rule 247 (Natural Gas-Fired Water Heaters, Small Boilers and Process Heaters)

The requirements in Rule 4308 are as stringent as or more stringent than those in Rule 247.

C.7.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan,* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive effort included an evaluation of the rule exemptions for units in mobile homes and in recreational vehicles. The District evaluation determined that Rule 4308 has the most stringent measures feasible to implement in the Valley. [18] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.7.7 Evaluation Findings

Rule 4308 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[18] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.8 RULE 4309 DRYERS, DEHYDRATORS, AND OVENS

C.8.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.22	0.24	0.26	0.28	0.29	0.31	0.32	0.33	0.34
VOC	0.20	0.21	0.23	0.25	0.26	0.27	0.28	0.29	0.29

C.8.2 District Rule 4309 Description

Rule 4309 is applicable to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel, or is fired on gaseous and liquid fuel sequentially, and the total rated heat input for the unit is 5.0 million British thermal units per hour (5.0 MMBtu/hr) or greater. The purpose of this rule is to limit NOx and carbon monoxide (CO) emissions from these units, which result from the combustion of fuel in the burners. The rule enforces NOx emission limits between 3.5-12 ppmv for four categories of equipment, achieving approximately 34% control of total NOx emissions.

Rule 4309 was adopted on December 15, 2005 and has not been amended. EPA finalized approval of Rule 4309 on May 30, 2007 and deemed this rule as being at least as stringent as established RACT requirements.

Dryers, dehydrators, and ovens are utilized in a broad range of industries. Analyses performed for the rule adoption separated the unit types into four broad industry groups: dehydrators; asphalt/concrete; milk, cheese, and other dairy processing; and other. Dryers, dehydrators, and ovens currently operate either seasonally or year-round depending on the industry and the unit's purpose within the process. There are 126 units subject to this rule, ranging in size from 5.0 MMBtu/hr to 200 MMBtu/hr.

C.8.3 How does District Rule 4309 compare with federal rules and regulations?

C.8.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.8.3.2 EPA – Alternative Control Technology (ACT)

C.8.3.2.1 ACT - EPA – 453/R-94-004 (Alternative Control Techniques Document–NOx Emissions from Cement Manufacturing)

The requirements of Rule 4309 are as stringent as or more stringent than the requirements in the ACT.

C.8.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.8.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.8.4 How does District Rule 4309 compare with California State regulations?

There are no state regulations applicable to this source category.

C.8.5 How does District Rule 4309 compare to regulations from other air districts?

C.8.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.8.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.8.5.3 South Coast AQMD

C.8.5.3.1 Rule 1147 (NOx Reductions from Miscellaneous Sources)

The requirements of Rule 4309 are as stringent as or more stringent than the requirements in Rule 1147.

C.8.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.8.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan,* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive effort included an evaluation of asphalt plants; dehydrators; and dryers. The District evaluation determined that Rule 4309 has the most stringent measures feasible to implement in the Valley. [19] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

[19] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.8.7 Evaluation Findings

Rule 4309 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.9 RULE 4311 FLARES

C.9.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.57	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.52
VOC	1.64	1.54	1.45	1.37	1.29	1.21	1.17	1.14	1.12

C.9.2 District Rule 4311 Description

Rule 4311 was adopted in June 2002 to establish flaring requirements and reduce VOC, NOx, and SOx emissions from operations involving the use of flares, with the exception of a limited list of sources identified in the rule. Amendments were adopted on June 15, 2006 and June 18, 2009. The September 2009 amendment incorporated requirements for flare minimization plans and increased the stringency of existing requirements for sulfur emissions.

Flaring is a high temperature oxidation process used to burn combustible components, primarily hydrocarbons, of waste gases from industrial operations, primarily for the purpose of controlling emissions and as a safety device. The majority of waste gases flared are natural gas, propane, ethylene, propylene, butadiene and butane.

Combustion efficiency depends on flame temperature, residence time in the combustion zone, vent gas flammability, auto ignition temperature, heating value, and turbulent mixing. When operated at an optimal combination of these factors, flares have a destruction efficiency of 98 percent or greater. Complete combustion converts all VOCs to CO_2 and water; however incomplete combustion generates air pollutants such as NOx, sulfur dioxide, carbon monoxide, and particulate matter. Additionally, there is a possibility of release of hydrocarbons if they have not been completely combusted. To prevent the creation of smoke or soot, which is influenced by fuel characteristics and the amount and distribution of oxygen in the combustion zone, most industrial flares are steam-assisted or air-assisted. In some cases, another fuel must be added to flare gas to achieve the minimum heating value of 200-250 Btu/ft^3 required for complete combustion.

There are two general types of flares: open and enclosed flares. Flares are further categorized by the height of the flare tip, and by the method of enhancing combustion by mixing at the flare tip (i.e., steam-assisted, air-assisted, pressure assisted, or non-assisted).

Ground flares, which are not typically found in the Valley, vary in complexity and can consist of either conventional flare burners discharging horizontally with no enclosures or multiple burners in refractory-lined steel enclosures.

Flaring in the San Joaquin Valley

Flares serve two basic functions: as a safety device during unforeseeable and unpreventable emergency situations/standby situations and less commonly as a primary emissions control device for VOC emissions. As safety devices, flares are necessary to prevent catastrophic consequences such as the release of toxic gases and explosions, which could result in loss of property, injury, and loss of human life. In the Valley, the vast majority of flares are employed as emergency/standby control devices, which is in direct contrast with other regions, such as North Dakota, where flares are used for primary disposal of waste gas from oil and natural gas production. Also, while regions like North Dakota utilize flares to combust associated gas during the initial extraction phase of the production process (i.e., directly from the well), Valley flares are typically used further down the process chain, primarily as a safety device associated with gas collection systems, resulting in far lower quantities of flared gas.

Valley operators have generally evaluated all feasible and cost effective options for handling and disposing of the associated/waste gases generated by their facilities and installing a flare as the primary method of disposal would be the last resort. In addition to Rule 4311 requirements to evaluate and implement all feasible measures to reduce flaring activities, other associated rules also implement stringent capture and control of these gases. Therefore, most facilities have made significant investments to capture and utilize these process gases in a variety of methods and this ability has allowed facilities to maximize income generation. Some capture and treat these gases and sell them to natural gas/utility providers (generates monetary income), while others utilize these gases on-site to fuel equipment that generates electricity and/or provides process heating (saves fuel costs). In fact, most Valley facilities regard flaring events as a significant monetary cost, through directly lost profits or increased fuel costs.

In the District's evaluation of Valley flaring activities,[20] nearly all of the flaring events were either one-time events due to new control equipment installation or maintenance of existing equipment, and therefore not repeated, or in response to emergency situations or process upsets. For example, one Valley facility (light oil production facility) experienced abnormally high flaring due to the sales transmission pipeline being offline for repairs. Another facility (wastewater treatment plant) normally uses the fuel onsite to produce electricity and process heating but could not do so because additional air pollution control devices were being installed.

Flares in the Valley subject to the requirements in Rule 4311 are employed by a diverse group of industries for a wide variety of applications, as illustrated by the below list. In contrast, other air districts' flare rules generally limit the applicability of their rules to petroleum production facilities or refineries.

- Gas plants
- Heavy oil production/ thermally enhanced oil recovery

[20] SJVAPCD. (2014). *Rule 4311 (Flares) Further Study*. Retrieved February 3, 2015 from: http://valleyair.org/Air_Quality_Plans/docs/R4311.pdf.

- Light oil production
- Refinery operations
- Wastewater treatment plants
- Cheese production
- Wine
- Dairy operations
- Flat glass production
- Correctional facility

C.9.3 How does District Rule 4311 compare with federal rules and regulations?

C.9.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.9.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.9.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.9.3.3.1 NSPS - 40 CFR 60.18 (General Control Device and Work Practice Requirements)

The requirements of Rule 4311 are as stringent as or more stringent than the requirements in the NSPS.

C.9.3.3.2 NSPS - 40 CFR 65.147 (Flares)

The requirements of Rule 4311 are as stringent as or more stringent than the requirements in the NSPS.

C.9.3.3.3 NSPS - 40 CFR 60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

The requirements of Rule 4311 are as stringent as or more stringent than the requirements in the NSPS.

C.9.3.3.4 NSPS - 40 CFR 60 Subpart Ja (Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007)

The requirements of Rule 4311 are as stringent as or more stringent than the requirements in the NSPS.

C.9.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.9.3.4.1 NESHAP/MACT - 40 CFR 63 Subpart SS (National Emission Standards for Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process)

The requirements of Rule 4311 are as stringent as or more stringent than the requirements in the NESHAP.

C.9.4 How does District Rule 4311 compare with California State regulations?

There are no state regulations applicable to this source category.

C.9.5 How does District Rule 4311 compare to regulations from other air districts?

The table below compares major elements of Rule 4311 with the rules in the Bay Area, South Coast, and Ventura County air districts.

C.9.5.1 Bay Area AQMD

C.9.5.1.1 Regulation 12 Rule 11 (Flare Monitoring at Petroleum Refineries)

The requirements in Rule 4311 are as stringent as or more stringent than those in Rule 12-11.

C.9.5.1.2 Regulation 12 Rule 12 (Flares at Petroleum Refineries)

The requirements in Rule 4311 are as stringent as or more stringent than those in Rule 12-12.

C.9.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.9.5.3 South Coast AQMD

C.9.5.3.1 Rule 1118 (Control of Emissions from Refinery Flares)

The requirements in Rule 4311 are as stringent as or more stringent than those in Rule 1118.

C.9.5.4 Ventura County APCD

C.9.5.4.1 Rule 54 (Sulfur Compounds)

The requirements in Rule 4311 are as stringent as or more stringent than those in Rule 54.

C.9.5.5 Other Air Quality Control Agencies

C.9.5.5.1 Santa Barbara County Air Pollution Control District (SBCAPCD) Rule 359 (Flares and Thermal Oxidizers) [21]

Rule 4311 is as stringent as or more stringent than those in Rule 359, as demonstrated in the extensive analysis presented in the District's *2015 PM2.5 Plan*.[22]

C.9.5.5.2 State of North Dakota Century Code 38-08-06.4[23] - Industrial Commission Order[24]

Rule 4311 is as stringent as or more stringent than those in the South Dakota Rule, as demonstrated in the extensive analysis presented in the District's *2015 PM2.5 Plan*.[25]

Potential Emission Reduction Opportunities

Flaring activities in the Valley emit 0.57 tpd of NOx emissions, representing 0.17% of the summer average NOx emissions in the Valley. Despite this relatively small amount of emissions, in keeping with its leave no stone unturned approach; the District has invested significant resources into evaluating potential emissions reductions opportunities from flares. In fact, after determining that the rule implements the most stringent measures feasible to implement in the Valley, in its *2015 PM2.5 Plan,* the District committed to perform another flare further study to continue to seek out additional emission reduction opportunities. The further study reports are available on the District's website at http://www.valleyair.org/Air_Quality_Plans/PM_Plans.htm.

C.9.6 Evaluation Findings

As demonstrated above, District Rule 4311 meets RACT requirements, and has also been demonstrated as implementing Most Stringent Measures.[26] As a commitment included in the District's *2015 Plan for the 1997 PM2.5 Standard* (*2015 PM2.5 Plan*), District staff conducted a further study to review additional emission reduction opportunities under Rule 4311 and reached the following findings:

1. Even though operators of flares in the Valley have already taken extensive measures to reduce flaring through Rule 4311, additional minimization practices

[21] Santa Barbara County Air Pollution Control District. (1994, June 28). *Rule 359 Flares and Thermal Oxidizers. Retrieved February 13, 2015 from http://www.ourair.org/wp-content/uploads/rule359.pdf.*
[22] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm
[23] North Dakota Legislative Branch. (2013, August). *Century Code 38-08-06.4 Flaring of Gas Restricted – Imposition of Tax – Payment of Royalties – Industrial Commission Authority. Retrieved February 13, 2015 from* http://www.legis.nd.gov/cencode/t38c08.pdf?20150213153521.
[24] North Dakota Industrial Commission. (2014, July 1). *Order of the Commission*. Obtained February 3, 2015 from https://www.dmr.nd.gov/oilgas/or24665.pdf.
[25] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm
[26] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

currently performed at some facilities may have the potential to be utilized at other facilities to further reduce flaring activities and emissions.

2. Ultra-low NOx technologies with the potential to further reduce emissions from flaring have recently become available and should be potentially required through future rule amendments where technologically achievable and economically feasible.

Given the enormity of reductions needed to develop plans that demonstrate attainment with the latest federal ozone and PM2.5 standards and based on findings from the recent flare further study, the District commits to working closely with affected operators to undergo a regulatory amendment process for Rule 4311 as follows:

1. District commits to amend Rule 4311 to include additional ultra-low NOx flare emission limitations for existing and new flaring activities at Valley facilities to the extent that such controls are technologically achievable and economically feasible, by December 31, 2017.

2. District commits to amend Rule 4311 to include additional flare minimization requirements to the extent that such controls are technologically achievable and economically feasible, by December 31, 2017.

C.10 RULE 4313 LIME KILNS

C.10.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The emissions inventory for the lime kiln source category is 0.00 tons per day because there are no lime kilns in operation in the Valley

C.10.2 District Rule 4313 Description

Rule 4313 was adopted in 2003 to limit NOx emissions from the operation of lime kilns. Lime kilns can be used in a variety of manufacturing and processing operations, including food and agriculture. EPA approved District Rule 4313 on September 4, 2003 and deemed this rule as being at least as stringent as established RACT requirements. There are currently no lime kilns operating in the Valley. At the time of rule adoption, there were a total of three lime kilns in operation in the Valley. These lime kilns were operated at two sugar processing plants; however, these plants have been non-operational since 2008. If any lime kilns were to begin operation in the Valley in the future it would be required to meet District BACT requirements, per District Rule 2201 (New and Modified Stationary Source Review Rule). There are no lime kilns currently going through the District's permitting process to become operational in the Valley, nor are any lime kilns expected to be operated in the Valley in the future.

C.10.3 How does District Rule 4313 compare with federal rules and regulations?

C.10.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.10.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.10.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.10.3.3.1 NSPS - 40 CFR 60 Subpart HH (Standards of Performance for Lime Manufacturing Plants)

The provisions of this subpart are applicable to each rotary lime kiln used in the manufacturing of lime. However, this subpart only has requirements for the particulate matter (PM) emissions from the rotary lime kilns. The purpose of this analysis is to

evaluate this source for NOx and VOC emission reduction opportunities, and is not applicable to this evaluation.

C.10.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.10.3.4.1 NESHAP - 40 CFR 63 Subpart AAAAA (National Emission Standards for Hazardous Air Pollutants for Lime Manufacturing Plants)

The provisions of this NESHAP are applicable to each rotary lime kiln used in the manufacturing of lime. However, this NESHAP only has requirements for the PM emissions from the rotary lime kilns. The purpose of this analysis is to evaluate NOx and VOC emission reduction opportunities.

C.10.4 How does District Rule 4313 compare with California State regulations?

There are no state regulations applicable to this source category.

C.10.5 How does District Rule 4313 compare to regulations from other air districts?

C.10.5.1 Bay Area AQMD

Bay Area AQMD has no analogous rules for this source category.

C.10.5.2 Sacramento Metro AQMD

Sacramento Metro AQMD has no analogous rules for this source category.

C.10.5.3 South Coast AQMD

South Coast AQMD has no analogous rules for this source category.

C.10.5.4 Ventura County APCD

Ventura County APCD has no analogous rules for this source category.

C.10.6 Potential Emission Reduction Opportunities

There are no emission reduction opportunities from lime kilns in the Valley.

C.10.7 Evaluation Findings

There are no lime kilns in operation in the Valley, nor are any expected to be operated in the Valley in the future. However, if any lime kilns were to begin operating in the Valley, it would be required to meet District BACT requirements, which by definition are beyond RACT. As such, Rule 4313 meets or exceeds federal RACT requirements for this source category.

C.11 RULE 4352 SOLID FUEL FIRED BOILERS, STEAM GENERATORS, AND PROCESS HEATERS

C.11.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	2.97	3.27	3.59	3.78	3.95	4.12	4.24	4.27	4.32
VOC	0.08	0.09	0.11	0.12	0.12	0.13	0.13	0.13	0.13

C.11.2 District Rule 4352 Description

The purpose of Rule 4352 is to limit NOx and carbon monoxide (CO) emissions from any boiler, steam generator or process heater fired on solid fuel. Prior to September 14, 1994 solid fuel fired units were exempt from the requirements of District Rule 4305. The adoption of Rule 4352 established NOx limits of 200 parts per million by volume (ppmv) for municipal solid waste facilities (MSW), 0.35 pounds per million British thermal units per hour (lb/MMBtu) for biomass facilities, and 0.20 lb/MMBtu for all other solid fuel fired units. Since its adoption, the rule has been amended three times. The December 2011 amendments strengthened the rule by lowering NOx emissions limits for all three source categories. However, no emissions reductions were quantified because the rule amendments were meant to satisfy EPA RACT requirements and all units were determined to be operating at the new emission limits. EPA finalized approval of Rule 4352 on November 6, 2012 and deemed this rule as being at least as stringent as established RACT requirements.

While previous rule-amending projects for Rule 4352 have not quantified specific emissions reductions, the use of biomass facilities in the Valley has fostered emissions reductions. As an energy source, biomass can either be used directly or converted into other energy products such as biofuel. Biomass facilities in the Valley reduce the amount of pollutants created by open burning practices and the landfilling of potential biofuels such as agricultural materials, and urban and forest wood waste products by utilizing these materials. The District has reduced the total acreage of agricultural materials burned in the Valley to date by more than 80%.

Boilers, steam generators, and process heaters are used in a broad range of industrial, commercial, and institutional settings. Units subject to this rule fire on a variety of solid fuels: coal, petroleum coke, biomass, tire-derived fuel, and MSW. Although the output from units subject to the rule could be utilized in many settings, all of the operators within the Valley use the units' output to generate electricity.

The two primary methods of controlling NOx emissions from boilers, steam generators, and process heaters are either to change the combustion parameters to reduce NOx formation (i.e., combustion modification) or to treat the NOx formed in the process before the NOx is emitted into the atmosphere (i.e., post-combustion control or flue gas treatment).

C.11.3 How does District Rule 4352 compare with federal rules and regulations?

C.11.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.11.3.2 EPA – Alternative Control Technology (ACT)

C.11.3.2.1 ACT - EPA–453/R-94-022 (Alternative Control Techniques Document– NOx Emissions from Industrial/Commercial/ Institutional Boilers)

The requirements of Rule 4352 are as stringent as or more stringent than the requirements in the ACT.

C.11.3.2.2 ACT - EPA – 453/R-94-023 (Alternative Control Techniques Document– NOx Emissions from Utility Boilers)

The requirements of Rule 4352 are as stringent as or more stringent than the requirements in the ACT.

C.11.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.11.3.3.1 NSPS - 40 CFR 60 Subpart Cb (Emission Guidelines and Compliance Times for Municipal Waste Combustors that are Constructed on or before December 19, 1995)

The requirements of Rule 4352 are as stringent as or more stringent than the requirements in the NSPS.

C.11.3.3.2 NSPS - 40 CFR 60 Subpart D (Standards of Performance for Fossil-Fuel-Fired Steam Generators for which Construction is Commenced after August 17, 1971)

The requirements of Rule 4352 are as stringent as or more stringent than the requirements in the NSPS.

C.11.3.3.3 NSPS - 40 CFR 60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)

The requirements of Rule 4352 are as stringent as or more stringent than the requirements in the NSPS.

C.11.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.11.3.4.1 NESHAP - 40 CFR 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR 63 Subpart DDDDD was amended on January 31, 2013 to include new emission limits for PM, CO, and total selective metals (TSM), replace numeric dioxin emission limits with work practice standards, add new subcategories of facilities, and add alternative monitoring approaches. The District evaluated the requirements contained within this NESHAP. The requirements of Rule 4352 are as stringent as or more stringent than the requirements in the NESHAP.

C.11.4 How does District Rule 4352 compare with California State regulations?

There are no state regulations applicable to this source category.

C.11.5 How does District Rule 4352 compare to regulations from other air districts?

C.11.5.1 Bay Area AQMD

C.11.5.1.1 Regulation 9 Rule 7 (Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The requirements in Rule 4352 are as stringent as or more stringent than those in Rule 9-7.

C.11.5.1.2 Regulation 9 Rule 11 (Nitrogen Oxides and Carbon Monoxide from Electric Power Generating Steam Boilers)

The requirements in Rule 4352 are as stringent as or more stringent than those in Rule 9-11.

C.11.5.2 Sacramento Metro AQMD

C.11.5.2.1 Rule 411 (NOx from Boilers, Process Heaters, and Steam Generators)

The requirements in Rule 4352 are as stringent as or more stringent than those in Rule 411.

C.11.5.3 South Coast AQMD

C.11.5.3.1 Rule 1146 (Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters)

The requirements in Rule 4352 are as stringent as or more stringent than those in Rule 1146.

C.11.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.11.6 Potential Emission Reduction Opportunities

In its *2015 Plan for the 1997 PM2.5 Standard* (*2015 PM2.5 Plan*) the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive effort included the evaluation of potential emission reduction opportunities such as long term solutions for the biomass industry; the addition of selective catalytic reduction technology; electrostatic precipitators, baghouses, and cyclones; and scrubbers. The District found that Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley.[27] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan*. Therefore, there are no additional emission reduction opportunities at this time.

C.11.7 Evaluation Findings

Rule 4352 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[27] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.12 RULE 4354 GLASS MELTING FURNACES

C.12.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	6.04	4.08	4.31	4.54	4.69	4.69	4.69	4.69	4.69
VOC	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

The emissions in this emission inventory table represent the emissions from both this rule and from Rule 4610 (Glass Coating Operations).

C.12.2 District Rule 4354 Description

The provisions of Rule 4354 are applicable to glass melting furnaces in the Valley. The purpose of this rule is to limit NOx, SOx, volatile organic compounds (VOC), carbon monoxide (CO), and PM emissions from glass melting furnaces.

Rule 4354 was adopted on September 14, 1994 and has been subsequently amended six times. Rule 4354 was amended September 16, 2010 to strengthen the NOx emission limits in the rule; EPA finalized approval for these amendments on August 29, 2011. Rule 4354 was subsequently amended again in May 19, 2011 to implement updated start-up requirements; EPA finalized approval of the 2011 amendments to Rule 4354 on January 31, 2013 and deemed this rule as being as stringent as, if not more stringent than, established RACT requirements. As a result of this stringent prohibitory rule and continuing efforts on behalf of this industry to reduce emissions, the Valley is home to glass-making facilities with glass melting furnaces that utilize the most advanced low-NOx firing technology.

Industrial glass making is a continuous process with raw materials supplied to the furnace at the front end, and product taken off the line at the back end of the process. The raw materials for making glass are silica sand and soda ash. Melting these basic materials and forming them into the desired product geometry creates the final glass product. The different end products vary widely in raw material additives, processing equipment and conditions, and product quality requirements. The emission limits of Rule 4354 depend on the type of glass produced, furnace firing technology and the emission-averaging period.

Rule 4354 is among the most stringent rules in the nation for glass melting furnaces. The NOx emission limits contained within Rule 4354 require the installation of the best available NOx technology (i.e. oxy-fuel firing or SCR systems).

C.12.3 How does District Rule 4354 compare with federal rules and regulations?

C.12.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.12.3.2 EPA – Alternative Control Technology (ACT)

C.12.3.2.1 ACT - EPA-435/R-94-037 (Alternative Control Techniques Document—NOx Emissions from Glass Manufacturing)

This ACT document outlines the available control techniques for three types of glass melting furnaces – container glass, flat glass and pressed-and-blown glass. The document lists no specific NOx emission limit, although it does suggest estimated percent NOx reduction from uncontrolled levels. In not having a specific NOx limit for any of the subject furnaces, the document does not define RACT for the three types of glass. As such, the requirements of Rule 4354 are as stringent as or more stringent than the requirements in the ACT.

C.12.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.12.3.3.1 NSPS - 40 CFR 60 Subpart CC (Standards of Performance for Glass Manufacturing Plants)

This NSPS targets the control of particulate matter from the specified glass manufacturing processes. As such, it defines applicable RACT for these sources. The requirements of Rule 4354 are as stringent as or more stringent than the requirements in the NSPS.

C.12.3.3.2 NSPS - 40 CFR 60 Subpart PPP (Standards of Performance for Wool Fiberglass Insulation Manufacturing Plants)

This NSPS targets the control of particulate matter from the specified glass manufacturing processes. As such, it does not regulate NOx or VOC for this source category; therefore this NSPS does not define applicable RACT for this source category.

C.12.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.12.3.4.1 NESHAP/ MACT - 40 CFR 61 Subpart N (National Emission Standard for Inorganic Arsenic Emissions from Glass Manufacturing Plants)

40 CFR 61 Subpart N was last amended February 27, 2014; however, this NESHAP only regulates inorganic arsenic emissions and therefore does not apply to this control measure source category evaluation.

C.12.3.4.2 NESHAP/MACT - 40 CFR 63 Subpart NNN (National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing Plants)

The portion of this MACT that applies to glass melting furnaces is specific to particulate matter emission limits and subsequent recordkeeping. As such, it does not regulate

NOx or VOC for this source category; therefore this MACT standard does not define applicable RACT for this source category.

C.12.3.4.3 NESHAP/MACT - 40 CFR 63 Subpart SSSSSS (National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources)

The portion of this MACT that applies to glass melting furnaces is specific to particulate matter emission limits and subsequent recordkeeping. As such, it does not regulate NOx or VOC for this source category; therefore this MACT standard does not define applicable RACT for this source category.

C.12.4 How does District Rule 4354 compare with California State regulations?

There are no state regulations specific to glass melting furnaces.

C.12.5 How does District Rule 4354 compare to regulations from other air districts?

C.12.5.1 Bay Area AQMD

C.12.5.1.1 Regulation 9 Rule 12 (Nitrogen Oxide Emissions from Glass Melting Furnaces)

Regulation 9-12 was adopted on January 19, 1994, and never amended, regulates the NOx emissions from glass melting furnaces with the exception of furnaces in which all the heat required for melting is provided by electric current and furnaces with a production capacity of 5 short tons of glass per day or less. The rule has a single NOx emission limit of 5.5 pounds of NOx per ton of glass pulled; however, there are no flat glass melting furnaces within the Bay Area AQMD, meaning the emission limit has not been achieved in practice in the Bay Area AQMD. The requirements in Rule 4354 are as stringent as or more stringent than those in Rule 9-12. EPA approved the District's 2009 RACT SIP on January 10, 2012 and deemed this rule as being at least as stringent as established RACT requirements. EPA reconfirmed this RACT determination when approving the District's 2011 amendments to the rule on January 31, 2013.

C.12.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.12.5.3 South Coast AQMD

C.12.5.3.1 Rule 1117 (Emissions of Oxides of Nitrogen from Glass Melting Furnaces)

Adopted in 1982 and subsequently amended in 1984, South Coast AQMD Rule 1117 has a single NOx limit of 4.0 pounds per ton glass pulled, however the limit does not apply to tableware glass, flat glass, or fiberglass furnaces – these are specifically exempt under Rule 1117. Meaning Rule 1117 applies only to container glass furnaces. Alternative emission control plans are allowed which let emissions to be averaged over more than one furnace as long as the total emissions are no greater than if each furnace was individually meeting the emission limit. Rule 4354 has lower NOx limits for container glass than South Coast Rule 1117. The District rule also goes beyond the South Coast AQMD rule to limit NOx emissions from flat glass and fiberglass furnaces. Additionally, the alternative emission control plan in District Rule 4354 requires a 10% reduction in total emissions for the averaged group of furnaces over controlling the furnaces individually.

District Rule 4354 is far more stringent than SCAQMD Rule 1117. District Rule 4354 requires a NOx limit of 1.5 lbs per ton of glass produced for container glass plants, while SCAQMD Rule 1117 requires a NOx limit of 4.0 lbs per ton of glass produced. Even though the District limit is at 1.5 lbs per ton of glass produced, the majority of glass plants in the Valley produce emissions much lower than the Rule limit.

It's important to note that the achievable NOx emissions level for glass furnaces is affected by factors other than the emission control device used. These other factors include the stability of the glass pull rate over an extended period of time, and the condition and age of the refractories and furnace insulation. When the operator adjusts the pull rate of the furnace in response to the market need, additional NOx emissions may occur during the transition time while the low-NOx oxy-fuel burners adjust to accommodate the new pull rate. To maintain high temperature levels, glass furnaces require high levels of heat input which is independent from the level of glass pulled each day but is specific to each glass furnace. In addition to this "baseline" heat input, additional energy is necessary to melt glass. This variable heat input required to melt glass fluctuates according to the quantity of glass pulled and is added to the "baseline" heat input. As a result, the total heat input necessary to melt a ton of glass varies according to the overall quantity of glass melted in conjunction with the intersect characteristics of the glass furnace. Consequently, the lb-NOx/ton varies in similar ways and is impacted by the glass pull rate.

The container glass furnaces in operation in the Valley manufacture a large variety of sizes and shapes of still and sparkling wine glass bottles, requiring the operators to utilize their furnaces in a fashion that results in a less stable pull rate in far varying conditions than facilities located in the South Coast which are mainly producing beer bottles. Due to the less stable pull rate, additional NOx emissions are expected during the change in the fire rate of the burners as explained above. Additionally, in response to business demands on the wine industry, Valley facilities must operate furnaces with a

high degree of flexibility and variable operational conditions causing constant changes in the furnace pull rate and variations in NOx emissions.

Finally, as furnaces age, the refractory is not as effective at retaining heat in the furnace. Therefore, under such conditions, the burner fire rate must be increased over time to maintain the same overall furnace and glass temperature and NOx on a lb/ton basis is expected to increase accordingly. The combination of these factors results in a situation where the NOx emission rate varies significantly over production conditions, campaign, and furnace life. Therefore, a simple comparison cannot be made between glass plants and their associated emissions limits and a thorough evaluation assessing all the multiple factors must be taken into consideration.

C.12.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.12.6 Potential Emission Reduction Opportunities

In its *2015 Plan for the 1997 PM2.5 Standard* (*2015 PM2.5 Plan*) the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive effort included the evaluation of SOx limits for container glass plants. The District found that Rule 4354 currently has in place the most stringent measures feasible to implement in the Valley.[28] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.12.7 Evaluation Findings

Rule 4354 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[28] SJVUAPCD. 2015 Plan for the 1997 PM2.5 Standard. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.13 RULE 4401 STEAM-ENHANCED CRUDE OIL PRODUCTION WELLS

C.13.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Emissions from this category are mapped to other emission source categories.

C.13.2 District Rule 4401 Description

This rule applies to all steam-enhanced crude oil production wells and any associated VOC collection and control systems. The purpose of this rule is to limit VOC emissions from these sources. The primary source of VOC emissions from the wells is the casing vent. The emissions from a casing vent are usually controlled through the operation of a VOC collection and control device.

The rule prohibits the operation of a steam-enhanced crude oil production well, except cyclic wells meeting certain requirements, unless the uncontrolled VOC emissions from any well vent are reduced by at least 99 percent by weight, or, if several steam-enhanced crude oil production well vents are connected to a vapor collection and control system, this rule requires that total uncontrolled VOC emissions be reduced by at least 99 percent.

Fugitive VOC emissions can also occur from oil and gas flowing through the various components (such as valves and flanges) that are part of the piping from the wells to the emission control system. Rule 4401 contains a schedule that specifies the number of allowable component leaks based on the number of wells connected to a vapor collection and control system. Rule 4401 requires an operator, upon detection of a leak, to affix a readily visible tag bearing the date on which the leak is detected. Rule 4401 further requires an operator to repair a leak within fifteen calendar days; failure to repair the leak would constitute a violation of the rule.

EPA finalized approval of the 2011 amendments to Rule 4401 on November 16, 2011 and deemed this rule as being at least as stringent as established RACT requirements.[29] EPA further confirmed this RACT determination when they finalized a partial approval/partial disapproval of the *2009 RACT SIP* on January 10, 2012 and again deemed this rule as being at least as stringent as established RACT requirements.[30]

[29] EPA. Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District; Final Rule. 76 Fed. Reg. 221, pp. 70886 – 70887. (2011, November 16). (to be codified at 40 CFR Part 52). Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2011-11-16/pdf/2011-29466.pdf

[30] EPA. Partial Approval and Partial Disapproval of Air Quality Implementation Plans; California; San Joaquin Valley; Reasonably Available Control Technology for Ozone; Final Rule. 77 Fed. Reg. 6, pp 1417 – 1427. (2012, January

C.13.3 How does District Rule 4401 compare with federal rules and regulations?

C.13.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.13.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.13.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.13.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.13.4 How does District Rule 4401 compare with California State regulations?

There are no state regulations applicable to this source category.

C.13.5 How does District Rule 4401 compare to regulations from other air districts?

C.13.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.13.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.13.5.3 South Coast AQMD

C.13.5.3.1 Rule 1148 (Thermally Enhanced Oil Recovery Wells)

South Coast AQMD Rule 1148 (Thermally Enhanced Oil Recovery Wells) was adopted on November 5, 1982 and has not been amended. Rule 1148 requires that ROG emissions from a steam drive well not to exceed 4.5 lb/day or if steamed drive wells are connected to vapor control system ROG emissions from the control system shall average no more than 4.5 lb/day/connected well.

Using CARB emissions factor for uncontrolled steam drive well of 220 lb-VOC/day, Rule

10). (to be codified at 40 CFR Part 52). Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf

4401's 99% control requirement equates to 2.2 lb/day/well, which is more stringent than 4.5 lb/day/well (heavy oil production results in no methane or ethane, meaning 100% of ROGs are considered VOCs).

South Coast AQMD Rule 1148 does not specify any fugitive VOC leak detection and repair provisions whereas Rule 4401 specifies the number of allowable component leaks based on the number of wells connected to a vapor collection and control system. Rule 4401 requires an operator, upon detection of a leak, to affix a readily visible tag bearing the date on which the leak is detected. Rule 4401 further requires an operator to repair a leak within fifteen (15) calendar days; failure to repair the leak would constitute a violation of the rule.

South Coast AQMD Rule 1148 contains a six month exemption for steam drive wells if steam is injected more frequently than 45 days and amount of steam injection expressed as water is more than 2,000 barrels. Rule 4401 provides exemptions for up to 40 cyclic wells owned by a company that are undergoing pilot testing and well stimulation. Rule 4401 also exempts for up to 5 cyclic wells (20 cyclic wells for small producer) if wells are located more than 1000 feet from an existing well control system operated by the company and operation is under District permit. South Coast AQMD Rule 1148 does not limit number of wells that can be exempt and Rule 4401 does not limit duration of exemption. Therefore exemptions in the both rules cannot be compared directly.

Both South Coast AQMD Rule 1148 and Rule 4401 require annual testing of vapor control systems. However District Rule waives this testing requirement if uncondensed vapors are incinerated in fuel burning equipment, internal combustion engine or in a smokeless flare.

C.13.5.4 The requirements in Rule 4401 are as stringent as or more stringent than those in Rule 1148.Ventura County APCD

There are no analogous rules for this source category.

C.13.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.13.7 Evaluation Findings

Rule 4401 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.14 RULE 4402 CRUDE OIL PRODUCTION SUMPS

C.14.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	2.41	2.25	2.11	1.97	1.85	1.73	1.65	1.62	1.58

C.14.2 District Rule 4402 Description

District Rule 4402 controls VOC emissions from crude oil production sumps located at facilities that produce heavy crude oil. Rule 4402 requires sumps to have a flexible floating cover, rigid floating cover, or fixed roof cover. The flexible floating cover has to be equipped between the sump wall and the cover edge, and the gap between the wall and at every point around the perimeter must not exceed 1 inch. The fixed-roof cover must have a PV and meet certain specific requirements. If sumps are replaced with above-ground fixed roof tanks, the tanks must comply with the provisions of Rule 4623.

This rule applies to all first, second, and third stage sumps at facilities producing, gathering, separating, processing, and/or storing crude oil in an oil field. The purpose of this rule is to limit VOC emissions from these sources. EPA finalized a partial approval/partial disapproval of the *2009 RACT SIP* on January 10, 2012, but EPA specified that Rule 4402 was one of the few rules not approved as RACT as part of the RACT SIP approval.[31] EPA finalized approval of the 2011 amendments to Rule 4402 on October 22, 2012 and deemed this rule as being at least as stringent as established RACT requirements.[32]

C.14.3 How does District Rule 4402 compare with federal rules and regulations?

C.14.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.14.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.14.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

[31] 77 FR 1417, http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf
[32] 77 FR 64427, http://www.gpo.gov/fdsys/pkg/FR-2012-10-22/pdf/2012-25810.pdf

C.14.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.14.4 How does District Rule 4402 compare with California State regulations?

There are no state regulations applicable to this source category.

C.14.5 How does District Rule 4402 compare to regulations from other air districts?

C.14.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.14.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.14.5.3 South Coast AQMD

There are no analogous rules for this source category.

C.14.5.4 Ventura County APCD

C.14.5.4.1 Rule 71.4 (Petroleum Sumps, Pits, Ponds and Well Cellars)

The control requirements of Rule 4402 are essentially the same as Rule 71.4. Although VCAPCD Rule 71.4 prohibits the use of first stage sumps, the District believes that other VCAPCD either do not have first stage sumps or such sumps have been replaced with tanks. Although use of first stage sumps is allowed by District Rule 4402, it does not necessarily mean that the rule is less stringent than other air districts' rules, for the following reason. If first stage sumps are replaced with tanks, the tanks would be subject to another rule that control emissions from the storage of organic liquids. District Rule 4623 (Storage of Organic Liquids) applies to tanks that have a capacity of at least 1,100 gallons that store organic liquids with a true vapor pressure (TVP) of 0.5 psia or greater. The tank VOC control requirements are based on the tank size and true vapor pressure (TVP) of the stored organic liquid. Organic liquids with a TVP less than 0.5 psia would not be subject to the VOC control requirements of Rule 4623. Replacing first stage sump with a tank could result in an unintended consequence that the tank would either be totally uncontrolled or less effectively controlled compared to Rule 4402 because the TVP might be lower than the control trigger level specified in Rule 4623.

Based on the District's Permit database, staff has determined that there are only very few permitted small-size first-stage sumps for processing heavy crude oil that were issued to very small producers (less than 150 barrels of oil/day production) and they are not major sources (less than 10 tons per year of VOC or NOx). The source testing

required by Rule 4623, shows the TVP of the heavy crude oil is less than 0.5 psia. As discussed above, prohibiting the use of first stage sumps would essentially force operators to replace the sumps with tanks, which could result in the tanks being exempt from Rule 4623 because the TVP is less than 0.5 psia. Although Rule 4402 allows the use of first stage sumps, the controls are equal to or better than that which would be required for such materials stored in tanks. Furthermore, it is important to mention that the District's 2007 survey of crude oil sumps[4] revealed that there are no active first stage sumps operating in the San Joaquin Valley.

Therefore, the requirements in Rule 4402 are as stringent as or more stringent than those in Rule 71.4.

C.14.5.5 Other Air Quality Control Agencies

Santa Barbara APCD - Rule 344 (Petroleum Sumps, Pits and Well Cellars)
Rule 4402 exempts small producers' second and third stage sumps less than 1,000 square feet surface area used exclusively for heavy crude oil. Another exemption is provided for very small producer second and third stage sumps less than 5,000 square feet used exclusively for heavy crude oil. Small producer is defined in the rule as a producer whose oil production does not exceed 6,000 barrels/day. Very small oil producer is defined in Rule 4402 as a producer whose oil production does not exceed 150 barrels/day, similar to SBCAPCD Rule 344. The requirements in Rule 4402 are as stringent as or more stringent than those in Rule 344.

C.14.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.14.7 Evaluation Findings

Rule 4402 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.15 RULE 4404 HEAVY OIL TEST STATION —KERN COUNTY

C.15.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The inventory for this source category is 0.00 tpd because there are no Heavy Oil Test Stations (HOTS) in operation in the Valley.

C.15.2 District Rule 4404 Description

This rule applies to the operation of heavy oil test stations with tanks that vent directly to the atmosphere. The purpose of this rule is to limit VOC emissions from the operation of heavy oil test stations. A HOTS is a tank setting comprised of both a family tank and one or more test tanks. A family tank directly receives crude oil production from more than one steam drive well through individual production lines with discharge into the tank. A test tank tests the production rate from a single steam drive well.

Rule 4404 prohibits operation of HOTS unless the VOC emissions are reduced by at least 99%. Except during sampling, gauging, and PV valve vent, any tank roof opening must be equipped with a cover, seal, or lid with no visible gap and maintained in a gas-tight condition.

Requirements of this rule are applicable to HOTS that are atmospheric tanks. A review of the District's permit database and observations of Compliance Division indicate that there are no atmospheric HOTS operating in the Valley. All previous HOTS operations are now employing pressure vessels which do not vent to the atmosphere. These unvented pressure vessels are exempt from District permitting per section 6.13 of District Rule 2020. Therefore, the VOC emissions from this source category are zero.

C.15.3 How does District Rule 4404 compare with federal rules and regulations?

C.15.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.15.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.15.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.15.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.15.4 How does District Rule 4404 compare with California State regulations?

There are no state regulations applicable to this source category.

C.15.5 How does District Rule 4404 compare to regulations from other air districts?

C.15.5.1 Bay Area AQMD

Bay Area AQMD has no analogous rules for this source category.

C.15.5.2 Sacramento Metro AQMD

Sacramento Metro AQMD has no analogous rules for this source category.

C.15.5.3 South Coast AQMD

South Coast AQMD has no analogous rules for this source category.

C.15.5.4 Ventura County APCD

Ventura County has no analogous rules for this source category.

C.15.6 Potential Emission Reduction Opportunities

There are no atmospheric HOTS in operation in the Valley. All HOTS operations now employ pressure vessels that do not vent to the atmosphere, and such vessels are exempt from District permitting per section 6.13 of District Rule 2020.

C.15.7 Evaluation Findings

Rule 4404 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category.

C.16 RULE 4407 IN-SITU COMBUSTION WELL VENTS

C.16.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The emission inventory for this source category is 0.00 tpd because there are no in-situ combustion well vents operating in the Valley.

C.16.2 District Rule 4407 Description

District Rule 4407 controls VOC emissions from in-situ combustion well vents. The rule applies to all crude oil production wells where production has been enhanced by in-situ combustion. In situ-combustion is defined in the rule as a thermal crude oil recovery process in which air is injected into an oil reservoir and in-place petroleum oxidizes at an accelerated rate. The heat of combustion and combustion products enhance oil production by decreasing oil viscosity and pressurizing the reservoir. In-situ combustion well is any crude oil production well which produces from the same zone in which an air injection well is completed and lies within 1,000 feet from an injection well.

District Rule 4407 prohibits operation of any in-situ combustion well unless the well vent is connected to an emission control device which abates 85% by weight of entering VOC gases or is connected to a fuel burning equipment (furnace, boiler, etc) or a smokeless flare. All components (piping, valves, fittings, pumps, compressors, etc.) should be maintained in good repair and must be inspected for leaks on a quarterly basis. If no more than 2% of all components of the collection system are found to be leaking during each three consecutive quarterly inspections, the inspection frequency may be changed from quarterly to annual. The total number of leaks in a collection system should not exceed 2% of all the components in the collection system. Upon detection of a leak, the operator should affix a visible tag indicating the date of detection of the leak and the tag must remain in place until the leak is repaired. A leaking component must be repaired within 15 days of leak detection, but a ten day extension to repair a leak may be granted provided the operator demonstrates that necessary and sufficient actions have been taken to correct the leak. Failure to repair a leak after the ten day extension constitutes a violation of the rule.

District Rule 4407 requires annual testing of the VOC control efficiency of the control and collection system (testing should be conducted during June, July, August, or September of each year if the system's control efficiency is dependent upon ambient temperature). The APCO may waive the test requirement if all uncondensed VOC emissions are collected by a collection and control system are burned in fuel burning equipment or a smokeless flare.

Currently there are no in-situ combustion crude oil wells operating in the Valley.

C.16.3 How does District Rule 4407 compare with federal rules and regulations?

C.16.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.16.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.16.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.16.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.16.4 How does District Rule 4407 compare with California State regulations?

There are no state regulations applicable to this source category.

C.16.5 How does District Rule 4407 compare to regulations from other air districts?

C.16.5.1 Bay Area AQMD

Bay Area AQMD has no analogous rules for this source category.

C.16.5.2 Sacramento Metro AQMD

Sacramento Metro AQMD has no analogous rules for this source category.

C.16.5.3 South Coast AQMD

South Coast AQMD has no analogous rules for this source category.

C.16.5.4 Ventura County APCD

Ventura County APCD has no analogous rules for this source category.

C.16.6 Potential Emission Reduction Opportunities

There are no in-situ combustion well vents operating in the Valley and thus no emission reduction opportunities for this category exist.

C.16.7 Evaluation Findings

There are no in-situ combustion well vents operating in the Valley and thus no emission reduction opportunities for this category exist. Any facility beginning use of such activity would be required to meet District BACT requirements, per District Rules 2201 (New and Modified Stationary Source Review Rule).

Rule 4407 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.17 RULE 4408 GLYCOL DEHYDRATION SYSTEMS

C.17.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities).

C.17.2 District Rule 4408 Description

This rule applies to any glycol dehydration system with a glycol dehydration vent that is subject to permitting requirements pursuant to Regulation II (Permits). The purpose of this rule is to limit VOC emissions from these sources.

C.17.3 How does District Rule 4408 compare with federal rules and regulations?

C.17.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.17.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.17.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.17.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.17.3.4.1 NESHAP/MACT - 40 CFR 63 Subpart HH (National Emission Standards for Hazardous Air Pollutants for Oil and Natural Gas Production)

The requirements of Rule 4408 are as stringent as or more stringent than the requirements in the NESHAP, since Rule 4408 requires controls on systems producing much smaller flow rates than the NESHAP threshold.

C.17.4 How does District Rule 4408 compare with California State regulations?

There are no state regulations applicable to this source category.

C.17.5 How does District Rule 4408 compare to regulations from other air districts?

C.17.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.17.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.17.5.3 South Coast AQMD

There are no analogous rules for this source category.

C.17.5.4 Ventura County APCD

C.17.5.4.1 Rule 71.5 (Glycol Dehydrators)

The requirements in Rule 4408 are as stringent as or more stringent than those in Rule 71.5.

C.17.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.17.7 Evaluation Findings

Rule 4408 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.18 RULE 4409 COMPONENTS AT LIGHT CRUDE OIL PRODUCTION FACILITIES, NATURAL GAS PRODUCTION FACILITIES, AND NATURAL GAS PROCESSING FACILITIES

C.18.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.21	1.13	1.06	0.99	0.93	0.87	0.83	0.81	0.79

This emission inventory table is comprised of the emission inventory of sources subject to Rules 4408 (Glycol Dehydration Systems), Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities), Rule 4453 (Refinery Vacuum Producing Devices or Systems), and Rule 4454 (Refinery Process Unit Turnaround).

C.18.2 District Rule 4409 Description

This rule applies to components containing or contacting VOC streams at light crude oil production facilities, natural gas production facilities, and natural gas processing facilities. The purpose of this rule is to limit VOC emissions from leaking components at these facilities.

C.18.3 How does District Rule 4409 compare with federal rules and regulations?

C.18.3.1 EPA – Control Technique Guidelines (CTG)

C.18.3.1.1 CTG - EPA-450/3-83-007 (Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants)

The requirements of Rule 4409 are as stringent as or more stringent than the requirements in the CTG.

C.18.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.18.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.18.3.3.1 NSPS - 40 CFR 60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

The requirements of Rule 4409 are as stringent as or more stringent than the requirements in the NSPS.

C.18.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.18.3.4.1 NESHAP/MACT - 40 CFR 63 Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities)

The requirements of Rule 4409 are as stringent as or more stringent than the requirements in the NESHAP.

C.18.4 How does District Rule 4409 compare with California State regulations?

There are no state regulations applicable to this source category.

C.18.5 How does District Rule 4409 compare to regulations from other air districts?

C.18.5.1 Bay Area AQMD

C.18.5.1.1 Regulation 8 Rule 18 (Equipment Leaks),

The requirements in Rule 4409 are as stringent as or more stringent than those in Rule 8-18.

C.18.5.1.2 Regulation 8 Rule 22 (Valves and Flanges at Chemical Plants)

The requirements in Rule 4409 are as stringent as or more stringent than those in Rule 8-22.

C.18.5.1.3 Regulation 8 Rule 28 (Episodic Releases From Pressure Relief Devices at Petroleum Refineries and Chemical Plants)

The requirements in Rule 4409 are as stringent as or more stringent than those in Rule 8-28.

C.18.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.18.5.3 South Coast AQMD

C.18.5.3.1 Rule 1173 (Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants)

The requirements in Rule 4409 are as stringent as or more stringent than those in Rule 1173.

C.18.5.4 Ventura County APCD

C.18.5.4.1 74.7 (Fugitive Emissions of Reactive Organic Compounds at Petroleum Refineries and Chemical Plants), and

The requirements in Rule 4409 are as stringent as or more stringent than those in Rule 74.7.

C.18.5.4.2 Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)

The requirements in Rule 4409 are as stringent as or more stringent than those in Rule 74.10.

C.18.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.18.7 Evaluation Findings

Rule 4409 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.19 RULE 4453 REFINERY VACUUM PRODUCING DEVICES OR SYSTEMS

C.19.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities).

C.19.2 District Rule 4453 Description

This rule applies to any vacuum producing device or system, including hot wells and accumulators installed in a refinery operation. The purpose of this rule is to limit VOC emissions from refinery vacuum producing devices or systems.

C.19.3 How does District Rule 4453 compare with federal rules and regulations?

C.19.3.1 EPA – Control Technique Guidelines (CTG)

C.19.3.1.1 CTG – EPA-450/2-77-025 (Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds)

The requirements of Rule 4453 are as stringent as or more stringent than the requirements in the CTG.

C.19.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.19.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.19.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.19.4 How does District Rule 4453 compare with California State regulations?

There are no state regulations applicable to this source category.

C.19.5 How does District Rule 4453 compare to regulations from other air districts?

C.19.5.1 Bay Area AQMD

C.19.5.1.1 Regulation 8 Rule 9 (Vacuum Producing Systems)

The requirements in Rule 4453 are as stringent as or more stringent than those in Rule 8-9.

C.19.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.19.5.3 South Coast AQMD

C.19.5.3.1 Rule 465 (Refinery Vacuum-Producing Devices or Systems)

The requirements in Rule 4453 are as stringent as or more stringent than those in Rule 465.

C.19.5.4 Ventura County APCD

C.19.5.4.1 Rule 74.8 (Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds)

The requirements in Rule 4453 are as stringent as or more stringent than those in Rule 74.8.

C.19.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.19.7 Evaluation Findings

Rule 4453 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.20 RULE 4454 REFINERY PROCESS UNIT TURNAROUND

C.20.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities).

C.20.2 District Rule 4454 Description

This rule applies to any refinery vessel containing VOCs, unless exempted. The purpose of this rule is to limit VOC emissions resulting from the purging, repair, cleaning, or otherwise opening or releasing pressure from a refinery vessel during a process unit turnaround.

C.20.3 How does District Rule 4454 compare with federal rules and regulations?

C.20.3.1 EPA – Control Technique Guidelines (CTG)

C.20.3.1.1 CTG – EPA-450/2-77-025 (Control of Refinery Vacuum Producing Systems, Water Separators and Process Unit Turnarounds)

The requirements of Rule 4454 are as stringent as or more stringent than the requirements in the CTG.

C.20.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.20.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.20.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.20.3.4.1 40 CFR 63 Subpart CC (National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries

The applicable MACT guideline was amended in 2010; however, the amendments did not implement any requirements more stringent than what is required in Rule 4454. The requirements of Rule 4454 are as stringent as or more stringent than the requirements in the MACT.

C.20.4 How does District Rule 4454 compare with California State regulations?

There are no state regulations applicable to this source category.

C.20.5 How does District Rule 4454 compare to regulations from other air districts?

C.20.5.1 Bay Area AQMD

C.20.5.1.1 Regulation 8 Rule 10 (Process Vessel Depressurization)

The requirements in Rule 4454 are as stringent as or more stringent than those in Rule 8-10.

C.20.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.20.5.3 South Coast AQMD

C.20.5.3.1 SCAQMD Rule 1123 (Refinery Process Turnarounds)

The requirements in Rule 4454 are as stringent as or more stringent than those in Rule 1123.

C.20.5.4 Ventura County APCD

C.20.5.4.1 Rule 74.8 (Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds)

The requirements in Rule 4454 are as stringent as or more stringent than those in Rule 74.8.

C.20.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.20.7 Evaluation Findings

Rule 4454 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.21 RULE 4455 COMPONENTS AT PETROLEUM REFINERIES, GAS LIQUIDS PROCESSING FACILITIES, AND CHEMICAL PLANTS

C.21.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40

C.21.2 District Rule 4455 Description

This rule applies to components containing or contacting VOC at petroleum refineries, gas liquid processing facilities, and chemical plants. The purpose of this rule is to limit VOC emissions from leaking components at these facilities.

C.21.3 How does District Rule 4455 compare with federal rules and regulations?

C.21.3.1 EPA – Control Technique Guidelines (CTG)

C.21.3.1.1 CTG - EPA-450/3-83-007 (Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants)

The requirements of Rule 4455 are as stringent as or more stringent than the requirements in the CTG.

C.21.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.21.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.21.3.3.1 NSPS (40 CFR 60 Subpart OOOO—Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

The requirements of Rule 4455 are as stringent as or more stringent than the requirements in the NSPS.

C.21.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.21.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities)

The requirements of Rule 4455 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.21.4 How does District Rule 4455 compare with California State regulations?

There are no state regulations applicable to this source category

C.21.5 How does District Rule 4455 compare to regulations from other air districts?

C.21.5.1 Bay Area AQMD

C.21.5.1.1 Regulation 8 Rule 18 (Equipment Leaks)

The requirements in Rule 4455 are as stringent as or more stringent than those in Rule 8-18.

C.21.5.1.2 Regulation 8 Rule 22 (Valves and Flanges at Chemical Plants)

The requirements in Rule 4455 are as stringent as or more stringent than those in Rule 8-22.

C.21.5.1.3 Regulation 8 Rule 28 (Episodic Releases From Pressure Relief Devices at Petroleum Refineries and Chemical Plants)

The requirements in Rule 4455 are as stringent as or more stringent than those in Rule 8-28.

C.21.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.21.5.3 South Coast AQMD

C.21.5.3.1 Rule 1173 (Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants)

The requirements in Rule 4455 are as stringent as or more stringent than those in Rule 1173.

C.21.5.4 Ventura County APCD

C.21.5.4.1 Rule 74.7 (Fugitive Emissions of Reactive Organic Compounds at Petroleum Refineries and Chemical Plants)

The requirements in Rule 4455 are as stringent as or more stringent than those in Rule 74.7.

C.21.5.4.2 Rule 74.10 (Components at Crude Oil and Natural Gas Production and Processing Facilities)

The requirements in Rule 4455 are as stringent as or more stringent than those in Rule 74.10.

C.21.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.21.7 Evaluation Findings

Rule 4455 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.22 RULE 4565 BIOSOLIDS, ANIMAL MANURE, AND POULTRY LITTER OPERATIONS

C.22.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	21.35	22.11	22.68	23.71	25.18	26.22	27.39	27.73	28.02

This emission inventory table includes emissions for sources subject to this rule and Rule 4566 (Organic Material Composting Operations).

C.22.2 District Rule 4565 Description

Rule 4565 was adopted on March 15, 2007. The provisions of this rule limit VOC emissions from facilities whose throughput consists entirely or in part of Biosolids, animal manure, or poultry litter. Rule 4565 is applicable to operations that landfill, land apply, compost, or co-compost these materials.

C.22.3 How does District Rule 4565 compare with federal rules and regulations?

C.22.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.22.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.22.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.22.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.22.4 How does District Rule 4565 compare with California State regulations?

There are no state regulations applicable to this source category.

C.22.5 How does District Rule 4565 compare to regulations from other air districts?

C.22.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.22.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.22.5.3 South Coast AQMD

C.22.5.3.1 Rule 1133.2 (Emission Reductions from Co-Composting Operations)

Rule 1133.2 was adopted on January 10, 2003, and has not been amended. This rule is applicable to new and existing co-composting operations operating within the jurisdictional boundaries of the South Coast AQMD. Rule 1133.2 requires operators of new operations to conduct all active co-composting within the confines of an enclosure that meets specific requirements. In lieu of compliance with rule requirements, these operations have the option to submit a compliance plan. During the development of the District's *2015 PM2.5 Plan*[33] the District conducted an extensive analysis comparing the requirements of Rule 4565 to Rule 1133.2. The District determined that overall Rule 4565 is more stringent than Rule 1133.2. This determination is further supported by the District's 2009 RACT SIP demonstration report[34] and the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[35] as approved by EPA.[36]

C.22.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.22.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.22.7 Evaluation Findings

Rule 4565 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

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[33] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

[34] SJVAPCD. *Reasonably Available Control Technology Demonstration for Ozone State Implementation Plans*. (2009, April 16). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/docs/RACTSIP-2009.pdf

[35] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[36] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.23 RULE 4566 ORGANIC MATERIAL COMPOSTING OPERATIONS

C.23.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this source category are included in the emission inventory table for Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations).

C.23.2 District Rule 4566 Description

District Rule 4566, was adopted on August 18, 2011, to limit VOC emissions from composting facilities whose feedstock consists of greenwaste and/or foodwaste. District Rule 4566 applies to operations that stockpile and compost greenwaste and foodwaste.

C.23.3 How does District Rule 4566 compare with federal rules and regulations?

C.23.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.23.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.23.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.23.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.23.4 How does District Rule 4566 compare with California State regulations?

There are no state regulations applicable to this source category.

C.23.5 How does District Rule 4566 compare to regulations from other air districts?

C.23.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.23.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.23.5.3 South Coast AQMD

C.23.5.3.1 Rule 1133.3 (Greenwaste Composting)

Rule 1133.3 was adopted on July 8, 2011, and has not been amended. The purpose of this rule is to reduce fugitive emissions of VOC and ammonia from greenwaste and foodwaste composting operations. During the development of the District's *2015 PM2.5 Plan*[37] the District conducted an extensive analysis comparing the requirements of Rule 4566 to Rule 1133.3. The District determined that overall; Rule 4566 is more stringent than Rule 1133.3. This determination is further supported by the District's 2009 RACT SIP demonstration report[38] and the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[39] as approved by EPA.[40]

C.23.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.23.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. Through this extensive effort the District found that Rule 4566 currently has in place the most stringent measures feasible to implement in the Valley.[41] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.23.7 Evaluation Findings

Rule 4566 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

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[37] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

[38] SJVAPCD. *Reasonably Available Control Technology Demonstration for Ozone State Implementation Plans*. (2009, April 16). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/docs/RACTSIP-2009.pdf

[39] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[40] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

[41] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.24 RULE 4570 CONFINED ANIMAL FACILITIES

C.24.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	95.90	95.90	95.90	95.90	95.90	95.90	95.90	95.90	95.90

C.24.2 District Rule 4570 Description

District Rule 4570, was originally adopted on June 15, 2006 and was most recently amended on October 21, 2010. The purpose of this rule is to limit emissions of VOCs from Confined Animal Facilities (CAFs). District Rule 4570 applies to facilities where animals are corralled, penned, or otherwise caused to remain in restricted areas and primarily fed by a means other than grazing for at least 45 days in any twelve-month period. In addition to limiting VOC emissions, District Rule 4570 also includes measures that limit ammonia (NH3) emissions from these operations; the required measures have reduced ammonia emissions by over 100 tpd[42] (this reduction is reflected in the emissions inventory data above). The analysis below focuses on how District Rule 4570 limits NH3 emissions in comparison to other rules and regulations.

A. Types of Confined Animal Facilities

Confined Animal Facilities are used for the raising of animals including, but not limited to, cattle, calves, chickens, ducks, goats, horses, sheep, swine, rabbits, and turkeys, which are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and fed by a means other than grazing. (CH&SC §39011.5 (a)(1)). The major categories of Confined Animal Facilities are listed below.

- Dairy Operations - Dairy operations are those operations producing milk or animals for facilities that produce milk.
- Poultry Operations - Poultry facilities operate either as layer ranches for egg production or as broiler ranches where birds are grown for the fresh meat market.
- Beef Cattle Feeding Operations – Beef cattle facilities are facilities that raise beef cattle (heifers and steers) for their meat.
- Swine Operations – These operations raise pigs for their meat. The production cycle for hogs has three (3) phases: farrowing (giving birth), nursing, and finishing.

[42] Appendix F of the Staff Report for the June 2009 re-adoption of Rule 4570, starting on the 329th page of the pdf available here http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2009/June/Agenda%20Item_10_June_18_2009.pdf

B. Rule 4570 Applicability Thresholds

The thresholds for a facility to be classified as a large CAF in the Valley and the thresholds for a facility to be subject to District Rule 4570 are shown in the following table. The large CAF thresholds are based on the definition of a large CAF adopted by ARB as required by California Senate Bill (SB) 700. District Rule 4570 applies to confined animal facilities that have the capacity to house a number of animals equal to or exceeding the Rule 4570 regulatory thresholds, which are lower than the large CAF thresholds for certain facilities.

Table C-4 Rule 4570 Thresholds for Regulation

Livestock Category	SJVAPCD Large CAF Thresholds	Rule 4570 Regulatory Thresholds
Dairy	1,000 milking cows	500 milking cows
Beef Feedlots	3,500 beef cattle	3,500 beef cattle
Other Cattle Facility	7,500 calves, heifers, or other cattle	7,500 calves, heifers, or other cattle
Poultry Facilities		
Chicken	650,000 head	400,000 head
Duck	650,000 head	400,000 head
Turkey	100,000 head	100,000 head
Swine Facility	3,000 head	3,000 head
Horses Facility	3,000 head	3,000 head
Sheep and Goat Facilities	15,000 head of sheep, goats, or any combination of the two	15,000 head of sheep, goats, or any combination of the two
Any livestock facility not listed above	30,000 head	30,000 head

C. Emission Control Requirements of District Rule 4570

District Rule 4570 requires multiple mitigation measures from the following CAF categories: Dairy, Beef Feedlots, Other Cattle Facilities, Swine Facilities, Poultry facilities, and various other smaller operations. Each of these facilities consists of multiple sources of emissions within the facility. Since these facilities generally cover a large area and have different processes, a single mitigation measure or technology is generally not sufficient to control overall emissions from the facility. Mitigation measures required by Rule 4570 have been tailored for each source of emissions, thereby ensuring that the overall emissions from a facility are reduced. The current methodology in Rule 4570 allows for the greatest overall control from the entire facility.

District Rule 4570 recognized the following five emission sources for all of the CAFs: Feed, Housing, Solid Waste, Liquid Waste, and Land Application of Manure. Rule 4570 requires each CAF to implement a certain number of mitigation measures for each of these sources. District Rule 4570 also distinguishes between the different types of housing configurations (freestall vs open corrals) for cattle and, as such, requires specific mitigation measures for each type of housing. By requiring mitigation

measure(s) for each source of emissions at a facility, District Rule 4570 ensures that reductions are achieved throughout the facility.

C.24.3 How does District Rule 4570 compare with federal rules and regulations?

C.24.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.24.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.24.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.24.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.24.4 How does District Rule 4570 compare with California State regulations?

There are no state regulations applicable to this source category.

C.24.5 How does District Rule 4570 compare to regulations from other air districts?

As the largest agricultural area in California, the District took the lead in devising a list of mitigation measures for the various emission sources during the initial development of District Rule 4570. This list of mitigation measures was essentially utilized, almost identically, by all air districts in their rules. However, during the last amendments to District Rule 4570, all of the mitigation measures were reevaluated in light of the latest available science. In comparison to the previous version of the rule, the current rule has lower threshold limits to bring in additional CAFs, requires additional mitigation measures, clarifies previous mitigation measures, and adds additional monitoring, testing, and recordkeeping to improve enforceability.

C.24.5.1 Bay Area AQMD

C.24.5.1.1 Regulation 2 Rule 10 (Large Confined Animal Facilities)

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 2-10.

C.24.5.2 Sacramento Metro AQMD

C.24.5.2.1 SMAQMD Rule 496 (Large Confined Animal Facilities)

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 496.

C.24.5.3 South Coast AQMD

C.24.5.3.1 Rule 223 (Emission Reduction Permits for Large Confined Animal Facilities)

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 223. In fact, the SCAQMD recently identified District Rule 4570 as the most stringent rule for this source category.[43]

C.24.5.3.2 Rule 1127 (Emission Reductions from Livestock Waste)

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 1127.

C.24.5.4 Ventura County APCD

VCAPCD Rule 23 (Exemptions from Permit)

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 23.

C.24.5.5 Other Air Quality Control Agencies

C.24.5.5.1 Imperial County Air Quality Management District (ICAPCD) Rule 217 (Large Confined Animal Facilities Permits Required) and ICAPCD Policy Number 38 (Recommended Mitigation Measures for Large Confined Animal Facilities)

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 217 and ICAPCD Policy Number 38.

C.24.5.5.2 Butte County Air Pollution Control District (BCAQMD) Rule 450 (Large Confined Animal Facilities)

[43] South Coast Air Quality Management District (June 6, 2014). Reasonably Available Control Technology Demonstration. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2014/2014-jun6-031.pdf?sfvrsn=2

The requirements in Rule 4570 are as stringent as or more stringent than those in Rule 450.

C.24.5.5.3 Yakima Regional Clean Air Agency

The Yakima Regional Clean Air Agency adopted recommended practices for dairy operations on March 8, 2012 in their document *Air Quality Management Policy and Best Management Practices for Dairy Operations*. The policy requires preparation of an annual Air Quality Management Plan and implementation of Best Management Practices to reduce emissions from dairy operations; however, the requirements of District Rule 4570 are more stringent and specific.

C.24.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. This extensive effort included the evaluation of this rule compared to analogous rules, policies, and procedures in other air districts, and identified potential emission reduction opportunities. The District found that Rule 4570 currently has in place the most stringent measures feasible to implement in the Valley.[44] This determination is further supported by the District's 2009 RACT SIP demonstration report[45] and the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[46] as approved by EPA.[47] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.24.7 Evaluation Findings

Rule 4570 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[44] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm
[45] SJVAPCD. *Reasonably Available Control Technology Demonstration for Ozone State Implementation Plans*. (2009, April 16). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/docs/RACTSIP-2009.pdf
[46] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[47] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.25 RULE 4601 ARCHITECTURAL COATINGS

C.25.1.1.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	8.24	8.37	8.72	9.11	9.57	9.99	10.27	10.47	10.60

C.25.2 District Rule 4601 Description

District Rule 4601 was adopted on April 11, 1991 and has been subsequently amended five times. This rule reduces VOC emissions from sources subject to this rule by establishing VOC content limits for architectural coatings. Rule 4601 is applicable to any person who supplies, sells, offers for sale, applies, or solicits the application of any architectural coating, or who manufactures, blends, or repackages any architectural coating for use within the District. The purpose of this rule is to limit VOC emissions from these sources.

C.25.3 How does District Rule 4601 compare with federal rules and regulations?

C.25.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.25.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.25.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.25.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.25.4 How does District Rule 4601 compare with California State regulations?

Rule 4601 is at least as stringent as the applicable ARB Suggested Control Measure (SCM) for Architectural Coatings, promulgated in September 2007. ARB's adoption of the SCM established consistent VOC content standards for architectural coatings used in California based on multiple years of public processes, which included exhaustive research and collaborative efforts between ARB and coating manufacturers.

C.25.5 How does District Rule 4601 compare to regulations from other air districts?

C.25.5.1 Bay Area AQMD

C.25.5.1.1 Regulation 8 Rule 3 (Architectural Coatings)

The requirements in Rule 4601 are as stringent as or more stringent than those in Rule 8-3.

C.25.5.2 Sacramento Metro AQMD

C.25.5.2.1 Rule 442 (Architectural Coatings)

The requirements in Rule 4601 are as stringent as or more stringent than those in Rule 442.

C.25.5.3 South Coast AQMD

C.25.5.3.1 Rule 1113 (Architectural Coatings)

The requirements in Rule 4601 are as stringent as or more stringent than those in Rule 1113. While there are some limits within the rule that go beyond RACT, the District is implementing the most stringent limits feasible given the Valley's unique characteristics. This determination is further supported by the District's 2009 RACT SIP demonstration report[48] and the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[49] as approved by EPA.[50]

C.25.5.4 Ventura County APCD

C.25.5.4.1 Rule 74.2 (Architectural Coatings)

The requirements in Rule 4601 are as stringent as or more stringent than those in Rule 74.2.

C.25.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.25.7 Evaluation Findings

According to the federal CAA §182(b)(2) and (f) this source category is not subject to federal RACT requirements because this source category has no sources subject to EPA CTGs and these sources are not "major sources" of VOCs and NOx, as confirmed by EPA in the Technical Support Document (TSD) for the partial approval of the

[48] SJVAPCD. *Reasonably Available Control Technology Demonstration for Ozone State Implementation Plans*. (2009, April 16). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/docs/RACTSIP-2009.pdf
[49] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[50] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

Districts 2009 RACT SIP.[51] However, pursuant to the District's No Stone Left Unturned philosophy, Rule 4601 was evaluated as a part of this plan development effort.

Rule 4601 currently has in place the most stringent measures feasible to implement in the Valley. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[51] U.S. EPA. Region IX Air Division. Technical Support Document for EPA's Notice of Proposed Rulemaking for the California State Implementation Plan. Prepared by Stanley Tong. (2011, August 29). https://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2011-0723-0006

C.26 RULE 4602 MOTOR VEHICLE ASSEMBLY COATINGS

C.26.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The emissions inventory for this source category is 0.00 tpd because there are no facilities operating in the Valley.

C.26.2 District Rule 4602 Description

This rule is applicable to any person who applies VOC-containing coatings to new automobiles, light-duty trucks, heavier vehicles, and other parts coated along with these bodies or body parts during the assembly process and associated solvent cleaning activities. The purpose of this rule is to limit VOC emissions from motor vehicle assembly coating operations.

There are currently no motor vehicle assembly operations in the Valley. Any such facilities beginning operation in the Valley in the future would be required to meet District BACT requirements, per District Rules 2201 (New and Modified Stationary Source Review Rule), which by definition are equal to or more stringent than RACT, and 4001 (New Source Performance Standards).

C.26.3 How does District Rule 4602 compare with federal rules and regulations?

C.26.3.1 EPA – Control Technique Guidelines (CTG)

C.26.3.1.1 CTG - EPA 453/R-08-006 Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings

Rule 4602 implements EPA CTG requirements and therefore is as stringent as the applicable CTG requirements.

C.26.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.26.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.26.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.26.4 How does District Rule 4602 compare with California State regulations?

There are no state regulations applicable to this source category.

C.26.5 How does District Rule 4602 compare to regulations from other air districts?

C.26.5.1 Bay Area AQMD

Bay Area AQMD has no analogous rules for this source category.

C.26.5.2 Sacramento Metro AQMD

Sacramento Metro AQMD has no analogous rules for this source category.

C.26.5.3 South Coast AQMD

South Coast AQMD has no analogous rules for this source category.

C.26.5.4 Ventura County APCD

Ventura County APCD has no analogous rules for this source category.

C.26.6 Potential Emission Reduction Opportunities

There are no motor vehicle assembly operations in the Valley; there are no emissions or emission reduction opportunities for this source category.

C.26.7 Evaluation Findings

There are no motor vehicle assembly operations in the Valley; there are no emissions or emission reduction opportunities for this source category.

C.27 RULE 4603 SURFACE COATING OF METAL PARTS AND PRODUCTS, PLASTIC PARTS AND PRODUCTS, AND PLEASURE CRAFTS

C.27.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.00	1.10	1.17	1.25	1.32	1.38	1.42	1.44	1.44

C.27.2 District Rule 4603 Description

The provisions of this rule apply to the surface coating of metal parts or products, large appliances' parts or products, metal furniture, plastic parts and products, and pleasure crafts, and to the organic solvent cleaning and storage and disposal of all solvents and waste solvent materials associated with such coatings. The purpose of this rule is to limit VOC emissions from these coatings.

C.27.3 How does District Rule 4603 compare with federal rules and regulations?

Rule 4603 is at least as stringent as the applicable federal CTG, ACT, NSPS, MACT, and NESHAP since the requirements have not been strengthened for these regulations since the Rule 4603 RACT approval.

C.27.3.1 EPA – Control Technique Guidelines (CTG)

C.27.3.1.1 CTG – EPA-453/R-07-004 (Control Techniques Guidelines for Large Appliance Coatings)

The requirements of Rule 4603 are more stringent than the requirements in the CTG.

C.27.3.1.2 CTG – EPA-453/R-07-005 (Control Techniques Guidelines for Metal Furniture Coatings)

The requirements of Rule 4603 are more stringent than the requirements in the CTG.

C.27.3.1.3 CTG – EPA-450/2-78-015 (Control of Volatile Organic Emissions from Existing Stationary Sources – Volume VI: Surface Coating of Miscellaneous Metal Parts and Products)

The requirements of Rule 4603 are more stringent than the requirements in the CTG.

C.27.3.1.4 CTG – EPA-453/R-08-003 (Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings)

The requirements of Rule 4603 are more stringent than the requirements in the CTG.

C.27.3.2 EPA – Alternative Control Technology (ACT)

C.27.3.2.1 ACT – EPA-453/R-94-015 (Alternative Control Techniques Document – Industrial Cleaning Solvents)

The requirements of Rule 4603 are more stringent than the requirements in the ACT.

C.27.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.27.3.3.1 NSPS – 40 CFR 60 Subpart EE (Surface Coating of Metal Furniture)

The requirements of Rule 4603 are more stringent than the requirements in the NSPS.

C.27.3.3.2 NSPS – 40 CFR 60 Subpart SS (Industrial Surface Coating of Large Appliances)

The requirements of Rule 4603 are more stringent than the requirements in the NSPS.

C.27.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.27.3.4.1 NESHAP/MACT – 40 CFR Part 63 Subpart MMMM (NESHAP for Surface Coating of Miscellaneous Metal Parts and Products).

The requirements of Rule 4603 are more stringent than the requirements in the NESHAP.

C.27.3.4.2 NESHAP/MACT – 40 CFR Part 63 Subpart NNNN (NESHAP for Surface Coating of Large Appliances)

The requirements of Rule 4603 are more stringent than the requirements in the NESHAP.

C.27.3.4.3 NESHAP/MACT – 40 CFR Part 63 Subpart RRRR (NESHAP for Surface Coating of Metal Furniture)

The requirements of Rule 4603 are more stringent than the requirements in the NESHAP.

C.27.4 How does District Rule 4603 compare with California State regulations?

There are no state regulations applicable to this source category.

C.27.5 How does District Rule 4603 compare to regulations from other air districts?

C.27.5.1 Bay Area AQMD

C.27.5.1.1 Regulation 8 Rule 14 (Surface Coating of Large Appliances and Metal Furniture)

The requirements in Rule 4603 are as stringent as or more stringent than those in Rule 8-14

C.27.5.1.2 Regulation 8 Rule 19 (Surface Coating of Miscellaneous Parts and Products)

The requirements in Rule 4603 are as stringent as or more stringent than those in Rule 8-19.

C.27.5.2 Sacramento Metro AQMD

C.27.5.2.1 SMAQMD Rule 451 (Surface Coating of Miscellaneous Metal Parts and Products)

SMAQMD Rule 451 was amended in 2010, but the rule requirements are not more stringent than the requirements in Rule 4603.

C.27.5.3 South Coast AQMD

C.27.5.3.1 SCAQMD Rule 1106.1 (Pleasure Craft Coating Operations)

The requirements in Rule 4603 are as stringent as or more stringent than those in Rule 1106.1.

C.27.5.3.2 SCAQMD Rule 1107 (Coating of Metal Parts and Products)

The requirements in Rule 4603 are as stringent as or more stringent than those in Rule 1107.

C.27.5.4 Ventura County APCD

C.27.5.4.1 Rule 74.12 (Surface Coatings of Metal Parts and Products)

The requirements in Rule 4603 are as stringent as or more stringent than those in Rule 74.12.

C.27.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.27.7 Evaluation Findings

Rule 4603 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category.

C.28 RULE 4604 CAN AND COIL COATING OPERATIONS

C.28.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.31	0.33	0.35	0.37	0.39	0.40	0.42	0.43	0.43

C.28.2 District Rule 4604 Description

This rule applies to can and coil coating operations and to organic solvent cleaning, storage, and disposal associated with can and coil coating operations. The purpose of this rule is to limit VOC emissions from these operations.

C.28.3 How does District Rule 4604 compare with federal rules and regulations?

C.28.3.1 EPA – Control Technique Guidelines (CTG)

C.28.3.1.1 CTG–EPA-450/2-77-022 (Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks

The requirements of Rule 4604 are more stringent than the requirements in the CTG.

C.28.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.28.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.28.3.3.1 NSPS – 40 CFR 60 Subpart TT (Standards of Performance for Metal Coil Surface Coating)

The requirements of Rule 4604 are more stringent than the requirements in the NSPS.

C.28.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.28.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart KKK (National Emission Standards for HAPs: Surface Coating of Metal Cans)

The requirements of Rule 4604 are more stringent than the requirements in the NESHAP/MACT.

C.28.3.4.2 NESHAP/MACT – 40 CFR 63 Subpart SSSS (National Emission Standards for HAPs: Surface Coating of Metal Coil)

The requirements of Rule 4604 are more stringent than the requirements in the NESHAP.

C.28.4 How does District Rule 4604 compare with California State regulations?

There are no state regulations applicable to this source category.

C.28.5 How does District Rule 4604 compare to regulations from other air districts?

C.28.5.1 Bay Area AQMD

C.28.5.1.1 Regulation 8 Rule 11 (Metal Container, Closure and Coil Coating)

The requirements in Rule 4604 are as stringent as or more stringent than those in Rule 8-11.

C.28.5.2 Sacramento Metro AQMD

C.28.5.2.1 Rule 452 (Can Coating)

The requirements in Rule 4604 are as stringent as or more stringent than those in Rule 452.

C.28.5.3 South Coast AQMD

C.28.5.3.1 Rule 1125 (Metal Container, Closure, and Coil Coating Operations)

The requirements in Rule 4604 are as stringent as or more stringent than those in Rule 1125.

C.28.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.28.6 Potential Emission Reduction Opportunities

There are BACT guidelines that are more stringent than what is required in Rule 4604. However, these requirements are beyond RACT and not technologically feasible or cost effective for all sources applicable to Rule 4604. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard, as approved by EPA.[52]

[52] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.28.7 Evaluation Findings

Rule 4604 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.29 RULE 4605 AEROSPACE ASSEMBLY AND COMPONENT COATING OPERATIONS

C.29.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

C.29.2 District Rule 4605 Description

This rule applies to the manufacturing, assembling, coating, masking, bonding, paint stripping, surface cleaning, service, and maintenance of aerospace components; the cleanup of equipment; and the storage and disposal of solvents and waste solvent materials associated with these operations. The purpose of this rule is to limit the emissions of VOCs from these sources.

C.29.3 How does District Rule 4605 compare with federal rules and regulations?

C.29.3.1 EPA – Control Technique Guidelines (CTG)

C.29.3.1.1 CTG – EPA-453/R-97-004 (Control of Volatile Organic Compound Emissions from Coating Operations at Aerospace Manufacturing and Rework Operations)

The requirements of Rule 4605 are more stringent than the requirements in the CTG.

C.29.3.1.2 CTG – EPA-450/2-77-022 (Control of Volatile Organic Emissions from Solvent Metal Cleaning)

The requirements of Rule 4605 are as stringent as or more stringent than the requirements in the CTG.

C.29.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.29.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.29.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.29.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart GG (National Emission Standards for HAPs: Aerospace Manufacturing and Rework Facilities)

The requirements of Rule 4605 are more stringent than the requirements in the NESHAP/MACT.

C.29.4 How does District Rule 4605 compare with California State regulations?

There are no state regulations applicable to this source category.

C.29.5 How does District Rule 4605 compare to regulations from other air districts?

C.29.5.1 Bay Area AQMD

C.29.5.1.1 Regulation 8 Rule 29 (Aerospace Assembly and Component Coating Operations)

The requirements in Rule 4605 are as stringent as or more stringent than those in Rule 8-29.

C.29.5.2 Sacramento Metro AQMD

C.29.5.2.1 SMAQMD Rule 456 (Aerospace Coating Operations)

The requirements in Rule 4605 are as stringent as or more stringent than those in Rule 456.

C.29.5.3 South Coast AQMD

C.29.5.3.1 Rule 1124 (Aerospace Assembly and Component Manufacturing Operations)

The requirements in Rule 4605 are as stringent as or more stringent than those in Rule 1124.

C.29.5.4 Ventura County APCD

C.29.5.4.1 Rule 74.13 (Aerospace Assembly and Component Manufacturing Operations)

The requirements in Rule 4605 are more stringent than those in Rule 74.13.

C.29.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.29.7 Evaluation Findings

Rule 4605 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.30 RULE 4606 WOOD PRODUCTS AND FLAT WOOD PANELING PRODUCTS COATING OPERATIONS

C.30.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.47	1.60	1.73	1.80	1.91	1.98	2.07	2.10	2.10

C.30.2 District Rule 4606 Description

This rule applies to the application of coatings to wood products, including furniture, cabinets, flat wood paneling, and custom replica furniture. The rule also applies to organic solvent cleaning, and to the storage and disposal of all solvents and waste solvent materials associated with such coating operations. The purpose of this rule is to limit the emissions of VOCs from these operations.

C.30.3 How does District Rule 4606 compare with federal rules and regulations?

C.30.3.1 EPA – Control Technique Guidelines (CTG)

C.30.3.1.1 CTG – EPA-453/R-96-007 (Control of Volatile Organic Compound Emissions from Wood Furniture Manufacturing Operations)

The requirements of Rule 4606 are as stringent as or more stringent than the requirements in the CTG.

C.30.3.1.2 CTG – EPA-453/R-06-004 (Control Techniques Guidelines for Flat Wood Paneling Coatings)

The requirements of Rule 4606 are as stringent as or more stringent than the requirements in the CTG.

C.30.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.30.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.30.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.30.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart JJ (National Emission Standards for Wood Furniture Manufacturing)

The requirements of Rule 4606 are more stringent than the requirements in the NESHAP.

C.30.4 How does District Rule 4606 compare with California State regulations?

There are no state regulations applicable to this source category.

C.30.5 How does District Rule 4606 compare to regulations from other air districts?

C.30.5.1 Bay Area AQMD

C.30.5.1.1 Regulation 8 Rule 32 (Wood Products Coatings)

Regulation 8 Rule 32 was amended in 2009 to include VOC limits that go beyond RACT for "Custom and Contract Furniture." EPA's partial approval of the *2009 RACT SIP,* which includes Rule 4606, further demonstrates that the BAAQMD limits are beyond RACT.

C.30.5.2 Sacramento Metro AQMD

C.30.5.2.1 Rule 463 (Wood Product Coatings)

The requirements in Rule 4606 are as stringent as or more stringent than those in Rule 463.

C.30.5.3 South Coast AQMD

C.30.5.3.1 Rule 1136 (Wood Product Coatings)

The requirements in Rule 4606 are as stringent as or more stringent than those in Rule 1136.

C.30.5.3.2 Rule 1104 (Wood Flat Stock Coating Operations)

The requirements in Rule 4606 are as stringent as or more stringent than those in Rule 1104.

C.30.5.4 Ventura County APCD

C.30.5.4.1 Rule 74.30 (Wood Products Coatings)

The requirements in Rule 4606 are as stringent as or more stringent than those in Rule 74.30.

C.30.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.30.7 Evaluation Findings

Rule 4606 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.31 RULE 4607 GRAPHIC ARTS AND PAPER FILM, FOIL, AND FABRIC COATINGS

C.31.1 *Emissions Inventory (Summer Average – Tons per day)*

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	5.18	5.48	5.76	6.05	6.33	6.66	6.87	6.98	6.98

C.31.2 District Rule 4607 Description

This rule is applicable to graphic arts printing operations; digital printing operations; paper, film, foil, or fabric coating operations; and the organic solvent cleaning materials and processes associated with such operations. The purpose of this rule is to limit VOC emissions from these operations.

C.31.3 How does District Rule 4607 compare with federal rules and regulations?

C.31.3.1 EPA – Control Technique Guidelines (CTG)

C.31.3.1.1 CTG – EPA-450/2-77-008 (Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the CTG.

C.31.3.1.2 CTG – EPA-450/2-78-033 (Control Techniques Guidelines for Control of VOCs from Existing Stationary Sources – Volume VIII: Graphic Arts- Rotogravure and Flexography

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the CTG.

C.31.3.1.3 CTG – EPA-453/R-06-002 (Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the CTG.

C.31.3.1.4 CTG – EPA-453/R-06-003 (Control Techniques Guidelines for Flexible Package Printing)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the CTG.

C.31.3.1.5 CTG – EPA-453/R-07-003 (Control Techniques Guidelines for Paper, Film, and Foil Coatings)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the CTG.

C.31.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.31.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.31.3.3.1 NSPS – 40 CFR 60 Subpart QQ (Standards of Performance for the Graphic Arts Industry: Publication Rotogravure Printing)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the NSPS.

C.31.3.3.2 NSPS – 40 CFR 60 Subpart RR- Standards of Performance for Pressure Sensitive Tape and Label Surface Coating Operations)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the NSPS.

C.31.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.31.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart KK (National Emission Standards for the Printing and Publishing Industry)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.31.3.4.2 NESHAP/MACT – 40 CFR 63 Subpart JJJJ (National Emission Standards for Hazardous Air Pollutants: Paper and Other Web Coating)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.31.3.4.3 NESHAP/MACT – 40 CFR 63 Subpart OOOO (National Emission Standards for Hazardous Air Pollutants: Printing, Coating, and Dyeing of Fabrics and Other Textiles)

The requirements of Rule 4607 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.31.4 How does District Rule 4607 compare with California State regulations?

There are no state regulations applicable to this source category.

C.31.5 How does District Rule 4607 compare to regulations from other air districts?

C.31.5.1 Bay Area AQMD

C.31.5.1.1 Regulation 8 Rule 4 (General Solvent and Surface Coating Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 8-4.

C.31.5.1.2 Regulation 8 Rule 12 (Paper, Fabric and Film Coating)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 8-12.

C.31.5.1.3 Regulation 8 Rule 20 (Graphic Arts Printing and Coating Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 8-20.

C.31.5.2 Sacramento Metro AQMD

C.31.5.2.1 Rule 450 (Graphic Arts Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 450.

C.31.5.3 South Coast AQMD

C.31.5.3.1 Rule 1128 (Paper, Fabric, and Film Coating Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 1128.

C.31.5.3.2 Rule 1130 (Graphic Arts)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 1130.

C.31.5.3.3 Rule 1130.1 (Screen Printing Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 1130.1.

C.31.5.3.4 Rule 1171 (Solvent Cleaning Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 1171.

C.31.5.4 Ventura County APCD

C.31.5.4.1 Rule 74.19 (Graphic Arts)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 74.19.

C.31.5.4.2 Rule 74.19.1 (Screen Printing Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 74.19.1.

C.31.5.4.3 Rule 74.3 (Paper, Fabric, and Film Coating Operations)

The requirements in Rule 4607 are as stringent as or more stringent than those in Rule 74.3.

C.31.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.31.7 Evaluation Findings

Rule 4607 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.32 RULE 4610 GLASS COATING OPERATIONS

C.32.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

The emissions from this rule are accounted for in the discussion for Rule 4354 (Glass Melting Furnaces).

C.32.2 District Rule 4610 Description

The requirements of this rule apply to any major source that coats glass products with VOC-containing materials. The purpose of this rule is to limit the emissions of VOCs from the coating of glass products. There are only two glass coating operations in the District, and neither emits enough VOCs to be considered a major source.

C.32.3 How does District Rule 4610 compare with federal rules and regulations?

C.32.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.32.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.32.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.32.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.32.4 How does District Rule 4610 compare with California State regulations?

There are no state regulations applicable to this source category.

C.32.5 How does District Rule 4610 compare to regulations from other air districts?

C.32.5.1 Bay Area AQMD

C.32.5.1.1 Regulation 8 Rule 4 (General Solvent and Surface Coating Operations)

The requirements in Rule 46010 are as stringent as or more stringent than those in Rule 8-4.

C.32.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.32.5.3 South Coast AQMD

C.32.5.3.1 SCAQMD Rule 1145 (Plastic, Rubber, Leather, and Glass Coatings)

SCAQMD adopted VOC limits in Rule 1145 that go beyond RACT for one-component, two-component, optical, and mirror backed roll coatings. This determination is further supported by the District's 2009 RACT SIP demonstration report[53] and the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[54] as approved by EPA.[55]

C.32.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.32.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.32.7 Evaluation Findings

Rule 4610 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[53] SJVAPCD. *Reasonably Available Control Technology Demonstration for Ozone State Implementation Plans*. (2009, April 16). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/docs/RACTSIP-2009.pdf
[54] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[55] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.33 RULE 4612 MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATIONS

C.33.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.53	1.57	1.59	1.56	1.59	1.62	1.64	1.65	1.65

C.33.2 District Rule 4612 Description

This rule applies to any person who supplies, sells, offers for sale, manufactures, or distributes any automotive coating for use within the District, as well as any person who uses, applies, or solicits the use or application of any automotive coating within the District. The purpose of this rule is to limit VOC emissions from coatings of motor vehicles, mobile equipment, and associated parts and components, and associated organic solvent cleaning, storage, and disposal.

C.33.3 How does District Rule 4612 compare with federal rules and regulations?

C.33.3.1 EPA – Control Technique Guidelines (CTG)

C.33.3.1.1 CTG – EPA-450/2-76-028 (Control of Volatile Organic Emissions from Existing Stationary Sources – Volume I: Control Methods for Surface Coating Operations)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in the CTG.

C.33.3.1.2 CTG – EPA-450/2-77-008 (Control of Volatile Organic Emissions from Existing Stationary Sources – Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in the CTG.

C.33.3.1.3 CTG – EPA-453/R-08-006 (Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in the CTG.

C.33.3.2 EPA – Alternative Control Technology (ACT)

C.33.3.2.1 ACT – EPA-453/R-94-017 (Alternative Control Techniques Document – Surface Coating of Automotive/Transportation and Business Machine Plastic Parts)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in the ACT.

C.33.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.33.3.3.1 NSPS – 40 CFR 60 Subpart MM (Standards of Performance for Automobile and Light-Duty Truck Surface Coating Operations)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in the NSPS.

C.33.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.33.3.4.1 NESHAP/MACT - 40 CFR 63 Subpart IIII (National Emission Standards for HAPs: Surface Coating of Automobiles and Light-Duty Trucks)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.33.4 How does District Rule 4612 compare with California State regulations?

C.33.4.1.1 ARB SCM for Automotive Coatings

The ARB SCM was adopted on October 20, 2005 and has not been updated since. Rule 4612 is as stringent as or more stringent than the requirements in the ARB SCM.

C.33.5 How does District Rule 4612 compare to regulations from other air districts?

C.33.5.1 Bay Area AQMD

C.33.5.1.1 Regulation 8 Rule 45 (Motor Vehicle and Mobile Equipment Coating Operations)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in Rule 8-45. SCAQMD Rule 1151 and BAAQMD Regulation 8 Rule 45 were last amended before the *2009 RACT SIP* was compiled. These rules contain VOC limits that go beyond RACT for two categories (Pre-Coat and Topcoat–Metallic/Iridescent). EPA's partial approval of the *2009 RACT SIP,* which includes Rule 4612, further demonstrates that the SCAQMD and BAAQMD limits are beyond RACT.

This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[56] as approved by EPA.[57]

C.33.5.2 Sacramento Metro AQMD

C.33.5.2.1 SMAQMD Rule 459 (Automotive, Mobile Equipment, and Associated Parts and Components Coating Operations)

The requirements of Rule 4612 are as stringent as or more stringent than Rule 459.

C.33.5.3 South Coast AQMD

C.33.5.3.1 Rule 1151 (Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in Rule 1151. SCAQMD Rule 1151 and BAAQMD Regulation 8 Rule 45 were last amended before the *2009 RACT SIP* was compiled. These rules contain VOC limits that go beyond RACT for two categories (Pre-Coat and Topcoat–Metallic/Iridescent). EPA's partial approval of the *2009 RACT SIP,* which includes Rule 4612, further demonstrates that the SCAQMD and BAAQMD limits are beyond RACT. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[58] as approved by EPA.[59]

C.33.5.4 Ventura County APCD

C.33.5.4.1 VCAPCD Rule 74.18 (Motor Vehicle and Mobile Equipment Coating Operations)

The requirements of Rule 4612 are as stringent as or more stringent than the requirements in Rule 74.18.

C.33.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.33.7 Evaluation Findings

Rule 4612 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source

[56] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[57] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).
[58] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[59] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.34 RULE 4621 GASOLINE TRANSFER INTO STATIONARY STORAGE CONTAINERS, DELIVERY VESSELS, AND BULK PLANTS

C.34.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.53	1.57	1.59	1.56	1.59	1.62	1.64	1.65	1.65

C.34.2 District Rule 4621 Description

Rule 4621 applies to all operations that transfer gasoline between delivery vessels and storage containers and loading racks that are used to load organic liquids with a True Vapor Pressure of 1.5 psi or greater. The purpose of this rule is to limit VOC emissions from stationary storage containers, delivery vessels, and bulk plants.

C.34.3 How does District Rule 4621 compare with federal rules and regulations?

C.34.3.1 EPA – Control Technique Guidelines (CTG)

C.34.3.1.1 EPA-450/2-77-026 Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals

The requirements of Rule 4621 are as stringent as or more stringent than the requirements in the CTG.

C.34.3.1.2 EPA-450/2-77-035 Control of Volatile Organic Emissions from Bulk Gasoline Plants

The requirements of Rule 4621 are as stringent as or more stringent than the requirements in the CTG.

C.34.3.1.3 EPA-450/2-78-051 Guideline for Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems

The requirements of Rule 4621 are as stringent as or more stringent than the requirements in the CTG.

C.34.3.2 EPA – Alternative Control Technology (ACT)

C.34.3.2.1 EPA-450/R-75-102 Alternative Control Technology Document for Stage I Vapor Control Systems on Gasoline Service Stations

The requirements of Rule 4621 are more stringent than the requirements in the ACT.

C.34.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.34.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.34.4 How does District Rule 4621 compare with California State regulations?

Rule 4621 aligns with ARB's certified Recovery System requirements.

C.34.5 How does District Rule 4621 compare to regulations from other air districts?

C.34.5.1 Bay Area AQMD

C.34.5.1.1 Regulation 8 Rule 7 (Gasoline Dispensing Facilities)

The requirements in Rule 4621 are as stringent as or more stringent than those in Rule 8-7.

C.34.5.1.2 Regulation 8 Rule 39 (Gasoline Bulk Plants and Gasoline Deliver Vehicles)

The requirements in Rule 4621 are as stringent as or more stringent than those in Rule 8-39.

C.34.5.2 Sacramento Metro AQMD

C.34.5.2.1 SMAQMD Rule 448 (Gasoline Storage Containers)

The requirements in Rule 4621 are as stringent as or more stringent than those in Rule 448.

C.34.5.3 South Coast AQMD

C.34.5.3.1 SCAQMD Rule 461 (Gasoline Transfer and Dispensing)

The requirements in Rule 4621 are more as stringent as or stringent than those in Rule 461.

C.34.5.4 Ventura County APCD

C.34.5.4.1 Ventura County APCD Rule 70 (Storage and Transfer of Gasoline)

The requirements in Rule 4621 are as stringent as or more stringent than those in Rule 70.

C.34.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.34.7 Evaluation Findings

Rule 4621 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.35 RULE 4622 GASOLINE TRANSFER INTO MOTOR VEHICLE FUEL TANKS

C.35.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.81	1.68	1.56	1.48	1.46	1.46	1.48	1.49	1.48

C.35.2 District Rule 4622 Description

This rule applies to any gasoline storage and dispensing operation or mobile fueler from which gasoline is transferred into motor vehicle fuel tanks. The purpose of this rule is to limit emissions of gasoline vapors from these sources.

C.35.3 How does District Rule 4622 compare with federal rules and regulations?

C.35.3.1 EPA – Control Technique Guidelines (CTG)

C.35.3.1.1 CTG - EPA-450/2-78-051 (Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems)

The requirements of Rule 4622 are as stringent as or more stringent than the requirements in the CTG.

C.35.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.35.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.35.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.35.3.4.1 NESHAP/MACT - 40 CFR Subpart 63 CCCCCC (National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities)

The requirements of Rule 4622 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.35.4 How does District Rule 4622 compare with California State regulations?

There are no state regulations applicable to this source category.

C.35.5 How does District Rule 4622 compare to regulations from other air districts?

C.35.5.1 Bay Area AQMD

C.35.5.1.1 Regulation 8 Rule 7 (Gasoline Dispensing Facilities)

The requirements in Rule 4622 are as stringent as or more stringent than those in Rule 8-7.

C.35.5.2 Sacramento Metro AQMD

C.35.5.2.1 SMAQMD Rule 449 (Transfer of Gasoline into Vehicle Fuel Tanks)

The requirements in Rule 4621 are more as stringent as or stringent than those in Rule 449.

C.35.5.3 South Coast AQMD

C.35.5.3.1 SCAQMD Rule 461 (Gasoline Transfer and Dispensing)

The requirements in Rule 4621 are more as stringent as or stringent than those in Rule 461.

C.35.5.4 Ventura County APCD

C.35.5.4.1 VCAPCD Rule 70 (Storage and Transfer of Gasoline)

The requirements in Rule 4622 are as stringent as or more stringent than those in Rule 70.

C.35.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.35.7 Evaluation Findings

Rule 4622 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.36 RULE 4623 STORAGE OF ORGANIC LIQUIDS

C.36.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
VOC	2.72	2.58	2.44	2.32	2.20	2.08	2.01	1.99	1.95

C.36.2 District Rule 4623 Description

This rule applies to any tank with a capacity of 1,100 gallons or greater in which any organic liquid is placed, held, or stored. The purpose of this rule is to limit VOC emissions from the storage of organic liquids.

C.36.3 How does District Rule 4623 compare with federal rules and regulations?

C.36.3.1 EPA – Control Technique Guidelines (CTG)

C.36.3.1.1 CTG – EPA-450/2-77-036 (Control Techniques Guideline Document for Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed Roof Tanks)

The requirements of Rule 4623 are as stringent as or more stringent than the requirements in the CTG.

C.36.3.1.2 CTG – EPA-450/2-78-047 (Control Techniques Guideline Document for Control of Volatile Organic Emissions from Petroleum Liquid Storage in External Floating Roof Tanks)

The requirements of Rule 4623 are as stringent as or more stringent than the requirements in the CTG.

C.36.3.2 EPA – Alternative Control Technology (ACT)

C.36.3.2.1 ACT – EPA 453/R-94-001 (Alternative Control Techniques Document for Volatile Organic Liquid Storage in Floating and Fixed Roof Tanks)

The requirements of Rule 4623 are as stringent as or more stringent than the requirements in the ACT.

C.36.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.36.3.3.1 NSPS – 40 CFR 60 Subpart Kb (a)(3)(i) (Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984)

The requirements in Rule 4621 are more as stringent as or stringent than those in the NSPS.

C.36.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.36.4 How does District Rule 4623 compare with California State regulations?

There are no state regulations applicable to this source category.

C.36.5 How does District Rule 4623 compare to regulations from other air districts?

C.36.5.1 Bay Area AQMD

C.36.5.1.1 Regulation 8 Rule 5 (Storage of Organic Liquids)

The requirements in Rule 4623 are as stringent as or more stringent than those in Rule 8-5.

C.36.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.36.5.3 South Coast AQMD

C.36.5.3.1 South Coast Rule 463 (Organic Liquid Storage)

The requirements in Rule 4623 are as stringent as or more stringent than those in Rule 463. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[60] as approved by EPA.[61]

C.36.5.4 Ventura County APCD

C.36.5.4.1 Rule 71.2 (Storage of Reactive Organic Compound Liquids)

The requirements in Rule 4623 are as stringent as or more stringent than those in Rule 71.2

[60] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[61] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.36.6 Potential Emission Reduction Opportunities

There are District BACT standards more stringent than what is currently required in Rule 4623; however, additional add-on controls are beyond RACT and are not technologically feasible and cost effective for all facilities subject to Rule 4623. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[62] as approved by EPA.[63]

C.36.7 Evaluation Findings

Rule 4623 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[62] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[63] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.37 RULE 4624 TRANSFER OF ORGANIC LIQUID

C.37.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.03	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06
VOC	1.11	1.15	1.20	1.25	1.31	1.39	1.44	1.45	1.45

C.37.2 District Rule 4624 Description

This rule applies to organic liquid transfer facilities. The purpose of this rule is to limit VOC emissions from the transfer of organic liquids.

C.37.3 How does District Rule 4624 compare with federal rules and regulations?

C.37.3.1 EPA – Control Technique Guidelines (CTG)

C.37.3.1.1 CTG - EPA-450/2-77-035 (Control of Volatile Organic Emissions from Bulk Plants)

The requirements of Rule 4624 are as stringent as or more stringent than the requirements in the CTG.

C.37.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.37.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.37.3.3.1 NSPS - 40 CFR 60 Subpart Kb (a)(3)(i) (Volatile Organic Liquid Storage Vessel)

The requirements of Rule 4624 are as stringent as or more stringent than the requirements in the NSPS.

C.37.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.37.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart EEE (Organic Liquids Distribution (Non-Gasoline))

The requirements of Rule 4624 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.37.4 How does District Rule 4624 compare with California State regulations?

There are no state regulations applicable to this source category.

C.37.5 How does District Rule 4624 compare to regulations from other air districts?

C.37.5.1 Bay Area AQMD

C.37.5.1.1 Regulation 8 Rule 6 (Terminals and Bulk Plants)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 8-6.

C.37.5.1.2 Regulation 8 Rule 39 (Gasoline Bulk Plants and Gasoline Delivery Vehicles)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 8-39.

C.37.5.1.3 Regulation 8 Rule 33 (Gasoline Bulk Terminals and Gasoline Delivery Vehicles)

Rule 8-33 was amended in April 2009 to require an emissions limit of 0.04lb VOC/1,000 gallons, which is lower than the RACT limit in current District Rule 4624 (0.08lb VOC/1,000 gallons liquid loaded). The BAAQMD Regulation 8 Rule 33 limit is beyond RACT. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[64] as approved by EPA in 2016.[65]

C.37.5.2 Sacramento Metro AQMD

C.37.5.2.1 SMAQMD Rule 447(Organic Liquid Loading)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 447.

C.37.5.3 South Coast AQMD

C.37.5.3.1 SCAQMD Rule 462 (Organic Liquid Loading)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 462.

[64] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[65] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.37.5.3.2 SCAQMD Rule 1142 (Marine Tank Vessel Operations)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 1142.

C.37.5.4 Ventura County APCD

C.37.5.4.1 VCAPCD Rule 70 (Storage and Transfer of Gasoline)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 70.

C.37.5.4.2 VCAPCD Rule 71.3 (Transfer of Reactive Organic Compound Liquids)

The requirements in Rule 4624 are as stringent as or more stringent than those in Rule 71.3.

C.37.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.37.7 Evaluation Findings

Rule 4624 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.38 RULE 4625 WASTEWATER SEPARATORS

C.38.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

C.38.2 District Rule 4625 Description

This rule applies to wastewater separators including air flotation units, as defined in this rule. The requirements of this rule only apply to the separation of crude oil and water after custody transfer. The purpose of this rule is to limit VOC emissions from wastewater separators by requiring vapor loss control devices, recordkeeping, inspection, and test methods.

C.38.3 How does District Rule 4625 compare with federal rules and regulations?

C.38.3.1 EPA – Control Technique Guidelines (CTG)

C.38.3.1.1 CTG - EPA-450/2-77-025 (Control of Refinery Vacuum Producing Systems, Water Separators and Process Unit Turnarounds)

The requirements of Rule 4625 are as stringent as or more stringent than the requirements in the CTG.

C.38.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.38.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.38.3.3.1 NSPS – 40 CFR 60 Subpart QQQ (Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems)

The requirements of Rule 4625 are as stringent as or more stringent than the requirements in the NSPS.

C.38.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.38.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart VV (National Emission Standards for Oil-Water Separators and Organic-Water Separators)

The requirements of Rule 4625 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.38.4 How does District Rule 4625 compare with California State regulations?

There are no state regulations applicable to this source category.

C.38.5 How does District Rule 4625 compare to regulations from other air districts?

C.38.5.1 Bay Area AQMD

C.38.5.1.1 Regulation 8 Rule 8 (Wastewater (Oil-Water) Separators)

The requirements in Rule 4625 are as stringent as or more stringent than those in Rule 8-8.

C.38.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.38.5.3 South Coast AQMD

C.38.5.3.1 SCAQMD Rule 1176 (VOC Emissions from Wastewater Systems)

The requirements in Rule 4625 are as stringent as or more stringent than those in Rule 1176.

C.38.5.4 Ventura County APCD

C.38.5.4.1 Rule 74.8 (Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds)

The requirements in Rule 4625 are as stringent as or more stringent than those in Rule 74.8.

C.38.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.38.7 Evaluation Findings

Rule 4625 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.39 RULE 4641 CUTBACK, SLOW CURE, AND EMULSIFIED ASPHALT, PAVING, AND MAINTENANCE OPERATIONS

C.39.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.76	0.76	0.77	0.77	0.77	0.79	0.79	0.80	0.80

C.39.2 District Rule 4641 Description

This rule applies to the manufacture and use of cutback asphalt, slow cure asphalt, and emulsified asphalt for paving and maintenance operations. The purpose of this rule is to limit VOC emissions by restricting the application and manufacturing of certain types of asphalt for paving and maintenance operations.

C.39.3 How does District Rule 4641 compare with federal rules and regulations?

C.39.3.1 EPA – Control Technique Guidelines (CTG)

C.39.3.1.1 CTG - EPA-450/2-77-037 (Control of Volatile Organic Compounds from Use of Cutback Asphalt)

The requirements of Rule 4641 are as stringent as or more stringent than the requirements in the CTG.

C.39.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.39.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.39.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.39.4 How does District Rule 4641 compare with California State regulations?

There are no state regulations applicable to this source category.

C.39.5 How does District Rule 4641 compare to regulations from other air districts?

C.39.5.1 Bay Area AQMD

C.39.5.1.1 Regulation 8 Rule 15 (Emulsified and Liquid Asphalts)

The requirements in Rule 4641 are as stringent as or more stringent than those in Rule 8-15.

C.39.5.2 Sacramento Metro AQMD

C.39.5.2.1 SMAQMD Rule 453 (Cutback and Emulsified Asphalt Paving Materials)

The requirements in Rule 4641 are as stringent as or more stringent than those in Rule 453.

C.39.5.3 South Coast AQMD

C.39.5.3.1 SCAQMD Rule 1108 (Cutback Asphalt)

The requirements in Rule 4641 are as stringent as or more stringent than those in Rule 1108.

C.39.5.3.2 SCAQMD Rule 1108.1 (Emulsified Asphalt)

The requirements in Rule 4641 are as stringent as or more stringent than those in Rule 1108.1.

C.39.5.4 Ventura County APCD

C.39.5.4.1 VCAPCD Rule 74.4 (Cutback Asphalt)

The requirements in Rule 4641 are as stringent as or more stringent than those in Rule 74.4.

C.39.6 Potential Emission Reduction Opportunities

Although Rule 4641 currently only regulates VOC emissions, the District made a commitment in the *2015 PM2.5 Plan* to conduct a further study to evaluate Warm Mix Asphalt (WMA) for the purposed of reducing NOx emissions associated with asphalt production. Using WMA instead of hot mix asphalt (HMA) results in lower temperatures necessary for production, storage, and transport. The District collaborated with asphalt industry stakeholders and policy makers to conduct a further study in order to gain an understanding of the use of warm mix technologies in the Valley and to identify potential opportunities and barriers for adoption of this technology.

This study found that WMA has the potential to reduce emissions by using less fuel and the potential to provide safer conditions by producing less odor and fumes. However, in the Valley, many barriers still remain. Poor paving performance in the Valley's high summer heat, lack of confidence in WMA technology, an insufficient number of pilot projects to support feasibility in the Valley, lack of Caltrans WMA specifications to support proper WMA usage, and not enough demand to provide the needed economies of scale to achieve the identified cost benefits have all hindered widespread adoption of WMA throughout the Valley.

The results of this further study effort are available here:
http://www.valleyair.org/Air_Quality_Plans/PM_Plans.htm

C.39.7 Evaluation Findings

Rule 4641 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for potential emission reduction opportunities.

C.40 RULE 4642 SOLID WASTE DISPOSAL SITES

C.40.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.37	1.42	1.48	1.55	1.63	1.70	1.76	1.78	1.81

C.40.2 District Rule 4642 Description

The provisions of this rule apply to any solid waste disposal sites with a gas collection system and/or control device in operation, or undergoing maintenance or repair. The purpose of this rule is to reduce VOC emissions from solid waste disposal sites.

C.40.3 How does District Rule 4642 compare with federal rules and regulations?

C.40.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.40.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.40.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.40.3.3.1 NSPS – 40 CFR 60 Subpart CC (Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills)

The requirements of Rule 4642 are as stringent as or more stringent than the requirements in the NSPS.

C.40.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.40.3.4.1 MACT – 40 CFR 63 Subpart AAAA (National Emission Standards for Hazardous Air Pollutants from Municipal Solid Waste Landfills)

EPA NESHAP requirements are not applicable to this source category. The requirements of Rule 4642 are as stringent as or more stringent than the requirements in the MACT.

C.40.4 How does District Rule 4642 compare with California State regulations?

There are no state regulations applicable to this source category.

C.40.5 How does District Rule 4642 compare to regulations from other air districts?

C.40.5.1 Bay Area AQMD

C.40.5.1.1 Regulation 8 Rule 34 (Solid Waste Disposal Sites)

The requirements in Rule 4642 are as stringent as or more stringent than those in Rule 8-34.

C.40.5.2 Sacramento Metro AQMD

C.40.5.2.1 SMAQMD Rule 485 (Municipal Landfill Gas)

The requirements in Rule 4642 are as stringent as or more stringent than those in Rule 485.

C.40.5.3 South Coast AQMD

C.40.5.3.1 SCAQMD Rule 1150 (Excavation of Landfill Sites)

The requirements in Rule 4642 are as stringent as or more stringent than those in Rule 1150.

C.40.5.3.2 SCAQMD Rule 1150.1 (Control of Gaseous Emissions from Municipal Solid Waste Landfills)

The requirements in Rule 4642 are as stringent as or more stringent than those in Rule 1150.1.

C.40.5.4 Ventura County APCD

C.40.5.4.1 Rule 74.17.1 (Municipal Solid Waste Landfills)

The requirements in Rule 4642 are as stringent as or more stringent than those in Rule 74.17.1.

C.40.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.40.7 Evaluation Findings

Rule 4642 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.41 RULE 4651 SOIL DECONTAMINATION OPERATIONS

C.41.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.14

C.41.2 District Rule 4651 Description

This rule applies to operations involved in the excavation, transportation, handling, decontamination, and disposal of contaminated soil. The purpose of this rule is to limit VOC emissions from soil that has been contaminated with a VOC-containing liquid.

C.41.3 How does District Rule 4651 compare with federal rules and regulations?

C.41.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.41.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.41.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.41.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.41.4 How does District Rule 4651 compare with California State regulations?

There are no state regulations applicable to this source category.

C.41.5 How does District Rule 4651 compare to regulations from other air districts?

C.41.5.1 Bay Area AQMD

C.41.5.1.1 Regulation 8 Rule 40 (Aeration of Contaminated Soil and Removal of Underground Storage Tanks)

The requirements in Rule 4651 are as stringent as or more stringent than those in Rule 8-40.

C.41.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.41.5.3 South Coast AQMD

C.41.5.3.1 SCAQMD Rule 1166 (Volatile Organic Compound Emissions from Decontamination of Soil)

The requirements in Rule 4651 are as stringent as or more stringent than those in Rule 1166.

C.41.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.41.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.41.7 Evaluation Findings

Rule 4651 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.42 RULE 4652 COATINGS AND INK MANUFACTURING

C.42.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02

C.42.2 District Rule 4652 Description

The provisions of this rule apply to all coatings and ink manufacturing operations. The purpose of this rule is to limit VOC emissions from these operations.

C.42.3 How does District Rule 4652 compare with federal rules and regulations?

C.42.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.42.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.42.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.42.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.42.4 How does District Rule 4652 compare with California State regulations?

There are no state regulations applicable to this source category.

C.42.5 How does District Rule 4652 compare to regulations from other air districts?

C.42.5.1 Bay Area AQMD

C.42.5.1.1 Regulation 8 Rule 35 (Coating, Ink and Adhesive Manufacturing)

Although there are some VOC limits in Rule 8-35 that differ in stringency in comparison to District Rule 4652, Rule 4652 is overall at least as stringent as Rule 46. This

determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[66] as approved by EPA in 2016.[67]

C.42.5.2 Sacramento Metro AQMD

C.42.5.2.1 Rule 466 (Solvent Cleaning)

Although there are some VOC limits in Rule 466 that differ in stringency in comparison to Rule 4652, Rule 4652 is overall more stringent than Rule 466. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[68] as approved by EPA in 2016.[69]

C.42.5.3 South Coast AQMD

C.42.5.3.1 Rule 1141.1 (Coatings and Ink Manufacturing)

The requirements in Rule 4652 are as stringent as or more stringent than those in Rule 1141.1.

C.42.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.42.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.42.7 Evaluation Findings

According to the federal CAA §182(b)(2) and (f) this source category is not subject to federal RACT requirements because this source category has no sources subject to EPA CTGs and these sources are not "major sources" of VOCs and NOx, as confirmed by EPA in the Technical Support Document (TSD) for the partial approval of the Districts 2009 RACT SIP.[70] However, pursuant to the District's No Stone Left Unturned philosophy, Rule 4652 was evaluated as a part of this plan development effort.

Rule 4652 currently has in place the most stringent measures feasible to implement in the Valley and therefore would meet or exceed federal RACT requirements for this

[66] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[67] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).
[68] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf
[69] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).
[70] U.S. EPA. Region IX Air Division. Technical Support Document for EPA's Notice of Proposed Rulemaking for the California State Implementation Plan. Prepared by Stanley Tong. (2011, August 29). https://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2011-0723-0006

source category were they applicable. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.43 RULE 4653 ADHESIVES AND SEALANTS

C.43.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.57	0.54	0.52	0.51	0.49	0.49	0.48	0.47	0.47

C.43.2 District Rule 4653 Description

This rule is applicable to any person who supplies, sells, offers for sale, or applies any adhesive product, sealant product, or associated solvent used within the District. The purpose of this rule is to reduce emissions of VOCs from these operations.

EPA finalized a partial approval/partial disapproval of the *2009 RACT SIP* on January 10, 2012 and deemed this rule as being at least as stringent as established RACT requirements: 77 FR 1417, http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf. EPA finalized approval of the 2010 amendments to Rule 4653 on February 13, 2012 and deemed this rule as being at least as stringent as established RACT requirements: 77 FR 7536, http://www.gpo.gov/fdsys/pkg/FR-2012-02-13/pdf/2012-3172.pdf

C.43.3 How does District Rule 4653 compare with federal rules and regulations?

C.43.3.1 EPA – Control Technique Guidelines (CTG)

C.43.3.1.1 CTG – EPA-453/R-08-005 (Control Techniques Guidelines for Miscellaneous Industrial Adhesives)

The requirements in Rule 4653 are as stringent as or more stringent than those in the CTG.

C.43.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.43.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.43.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.43.4 How does District Rule 4653 compare with California State regulations?

There are no state regulations applicable to this source category.

C.43.4.1.1 ARB's RACT/Best Available Retrofit Control Technology (BARCT) - Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Adhesives and Sealants

The requirements of Rule 4653 are as stringent as or more stringent than the requirements in the BARCT.

C.43.5 How does District Rule 4653 compare to regulations from other air districts?

C.43.5.1 Bay Area AQMD

C.43.5.1.1 Regulation 8 Rule 51 (Adhesive and Sealant Products)

The requirements in Rule 4653 are as stringent as or more stringent than those in Rule 8-51.

C.43.5.2 Sacramento Metro AQMD

C.43.5.2.1 SMAQMD Rule 460 (Adhesives and Sealants)

The requirements in Rule 4653 are as stringent as or more stringent than those in Rule 460.

C.43.5.3 South Coast AQMD

C.43.5.3.1 SCAQMD Rule 1168 (Adhesive and Sealant Applications)

The requirements in Rule 4653 are as stringent as or more stringent than those in Rule 1168.

C.43.5.4 Ventura County APCD

C.43.5.4.1 Rule 74.20 (Adhesives and Sealants)

The requirements in Rule 4653 are as stringent as or more stringent than those in Rule 74.20.

C.43.6 Potential Emission Reduction Opportunities

No additional emissions reductions opportunities have been identified at this time. This determination is further supported by the District's *2013 Plan for the Revoked 1-hour Ozone Standard*,[71] as approved by EPA.[72]

C.43.7 Evaluation Findings

Rule 4653 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[71] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[72] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.44 RULE 4661 ORGANIC SOLVENTS

C.44.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
VOC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Rule 4661 establishes limits for the use of organic solvents, however their emissions are represented in the rules that regulate their use: Rule 4662 (Organic Solvent Degreasing Operations), and Rule 4663 Organic Solvent Cleaning, Storage, and Disposal).

C.44.2 District Rule 4661 Description

This rule applies to any source operation that uses organic solvents, with the exception of operations exempted under Section 4.0 of the rule (generally, the manufacture or transport of organic solvents or any source operation that is subject to or exempted by another District rule). The purpose of this rule is to limit VOC emissions from the use of organic solvents. EPA finalized approval of the 2007 amendments to Rule 4661 on May 5, 2010 and deemed this rule as being at least as stringent as established RACT requirements.[73]

C.44.3 How does District Rule 4661 compare with federal rules and regulations?

C.44.3.1 EPA – Control Technique Guidelines (CTG)

C.44.3.1.1 CTG - EPA-453/R-06-001 2006/09 (Control Techniques Guidelines for Industrial Cleaning Solvents)

The requirements of Rule 4661 are as stringent as or more stringent than the requirements in the CTG.

C.44.3.2 EPA – Alternative Control Technology (ACT)

C.44.3.2.1 ACT - EPA-453/R-94-015 1994/02 (Industrial Cleaning Solvents)

The requirements of Rule 4661 are as stringent as or more stringent than the requirements in the ACT.

C.44.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

[73] 75 FR 24406, http://www.gpo.gov/fdsys/pkg/FR-2010-05-05/pdf/2010-10402.pdf

C.44.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.44.3.4.1 NESHAP/MACT – 40 CFR 63 Subpart T (National Emission Standards for HAPs: Halogenated Solvent Cleaning)

The requirements of Rule 4661 are as stringent as or more stringent than the requirements in the NESHAP.

C.44.4 How does District Rule 4661 compare with California State regulations?

There are no state regulations applicable to this source category.

C.44.5 How does District Rule 4661 compare to regulations from other air districts?

C.44.5.1 Bay Area AQMD

C.44.5.1.1 Regulation 8 Rule 11 (Metal Container, Closure and Coil Coating)

No requirements in Rule 8-11 are more stringent than those in Rule 4661.

C.44.5.2 Sacramento Metro AQMD

C.44.5.2.1 SMAQMD Rule 441 (Organic Solvents)

The requirements in Rule 4661 are as stringent as or more stringent than those in Rule 441.

C.44.5.3 South Coast AQMD

C.44.5.3.1 SCAQMD Rule 1171 (Solvent Cleaning Operation)

The requirements in Rule 4661 are as stringent as or more stringent than those in Rule 1171.

C.44.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.44.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.44.7 Evaluation Findings

Rule 4661 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address

increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.45 RULE 4662 ORGANIC SOLVENTS DEGREASING OPERATIONS

C.45.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1.05	1.05	1.06	1.06	1.06	1.07	1.08	1.08	1.08

C.45.2 District Rule 4662 Description

This rule applies to all organic solvent degreasing operations. The purpose of this rule is to limit VOC emissions and hazardous air pollutant emissions from these operations. EPA finalized approval of the 2007 amendments to Rule 4662 on July 30, 2009 and deemed this rule as being at least as stringent as established RACT requirements.[74]

C.45.3 How does District Rule 4662 compare with federal rules and regulations?

C.45.3.1 EPA – Control Technique Guidelines (CTG)

C.45.3.1.1 CTG - EPA 450/2-77-022 1977/11 (Control of Volatile Organic Emissions from Solvent Metal Cleaning

The requirements of Rule 4662 are as stringent as or more stringent than the requirements in the CTG.

C.45.3.1.2 CTG - EPA 453/R-06-001 Control Technique Guidelines for Industrial Cleaning Solvents

The requirements of Rule 4662 are as stringent as or more stringent than the requirements in the CTG.

C.45.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.45.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.45.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

[74] 74 FR 37948, http://www.gpo.gov/fdsys/pkg/FR-2009-07-30/pdf/E9-18001.pdf

C.45.4 How does District Rule 4662 compare with California State regulations?

There are no state regulations applicable to this source category.

C.45.5 How does District Rule 4662 compare to regulations from other air districts?

C.45.5.1 Bay Area AQMD

C.45.5.1.1 Regulation 8 Rule 16 (Solvent Cleaning Operations)

BAAQMD does not have a rule that specifically covers organic solvent degreasing operations, but conveyorized solvent cleaner operation requirements are included in Regulation 8, Rule 16 (Solvent Cleaning Operations). The requirements in Rule 4662 are as stringent as or more stringent than those in Rule 8-16.

C.45.5.2 Sacramento Metro AQMD

C.45.5.2.1 SMAQMD Rule 454 (Degreasing Operations)

The requirements of Rule 4663 are as stringent as or more stringent than the requirements in rule 454.

C.45.5.3 South Coast AQMD

C.45.5.3.1 SCAQMD Rule 1122 (Solvent Degreasers)

The requirements of Rule 4663 are as stringent as or more stringent than the requirements in rule 1122.

C.45.5.4 Ventura County APCD

C.45.5.4.1 Rule 74.6 (Surface Cleaning and Degreasing)

The requirements of Rule 4663 are as stringent as or more stringent than the requirements in rule 74.6.

C.45.6 Potential Emission Reduction Opportunities

No additional emissions reductions opportunities have been identified at this time. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[75] as approved by EPA.[76]

C.45.7 Evaluation Findings

[75] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[76] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

Rule 4662 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.46 RULE 4663 ORGANIC SOLVENT CLEANING, STORAGE, AND DISPOSAL

C.46.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.62	0.66	0.71	0.74	0.8	0.82	0.86	0.87	0.87

C.46.2 District Rule 4663 Description

This rule applies to organic solvent cleaning performed outside a degreaser during the production, repair, maintenance, or servicing of parts, products, tools, machinery, equipment, or in general work areas at stationary sources. This rule also applies to the storage and disposal of all solvents and waste solvent materials at stationary sources. The purpose of this rule is to limit VOC emissions from these processes. EPA finalized approval of the 2007 amendments to Rule 4663 on July 30, 2009 and deemed this rule as being at least as stringent as established RACT requirements. [77]

C.46.3 How does District Rule 4663 compare with federal rules and regulations?

C.46.3.1 EPA – Control Technique Guidelines (CTG)

C.46.3.1.1 CTG - EPA-453/R-06-001 2006/09 (Control Techniques Guidelines for Industrial Cleaning Solvents)

The requirements of Rule 4663 are as stringent as or more stringent than the requirements in the CTG.

C.46.3.2 EPA – Alternative Control Technology (ACT)

C.46.3.2.1 ACT - EPA-453/R-94-015 1994/02 (Alternative Control Techniques Document--Industrial Cleaning Solvents)

The requirements of Rule 4663 are as stringent as or more stringent than the requirements in the ACT.

C.46.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.46.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

[77] FR 74 37948, http://www.gpo.gov/fdsys/pkg/FR-2009-07-30/pdf/E9-18001.pdf

EPA NESHAP and MACT requirements are not applicable to this source category.

C.46.4 How does District Rule 4663 compare with California State regulations?

There are no state regulations applicable to this source category.

C.46.5 How does District Rule 4663 compare to regulations from other air districts?

C.46.5.1 Bay Area AQMD

C.46.5.1.1 Regulation 8 Rule 16 (Solvent Cleaning Operations)

The requirements in Rule 4663 are as stringent as or more stringent than those in Rule 8-16.

C.46.5.2 Sacramento Metro AQMD

C.46.5.2.1 SMAQMD Rule 441 (Organic Solvents)

The requirements in Rule 4663 are as stringent as or more stringent than those in Rule 441.

C.46.5.3 South Coast AQMD

C.46.5.3.1 SCAQMD Rule 1171(Solvent Cleaning Operation)

The requirements in Rule 4663 are as stringent as or more stringent than those in Rule 1171.

C.46.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.46.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.46.7 Evaluation Findings

Rule 4663 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.47 RULE 4672 PETROLEUM SOLVENT DRY CLEANING OPERATIONS

C.47.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C.47.2 District Rule 4672 Description

This rule applies to petroleum solvent washers, dryers, solvent filters, settling tanks, vacuum stills, and other containers and conveyors of petroleum solvents used in petroleum solvent dry cleaning facilities. The purpose of this rule is to limit VOC emissions from petroleum solvent dry cleaning operations.

EPA finalized approval of the 1992 amendments to Rule 4672 on March 9, 2010 and deemed this rule as being at least as stringent as established RACT requirements: 75 FR 10690, http://www.gpo.gov/fdsys/pkg/FR-2010-03-09/pdf/2010-4967.pdf EPA finalized a partial approval/partial disapproval of the *2009 RACT SIP* on January 10, 2012 and deemed this rule as still being at least as stringent as established RACT requirements: 77 FR 1417, http://www.gpo.gov/fdsys/pkg/FR-2012-01-10/pdf/2012-139.pdf

C.47.3 How does District Rule 4672 compare with federal rules and regulations?

C.47.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.47.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.47.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.47.3.3.1 NSPS – 40 CFR 60 Subpart JJJ (Standards of Performance for Petroleum Dry Cleaners)

The requirements of Rule 4672 are as stringent as or more stringent than the requirements in the NSPS.

C.47.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.47.4 How does District Rule 4672 compare with California State regulations?

There are no state regulations applicable to this source category.

C.47.5 How does District Rule 4672 compare to regulations from other air districts?

C.47.5.1 Bay Area AQMD

C.47.5.1.1 Regulation 8 Rule 17 (Petroleum Dry Cleaning Operations)

The requirements in Rule 4672 are as stringent as or more stringent than those in Rule 8-17.

C.47.5.2 Sacramento Metro AQMD

C.47.5.2.1 Rule 444 (Petroleum Solvent Dry Cleaning)

The requirements in Rule 4672 are as stringent as or more stringent than those in Rule 444.

C.47.5.3 South Coast AQMD

C.47.5.3.1 Rule 1102 (Dry Cleaners Using Solvent Other Than Perchloroethylene)

The requirements in Rule 4672 are as stringent as or more stringent than those in Rule 1102.

C.47.5.4 Ventura County APCD

C.47.5.4.1 Rule 74.5.1 (Petroleum Solvent Dry Cleaning)

The requirements in Rule 4672 are as stringent as or more stringent than those in Rule 74.5.1.

C.47.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.47.7 Evaluation Findings

Rule 4672 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.48 RULE 4681 RUBBER TIRE MANUFACTURING

C.48.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

There are no sources in the Valley. There are no emissions from this source category.

C.48.2 District Rule 4681 Description

This rule applies to rubber tire and recapping tread stock manufacturing facilities. The purpose of this rule is to limit emissions of VOC from these facilities.

EPA finalized approval of the 1993 amendments to Rule 4681 on August 17, 1998 and deemed this rule as being at least as stringent as then established RACT requirements.[78]

The District adopted a Negative Declaration on December 16, 2010 to satisfy Clean Air Act CTG RACT requirements for this source category. There are currently no rubber tire manufacturers operating in the Valley. Any rubber tire manufacturers beginning operation in the Valley in the future would be required to go beyond CTG RACT requirements and meet District BACT requirements, per District Rules 2201 (New and Modified Stationary Source Review Rule).

C.48.3 How does District Rule 4681 compare with federal rules and regulations?

C.48.3.1 EPA – Control Technique Guidelines (CTG)

C.48.3.1.1 CTG – EPA-450-2-78-030 (Control of Volatile Organic Emissions from Manufacture of Pneumatic Rubber Tires)

The requirements of Rule 4681 are as stringent as or more stringent than the requirements in the CTG.

C.48.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

[78] 63 FR 43881, http://www.gpo.gov/fdsys/pkg/FR-1998-08-17/pdf/98-21900.pdf

C.48.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.48.3.3.1 NSPS – 40 CFR 60 Subpart BBB (Standards of Performance for the Rubber Tire Manufacturing Industry)

The requirements of Rule 4681 are as stringent as or more stringent than the requirements in the NSPS.

C.48.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.48.4 How does District Rule 4681 compare with California State regulations?

There are no state regulations applicable to this source category.

C.48.5 How does District Rule 4681 compare to regulations from other air districts?

C.48.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.48.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.48.5.3 South Coast AQMD

There are no analogous rules for this source category.

C.48.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.48.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.48.7 Evaluation Findings

There are no rubber tire manufacturers in operation in the Valley, nor are any expected to be operated in the Valley in the future. However, if any rubber tire manufacturers were to begin operating in the Valley, it would be required to meet District BACT requirements, which by definition are beyond RACT. As such, Rule 4681 meets or exceeds federal RACT requirements for this source category.

C.49 RULE 4682 POLYSTYRENE, POLYETHYLENE, AND POLYPROPYLENE PRODUCTS MANUFACTURING

C.49.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.30	0.31	0.32	0.34	0.36	0.39	0.41	0.42	0.42

C.49.2 District Rule 4682 Description

The provisions of this rule apply to the manufacturing, processing, and storage of products composed of polystyrene, polyethylene, or polypropylene. The purpose of this rule is to limit emissions of VOCs, trichlorofluoromethane, and dichlorofluoromethane from this source category. EPA finalized approval of the 2011 amendments to Rule 4682 on September 20, 2012 and deemed this rule as being at least as stringent as established RACT requirements.[79]

C.49.3 How does District Rule 4682 compare with federal rules and regulations?

C.49.3.1 EPA – Control Technique Guidelines (CTG)

There are two federal CTGs guidelines that regulate the manufacturing of raw polystyrene, polyethylene, and polypropylene. The facilities subject to Rule 4682 use these raw materials in their manufacturing processes, but do not manufacture such material on site; as such, these regulations do not apply to this source category. EPA CTG requirements are not applicable to this source category.

C.49.3.2 EPA – Alternative Control Technology (ACT)

C.49.3.2.1 ACT – EPA-450/3-90-020 (Control of VOC Emissions from Polystyrene Foam Manufacturing)

The requirements of Rule 4682 are as stringent as or more stringent than the requirements in the ACT.

C.49.3.3 Standards of Performance for New Stationary Sources (NSPS)

[79] 77 FR 58312, http://www.gpo.gov/fdsys/pkg/FR-2012-09-20/pdf/2012-21218.pdf

C.49.3.3.1 NSPS – 40 CFR Part 60 Subpart DDD (Standards of Performance for Volatile Organic Compound (VOC) Emissions from the Polymer Manufacturing Industry)

There is a NSPS guideline that regulates the manufacturing of raw polystyrene, polyethylene, and polypropylene. The facilities subject to Rule 4682 use these raw materials in their manufacturing processes, but do not manufacture such material on site; as such, these regulations do not apply to this source category.

C.49.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.49.4 How does District Rule 4682 compare with California State regulations?

There are no state regulations applicable to this source category.

C.49.5 How does District Rule 4682 compare to regulations from other air districts?

C.49.5.1 Bay Area AQMD

C.49.5.1.1 Regulation 8 Rule 52 (Polystyrene, Polypropylene and Polyethylene Foam Product Manufacturing Operations)

The requirements in Rule 4682 are as stringent as or more stringent than those in Rule 8.

C.49.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.49.5.3 South Coast AQMD

C.49.5.3.1 SCAQMD Rule 1175 (Control of Emissions from the Manufacture of Polymeric Cellular (Foam) Products

The requirements in Rule 4682 are as stringent as or more stringent than those in Rule 1175.

C.49.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.49.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.49.7 Evaluation Findings

Rule 4682 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.50 RULE 4684 POLYESTER RESIN OPERATIONS

C.50.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.23	0.24	0.24	0.26	0.28	0.30	0.31	0.32	0.33

C.50.2 District Rule 4684 Description

The provisions of this rule apply to commercial and industrial polyester resin operations, fiberglass boat manufacturing operations, organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials associated with such operations. The purpose of this rule is to reduce VOC emissions from these operations.

EPA finalized approval of the 2011 amendments to Rule 4684 on February 6, 2012 and deemed this rule as being at least as stringent as established RACT requirements.[80] Rule 4684 was recently amended in 2011 to add new specialty coating categories, lower VOC limits, and raise control system effectiveness limits to match existing limits in other air districts. There were no additional feasible emission reduction opportunities that were identified at that time.

C.50.3 How does District Rule 4684 compare with federal rules and regulations?

C.50.3.1 EPA – Control Technique Guidelines (CTG)

C.50.3.1.1 CTG – EPA-450/3-83-006 (Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins)

The requirements of Rule 4684 are as stringent as or more stringent than the requirements in the CTG.

C.50.3.1.2 CTG – EPA-453/R-08-004 (Control Technique for Fiberglass Boat Manufacturing Materials)

The requirements of Rule 4684 are as stringent as or more stringent than the requirements in the CTG.

C.50.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

[80] 77 FR 5709, http://www.gpo.gov/fdsys/pkg/FR-2012-02-06/pdf/2012-2599.pdf

C.50.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.50.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.50.3.4.1 NESHAP/MACT – 40 CFR Part 61 Subpart VVVV (National Emission Standards for Hazardous Air Pollutants for Boat Manufacturing)

The requirements of Rule 4684 are as stringent as or more stringent than the requirements in the NESHAP/MACT.

C.50.4 How does District Rule 4684 compare with California State regulations?

There are no state regulations applicable to this source category.

C.50.5 How does District Rule 4684 compare to regulations from other air districts?

C.50.5.1 Bay Area AQMD

C.50.5.1.1 Regulation 8 Rule 50 (Polyester Resin Operations)

The requirements in Rule 4684 are as stringent as or more stringent than those in Rule 8-50.

C.50.5.2 Sacramento Metro AQMD

C.50.5.2.1 Rule 465 (Polyester Resin Operations)

The requirements in Rule 4684 are as stringent as or more stringent than those in Rule 465.

C.50.5.3 South Coast AQMD

C.50.5.3.1 Rule 1162 (Polyester Resin Operations)

The requirements in Rule 4684 are as stringent as or more stringent than those in Rule 1162.

C.50.5.4 Ventura County APCD

C.50.5.4.1 Rule 74.14 (Polyester Resin Material Operations)

The requirements in Rule 4684 are as stringent as or more stringent than those in Rule 74.14.

C.50.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.50.7 Evaluation Findings

Rule 4684 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.51 RULE 4691 VEGETABLE OIL PROCESSING OPERATIONS

C.51.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C.51.2 District Rule 4691 Description

This rule applies to facilities that extract oil from vegetable sources such as cottonseeds and corn. The purpose of this rule is to limit VOC emissions from vegetable oil processing operations. EPA finalized approval of the original 1991 District Rule 461.2 (Vegetable Oil Processing Operations), which subsequently became District Rule 4691, on January 18, 1994.[81]

C.51.3 How does District Rule 4691 compare with federal rules and regulations?

C.51.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.51.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.51.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.51.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.51.4 EPA NESHAP/MACT requirements are not applicable to this source category. How does District Rule 4691 compare with California State regulations?

There are no state regulations applicable to this source category.

C.51.5 How does District Rule 4691 compare to regulations from other air districts?

[81] 59 FR 2535, http://www.gpo.gov/fdsys/pkg/FR-1994-01-18/html/94-1059.htm

C.51.5.1 Bay Area AQMD

C.51.5.1.1 Regulation 8 Rule 41 (Vegetable Oil Manufacturing Operations)

The requirements in Rule 4691 are as stringent as or more stringent than those in Rule 8-41.

C.51.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.51.5.3 South Coast AQMD

There are no analogous rules for this source category.

C.51.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.51.6 Potential Emission Reduction Opportunities

No additional emission reduction opportunities have been identified at this time.

C.51.7 Evaluation Findings

Rule 4691 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.52 RULE 4692 COMMERCIAL CHARBROILERS

C.52.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.39	0.41	0.43	0.45	0.47	0.49	0.51	0.51	0.52

C.52.2 District Rule 4692 Description

The Rule 4692 source category includes charbroiling equipment located in restaurants, including hospitals, educational institutions, military, and government facilities. The purpose of this rule is to limit VOC and PM emissions from commercial charbroiling.

The original rule, adopted in March 2002, reduced PM2.5 emissions from chain-driven charbroilers by 84%. The September 2009 rule amendment expanded rule applicability to more chain-driven charbroilers, reducing 25% of the remaining PM2.5 chain-driven charbroiler emissions. EPA finalized approval for Rule 4692 on November 3, 2011.

C.52.3 How does District Rule 4692 compare with federal rules and regulations?

C.52.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.52.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.52.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.52.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.52.4 How does District Rule 4692 compare with California State regulations?

There are no state regulations applicable to this source category.

C.52.5 How does District Rule 4692 compare to regulations from other air districts?

C.52.5.1 Bay Area AQMD

C.52.5.1.1 Regulation 6 Rule 2 (Commercial Cooking Equipment)

BAAQMD Regulation 6 Rule 2 regulates both chain-driven and under-fired units. Newly installed under-fired units with more than 10 square feet of cooking area are required to limit emissions to 1 lb of PM10 per 1,000 lbs of cooked beef. Effective January 2013, the same emissions requirements also apply to pre-existing units. However, as the BAAQMD rule is implemented, a significant portion of under-fired charbroilers are below the applicability thresholds for grill size or amount of food cooked, and are thus exempt from rule requirements. In addition, BAAQMD has been unable to enforce this rule because no control technologies have been certified.

The applicability thresholds for grill size in District Rule 4692 are lower than those in BAAQMD Regulation 6 Rule 2. However, because BAAQMD Regulation 6 Rule 2 is not currently being enforced for under-fired charbroilers, District Rule 4692 is effectively more stringent.

C.52.5.2 Sacramento Metro AQMD

Sacramento Metro AQMD has no analogous rules for this source category.

C.52.5.3 South Coast AQMD

South Coast AQMD has no analogous rules for this source category.

C.52.5.4 Ventura County APCD

C.52.5.4.1 Rule 74.25 (Restaurant Cooking Operations)

The District evaluated the requirements contained within VCAPCD's Rule 74.25 and found no requirements more stringent than those already in Rule 4692.

C.52.6 Potential Emission Reduction Opportunities

Under-fired charbroiler technologies are still un-tested in real-life applications and need further evaluation and demonstration at Valley restaurants before these technologies can be considered as requirements to Rule 4692. Technological feasibility issues and logistical issues such as the need to modify hoods and exhaust systems and reinforce roof supports in addition to the purchase, installation, maintenance, and labor costs must all be evaluated.

During the summer of 2015 the Governing Board approved $750,000 to fund the Restaurant Charbroiler Technology Partnership (RCTP) program which provides funding for restaurants to install particulate control systems for under-fired charbroilers as demonstration projects to assess their feasibility and effectiveness. This information will assist in evaluating potential amendments to Rule 4692. The first demonstration

unit funded under the RCTP program started operation in September 2015. Several additional projects are expected to be funded in the near future.

At this time, no additional potential emission reduction opportunities are available for this source category.

C.52.7 Evaluation Findings

According to the federal CAA §182(b)(2) and (f), this source category is not subject to federal RACT requirements, because this source category has no sources subject to EPA CTGs and are not "major sources" of VOCs and NOx, as confirmed by EPA in the Technical Support Document (TSD) for the partial approval of the Districts 2009 RACT SIP.[82] However, pursuant to the District's No Stone Left Unturned philosophy, Rule 4692 was evaluated as a part of this plan development effort.

Rule 4692 currently has the most stringent control requirements. The District has no recommendations for future actions from this source category as a part of this attainment plan. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[82] U.S. EPA. Region IX Air Division. Technical Support Document for EPA's Notice of Proposed Rulemaking for the California State Implementation Plan. Prepared by Stanley Tong. (2011, August 29). https://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2011-0723-0006

C.53 RULE 4693 BAKERY OVENS

C.53.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	0.31	0.32	0.34	0.36	0.37	0.39	0.40	0.41	0.41

C.53.2 District Rule 4693 Description

The requirements of this rule apply to bakery ovens operated at major source facilities, which emit VOCs during the baking of yeast-leavened products. The purpose of this rule is to limit VOC emissions from these sources. EPA finalized approval of the 2002 adoption of Rule 4693 on April 26, 2004 and deemed this rule as being at least as stringent as established RACT requirements.[83]

C.53.3 How does District Rule 4693 compare with federal rules and regulations?

C.53.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.53.3.2 EPA – Alternative Control Technology (ACT)

C.53.3.2.1 ACT – EPA-453/R-92-017 (Alternative Control Technology Document for Bakery Oven Emissions)

The requirements of Rule 4691 are as stringent as or more stringent than the requirements in the ACT.

C.53.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.53.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.53.4 How does District Rule 4693 compare with California State regulations?

There are no state regulations applicable to this source category.

[83] 69 FR 22441, http://www.gpo.gov/fdsys/pkg/FR-2004-04-26/pdf/04-9279.pdf

C.53.5 How does District Rule 4693 compare to regulations from other air districts?

C.53.5.1 Bay Area AQMD

C.53.5.1.1 Regulation 8 Rule 42 (Large Commercial Bread Bakeries)

The requirements in Rule 4693 are as stringent as or more stringent than those in Rule 8-42.

C.53.5.2 Sacramento Metro AQMD

C.53.5.2.1 SMAQMD Rule 458 (Large Commercial Bread Bakeries)

The requirements in Rule 4693 are as stringent as or more stringent than those in Rule 458.

C.53.5.3 South Coast AQMD

C.53.5.3.1 SCAQMD Rule 1153 (Commercial Bakery Ovens)

The requirements in Rule 4693 are as stringent as or more stringent than those in Rule 1153.

C.53.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.53.6 Potential Emission Reduction Opportunities

No additional emissions reductions opportunities have been identified at this time. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[84] as approved by EPA.[85]

C.53.7 Evaluation Findings

Rule 4693 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[84] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[85] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.54 RULE 4694 WINE FERMENTATION AND STORAGE TANKS

C.54.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	3.56	3.72	3.98	4.18	4.35	4.50	4.58	4.61	4.64

C.54.2 District Rule 4694 Description

Rule 4694 was adopted on December 15, 2005 to reduce VOC emissions from the fermentation and bulk storage of wine, or achieve equivalent reductions from alternative emission sources. This rule is applicable to any winery fermenting wine and/or storing bulk containers with the exception of wineries with baseline fermentation emissions of less than 10 tpy or is limited by a District permit condition to a Potential To Emit of less than 10 tpy VOC emissions from fermentation, or storage tanks made of concrete and/or wood.

The rule requires facilities to reduce the VOC emissions from fermentation by 35% of their baseline emissions annually. Tanks over 5,000 gallons in volume must be equipped with pressure/vacuum relieve valves operating within 10% of the maximum allowable working pressure of the tank, and the temperature of stored wine must be maintained at or below 75 degrees Fahrenheit. The rule exempts storage tanks constructed primarily of concrete or wood and wineries that emit less than 10 tons of VOC per year.

General Process Description
Wine making involves three major steps: grapes are harvested, crushed, and then fermented. Rule 4694 focuses on the third step of this process, wine fermentation which is typically a batch process. The majority of the volume of the State of California's wine production occurs in the Valley. The majority of wine production in the Valley occurs at large wineries, with annual wine production capacities of tens of millions of gallons. Wine fermentation is a significant industry in the Valley with total projected emissions of 4.64 tpd of VOC in 2031.

Ethanol is the primary VOC produced during wine fermentation. Many different types of established technologies can be used to control ethanol emissions. Five types of VOC controls are:

1. Oxidation (conversion of the VOC to CO_2);
2. Absorption ("scrubbers", which transfer the VOC in air emissions to a liquid waste stream);
3. Adsorption (often using activated carbon, which transfers the VOC in the air onto a solid substrate);

4. Condensation (conversion of the VOC gases into liquids); and
5. Biological control systems (e.g., bio-filters or bio-scrubbers)

C.54.3 How does District Rule 4691 compare with federal rules and regulations?

C.54.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.54.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.54.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.54.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.54.4 How does District Rule 4694 compare with California State regulations?

There are no state regulations applicable to this source category.

C.54.5 How does District Rule 4694 compare to regulations from other air districts?

C.54.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.54.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.54.5.3 South Coast AQMD

There are no analogous rules for this source category.

C.54.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.54.6 Potential Emission Reduction Opportunities

Through ongoing review of wine fermentation permitting applications, the District has closely tracked the development of new emission control technologies for capturing ethanol emissions from wine fermentation processes. Technologies of interest have included scrubbers, condensers, activated carbon and thermal oxidizers. In recent years, several wine manufacturing facilities have successfully implemented or are experimenting with new emission control systems that capture ethanol emissions from some of their wine fermentation operations. Two wineries currently utilize water scrubbers to capture ethanol emissions from wine fermentation tanks, and several other wineries have developed systems that utilize scrubbers and chilled vapor condensers. Preliminary cost effectiveness analyses results indicate the costs to be between $18,337 and $89,644 per ton of VOC reduced, depending on the size of the winery, fermentation tank configuration, type of wine, number of fermentation rotations, and other factors.

C.54.7 Evaluation Findings

As demonstrated above, District Rule 4694 meets RACT requirements.

The District commits to working closely with affected operators to undergo a regulatory amendment process for Rule 4694 as follows:

Modeling shows that the Valley is a NOx-limited regime, especially in projections of future years. As such, VOC reductions are not as effective in reducing Valley ozone concentrations as NOx reductions. The District will evaluate the technological achievability and economic feasibility of implementing emission control technologies to reduce VOC emissions from wine fermentation processes and potential benefits to help reduce ozone concentrations. Upon completion of this review, the District commits to amend Rule 4694 to include additional requirements to further reduce emissions from wine fermentation processes as appropriate by December 31, 2018.

C.55 RULE 4695 BRANDY AGING AND WINE AGING OPERATIONS

C.55.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOC	7.04	7.35	7.87	8.26	8.60	8.89	9.05	9.12	9.17

C.55.2 District Rule 4695 Description

Adopted on September 19, 2009, Rule 4695 is applicable to brandy aging and wine aging operations in the Valley. The purpose of this rule is to limit VOC emissions from these operations. EPA finalized approval of Rule 4695 on August 4, 2011 and deemed this rule as meeting RACT requirements.[86]

C.55.3 How does District Rule 4695 compare with federal rules and regulations?

C.55.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.55.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.55.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.55.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.55.4 How does District Rule 4695 compare with California State regulations?

There are no state regulations applicable to this source category.

C.55.5 How does District Rule 4695 compare to regulations from other air districts?

[86] Environmental Protection Agency. EPA. *Revision to the State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District;* Final rule. 76 Federal Register Fed. Reg. 150 (2011, August 4), pp. 47076 – 47077. (To be codified at 40 CFR Part 52). Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2011-08-04/pdf/2011-19384.pdf

C.55.5.1 Bay Area AQMD

There are no analogous rules for this source category.

C.55.5.2 Sacramento Metro AQMD

There are no analogous rules for this source category.

C.55.5.3 South Coast AQMD

There are no analogous rules for this source category.

C.55.5.4 Ventura County APCD

There are no analogous rules for this source category.

C.55.6 Potential Emission Reduction Opportunities

No additional emissions reductions opportunities have been identified at this time. This determination is further supported by the District's 2013 Plan for the Revoked 1-hour Ozone Standard,[87] as approved by EPA.[88]

C.55.7 Evaluation Findings

Rule 4695 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

[87] SJVAPCD. *2013 Plan for the Revoked 1-Hour Ozone Standard.* (2013, September 19). Retrieved from: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf

[88] EPA. *Clean Air Plans; 1-Hour and 1997 8-Hour Ozone Nonattainment Area Requirements; San Joaquin Valley, California;* final rule. 81 Fed. Reg. 65, pp. 19492 – 19495. (2016, April 5) (to be codified at 40 CFR Part 52).

C.56 RULE 4702 INTERNAL COMBUSTION ENGINES

C.56.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	16.83	11.68	8.16	7.30	6.46	5.79	5.36	5.16	5.05
VOC	1.55	1.27	0.96	0.89	0.79	0.73	0.69	0.67	0.66

C.56.2 District Rule 4702 Description

Rule 4702 applies to any internal combustion (IC) engine rated at 25 brake horsepower (bhp) or greater. The purpose of this rule is to limit NOx, carbon monoxide (CO), VOC, and SOx emissions from units subject to this rule.

The District's original IC engine rule, Rule 4701 (Internal Combustion Engines – Phase 1), was adopted on May 21, 1992, superseded by Rule 4702, adopted on August 21, 2003, and subsequently amended five times. The rule established NOx limits between 25-50 ppmv achieving 90-96% control for non-agricultural operation rich-burn engines, and 65-75 ppmv achieving 85-90% control for non-agricultural operation lean-burn engines. Through years of implementing increasingly stringent requirements, Rules 4701 and 4702 have achieved significant reductions of NOx and PM emissions.

Substantial emission reductions from agricultural IC engines have also been achieved through a combination of regulatory efforts and incentive actions. Rule 4702 has effectively reduced emissions from agricultural engines by 84% since the 2005 amendments to the rule, with substantial investments being made by the affected sources to comply with the rule. The rule was further strengthened in August 2011 when rule amendments implemented more stringent NOx limits as low as 11 ppmv for non-agricultural operations spark-ignited engines. Additional emission reductions are forthcoming under Rule 4702 as compliance dates for emission control requirements continue to approach over the coming years.

An internal combustion engine is any engine that operates by burning its fuel inside the engine. Engines generate power by the combustion of an air/fuel mixture. The main types of engines are spark-ignited engines and compression-ignited (or diesel) engines. In the case of spark-ignited engines, a spark plug ignites the air/fuel mixture. Spark-ignited engines come in several designs such as: two-stroke and four-stroke, rich-burn and lean-burn, turbocharged and naturally aspirated. Spark-ignited engines may use one or more fuels, such as natural gas, propane, butane, liquefied petroleum gas, oil field gas, digester gas, landfill gas, methanol, ethanol, and gasoline. Compression-ignited engines rely on heating of the inducted air during the compression stroke to ignite the injected diesel fuel. In addition to being classified into spark-ignited and compression-ignited, IC engines can be further classified as either two-stroke or four-stroke engines. Most diesel engines are four-stroke, while larger diesel engines often

are two-stroke. Natural gas-fired spark-ignited engines are usually four-stroke, but some operators prefer two-stroke engines for their applications.

Engines are used by a variety of private businesses and public agencies throughout the Valley for a number of purposes, primarily for powering pumps, compressors, or electrical generators. Examples of businesses and industries that use engines include: schools and universities, agriculture, oil and gas production and pipelines, petroleum refining, manufacturing facilities, food processing, electrical power generation, landfill and waste water treatment facilities, and water districts. Many engines are limited or low use in nature, such as emergency standby engines that provide backup power when electric service is interrupted.

C.56.3 How does District Rule 4702 compare with federal rules and regulations?

C.56.3.1 EPA – Control Technique Guidelines (CTG)

There are no EPA Control Technique Guidelines (CTG) requirements for this source category.

C.56.3.2 EPA – Alternative Control Technology (ACT)

C.56.3.2.1 EPA – 453/R-93-032 (Alternative Control Techniques Document – NOx Emissions from Stationary Reciprocating Internal Combustion Engines)

The District evaluated the requirements contained within the EPA – 453/R-93-032 ACT document and found no requirements that were more stringent than those already in Rule 4702.

C.56.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.56.3.3.1 40 CFR 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 60 Subpart IIII and found no requirements that were more stringent than those already in Rule 4702.

C.56.3.3.2 40 CFR 60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 60 Subpart JJJJ and found no requirements that were more stringent than those already in Rule 4702.

C.56.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.56.3.4.1 40 CFR 63 Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines)

The District evaluated the requirements contained within 40 CFR 63 Subpart ZZZZ NESHAP and found no requirements that were more stringent than those already in Rule 4702.

C.56.4 How does District Rule 4702 compare with California State regulations?

C.56.4.1 17 CCR 93114 (ATCM to Reduce Particulate Emissions from Diesel-Fueled Engines—Standards for Nonvehicular Diesel Fuel)

The District implements the requirements of 17 CCR 93114 through Rule 4702 and the District's new source review permitting program (Rule 2201).

C.56.4.2 17 CCR 93115 (ATCM for Stationary Compression Ignition Engines)

The District implements the requirements of 17 CCR 93115 through Rule 4702 and the District's new source review permitting program (Rule 2201).

C.56.5 How does District Rule 4702 compare to regulations from other air districts?

C.56.5.1 Bay Area AQMD

C.56.5.1.1 Regulation 9 Rule 8 (Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines)

The District evaluated the requirements contained within BAAQMD's Regulation 9 Rule 8 and found no requirements that were more stringent than those already in Rule 4702.

C.56.5.2 Sacramento Metro AQMD

C.56.5.2.1 Rule 412 (Stationary Internal Combustion Engines Located at Major Stationary Sources of NOx)

The District evaluated the requirements contained within SMAQMD's Rule 412 and found no requirements that were more stringent than those already in Rule 4702.

C.56.5.3 Ventura County APCD

C.56.5.3.1 Rule 74.9 (Stationary Internal Combustion Engines)

The District evaluated the requirements contained within VCAPCD's Rule 74.9 and found no requirements that were more stringent than those already in Rule 4702.

C.56.5.4 South Coast AQMD

C.56.5.4.1 Rule 1110.2 (Emissions from Gaseous- and Liquid-Fueled Engines) and Rules 2000 – 2020 (RECLAIM program)

South Coast Air Quality Management District (SCAQMD) regulates the emissions from IC engines through a combination of control measures. SCAQMD 1110.2 is directly applicable to IC engines and includes emissions limitations for various applications. SCAQMD's RECLAIM program (Rules 2000 – 2020) allows most operators to purchase credits in lieu of instituting engine emissions controls otherwise required under SCAQMD 1110.2. Given these overlapping sets of requirements, Rule 4702 must be compared in context of both regulations. Additionally, many of the engine applications found in the Valley vary substantially from engine applications in SCAQMD; for example, engines used for agricultural irrigation pumping that exist in the Valley and are no longer found in SCAQMD. While not directly comparable, the following tables compare the emission limits between SCAQMD Rule 1110.2 and District Rule 4702.

Table C-5 Comparison of District and SCAQMD NOx Emission Limits for Non-Agricultural Operations (Non-AO) Spark-Ignited Waste Gas Engines Rated at > 50 bhp (corrected to 15% oxygen on a dry basis)

Engine Type	District NOx Limit (ppmv)	SCAQMD NOx Limit (ppmv)
Waste Gas Fueled (Rich-Burn)	50	*Until 01-01-16* bhp ≥ 500: 36 x ECF[89] bhp < 500: 45 x ECF[92] *On and after 01-01-16* 11 ppmv
Waste Gas Fueled (Lean-Burn)	65 ppmv or 90% reduction	*Until 01-01-16* bhp ≥ 500: 36 x ECF[92] bhp < 500: 45 x ECF[92] *On and after 01-01-16* 11 ppmv

[89] The efficiency correction factor (ECF) is 1.0, unless: 1) The engine operator has measured the engine's net specific energy consumption, in compliance with ASME Performance Test Code PTC 17 -1973, at the average load of the engine; and 2) the ECF-corrected emission limit is made a condition of the engine's permit to operate. The ECF is never less than 1.0 so in some cases the SCAQMD limits could potentially be less stringent than the District's NOx limits.

Table C-6 Comparison of District and SCAQMD NOx Emission Limits for Non-AO Spark-Ignited Engines Rated > 50 bhp (corrected to 15% oxygen on a dry basis)

Engine Type	District NOx Limit (ppmv)	SCAQMD NOx Limit (ppmv)
1. Rich-Burn		
Rich-Burn Engine (except for below special applications)	11	11
Cyclic Loaded, Field Gas Fueled	50	11
Limited Use	25	11[90]
2. Lean-Burn Engines		
Lean-Burn Engine (except for below special applications)	11	11
Two-Stroke, Gaseous Fueled, > 50 bhp and < 100 bhp	75	11
Limited Use	65	11
Lean-Burn Engine used for gas compression	65 ppmv or 93% reduction	11

Table C-7 Comparison of District and SCAQMD NOx Emission Limits for Agricultural Operations (AO) Spark-Ignited Engines Rated > 50 bhp (corrected to 15% oxygen on a dry basis)

Engine Type	District NOx Limit	SCAQMD NOx Limit
1. Rich-Burn	90 ppmv or 80% reduction	11
2. Lean-Burn	150 ppmv or 70% reduction	11
3. Certified and installed on or before June 16, 2005	Meet a Certified Spark-Ignited Engine Standard of HC + NOx < 0.6 g/bhp-hr	11

Medium and large operators in the South Coast Air Basin are most likely part of the South Coast RECLAIM program and are subsequently not required to meet the engine emission limitations included in Rule 1110.2. All facilities that emit over a certain threshold are required to participate in the RECLAIM program. As part of the RECLAIM program, certain companies receive emission allocations every year, usable for 12 months. The portion of the allocation not needed to offset the operator's own emissions can be sold to other companies. If the operator does not receive an emission allocation, they must buy emission credits from operators with unused emission allocations. In this way, the RECLAIM program is similar to a cap-and-trade program. The District does not have a RECLAIM-type program for this source category; therefore, all operators are required to meet the stringent emission limitations included in Rule 4702.

[90] SCAQMD exempt units that operate less than 500 hours from this limit; District defines "limited use" units as those operating less than 4,000 hours and only exempts engines operating less than 200 hours.

Although the SCAQMD emission level of 11 ppm has not yet been proven as technologically feasible in agricultural settings and it is unclear what percentage of facilities are complying with the current SCAQMD NOx limits for non-ag categories, the District evaluated the cost-effectiveness and feasibility of implementing an 11 ppmv NOx emission limit for the following categories of IC engines:

- Non-Agricultural Operations (Non-AO) Waste Gas Engines
- Non-AO Spark-Ignited Engines
  - Cyclic Loaded, Field Gas Fueled
  - Limited Use Engines
    - Lean-Burn Engines
    - Rich-Burn Engines
  - Two-Stroke, Gaseous Fueled Engines 50-100 bhp
  - Lean-Burn Engines Used for Gas Compression
- Agricultural Operations (AO) Spark-Ignited Engines

The District also evaluated the cost-effectiveness and feasibility of implementing intermediate NOx emission limits for AO spark-ignited engines that more closely match the current NOx emission limits for non-AO limited use rich-burn and lean-burn engines.

To determine potential emissions reductions, the District used the following equations:

NOx = (BHP x HR x EF x LF) / (CF)

Where:

NOx = Current annual NOx emissions or potential annual NOx emissions in ton/year
BHP = engine power
HR = annual hours of operation
EF = NOx emission factor
LF = engine load factor
CF = conversion factor from grams to pounds

The estimated annual NOx emissions reduction was calculated using the following equation:

Potential Emissions Reduction = current annual NOx emissions – potential NOx annual NOx emissions

NON-AGRICULTURAL OPERATIONS (NON-AO) WASTE GAS ENGINES

The District analyzed the technological feasibility of lowering the NOx emission limit for waste gas engines and determined that due to the variability of waste gas, additional levels of NOx control on existing waste gas engines can pose significant technical and feasibility challenges. Waste gas includes landfill gas, which is generated at landfills, and digester gas, which is generated from anaerobic digestion. Both landfill and digester gas result from the decomposition of organic matter by microorganisms in the absence of oxygen. Unlike pipeline natural gas, the composition of waste gas is not consistent or guaranteed. The heating value and composition of the gas (e.g. methane and oxygen contents) will vary with the type of materials that enter the landfill or digester and can also fluctuate seasonally or even daily. Both landfill and digester gases contain impurities, such as siloxanes, sulfur compounds, and halides. Landfill gas also contains entrained particulate matter, and both landfill and digester gas may contain particulate that results from combustion of the impurities in the gas. The contaminants in waste gas can coat and/or poison catalysts, rendering them ineffective. Because of its variable composition and contaminants, untreated waste gas is not interchangeable with pipeline-quality natural gas, and extensive and costly cleanup would be necessary to allow the use of catalytic emission controls needed to achieve 11 ppmv. This is not a practical option for most existing waste gas-fired engines, which were not designed to include the required gas systems and catalytic controls.

In addition to the District's efforts to identify additional potential technology options for this category, SCAQMD has also been evaluating this issue. In February 2008, SCAQMD amended Rule 1110.2 to include an 11 ppmv limit for waste gas engines rated at > 50 bhp. The original compliance date for this emissions limit was July 1, 2012, with the assumption that SCAQMD would complete a Technology Assessment to verify the feasibility of available control technologies for waste gas engines. However, SCAQMD had to amend Rule 1110.2 in September 2012 to extend the compliance deadline for waste gas engines from 2012 to 2016 in order to allow for more time to complete their Final Technology Assessment, which is currently still incomplete and has yet to identify feasible technology options. Additionally, these sources may also be in a position to avoid installing additional NOx control technologies through their participation in SCAQMD's RECLAIM program.

District Rule 4702 contains the most stringent limits feasible for existing waste gas-fueled engines based on the use of combustion processes that minimize emissions without the use of post-combustion catalytic controls. Therefore, Rule 4702 meets or exceeds RACT for non-AO waste gas-fueled spark-ignited engines.

OTHER NON-AO SPARK-IGNITED ENGINES

Cyclic Loaded, Field Gas Fueled

Cyclic-loaded, field gas fueled engines can achieve some level of control, but not the stringent level of control that can be imposed on engines that operate in a narrow and more stable range of loads. The exhaust gas temperature of cyclic loaded engines

varies as a function of the engine load; however, catalyst chemistry is dependent on a minimum temperature to be effective in reducing emissions. When the cyclic load engine is operating in a particular engine load range, the exhaust gas temperature can reach the catalyst's effective range and allow for emissions to be well-controlled; however, as the engine cycles out of this load range, the exhaust gas temperature becomes too low for effective emissions control. Since the exhaust temperature fluctuates frequently for this category of units, it is technologically infeasible to require a lower NOx limit for cyclic loaded field-gas fueled engines. The current emission limit for this category of engines meets or exceeds RACT for these sources.

Limited Use Engines

During the 2011 amendments to Rule 4702, the District created this category of engines based on the high costs and cost effectiveness associated with the installation of additional controls for these engines (< 4,000 hours of operation). As discussed in the staff report, the NOx emission reductions foregone from not lowering the existing NOx limits to 11 ppmv for limited use engines was insignificant (about 0.004 tons per day in 2011).[91]

However, because the evaluation was conducted in 2011, the District re-evaluated the cost effectiveness of lowering the NOx emission limits to 11 ppmv for limited use non-AO rich-burn and lean-burn engines. The costs in the analyses below were gathered from information in the District's Permits database, IC engine manufacturers, and operators.

Limited Use Lean-Burn Engines

When evaluating the ability to lower NOx emissions to 11 ppmv, an operator can either retrofit the existing lean-burn IC engine with a selective catalytic reduction (SCR) system or install a new lean-burn engine with an SCR system. In many cases, retrofitting an existing IC engine is technologically infeasible or may require substantial additional unanticipated costs (such as the incompatibility of an older engine with less sophisticated operating controls with additional control technology, additional labor/maintenance costs, etc.). However, for the purpose of evaluating all potential controls, the District has included both options in the below analysis.

[91] SJVAPCD. (2011, August 18). *Adopt Revised Proposed Amendments to Rule 4702 (Internal Combustion Engines).* Retrieved from http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2011/August/Agenda_Item_10_Aug_18_2011.pdf

Table C-8 Annual Costs for Retrofitting an Existing Limited Use Lean-Burn Engine and Installing a New Limited Use Lean-Burn Engine with SCR

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	1,100 brake horsepower (bhp)	n/a
Annual Operation	2,500 hours (hr)	n/a
Capital Costs		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$110,656
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$18,037**
SCR Equipment Costs		
SCR System	$73,000 per engine	$73,000
550 gallon double wall plastic urea tank and accessories	$5,270 per tank	$5,270
3 hp rotary screw air compressor with dryer and receiver tank	$5,875 per compressor package	$5,875
Total SCR Equipment Costs	Equipment costs x 20% profit/mark-up	$100,974
SCR Installation Costs		
Start-up and Commissioning Rate	$1,500/day; assume 1 day for each system	$1,500
Electrical upgrade to power compressor	n/a	$0
Total SCR Installation Costs		$1,500
Total SCR Capital Costs	SCR Equipment Costs + SCR Installation Costs	$102,474
Annualized SCR Capital Costs (10 years, 10%)	0.163 x Total SCR Capital Costs	**$16,703**
Annual Operating and Maintenance Costs		
Annual Reagent (urea) Cost	$3 per gallon; 1 gallon/hr Cost = $3 x 2,500 hr	$7,500
Annual Increase in Fuel Cost (due to drop in fuel efficiency with SCR)	Fuel usage = 9,322.5 standard cubic feet per hour (scf/hr) Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (9,322.5 x $7.36) / 1,000 Fuel cost (per year) = hourly cost x 2,500 hr 2.5% drop in fuel efficiency Added Fuel Cost = Annual fuel cost x 2.5%	$4,288
Annual Electricity Cost (for compressor)	3 hp compressor = 2.24 kW power rating Electricity rate for industrial operations = $0.132/kW-hr Hourly electricity cost = 2.24 kW x $0.132/kW-hr Daily meter charge = $49.281 Annual electricity cost = hourly cost x 2500 hr Annual meter charge = daily meter charge x 365 days Total utility cost = Annual electricity cost + Annual meter charge	$18,728

Item	Assumptions/Methodology	Cost
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual cost = $0.02 x 1,100 bhp x 2,500 hr	$55,000
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Reagent Cost+ Annual Increase in Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$87,147**
Annual Cost for Retrofit of LB Engine with SCR	Annualized SCR Capital Cost + Annual O&M Cost	**$103,850**
Annual Cost for New LB Engine with SCR	Annualized Engine Capital Cost + Annualized SCR Capital Cost + Annual O&M Cost	**$121,887**

The emissions reductions are calculated below:

BHP = 1,100 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 0.78 g-NOx/bhp-hr (equivalent to 65 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
LF = 0.8
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (1,100 bhp x 2,500 hr/yr x 0.78 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 3,783 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (1,100 bhp x 2,500 hr/yr x 0.132 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 640 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (3,783-640 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 1.57 tons/year

Cost Effectiveness*:* The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of retrofitting or replacing current limited use lean-burn spark-ignited engines is as follows:

- Retrofitted limited use lean-burn engine with SCR: $66,146/ton of NOx reduced
- New limited use lean-burn engine with SCR: $77,635/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to require the retrofit or replacement of limited use lean-burn engines to achieve 11 ppmv.

Limited Use Rich-Burn Engines

When evaluating the ability to lower NOx emissions to 11 ppmv, an operator will generally retrofit the existing rich-burn IC engine with a nonselective catalytic reduction (NSCR) system. In many cases, retrofitting an existing IC engine is technologically infeasible or may require substantial additional unanticipated costs (such as the incompatibility of an older engine with less sophisticated operating controls with additional control technology, additional labor/maintenance costs, etc.). However, for the purpose of evaluating potential controls in this category, the District has included the less costly, potentially feasible scenario of retrofitting an existing rich-burn engine with NSCR in the below analysis.

Table C-9 Annual Costs for Retrofitting an Existing Limited Use Rich-Burn Engine

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	500 bhp	n/a
Annual Operation	2,500 hours (hr)	n/a
Capital Costs		
New Catalyst System	Includes: catalyst, air-to fuel ratio controller, ignition system, and installation	$75,000
Annualized Catalyst Capital Cost (10 years, 10%)	0.163 x New Catalyst System	**$12,225**
Annual Cost for Retrofit of RB Engine with New Catalyst	Annualized Catalyst Capital Cost	**$12,225**

The emissions reductions are calculated below:

BHP = 500 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 0.30 g-NOx/bhp-hr (equivalent to 25 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmvd NOx at 15% O2; assuming 35% thermal efficiency)
LF = 0.8
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (500 bhp x 2,500 hr/yr x 0.30 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 661 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (500 bhp x 2,500 hr/yr x 0.132 g-NOx/bhp-hr x 0.8) / (453.6 g/lb)
= 291 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (661 - 291 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.19 tons/year

Cost Effectiveness: The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of retrofitting limited use rich-burn spark-ignited engines is as follows:

- Retrofitted limited use rich-burn non-AO engine with new catalyst: $64,342/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to require the retrofit of limited use rich-burn engines to achieve 11 ppmv, even without including additional substantial costs, such as annual operating and maintenance costs.

Two-Stroke, Gaseous Fueled Engines 50-100 bhp
There is no control technology compatible with two-stroke, gaseous fueled engines, including SCR, which will allow these units to achieve a NOx emission limit below 75 ppmv. An 11 ppmv NOx emission limit is not technologically feasible for these engines; the current limit implements RACT for two-stroke, gaseous fueled engines less than 100 bhp.

Lean-Burn Engines Used in Gas Compression
Similar to the "Limited Use" engine category, during the 2011 amendments to Rule 4702, the District created this category of engines based on the technological infeasibility to control these types of engines. Lean-burn engines used in gas compression in the Valley are used in natural gas distribution and storage service, and these engines frequently experience changing load conditions. As noted in EPA's Stationary IC Engine Technical Support Document[92], SCR use is problematic for these engines due to the fluctuations over a broad range of conditions. For this reason, EPA states that there is an insufficient basis to conclude that SCR is an appropriate technology for large lean-burn engines used for gas compression. The current emission limit is achievable through low-NOx combustion technology, which includes changes to the engine's timing, enhanced control of the air-fuel ratio, and other changes that lower NOx emissions. Due to the technological complexities associated with lean-burn engines used in gas compression, the current emissions limit implements RACT for these units.

[92] EPA. (2003, October). *Stationary Reciprocating Internal Combustion Engines Technical Support Document for NOx SIP Call*.

AO SPARK-IGNITED ENGINES

Over the past decade, AOs have invested significant capital to retrofit and replace thousands of irrigation pump and other engines reducing emissions by over 80% in this category, and continue to do so as emission limitations and associated compliance deadlines come into effect under Rule 4702. In addition to the high cost-effectiveness and potential technical infeasibility associated with retrofitting or replacing existing AO spark-ignited engines, requiring additional costly controls on existing AO engines is economically challenging and potentially infeasible.

AO Rich-Burn and Lean-Burn Engine Retrofit Evaluation

Retrofitting existing spark-ignited rich-burn and lean-burn engines poses several challenges that are not present when installing new, replacement engines. The District had to overcome many obstacles and challenges in retrofitting existing AO engines when the District adopted its current emission limits and has worked closely with AO engine owners and operators and control system manufacturers to ensure compliance with this stringent emission limit. Efforts to ensure compliance with the current rule limit are continuing today. However, lowering the emission limits even further would present a number of challenges with respect to technological feasibility as outlined in the following list.

1. Engine power losses from adding controls
2. Existing engines may require overhaul
3. Existing engines cannot meet lower emissions levels due to narrower margin of compliance
4. Control systems must be custom designed
5. Errors generated during control system installation
6. Retrofit controls can damage an engine
7. Engine can damage a control system
8. Compliance costs
9. Engines operated in remote locations

1. Engine power losses from adding controls

An engine is chosen based on its ability to provide the required power output at a reasonable engine speed (rpm) that will not over-stress the engine over its expected service life. Add-on emission control systems result in additional loads that the engine may not have been originally designed to accommodate. In addition, due to the extreme drought conditions, engine owners and operators have needed to increase the power output for well pump engines as the water table has dropped. As the engines work harder to pump water, there is less power output available to accommodate emission control systems.

2. Existing engines may require overhaul

The engines in use at AOs have been in service for many years, even decades, and are heavily worn. A worn engine can burn oil, leak fluids, and run rough. For an uncontrolled engine, some of the effects of engine wear do not have a major effect on the engine's ability to do its job (e.g. pumping water). However, the operation of a catalytic emission control system requires that the engine be operated consistently smooth. An expensive major engine overhaul or rebuild would be necessary to ensure smooth engine operation prior to installing a catalytic emission control system. Many AOs do not have the resources (e.g., staff, experience, technical training, etc.) to complete an engine overhaul or rebuild without outside assistance. Meeting more stringent/lower emission standards increases the need for the engine to operate properly.

3. Existing engines cannot meet lower emissions levels due to narrower margin of compliance

As emission limits are lowered, there is a narrower margin of compliance and proper engine operation becomes more critical. AOs in the District have to constantly ensure that their engine is properly maintained and within all the appropriate specifications to ensure compliance with the current emission limit, more so than newer engines. The lower emissions levels will result in additional stresses on the engine and increased maintenance and monitoring efforts that result from operating a retrofitted engine. Even then, due to the age of the engine and based on engine not appropriately designed for additional add-on systems and the associated loads, engines will not be able to meet the lower limits.

4. Control systems must be custom designed

For proper control system design, the engine condition, make, model, power output, and exhaust gas flow rate and temperature must be considered. There are no universal, off-the-shelf, one size-fits-all systems available for purchase. Control system design also assumes that an engine is operating properly and smoothly per the engine manufacturer's specifications. To ensure proper operation of the control system, an engine may need to be overhauled or rebuilt prior to installation of the control system. A common problem with many retrofit emission control systems is installation of a system on an engine that is not operating smoothly or to engine manufacturer specifications. Installing a control system on a rough running engine will result in poor control system operation and eventually system and engine damage. Proper system design and engine operation is more important as emission limits are lowered since the margin of compliance will be much less.

5. Errors generated during control system installation

Site conditions like gas supply pressure can cause an existing engine to operate rough. If site issues are not addressed prior to installation of a control system, the control system will not operate correctly. An installer may attempt to correct rough engine

operation by making the combustion more fuel rich; however, this technique will not provide lasting results and will cause accelerated engine and control system wear and eventually failure. An emission control system that is designed to meet lower emission limits will require a larger catalyst element which will be more expensive to replace if permanently damaged.

6. Retrofit controls can damage an engine

For proper control of exhaust pollutants, a catalyst must be operated at a certain temperature range that is higher than normal exhaust temperatures. Additional fuel is often injected into the engine with the intent that the additional fuel will pass through the combustion chamber and ignite in the exhaust system prior to the catalyst (the high catalyst temperature ignites the fuel). This extra fuel results in higher engine operating temperatures since some of the extra fuel is combusted during normal engine combustion. The increased engine temperature leads to accelerated engine wear and reduced engine reliability. Due to wear and older design, increased combustion temperatures lead to engine failure and permanent engine damage.

7. Engine can damage a control system

An existing, worn engine can burn oil and run rough. Oil in the exhaust stream will foul/mask a catalyst which will result in reduced emission control efficiency and likely permanent damage to a catalyst element. The air-fuel ratio controller will attempt to adjust engine operation (e.g., injecting more fuel) to keep the control system operating within the specified parameters; however, adjusting engine operation will not correct a fouled catalyst. Continued operation with a damaged catalyst will lead to permanent catalyst damage. An emission control system that is designed to meet lower emission limits will require a larger catalyst element which will be more expensive to replace if permanently damaged and this cycle will be repeated further adding to the cost.

8. Compliance costs

Unlike many industries, AOs compete on an international basis and cannot pass increased production costs on to consumers. AOs must absorb the compliance costs associated with lower emission standards, for example: retrofit and replacement costs; additional maintenance costs; additional monitoring costs; and additional testing costs. These additional regulatory costs put them at an economic disadvantage to their competitors.

9. Engines operated in remote locations

AO spark-ignited engines are generally located in rural, hard to access areas with minimal oversight since AOs have limited resources and staffing. With seasonal labor and minimal year-round staffing, it is difficult for AOs to provide the frequent and complex maintenance required for retrofitted or new engines equipped with advanced emission controls. Lower emission limits are achieved only through well maintained engines and control systems. Lower emissions limits lead to increased maintenance

and monitoring efforts. The oil production industry is the only other major industry in the Valley that has IC engines located in remote locations; however, with the highly technical nature of oil production and refining as compared to agricultural production and additional economic resources, it is feasible for the oil and gas production industry to hire qualified staff dedicated to maintaining and operating IC engines and other equipment on-site.

Retrofitting AO engines with emission control systems to meet increasingly stringent emission limits poses unique challenges that are not applicable when replacing engines. Based on the challenges outlined above, meeting 25 ppm or even 11 ppmv with existing AO engines is not feasible. The additional maintenance, monitoring, and testing, along with the cost of rebuilding engines and the cost of the emission control system, may even be more costly than installing a replacement engine.

AO Lean-Burn Engine Replacement with SCR

When evaluating the ability to lower NOx emissions, an agricultural operator can install a new lean-burn engine with an SCR system. The cost-effectiveness analysis to lower emissions to 11 ppmv is as follows:

Table C-10 Annual Costs for Installing a New AO Lean-Burn Engine with SCR

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	241 bhp	n/a
Annual Operation	2,500 hours (hr)	n/a
Capital Costs (Engine)		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$109,480
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$17,845**
SCR Equipment Costs		
SCR System	$73,000 per engine	$73,000
550 gallon double wall plastic urea tank and accessories	$5,270 per tank	$5,270
3 hp rotary screw air compressor with dryer and receiver tank	$5,875 per compressor package	$5,875
Total SCR Equipment Costs	Equipment costs x 20% profit/mark-up	$100,974
SCR Installation Costs		
Start-up and Commissioning Rate	$1,500/day; assume 1 day for each system	$1,500
Electrical upgrade to power compressor	$43.22/foot; avg. 1,020 feet to extend electrical line	$44,084
Total SCR Installation Costs		$45,584
Total SCR Capital Costs	SCR Equipment Costs + SCR Installation Costs	$146,558

Item	Assumptions/Methodology	Cost
Annualized SCR Capital Costs (10 years, 10%)	0.163 x Total SCR Capital Costs	**$23,889**
Annual Operating and Maintenance Costs (SCR)		
Annual Reagent (urea) Cost	$3 per gallon; 1 gallon/hr Cost = $3 x 2,500 hr	$7,500
Annual Increase in Fuel Cost (due to drop in fuel efficiency with SCR)	Fuel usage = 1,750.7 standard cubic feet per hour (scf/hr) Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (1,750.7 x $7.36) / 1,000 Fuel cost (per year) = hourly cost x 2,500 hr 2.5% drop in fuel efficiency Added Fuel Cost = Annual fuel cost x 2.5%	$805
Annual Electricity Cost (for compressor)	3 hp compressor = 2.24 kW power rating Electricity rate for AO = $0.136/kW-hr Hourly electricity cost = 2.24 kW x $0.136/kW-hr Annual electricity cost = hourly cost x 2,500 hr	$761
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual cost = $0.02 x 241 bhp x 2,500 hr	$12,050
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Reagent Cost+ Annual Increased Fuel Cost + Annual Electricity Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$22,746**
Annual Cost for New LB Engine with SCR	Annualized Engine Capital Cost + Annualized SCR Capital Cost + Annual O&M Cost	**$64,480**

*The values within this table are rounded.

The emissions reductions are calculated below:

BHP = 241 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 2.092 g-NOx/bhp-hr (equivalent to 150 ppmv)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmv)
LF = 0.65
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (241 bhp x 2,500 hr/yr x 2.092 g-NOx/bhp-hr x 0.65) / (453.6 g/lb)
= 1,806 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (241 bhp x 2,500 hr/yr x 0.132 g-NOx/bhp-hr x 0.65) / 453.6
= 114 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,806-114 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.85 tons/year

Cost Effectiveness: The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO lean-burn spark-ignited engines is as follow:

- New lean-burn engine with SCR: $75,859/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to replace existing AO lean-burn engines with newer engines equipped with SCR systems.

Since new lean-burn engines equipped with SCR systems are now all currently designed and sold to meet NOx emissions levels of 11 ppmv, there is not a more cost-effective option available to meet an intermediate emissions level of 25 ppmv through the purchase of new lean-burn engines equipped with SCR.

AO Lean-Burn Engine Replacement without SCR

When evaluating the ability to lower NOx emissions to 65 ppmv, an agricultural operator can replace the existing lean-burn IC engine with a new lean-burn engine certified to meet 65 ppmv without the need of an SCR system.

Table C-11 Annual Costs for Installing a New AO Lean-Burn Engine

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	241 bhp	n/a
Annual Operation	2,500 hours (hr)	n/a
Capital Costs (Engine)		
New Engine Cost (without SCR)	Includes: engine, freight, installation, start-up, additional equipment (belt guards, fuel connection, etc.), and tax	$109,480
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$17,845**
Annual Operating and Maintenance Costs		
Annual Maintenance Cost	Maintenance = $0.01 per bhp per hour of operation Annual cost = $0.01 x 241 bhp x 2,500 hr	**$6,025**
Annual Cost for New LB Engine	Annualized Engine Capital Cost + Annual O&M Cost	**$23,870**

*The values within this table are rounded.

The emissions reductions are calculated below:

BHP = 241 bhp
HR = 2,500 hours/year (hr/yr)
EF1 = 2.092 g-NOx/bhp-hr (equivalent to 150 ppmv)
EF2 = 0.78 g-NOx/bhp-hr (equivalent to 65 ppmv)
LF = 0.65
CF = 453.6 grams/pound (g/lb)

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (241 bhp x 2,500 hr/yr x 2.092 g-NOx/bhp-hr x 0.65) / (453.6 g/lb)
= 1,806 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (241 bhp x 2,500 hr/yr x 0.78 g-NOx/bhp-hr x 0.65) / 453.6
= 673 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,806-673 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.57 tons/year

Cost Effectiveness: The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO lean-burn spark-ignited engines is as follows:

- New lean-burn engine: $41,877/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to replace existing AO lean-burn engines with newer engines.

AO Rich-Burn Engine Replacement with 3-Way Catalyst Meeting 11 ppmv

When evaluating the ability to lower NOx emissions, an agricultural operator can install a new rich-burn engine with a 3-way catalyst. The cost-effectiveness is shown below:

Table C-12 Annual Cost for Installing a New AO Rich-Burn Engine with a 3-way Catalyst

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	256 bhp	n/a
Annual Operation	2,500 hours (hr)	n/a
Total Capital Costs		
New Engine Cost	Includes: engine with 3-way catalyst, freight, installation, and tax	$95,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$15,485**
Annual Operating and Maintenance Costs (SCR)		
Annual Added Fuel Cost (due to drop in fuel efficiency with catalyst)	Fuel usage = 1,859.7 scf/hr Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (1,859.7 x $7.36) / 1,000 Fuel cost (per year) = hourly cost x 2,500 hr Assume 2.5% drop in fuel efficiency Added Fuel cost = Annual fuel cost x 2.5%	$855
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $5,000 Catalyst costs for 10 years = $5,000 x 2 Annualized Catalyst Cost = $10,000 x 0.163	$1,630
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual Maintenance Cost = $0.02 x 256 bhp x 2,500 hr	$12,800
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Added Fuel Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$15,285**
Annual Cost for New RB Engine with 3-way	Annualized Engine Capital Cost + Annual O&M Cost	**$30,770**

*The values within the above table are rounded.

The emissions reductions are calculated below:

BHP = 256 bhp
HR = 2,500 hours/year
EF1 = 1.255 g-NOx/bhp-hr (equivalent to 90 ppmv)
EF2 = 0.132 g-NOx/bhp-hr (equivalent to 11 ppmv)
LF = 0.65
CF = 453.6 grams/pound

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (256 bhp x 2,500 hr/yr x 1.255 g-NOx/bhp-hr x 0.65) / 453.6
= 1,151 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (256 bhp x 2,500 hr/yr x 0.132 g-NOx/bhp-hr x 0.65) / 453.6
= 121 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,151-121 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.52 tons/year

Cost Effectiveness: The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO rich-burn engines is as follows:

- New rich-burn engine with a 3-way catalyst to meet 11 ppmv: $59,173/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to replace existing spark-ignited engines with new rich-burn engines with 3-way catalysts meeting 11 ppmv.

AO Rich-Burn Engine Replacement with 3-Way Catalyst Meeting 25 ppmv

In order to meet 25 ppmv, an agricultural operator can install a new rich-burn engine with a slightly smaller catalyst compared to the catalyst needed to meet an 11 ppmv emission level.

Table C-13 Annual Cost for Installing a New AO Rich-Burn Engine with a 3-way Catalyst

Item	Assumptions/Methodology	Cost
Average Engine Power Rating	256 bhp	n/a
Annual Operation	2,500 hr	n/a
Total Capital Costs		
New Engine Cost	Includes: engine with 3-way catalyst, freight, installation, and tax	$95,000
Annualized Engine Capital Costs (10 years, 10%)	0.163 x New Engine Cost	**$15,485**
Annual Operating and Maintenance Costs (SCR)		
Annual Added Fuel Cost (due to drop in fuel efficiency with catalyst)	Fuel usage = 1,859.7 scf/hr Fuel cost (per 1,000 scf) = $7.36 Fuel cost (per hour) = (1,859.7 x $7.36) / 1,000 Fuel cost (per year) = hourly cost x 2,500 hr Assume 2.5% drop in fuel efficiency Added Fuel cost = Annual fuel cost x 2.5%	$855
Annual Catalyst Cost	Life of catalyst = 5 years Cost per catalyst = $4,000 Catalyst costs for 10 years = $4,000 x 2 Annualized Catalyst Cost = $8,000 x 0.163	$1,304
Annual Maintenance Cost	Maintenance = $0.02 per bhp per hour of operation Annual Maintenance Cost = $0.02 x 256 bhp x 2,500 hr	$12,800

Item	Assumptions/Methodology	Cost
Annual Operating & Maintenance (O&M) Costs	Annual O&M = Annual Added Fuel Cost + Annual Catalyst Cost + Annual Maintenance Cost	**$14,959**
Annual Cost for New RB Engine with 3-way	Annualized Engine Capital Cost + Annual O&M Cost	**$30,444**

*The values within the above table are rounded.

The emissions reductions are calculated below:

BHP = 256 bhp
HR = 2,500 hours/year
EF1 = 1.255 g-NOx/bhp-hr (equivalent to 90 ppmv)
EF2 = 0.30 g-NOx/bhp-hr (equivalent to 25 ppmv)
LF = 0.65
CF = 453.6 grams/pound

Current NOx = (BHP x HR x EF1 x LF) / (CF)
= (256 bhp x 2,500 hr/yr x 1.255 g-NOx/bhp-hr x 0.65) / 453.6
= 1,151 lb-NOx/year

Potential NOx = (BHP x HR x EF2 x LF) / (CF)
= (256 bhp x 2,500 hr/yr x 0.30 g-NOx/bhp-hr x 0.65) / 453.6
= 275 lb-NOx/year

Potential Emissions Reduction = Current NOx – Potential NOx
Potential Emissions Reduction = (1,151-275 lb) x (1 ton / 2,000 lb)
Potential Emissions Reduction = 0.44 tons/year

Cost Effectiveness: The cost effectiveness is the added cost, in dollars per year, of the control technology, divided by the emissions reductions achieved, in tons per year. Based on the calculations above, the cost effectiveness of replacing current AO rich-burn engines is as follows:

- New rich-burn engine with a 3-way catalyst to meet 25 ppmv: $69,191/ton of NOx reduced

As demonstrated in the analysis and summary above, it is not cost effective to replace existing spark-ignited engines with new rich-burn engines with 3-way catalysts meeting 25 ppmv.

Since new rich-burn engines equipped with 3-way catalysts are now all currently designed and sold to meet NOx emissions levels of 25 ppmv, there is not a more cost-effective option available to meet an intermediate emissions level of 65 ppmv through the purchase of new rich-burn engines.

C.56.7 Potential Emission Reduction Opportunities

As discussed above, there are no additional emission reduction opportunities at this time for Rule 4702.

C.56.8 Evaluation Findings

Rule 4702 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.57 RULE 4703 STATIONARY GAS TURBINES

C.57.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	3.17	2.84	2.98	2.89	2.94	2.99	3.03	3.04	3.06
VOC	0.71	0.69	0.72	0.73	0.74	0.76	0.77	0.78	0.78

C.57.2 District Rule 4703 Description

The provisions of this rule are applicable to all stationary gas turbine systems, which are subject to District permitting requirements, and with electrical generation ratings equal to or greater than 0.3 megawatt (MW) or a maximum heat input rating of more than 3 million British Thermal Units per hour (MMBtu/hr), and that are used for the generation of electrical power. The purpose of this rule is to limit NOx emissions from these stationary gas turbines.

Rule 4703 was adopted on August 18, 1994. Since its adoption, the rule has been amended six times. The latest rule amendment in September 2007 strengthened the rule by establishing more stringent NOx limits for existing stationary gas turbines. EPA finalized approval for Rule 4703 on October 21, 2009 and deemed this rule as being at least as stringent as established RACT requirements. NOx emissions have been controlled by over 86% for this source category.

The requirements of Rule 4703 affect owners and operators of stationary gas turbine systems used to pump, compress, generate electricity, or perform other tasks. The four major industry groups are oil and gas production, utilities, manufacturing, and government.

In complying with the rule, all affected entities are required to control NOx and CO emissions by installing approved emissions control devices. Early in the rule development process, the District identified five different emissions control technologies that could be used to achieve proposed limits for stationary gas turbines. Of the five options, four mainly control NOx emissions, while the other one controls CO emissions. The four NOx control technologies are:

- Dilutant (water or steam) injection systems,
- Dry, low-NOx,
- Selective catalytic reduction, and
- SCONOx

Costs associated with different compliance options vary a great deal depending on technologies and available products. Depending on the size of the existing turbine systems, engine model and make, type of existing emissions control equipment, and many other factors, owners and operators of stationary gas turbine systems face different compliance costs. The impacts of Rule 4703 have been concentrated in the oil

and gas production sector and utilities sector of the Valley, as they own and operate the vast majority of stationary gas turbines subject to the rule.

C.57.3 How does District Rule 4703 compare with federal rules and regulations?

C.57.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.57.3.2 EPA – Alternative Control Technology (ACT)

C.57.3.2.1 EPA–435/R-93-007 (Alternative Control Techniques Document—NOx Emissions from Stationary Gas Turbines)

The requirements of Rule 4703 are as stringent as or more stringent than the requirements in the ACT.

C.57.3.3 Standards of Performance for New Stationary Sources (NSPS)

C.57.3.3.1 40 CFR 60 Subpart GG (Standards of Performance for Stationary Gas Turbines)

The requirements of Rule 4703 are as stringent as or more stringent than the requirements in the NSPS.

C.57.3.3.2 40 CFR 60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines)

The requirements of Rule 4703 are as stringent as or more stringent than the requirements in the NSPS.

C.57.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

C.57.3.4.1 40 CFR 63 Subpart YYYY (NESHAP for Stationary Combustion Turbines)

The requirements of Rule 4703 are as stringent as or more stringent than the requirements in the NESHAP.

C.57.4 How does District Rule 4703 compare with California State regulations?

There are no state regulations applicable to this source category.

C.57.5 How does District Rule 4703 compare to regulations from other air districts?

C.57.5.1 Bay Area AQMD

C.57.5.1.1 Regulation 9 Rule 9 (Nitrogen Oxides from Stationary Gas Turbines)

The requirements in Rule 4703 are as stringent as or more stringent than those in Rule 9-9.

C.57.5.2 Sacramento Metro AQMD

C.57.5.2.1 Rule 413 (Stationary Gas Turbines)

The requirements in Rule 4703 are as stringent as or more stringent than those in Rule 413.

C.57.5.3 South Coast AQMD

C.57.5.3.1 Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines)

The requirements in Rule 4703 are as stringent as or more stringent than those in Rule 1134.

C.57.5.4 Ventura County APCD

C.57.5.4.1 Rule 74.23 (Stationary Gas Turbines)

The requirements in Rule 4703 are as stringent as or more stringent than those in Rule 74.23.

C.57.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. The District found that Rule 4703 currently has in place the most stringent measures feasible to implement in the Valley.[93] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.57.7 *Evaluation Findings*

Rule 4703 currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds federal RACT requirements for this source category.

[93] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

C.58 RULE 4902 RESIDENTIAL WATER HEATERS

C.58.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	1.48	1.44	1.39	1.34	1.28	1.29	1.31	1.32	1.32
VOC	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.12	0.12

C.58.2 District Rule 4902 Description

Adopted July 17, 1993, Rule 4902 is a point-of-sale rule that limits NOx emissions from natural gas-fired residential water heaters with heat input rates less than or equal to 75,000 Btu/hr. The original rule enforced a NOx emissions limit of 40 nanograms of NOx per Joule of heat output (ng/J). Amendments in March 2009 strengthened the rule by enforcing a limit of 10 ng/J for new or replacement water heaters and a limit of 14 ng/J for instantaneous water heaters. NOx emissions have been controlled by approximately 88% for this source category. EPA finalized approval for Rule 4902 on May 5, 2010.[94]

As a point-of-sale rule, Rule 4902 affects water heater manufacturers, plumbing wholesalers, retail home supply stores, plumbers and contractors, and homeowners. This source category encompasses several types of water heaters, including conventional storage water heaters, demand water heaters, heat pump water heaters, solar water heaters, and tankless coil and indirect water heaters. Water heater options also vary by fuel type which includes electricity, fuel oil, geothermal energy, natural gas, propane, and solar energy.

Conventional storage water heaters are the most common. They have an insulated tank sized from 20 to 80 gallons and natural gas fired units have a gas burner under the tank regulated by a thermostat. Demand water heaters, also known as instantaneous water heaters, heat water as it is required and do not use a storage tank. As soon as there is a demand for hot water, a gas burner heats cold water as it travels through a pipe in the unit. Natural gas-fired units generally provide hot water at a rate upwards of 5 gallons per minute.

A tankless coil water heater heats water flowing through a heat exchanger installed in a furnace or boiler. Similar to the tankless coil water heater an indirect water heater uses a furnace or boiler. Fluid heated by the furnace or boiler is circulated through a heat exchanger in a storage tank.

[94] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District;* Final Rule. 75 Fed. Reg. 86, pp. 24408 – 24409. (2010, May 5), (to be codified at 40 CFR 52) retrieved from: http://www.gpo.gov/fdsys/pkg/FR-2010-05-05/pdf/2010-10404.pdf

Manufacturers have focused on combustion modification to meet the lower NOx limit as required in other California air districts. Combustion modification systems are designed to reduce thermal NOx formation by changing the flame characteristics to reduce peak flame temperature. Combustion modification for residential water heaters is achieved by different burner designs such as low NOx and ultra-low NOx burners. Some of the design principles used in low NOx and ultra-low NOx burners include staged air burners, staged fuel burners, pre-mix burners, internal recirculation, and radiant burners.

C.58.3 How does District Rule 4902 compare with federal rules and regulations?

C.58.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.58.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.58.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.58.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

C.58.4 How does District Rule 4902 compare with California State regulations?

There are no state regulations applicable to this source category.

C.58.5 How does District Rule 4902 compare to regulations from other air districts?

C.58.5.1 Bay Area AQMD

C.58.5.1.1 Regulation 9 Rule 6 (Nitrogen Oxides Emissions from Natural Gas-Fired Boilers and Water Heaters)

The requirements in Rule 4902 are as stringent as or more stringent than those in Rule 9-6.

C.58.5.2 Sacramento Metro AQMD

C.58.5.2.1 Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU per Hour)

The requirements in Rule 4902 are as stringent as or more stringent than those in Rule 414.

C.58.5.3 South Coast AQMD

C.58.5.3.1 Rule 1121 (Control of Nitrogen Oxides from Residential Type, Natural Gas-Fired Water Heaters)

The requirements in Rule 4902 are as stringent as or more stringent than those in Rule 1121.

C.58.5.4 Ventura County APCD

C.58.5.4.1 Rule 74.11 (Natural Gas-Fired Water Heaters)

The requirements in Rule 4902 are as stringent as or more stringent than those in Rule 74.11.

C.58.6 Potential Emission Reduction Opportunities

In its *2015 PM2.5 Plan* the District evaluated this source category to determine if there are any feasible emission reduction opportunities. The District found that Rule 4902 currently has in place the most stringent measures feasible to implement in the Valley.[95] The District re-evaluated the aforementioned options and has determined that no additional feasible opportunities have been developed in the last 12 months since the adoption of the *2015 PM2.5 Plan.* Therefore, there are no additional emission reduction opportunities at this time.

C.58.7 Evaluation Findings

According to the federal CAA §182(b)(2) and (f) this source category is not subject to federal RACT requirements because this source category has no sources subject to EPA CTGs and these sources are not “major sources” of VOCs and NOx, as confirmed by EPA in the Technical Support Document (TSD) for the partial approval of the Districts 2009 RACT SIP.[96] However, pursuant to the District’s No Stone Left Unturned philosophy, Rule 4902 was evaluated as a part of this plan development effort.

[95] SJVUAPCD. *2015 Plan for the 1997 PM2.5 Standard*. Appendix C Best Available Control Measures and Most Stringent Measures (2015, April 16). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2015.htm

[96] U.S. EPA. Region IX Air Division. Technical Support Document for EPA’s Notice of Proposed Rulemaking for the California State Implementation Plan. Prepared by Stanley Tong. (2011, August 29). https://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2011-0723-0006

Rule 4902 currently has in place the most stringent measures feasible to implement in the Valley and therefore would meet or exceed federal RACT requirements for this source category were they applicable. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.59 RULE 4905 NATURAL GAS-FIRED, FAN-TYPE CENTRAL FURNACES

C.59.1 Emissions Inventory (Summer Average – Tons per day)

	2012	2015	2018	2021	2024	2027	2029	2030	2031
NOx	2.62	2.68	2.78	2.87	2.93	2.95	2.99	3.01	3.03
VOC	0.21	0.21	0.21	0.22	0.23	0.23	0.23	0.23	0.24

C.59.2 District Rule 4905 Description

Rule 4905 is a point-of-sale rule applicable to any person who sells, offers for sale, installs or solicits the installation of natural-gas-fired, fan-type central furnaces, for use within the Valley with a rated heat input capacity of less than 175,000 Btu/hour, and for combination heating and cooling units with a rated cooling capacity of less than 65,000 Btu/hour. Affected parties include furnace manufacturers, residential heating wholesalers, supply stores, contractors and end-users. The point-of-sale approach has allowed the District to achieve NOx reductions without placing an undue financial burden on the residents, operators and businesses that sell these units in the Valley.

Rule 4905 was adopted on October 20, 2005 to establish NOx limits for residential central furnaces supplied, sold, or installed in the Valley. EPA finalized approval for Rule 4905 on May 30, 2007.[97] The District's Governing Board adopted amendments to Rule 4905 on January 22, 2015 making it the most stringent rule in the nation for this source category. The following is a summary of the amendments:

- Lower the NOx emission limit for residential units from 40 ng/J (0.093 lb/MMBtu) to 14 ng/J
- Expand the rule applicability to include non-residential units with a NOx emission limit of 14 ng/J and units installed in manufactured homes with a NOx limit of 40 ng/J, to be lowered to 14 ng/J in 2018
- Additional labeling requirements

Rule 4905 applies to furnaces fueled by natural gas that use forced air distribution, the most common type of heating system for residential and commercial buildings. Central furnaces are controlled by a thermostat, which sends signals to turn the device on or off when the building temperature does not match a chosen set point. A valve then opens to send natural gas to the burners, which combust the gas directly into the heat exchangers. A blower pulls air from outside the building through a filter, across the heat exchanger, and through a series of ducts and vents to different areas of the building. Exhaust from the combustion exits the building through a separate duct. Condensing units use an additional heat exchanger to extract the latent heat in the flue (exhaust)

[97] EPA. *Revisions to the California State Implementation Plan, San Joaquin Valley Unified Air Pollution Control District*; Direct Final Rule. 72 Fed. Reg. 103, pp. 29886 – 29889. (2007, May 30). (to be codified at 40 CFR Part 52), Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2007-05-30/pdf/E7-10236.pdf

gas by cooling the combustion gasses to near ambient temperature and thereby increase the heating efficiency by up to 10%. The water vapor in the flue gas is condensed, collected, and drained.

Applicable units are used in approximately 71% of Valley residences and are not labeled for retail as "residential" or "commercial" furnaces. Units used in commercial buildings, which are subject to the requirements of Rule 4905 as of the January 2015 amendments, are essentially the same as residential units with the exception of possible differences in usage patterns and indoor/outdoor location. Research for the analyses in the January 2015 amendments estimated 1,252,190 residential and commercial units will be operating in the Valley in 2017. Replacement will occur gradually as these units reach the end of the 20-year useful life.

Units installed in manufactured homes utilize the same types of materials and operating principles as commercial and residential units; however, significant differences exist. Furnaces installed in manufactured homes use sealed combustion, meaning all of the combustion air is taken from outside the building. These units also pre-heat the air, typically to 50-60°F, using a concentric vent where the combustion air is drawn in through the outer ring, while exhaust gases are vented through the inside core of the vent pipe. The air is pre-heated because the cold outside air does not mix well with the fuel, while pre-heated air blends well and allows for quieter ignition and combustion. Furnaces installed in manufactured homes also have to comply with strict space restrictions.[98]

C.59.3 How does District Rule 4905 compare with federal rules and regulations?

C.59.3.1 EPA – Control Technique Guidelines (CTG)

EPA CTG requirements are not applicable to this source category.

C.59.3.2 EPA – Alternative Control Technology (ACT)

EPA ACT requirements are not applicable to this source category.

C.59.3.3 Standards of Performance for New Stationary Sources (NSPS)

EPA NSPS requirements are not applicable to this source category.

C.59.3.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

EPA NESHAP and MACT requirements are not applicable to this source category.

[98] U.S. Department of Energy. (2014, July 7). *Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans.* Retrieved 9/23/14 from https://www.federalregister.gov/articles/2014/07/03/2014-15387/energy-conservation-program-for-consumer-products-energy-conservation-standards-for-residential.

C.59.4 How does District Rule 4905 compare with California State regulations?

There are no state regulations applicable to this source category.

C.59.5 How does District Rule 4905 compare to regulations from other air districts?

C.59.5.1 Bay Area AQMD

C.59.5.1.1 Regulation 9 Rule 4 (Nitrogen Oxides from Fan Type Residential Central Furnaces)

The requirements in Rule 4905 are as stringent as or more stringent than those in Rule 9-4.

C.59.5.2 Sacramento Metro AQMD

C.59.5.2.1 Rule 414 (Water Heaters, Boilers and Process Heaters Rated Less than 1,000,000 BTU per Hour)

The requirements in Rule 4905 are as stringent as or more stringent than those in Rule 414.

C.59.5.3 South Coast AQMD

C.59.5.3.1 Rule 1111 (Reduction of NOx Emissions from Natural Gas-Fired, Fan-Type Central Furnaces)

The requirements in Rule 4905 are as stringent as or more stringent than those in Rule 1111.

C.59.5.4 Ventura County APCD

C.59.5.4.1 Rule 74.22 (Natural Gas-Fired, Fan-Type Central Furnaces)

The requirements in Rule 4905 are as stringent as or more stringent than those in Rule 74.22.

C.59.6 Potential Emission Reduction Opportunities

No additional emissions reductions opportunities have been identified at this time.

C.59.7 Evaluation Findings

Pursuant to federal Clean Air Act §182(b)(2) and (f), this source category is not subject to federal RACT requirements, because this source category has no sources subject to EPA CTGs and these sources are not “major sources” of VOCs and NOx. However, Rule 4905 currently has in place the most stringent measures feasible to implement in the Valley and therefore would meet or exceed federal RACT requirements for this

source category were they applicable. As the District continues to develop future attainment plans to address increasingly stringent federal air quality standards, this source category will be re-evaluated for additional potential opportunities to reduce emissions.

C.60 EMISSION INVENTORY CODES

The following are the emission inventory codes used for the allocation of emissions as presented in this attainment plan.

Table 14 Emission Inventory Codes

Control Measure	Emission Inventory Codes
Rule 4103 (Open Burning)	670-660-0262-9842; 670-660-0262-9862; 670-660-0262-9874; 670-660-0262-9884; 670-660-0262-9888; 670-660-0262-9892; 670-662-0262-9878; 670-668-0200-9858; 670-668-0200-9872; 670-668-0200-9886; 670-995-0240-9848
Rule 4106 (Prescribed Burns)	670-666-0200-0000; 670-670-0200-0000
Rule 4301 (Fuel Burning Equipment)	None
Rule 4302 (Incinerator Burning)	130-130-0110-0000; 130-130-0130-0000; 130-130-0240-0000; 130-130-0324-0000; 130-130-0266-0000
Rule 4307 (Boilers, Steam Generators and Process Heaters 2 – 5 MMBtu/hr)	010-005-0110-0000; 010-005-0124-0000; 010-005-0130-0000; 010-005-0300-0000; 010-005-1220-0000; 020-005-0110-0000; 030-005-0110-0000; 030-005-0124-0000; 030-005-0130-0000; 030-005-1220-0000; 030-005-1530-0000; 030-010-0110-0000; 030-010-0130-0000; 030-010-1220-0000; 030-010-1600-0000; 030-015-0110-0000; 030-015-0130-0000; 040-005-0110-0000; 040-005-1530-0000; 040-010-0100-0000; 040-010-0110-0000; 040-010-0120-0000; 040-010-0130-0000; 040-010-1000-0000; 050-005-0110-0000; 050-005-0122-0000; 050-005-0124-0000; 050-005-0130-0000; 050-005-0320-0000; 050-005-1100-0000; 050-005-1220-0000; 050-005-1510-0000; 050-005-1520-0000; 050-005-3220-0000; 050-010-0110-0000; 050-010-0120-0000; 050-010-0320-0000; 050-010-1220-0000; 050-010-1500-0000; 052-005-0110-0000; 052-005-0124-0000; 052-005-1220-0000; 052-010-0110-0000; 052-010-0120-0000; 052-010-1224-0000; 060-005-0110-0000; 060-005-0122-0000; 060-005-0124-0000; 060-005-0130-0000; 060-005-0142-0000; 060-005-0144-0000; 060-005-0320-0000; 060-005-1220-0000; 060-005-1510-0000; 060-005-1520-0000; 060-010-0100-0000; 060-010-0110-0000; 060-010-0120-0000; 060-010-0142-0000 The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories.

Control Measure	Emission Inventory Codes
Rule 4308 (Boilers, Steam Generators and Process Heaters 0.075 to less than 2.0 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories. See Rule 4307 for the EICs.
Rule 4309 (Dryers)	430-422-7078-0000; 430-424-7006-0000; 430-995-7000-0000; 499-995-0000-0000; 499-995-5630-0000
Rule 4311 (Flares)	110-132-0130-0000; 110-132-0146-0000; 120-132-0136-0000; 130-132-0110-0000; 130-132-0130-0000; 130-132-0136-0000; 310-320-0010-0000; 310-320-0110-0000; 310-320-0120-0000; 310-320-0130-0000; 310-320-0136-0000; 310-320-1600-0000; 320-320-0010-0000; 320-320-0110-0000; 320-320-0120-0000; 320-320-0130-0000
Rule 4313 (Lime Kilns)	Lime kilns are not included in the ARB emissions inventory. There are no lime kilns currently operating in the Valley.
Rule 4320 (AERO for Boilers, Steam Generators, and Process Heaters >5 MMBtu/hr)	The EICs are the same for Rules 4306/4320, 4307, and 4308; the three rules share a combined emission inventory. Baseline emissions from the 2008 and 2009 rule amendments of these rules were used to determine the percentage of emissions for each rule. Those respective percentages are applied to the combined inventory to get the individual emission inventories. See Rule 4307 for the EICs.
Rule 4352 (Solid Fuel Fired Boilers, Steam Generators, and Process Heaters)	010-005-0214-0000; 010-005-0218-0000; 010-005-0220-0000; 010-005-0240-0000; 010-005-0243-0000; 010-005-0254-0000; 020-005-0218-0000; 020-005-0230-0000; 030-005-0214-0000; 050-005-0214-0000; 050-005-0240-0000; 050-005-0254-0000; 052-005-0240-0000; 060-005-0240-0000; 060-005-0264-0000
Rule 4354 (Glass Melting Furnaces)	460-460-7037-0000; 460-460-7038-0000; 460-460-7039-0000
Rule 4401 (Steam-Enhanced Crude Oil Production Wells)	310-342-1600-0000; 310-344-1600-0000; 310-346-1600-0000; 310-348-1600-0000
Rule 4402 (Crude Oil Production Sumps)	310-300-1600-0000
Rule 4404 (Heavy Oil Test Station - Kern County)	310-350-1600-0000
Rule 4407 (In-Situ Combustion Well Vents)	The emissions from this source category are accounted for in Rule 4401.
Rule 4408 (Glycol Dehydration Systems)	The emissions from this source category are accounted for in Rule 4409.
Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities)	310-302-0110-0000; 310-302-1600-0000; 310-304-1600-0000; 310-306-1600-0000; 310-308-1600-0000; 310-308-0110-0000; 310-310-0110-0000; 310-310-1600-0000; 310-316-1600-0000; 310-352-0100-0000; 310-356-0110-0000

Control Measure	Emission Inventory Codes
Rule 4453 (Refinery Vacuum Producing Devices or Systems)	The emissions from this source category are accounted for in Rule 4409.
Rule 4454 (Refinery Process Unit Turnaround)	The emissions from this source category are accounted for in Rule 4409.
Rule 4455 (Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants)	320-302-0010-0000; 320-304-0010-0000; 320-306-0010-0000; 320-316-0010-0000
Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations)	199-170-0240-0000; 199-170-0260-0000; 199-190-0010-0000; 199-190-0110-0000; 199-190-0300-0000; 199-995-0000-0000; 199-995-0130-0000; 199-995-0240-0000; 199-995-0260-0000; 199-995-0300-0000; 199-995-0324-0000 The EICs are the same for Rules 4565 and 4566; the two rules share a combined emission inventory.
Rule 4566 (Organic Material Composting Operations)	The EICs are the same for Rules 4565 and 4566; the two rules share a combined emission inventory.
Rule 4570 (Confined Animal Facilities)	620-618-0262-0101; 620-618-0262-0102; 620-618-0262-0103; 620-618-0262-0104; 620-618-0262-0105; 620-618-0262-0106; 620-618-0262-0107; 620-618-0262-0108; 620-618-0262-0109; 620-618-0262-0110; 620-618-0263-0000
Rule 4601 (Architectural Coatings)	520-520-91XX-0000; 520-520-92XX-0000
Rule 4602 (Motor Vehicle Assembly Coatings)	The emissions from this source category are accounted for in Rule 4612.
Rule 4603 (Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts)	230-226-9000-0000; 230-226-9100-0000; 230-226-9200-0000; 230-230-9020-0000; 230-230-9050-0000; 230-230-9052-0000; 230-230-9054-0000; 230-230-9100-0000; 230-230-9200-0000
Rule 4604 (Can and Coil Coating Operations)	230-228-9000-0000; 230-228-9020-0000; 230-228-9052-0000; 230-228-9057-0000; 230-228-9100-0000; 230-228-9200-0000
Rule 4605 (Aerospace Assembly and Component Coating Operations)	230-238-9000-0000, 230-238-9020-0000; 230-238-9100-0000, 230-238-9200-0000
Rule 4606 (Wood Products and Flat Wood Paneling Products Coating Operations)	230-232-9000-0000; 230-232-9020-0000; 230-232-9040-0000; 230-232-9052-0000; 230-232-9054-0000; 230-232-9100-0000; 230-232-9200-0000
Rule 4607 (Graphic Arts and Paper, Film, Foil, and Fabric Coatings)	230-222-9000-0000, 230-222-9100-0000, 230-224-9200-0000; 240-240-3202-0000; 240-240-3314-0000; 240-240-8302-0000; 240-260-8400-0000; 240-262-8400-0000; 240-264-8400-0000; 240-266-8350-0000; 240-266-8400-0000; 240-268-8400-0000; 240-995-8000-0000; 240-995-8400-0000
Rule 4610 (Glass Coating Operations)	The emissions from this source category are accounted for in Rule 4354.
Rule 4612 (Motor Vehicle and Mobile Equipment Coating Operations)	230-218-9000-0000; 230-218-9010-0000; 230-218-9020-0000; 230-218-9050-0000; 230-218-9054-0000; 230-218-9100-0000; 230-218-9200-0000

Control Measure	Emission Inventory Codes
Rule 4621 (Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants)	330-395-1100-0000; 330-374-1100-0000; 330-330-1110-0000; 330-397-1100-0000; 330-390-1100-0000; 330-390-1400-0000; 330-396-1100-0000; 330-330-1000-0000; 330-376-1100-0000; 330-382-1100-0000; 330-384-1100-0000; 330-384-1110-0000; 330-382-1110-0000; 330-382-1120-0000; 330-384-1120-0000; 330-390-0010-0000
Rule 4622 (Gasoline Transfer into Motor Vehicle Fuel Tanks)	330-378-1100-0000; 330-380-1100-0000
Rule 4623 (Storage of Organic Liquids)	310-326-1600-0000; 310-328-1600-0000; 310-995-1600-0000; 320-326-1000-0000; 320-326-1214-0000; 320-326-1410-0000; 320-326-1610-0000; 320-328-1000-0000; 320-328-1110-0000; 320-328-1214-0000; 320-328-1410-0000; 320-328-1610-0000; 330-326-1110-0000; 330-326-1420-0000; 330-328-1000-0000; 330-328-1110-0000; 330-328-1600-0000; 330-328-1610-0000; 430-328-7006-0000
Rule 4624 (Transfer of Organic Liquid)	330-302-0010-0000; 330-995-0110-0000; 330-304-0010-0000; 330-995-0010-0000; 330-316-0010-0000; 330-318-0110-0000
Rule 4625 (Wastewater Separators)	320-340-0010-0000
Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations)	540-560-0400-0000; 540-562-0400-0000; 540-564-0400-0000; 540-566-0400-0000
Rule 4642 (Solid Waste Disposal Sites)	120-120-0240-0000; 120-122-0242-0000
Rule 4651 (Soil Decontamination Operations)	140-995-0010-0000; 140-995-0110-0000; 140-995-0120-0000; 140-995-0240-0000; 330-995-0010-0000
Rule 4652 (Coatings and Ink Manufacturing)	410-995-8400-0000; 410-407-9000-0000
Rule 4653 (Adhesives and Sealants)	250-292-8200-0000; 250-292-8202-0000; 250-292-8250-0000
Rule 4661 (Organic Solvents)	The emissions from this source category are accounted for in Rules 4662 and 4663.
Rule 4662 (Organic Solvent Degreasing Operations)	220-204-0500-0000; 220-204-3008-0000; 220-204-3022-0000; 220-204-3083-0000; 220-204-3176-0000; 220-204-3204-0000; 220-204-3246-0000; 220-204-3333-0000; 220-204-3339-0000; 220-204-3344-0000; 220-204-8104-0000; 220-204-8106-0000; 220-206-3083-0000; 220-206-3107-0000; 220-206-3246-0000; 220-206-3300-0000; 220-206-3301-0000; 220-206-3328-0000; 220-206-3344-0000; 220-206-3346-0000; 220-206-8106-0000
Rule 4663 (Organic Solvent Cleaning, Storage, and Disposal)	220-208-0500-0000; 220-208-3022-0000; 220-208-3083-0000; 220-208-3176-0000; 220-208-3204-0000; 220-208-3246-0000; 220-208-3333-0000; 220-208-3339-0000; 220-208-3344-0000; 220-208-3346-0000; 220-208-8104-0000; 220-208-8106-0000; 230-216-8350-0000; 230-240-0500-0000; 230-240-3008-0000; 230-240-3060-0000; 230-240-3202-0000; 230-240-3232-0000; 230-240-3252-0000; 230-240-3372-0000; 230-240-8300-0000; 230-240-8302-0000; 230-240-8350

Control Measure	Emission Inventory Codes
Rule 4672 (Petroleum Solvent Dry Cleaning Operations)	210-200-3300-00000; 210-200-8102-0000; 210-200-8150-0000
Rule 4681 (Rubber Tire Manufacturing)	410-402-0248-0000
Rule 4682 (Polystyrene, Polyethylene, and Polypropylene Products Manufacturing)	410-404-5034-0000; 410-404-5036-0000; 410-404-5038-0000; 410-404-5044-0000; 410-404-5046-0000
Rule 4684 (Polyester Resin Operations)	410-403-5018-0000; 410-404-5016-0000; 410-404-5028-0000; 410-404-5030-0000
Rule 4691 (Vegetable Oil Processing Operations)	420-420-6030-0000
Rule 4692 (Commercial Charbroiling)	690-680-6000-0000
4693 (Bakery Ovens)	420-412-6012-0000; 420-412-6037-0000
Rule 4694 (Wine Fermentation and Storage Tanks)	420-408-6090-0000
Rule 4695 (Brandy Aging and Wine Aging Operations)	420-410-6090-0000
Rule 4702 (Internal Combustion Engines)	010-040-0110-0000; 010-040-1200-0000; 020-040-0110-0000; 020-040-1200-0000; 030-040-0110-0000; 030-040-0124-0000; 030-040-1200-0000; 030-040-1210-0000; 040-040-0110-0000; 050-040-0012-0000; 050-040-0110-0000; 050-040-0124-0000; 050-040-1200-0000; 052-040-0110-0000; 052-040-1200-0000; 052-042-0110-0000; 052-042-1200-0000; 052-042-1200-0010; 052-042-1200-0011; 060-040-0110-0000; 060-040-0124-0000; 060-040-0142-0000; 060-040-0146-0000; 060-040-1100-0000; 060-040-1200-0000; 060-040-1210-0000; 060-995-1220-0000; 099-040-1200-0000
Rule 4703 (Stationary Gas Turbines)	010-045-0110-0000; 010-045-1200-0000; 020-045-0110-0000; 030-045-0110-0000; 040-045-0134-0000; 050-045-1200-0000; 060-045-0110-0000; 060-045-1200-0000
Rule 4902 (Residential Water Heaters)	610-608-0110-0000
Rule 4905 (Natural Gas – Fired, Fan Type Residential Central Furnace)	610-606-0110-0000; 060-020-0110-0000

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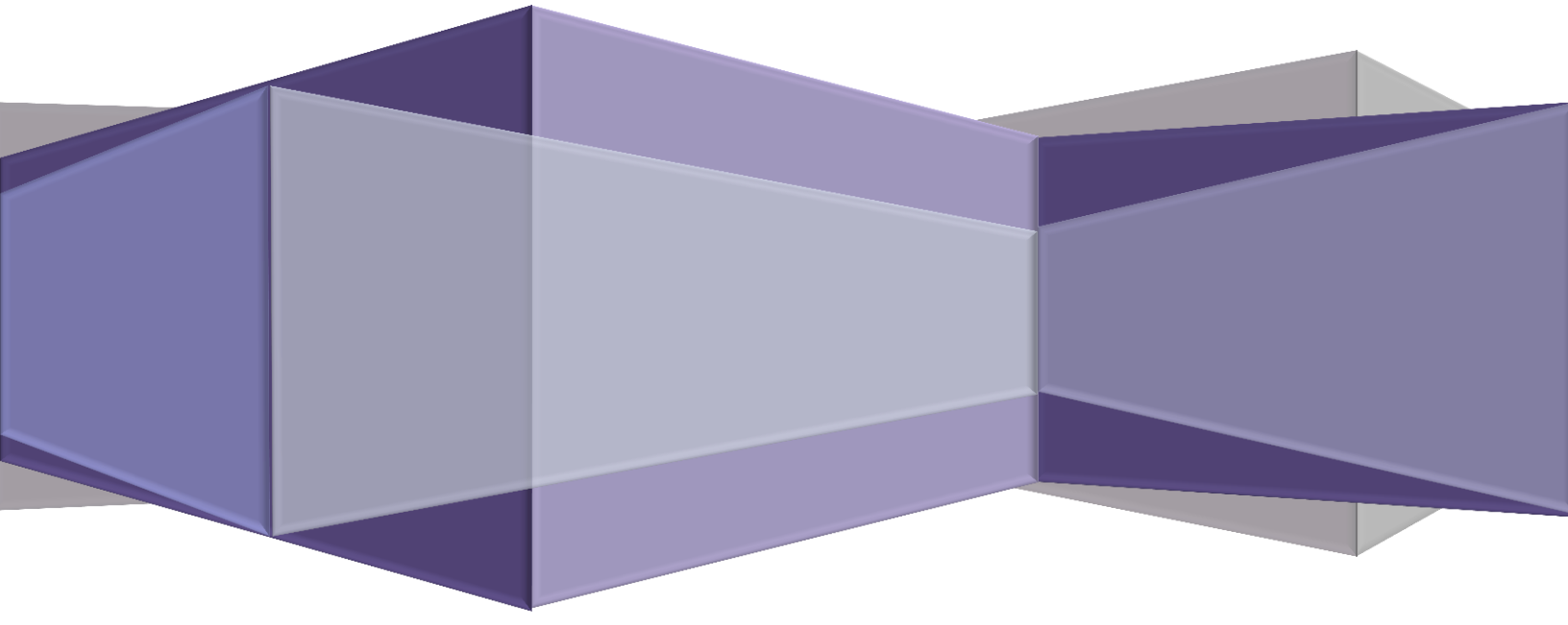
Attachment 2

Mobile Source Control Measure Analyses

2016 Moderate Area Plan for the 2012 PM2.5 Standard



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Appendix D

BACM and MSM for Mobile Sources (Provided by ARB)

2015 Plan for the 1997 PM2.5 Standard
SJVUAPCD

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Air Resources Board Mobile Source Control Program
Best Available Control Measures and Most Stringent Measures Assessment

Overview

Given the severity of California's air quality challenges and the need for ongoing emission reductions, the Air Resources Board (ARB) has implemented the most stringent mobile source emissions control program in the nation. ARB's comprehensive program relies on four fundamental approaches:

- stringent emissions standards that minimize emissions from new vehicles and equipment;
- in-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- cleaner fuels that minimize emissions during combustion; and,
- incentive programs that remove older, dirtier vehicles and equipment and pay for early adoption of the cleanest available technologies.

This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and pre-date the federal Clean Air Act Amendments (Act) of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of ARB's efforts, the Act provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards under Section 209(b). This waiver provision preserves a pivotal role for California in the control of emissions from new motor vehicles, recognizing that California serves as a laboratory for setting motor vehicle emission standards. Since then, the ARB has consistently sought and obtained waivers and authorizations for its new motor vehicle regulations. ARB's history of progressively strengthening standards as technology advances, coupled with the waiver process requirements, ensures that California's regulations remain the most stringent in the nation. A list of regulatory actions ARB has taken since 1985 is provided at the end of this analysis to highlight the scope of ARB's actions to reduce mobile source emissions.

As a result of these efforts, ARB's programs to reduce emissions from passenger vehicles have resulted in vehicles on the road today that are significantly cleaner than they were twenty years ago. ARB's groundbreaking Advanced Clean Cars program is now providing the next generation of emission reductions in California, and ushering in a new zero emission passenger transportation system. In addition, California has adopted in-use regulations aimed at reducing emissions from on-road and off-road diesel engines by accelerating the penetration of the cleanest emission technologies into these fleets. Cleaner burning fuels also play an important role in reducing emissions from motor vehicles and engines as ARB has adopted a number of more

stringent standards for fuels sold in California, including the Reformulated Gasoline program, low sulfur diesel requirements, and the Low Carbon Fuel Standard. These fuel standards, in combination with engine technology requirements, ensure that California's transportation system achieves the most effective emission reductions possible.

In addition to these regulatory efforts, ARB and the San Joaquin Valley Air Pollution Control District (District) implement incentive programs that invest significant amounts of funding to accelerate the purchase of cleaner technologies beyond those achieved by regulations alone. Combined, California's incentive programs have provided hundreds of millions of dollars dedicated to reducing emissions from both on- and off-road vehicles and equipment.

ARB and the District both operate highly effective and comprehensive incentive programs. Two of ARB's largest programs are the Proposition 1B (Prop 1B): Goods Movement Emission Reduction Program, and the Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer). Eligible projects span the mobile source sector, and include cleaner on-road and off-road vehicles and equipment, marine, locomotive, lawn and garden, light-duty passenger vehicles, and agricultural equipment. To date, as part of Prop 1B ARB has awarded $718 million over multiple fiscal years to nine local agencies across the state that are impacted by freight movement, and $980 million under the Moyer program. Of these funds, $145 million each in Prop 1B and $145 million in Moyer (including matching funds) were awarded in the San Joaquin Valley. In addition to ARB's incentive funding, the District provides its own funding such as the Indirect Source Review and Voluntary Emission Reduction Agreements and Local Motor Vehicle Surcharge Fees. To date, the District has provided over $600 million in incentive funding, with a combined District and grant recipients matching funds investment of $1.2 billon. These programs help advance the pace of clean technology penetration, and provide for the most cost-effective, feasible degree of emission reductions possible.

The remainder of this document contains a description of State Implementation Plan (SIP) requirements related to assessment of emission control programs. This is followed by a demonstration of how the comprehensive scope of California's current mobile source control program, through a combination of emission standards, in-use requirements, cleaner fuel formulations, and incentive programs, represents the most stringent and far-reaching level of control being implemented in the United States today.

BACM/MSM Requirements

The particulate matter provisions in the Act specify a step-wise process for the required level of emission control in a SIP, depending upon the severity of the air quality problem and amount of time a nonattainment area needs to meet the PM2.5 standard. For a moderate PM2.5 nonattainment area the Act requires SIPs to provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable, including at minimum reasonably available control technologies. U.S. EPA has interpreted RACM to be those emission control measures that are

technologically and economically feasible and when considered in aggregate, would advance the attainment date by at least one year.

For a serious nonattainment area, best available control measures (BACM) are the required level of control. BACM is required for those sources with emissions that are a significant contributor to the nonattainment problem. U.S. EPA defines BACM to be the maximum degree of emission reductions achievable from a source or source category determined on a case-by-case basis considering energy, economic, and environmental impacts.

Following U. S. EPA guidance, the District developed a BACM significance level for sulfur oxides, nitrogen oxides, and PM2.5 combustion emissions (Table 1). The following mobile source categories in the San Joaquin Valley have emissions above NOx and PM2.5 significance levels: light- and medium-duty vehicles, heavy-duty vehicles, off-road vehicles, and farm equipment. None of the mobile source categories were above the significance level for SOx.

Table 1
BACM Significance Levels

Emissions	Level of Significance (tpd)
Sulfur Oxide (SOx) Emissions	1.0
Nitrogen Oxide (NOx) Emissions	13.1
PM2.5 Combustion Emissions	1.4

Serious areas that cannot achieve the standard by the serious area attainment date are allowed to request a five-year extension if they have BACM in place and the SIP demonstrates it includes most stringent measures (MSM). The Act specifies that MSM is the maximum degree of emission reduction that has been required or achieved from a source or source category in other SIPs or in practice in other states and can feasibly be implemented in the area.

Review of ARB's Mobile Source Programs

ARB conducted a BACM/MSM assessment for the mobile source categories under ARB's regulatory authority. Ocean Going Vessels have de minimis emission levels in the Valley and aircraft and locomotives are controlled at the federal level; therefore these sources were not included in this analysis. For the remaining mobile source categories, this assessment included:

- Documentation of California waivers and authorizations;
- Description of the scope and stringency of California's regulations and comparison to programs implemented at the federal level or in other states;
- Documentation of states that have been granted waivers to adopt California rules; and,

- Discussion of incentive programs and other initiatives that go beyond regulatory requirements to provide an enhanced level of emission reductions.

The results of this evaluation are described in the sections that follow.

Waiver Approvals

While the Act preempts most states from adopting emission standards and other emission-related requirements for new motor vehicles and engines, it allows California to seek a waiver or authorization from the federal preemption to enact emission standards and other emission-related requirements for new motor vehicles and engines and new and in-use off-road vehicles and engines, except for locomotives and engines used in farm and construction equipment which are less than 175 horsepower (hp). Over the years, California has received waivers and authorizations for over 100 regulations. The most recent California standards and regulations that have received waivers and authorizations are listed in Tables 2 and 3 below.

Table 2
ARB Emission Standards Waivers

Light- and Medium-Duty	
Advanced Clean Cars (including ZEV and LEV III)	
Heavy-duty	
On-Board Diagnostics	Engine Manufacturer Diagnostics
Heavy-Duty Idling	Diesel Engine Standard
Malfunction and Diagnostics System	Gasoline Standard

Table 3
ARB Emission Standards Authorizations

Heavy-Duty	
Heavy-Duty Idling	New Compression Ignition Off-Road Engines
In-Use Off-Road Diesel Fleets	Yard Truck Regulation
Large Spark Ignition Fleet	Transport Refrigeration Unit (TRU)
Mobile Cargo Handling Equipment	Truck & Bus Regulation* (Off-road yard trucks and two-engine sweepers)
Other	
Off-Highway Recreational Vehicles	Portable Airborne Toxic Control Measures
Portable Equipment Registration Program	Small Off-Road Engines (Utility Lawn and Garden)

* On May 23, 2013, ARB obtained an authorization from U.S. EPA to enforce adopted emission standards for off-road engines used in yard trucks and two-engine sweepers. ARB adopted the off-road emission standards as part of its "Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from In-Use Heavy-Duty Diesel-Fueled Vehicles," (commonly referred to as the Truck and Bus Regulation). The bulk of the regulation applies to in-use (non-new) heavy-duty diesel on-road motor vehicles with a gross vehicle weight rating (GVWR) in excess of 14,000 pounds, which are not subject to preemption under CAA section 209(a) and do not require a waiver under section 209(b).

Light- and Medium-Duty Vehicles

The light- and medium-duty vehicle category is composed of passenger cars, light-duty trucks, and medium-duty trucks. This category is considered significant for the purpose of BACM, and current emissions are shown in Table 4 below.

Table 4
Emissions from Light- and Medium-Duty Vehicles in the San Joaquin Valley

ARB Vehicle Category	NOx Emissions (tpd)	Direct PM2.5 Emissions (tpd)
Light-Duty Passenger	10.5	1.0
Light-Duty Truck 1	3.2	0.1
Light-Duty Truck 2	7.7	0.4
Medium-Duty Trucks	10.8	0.4
Total	32.2	1.9

Appendix B, 2015 Plan for the 1997 PM2.5 Standards

ARB has a long history of programs addressing light- and medium-duty vehicles, dating back to the 1960s when California adopted the first tailpipe emission standards for hydrocarbons and carbon monoxide in the nation. ARB's current efforts encompass stringent emission standards and fuels regulations, requirements for on-board diagnostics, initiatives to facilitate a transformation of California's fleet to zero emissions technologies, and incentive programs to accelerate the retirement of older, dirtier vehicles and support development of a market for zero-emission vehicles.

Light- and medium-duty vehicles are currently regulated under California's Low-Emission Vehicle III (LEV III) and Zero-Emission Vehicle (ZEV) programs that are incorporated in the Advanced Clean Cars program. The Board established California's Low-Emission Vehicle (LEV) program in 1990 and the second-generation LEV II program in 1998. The LEV regulations established increasingly stringent tailpipe standards for passenger cars and trucks each model year through 2025. As a result, today's new vehicles are over 99 percent cleaner than their uncontrolled counterparts. In March 2014, U.S. EPA set Tier 3 standards for passenger vehicles that harmonized with California's LEV III standards.

ARB's Advanced Clean Cars (ACC) Program, approved in January 2012, is a pioneering approach of a 'package' of regulations, that while separate in construction, are related in terms of the synergy developed to address both ambient air quality needs and climate change goals. The ACC program combines the control of smog and soot causing pollutants, and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. In 2025, cars under the ACC program will emit 75 percent less smog-forming pollution than the average new car sold in 2012.

Additionally, ARB's ZEV regulation for passenger cars and light-duty trucks, first adopted as part of the original LEV program in 1990, has spurred commercialization of advanced clean cars and light-duty trucks. The ZEV regulation focuses primarily on

zero-emission technology – battery electric vehicles, hydrogen fuel cell vehicles, and plug-in hybrid electric vehicles – in order to ensure that these low-emission technology vehicles transition from demonstration phase to full commercialization in a reasonable timeframe to meet long-term emission reductions goals. Conventional hybrid electric vehicles have now gained a significant market share in California, and the number of models offered for sale continues to expand. In-state ZEV ownership surpasses that of any other state or nation, and Californians own 40 percent of all ZEVs on the road in America. In addition, an increasing number of battery electric vehicles and plug-in hybrid electric vehicles have been introduced for sale, and fuel cell electric vehicles are beginning to be commercialized.

The LEV III element of the ACC program includes increasingly stringent criteria pollutant emission requirements for light-duty vehicles from 2015 through 2025. When fully phased-in, these requirements will achieve near-zero emission levels from new light-duty vehicles. In addition, the ACC program included amendments affecting the current ZEV regulation through the 2017 model year in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. The ZEV amendments for 2018 and subsequent model years in the ACC program are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions.

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

In addition, in 2012 Governor Brown issued an Executive Order establishing a goal of 1.5 million zero-emission vehicles on the road by 2025. The Executive Order directed the ARB to work with the California Energy Commission and the California Public Utilities Commission to establish benchmarks for ensuring the necessary charging infrastructure, and also specified that California's state vehicle fleet increase the number of its zero-emission vehicles through the normal course of fleet replacement so that at least 10 percent of fleet purchases of light-duty vehicles be zero-emission by 2015 and at least 25 percent of fleet purchases of light-duty vehicles be zero-emission by 2020.

Cleaner burning fuels are also integral to reducing emissions. California's Reformulated Gasoline program (CaRFG) sets stringent standards producing cost-effective emission reductions from gasoline-powered vehicles. The CaRFG program was implemented in three increasingly more stringent phases. The final and current phase, Phase 3 CaRFG, eliminated methyl-tertiary-butyl-ether from California gasoline.

ARB is also active in implementing programs for consumers with older dirtier vehicles to retire them early. Replacing older, dirtier vehicles with new vehicles provides permanent emission reductions and accelerates the introduction of the cleanest technologies. ARB's voluntary vehicle retirement or "car scrap" programs, like the Enhanced Fleet Modernization Program (EFMP), provide monetary incentives of $1,500

to vehicle owners to retire older, more polluting vehicles, and up to $9,000 for low-income consumers to scrap and replace their vehicle with a zero-emission vehicle. Approximately $30 million is available annually through 2015 to fund the EFMP via a $1 increase in vehicle registration fees. ARB developed the program in consultation with Bureau of Automotive Repair (BAR). The program is jointly administered by both BAR (for vehicle retirement) and the local air district (for vehicle replacement). In addition, ARB's Clean Vehicle Rebate Project is designed to promote the purchase of new battery electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles. Rebates of up to $5,000 per light-duty vehicle are available and approximately 90,000 rebates have been issued to date, totaling nearly $200 million in the State.

Other programs, in addition to vehicle retirement programs, help clean up the light-duty fleet. The Air Quality Improvement Program (AQIP), established by AB 118, is an ARB voluntary incentive program to fund clean vehicle and equipment projects. The Clean Vehicle Rebate Project (CVRP) is one of the current projects under AQIP. CVRP, started in 2009, is designed to accelerate widespread commercialization of zero-emission vehicles and plug-in hybrid electric vehicles by providing consumer rebates up to $2,500 to partially offset the higher cost of these advanced technologies.

As a result of ARB's efforts, and as provided for in the Act, a number of other states have now adopted ARB's LEV III and ZEV programs as listed below in Table 5. These states are also known as the "Section 177 States" in reference to this provision of the Act.

Table 5
State's Adoption of ARB's Light- and Medium-Duty Vehicle Regulations

Section 177 States	2012 ZEV	2012 LEVIII
Connecticut	X	X
Delaware		X
Maine	X	X
Maryland	X	X
Massachusetts	X	X
New Jersey	X	X
New York	X	X
Oregon	X	X
Pennsylvania		X
Rhode Island	X	X
Washington		X
Vermont	X	X

Taken together, California's comprehensive suite of emission standards, fuel specifications, and incentive programs for on-road light- and medium-duty vehicles represent the most stringent level of control and achieve the maximum feasible emission reductions for this category in the nation.

Heavy-Duty Vehicles

The heavy-duty vehicles category is composed of heavy-duty gas and diesel trucks, heavy-duty gas and diesel urban buses, school buses, and motor homes. Emissions from heavy-duty diesel trucks in the San Joaquin Valley are a significant BACM category (Table 6).

Table 6
Emissions from Heavy-Duty Vehicles in SJV

Vehicle Category	NOx Emissions (tpd)	Direct PM2.5 Emissions (tpd)
Heavy Heavy-Duty Diesel Trucks	120.5	4.0
Medium Heavy-Duty Diesel Trucks	18.1	0.8
Total	138.6	4.8

Appendix B, 2015 Plan for the 1997 PM2.5 Standards

California also has the most stringent and successful heavy-duty vehicle emissions control program in the nation. These regulatory efforts include not only requirements for increasingly tighter new engine standards, but also address vehicle idling, certification procedures, on-board diagnostics, and emissions control device verification. More stringent diesel fuel requirements further ensure that diesel engines are operating as cleanly as possible. The ARB has also adopted in-use requirements that provide substantial further emission reductions beyond those occurring anywhere else in the nation. These in-use requirements began with a focus on public fleets and solid waste collection vehicles, followed by drayage trucks, and now encompass all trucks operating in California. Together, they are designed to achieve an on-road heavy-duty diesel fleet with 2010 engine standards years ahead of a normal vehicle attrition rate. Substantial investments in incentive programs are providing further reductions by accelerating the turnover of the fleet ahead of regulatory requirements.

Examples of ARB's most recent regulations and efforts that provide for significant reductions well beyond current federal programs or programs in other states are listed below.

New Vehicle Standards

- Engine standards for 2007 and Subsequent Model Year Heavy-Duty Diesel Engines/Vehicles;
- 2005 Not-to-Exceed and Euro III European Stationary Source Cycle Supplemental Test Procedures;
- Heavy-Duty Vehicle and Engine Certification;
- Optional Reduced Emissions Standards for Heavy-Duty Engines;
- Heavy-Duty Hybrid Electric Vehicle Certification Procedures; and
- Heavy-Duty Vehicle and Engine On-Board Diagnostics Requirements.

A central element of ARB's heavy-duty diesel vehicle program is increasingly stringent standards for new trucks and urban buses, as shown in the Table 7. Through implementation of these standards, new heavy-duty trucks sold since 2010 emit 98 percent less NOx and PM2.5 than new trucks sold in 1986.

Table 7
Phase-in of Truck Engine Standards

Model Year	Applicable Standard (g/bhp-hr)	
	NOx	PM
1986 and older	10.7	0.60
1987-2006	From 6.0 to 2.0	From 0.6 to 0.1
2007-2009	1.1	0.01
2010	0.2	0.01

On August 26, 2005, ARB obtained a waiver from the federal preemption for the Engine standards for 2007 and Subsequent Model Year Heavy-Duty Diesel Engines/Vehicles regulation, generally aligning California's standards with the federal standards for 2007 and subsequent model year vehicles and engines. Thus California's current standards are equal to or more stringent than current federal standards.

Most recently, in ongoing efforts to go beyond federal standards and achieve further reductions, ARB adopted the Optional Reduced Emissions Standards for Heavy-Duty Engines regulation in 2014. This regulation establishes the new generation of optional NOx emission standards for heavy-duty engines which are 50 percent, 70 percent, and 90 percent lower than the current primary standard of 0.2 g/bhp-hr.

Requirements for vehicle certification demonstrate that emission control systems are durable, and that the exhaust emissions and evaporative emissions, as applicable, comply with the regulatory standards for the duration of the required useful life of the product. This demonstration is accomplished through durability and certification testing of the prototype certification engine or vehicle. Such demonstrations include the 2005 Not-to-Exceed and Euro III European Stationary Source Cycle Supplemental Test Procedures, Heavy-Duty Hybrid Electric Vehicle Certification Procedures, and Heavy-Duty Vehicle and Engine On-Board Diagnostics Requirement. These test procedures require the control of emissions during the majority of real world operating conditions, ensuring that in the future defect devices will no longer be employed and determining that vehicles are, in fact, heavy-duty hybrid electric vehicles. Finally, the Heavy-Duty Vehicle and Engine On-Board Diagnostics Requirement detect emission control system malfunctions as they occur by monitoring virtually every component and system that can cause increases in emissions.

While these requirements collectively ensure that new vehicles are as clean as possible, older, higher-emitting heavy-duty vehicles with long service lives can remain on the road for many years. To address this legacy fleet, ARB has adopted heavy-duty

vehicle in-use control measures to significantly reduce PM2.5 and NOx emissions from existing diesel vehicles operating in California. These recent in-use control measures include:

- On-Road Heavy-Duty Diesel Vehicle (In-Use) Regulation;
- Drayage (Port or Rail Yard) Regulation;
- Public Agency and Utilities Regulation;
- Solid Waste Collection Vehicle Regulation;
- Heavy-Duty (Tractor-Trailer) Greenhouse Gas Regulation;
- ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling;
- Heavy-Duty Diesel Vehicle Inspection Program;
- Periodic Smoke Inspection Program;
- Fleet Rule for Transit Agencies;
- Lower-Emission School Bus Program; and
- Heavy-Duty Truck Idling Requirements.

Many of these ARB's in-use regulations focus on fleets by trade such as the Drayage, Public Agency and Utilities, and Solid Waste Collection Vehicle Regulations. Each of these regulations focuses on the unique duty cycles of these trades to maximize the emission reduction effectiveness. Along with these in-use trade-specific regulations, ARB also adopted the Periodic Smoke Inspection Program (PSIP) and Heavy-Duty Truck Idling Requirements. The PSIP requires that diesel and bus fleet owners conduct annual smoke opacity inspections of their vehicles and repair those with excessive smoke emissions to ensure compliance. As a follow up to the ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling, ARB approved the Heavy-Duty Truck Idling Requirements to further reduce emissions from NOx and PM2.5 by limiting idling of new and in-use sleeper berth equipped diesel trucks.

ARB's bus program is composed of the transit bus fleet rule, school bus idling program, and the lower-emission school bus program. Adopted in 2000, the Fleet Rule for Transit Agencies (Transit Fleet Rule) requires reductions in emissions from urban buses and transit fleet vehicles. In effect since 2003, the school bus airborne toxic control measure has limited bus and commercial motor vehicle idling near schools or at school bus destinations. The lower-emission school bus program provides grant funding for new, safer school buses and to install air pollution control equipment that are already on the road.

ARB's Cleaner In-Use Heavy-duty Truck Regulation (Truck and Bus Regulation) is one of the most significant elements in this suite of recent actions. This measure leverages the benefits provided by new truck emission standards by accelerating introduction of the cleanest trucks. The Truck and Bus Regulation was adopted in December 2008, and amended in December 2010 and December 2014. The rule represents a multi-year effort to turn over the legacy fleet of engines and replace them with the cleanest technology available.

Starting in 2012, the Truck and Bus Regulation phases in requirements so that by 2014, nearly all vehicles operating in California will have PM emission controls, and by 2023 nearly all vehicles will meet 2010 model year engine emissions levels. The regulation applies to nearly all diesel fueled trucks and buses with a gross vehicle weight rating greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-state or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation must disclose the regulation's potential applicability to buyers of the vehicles.

To further encourage the replacement of dirtier vehicles/engines with cleaner ones, ARB and the District have made extensive investments in incentive programs. The Proposition 1B: Goods Movement Reduction Program is a partnership between ARB and agencies to reduce air pollution emissions and health risk from freight movement along California's trade corridors through incentives. The Carl Moyer Program is a voluntary grant program, for various vehicles including on-road heavy-duty, which reduces air pollution from vehicles and equipment by providing incentive funds to private companies and public agencies to purchase cleaner-than-required engines, equipment, and emission reduction technologies. The District's truck voucher programs have been designed to provide an alternative source of incentive funding for small businesses that do not qualify for funding under Prop 1B. The District contracts with Valley dealerships and makes the review and approval process efficient and streamlined to provide vouchers to truck operators.

Only one other state, Texas, has received SIP credit for emission reductions from incentive programs. The Texas Clean Fleet Program encourages large fleets in Texas to replace light- and heavy-duty on-road diesel vehicles with alternative fuel vehicles. The Texas program currently has two-year funding of approximately $7.7 million. By comparison, in the San Joaquin Valley, $32 million is available for Prop 1B projects in the 2013/14 fiscal year and $12 million will be available for Carl Moyer projects in the 2014/15 fiscal year. To date, the Prop1B program has scrapped and replaced old on-road trucks with over 2,000 cleaner trucks in the SJV while the Carl Moyer Program has replaced over 200 trucks.

In addition to new engine and in-use standards, cleaner burning fuels represent an important component in reducing emissions from heavy-duty diesel trucks. The California diesel fuel program sets stringent standards for diesel fuel sold in California and produces cost-effective emission reductions from diesel-powered vehicles. Diesel fuel regulations in California set fuel mixture specifications for aromatic hydrocarbons and sulfur, and establish a lubricity standard. The program applies to sales of fuel used in on-road vehicles and off-road vehicles and locomotives in California.

Similar to the light-duty sector, as provided for in the Act, a number of other states have followed California's lead and adopted at least one of California's heavy-duty regulations. These states are listed below in Table 8.

Table 8
States Adoption of ARB's Heavy-Duty Vehicle Regulation

Section 177 States	Heavy-Duty Diesel Engine Regulation
Connecticut	X
Delaware	X
Georgia	X
Maine	X
Massachusetts	X
New Jersey	X
New York	X
North Carolina	X
Pennsylvania	X

In aggregate, ARB's heavy-duty diesel program goes beyond stringent tailpipe emission standards through in-use control measures, idling restrictions, certification and verification requirements, and the clean diesel fuel program. The in-use control measures are national models for aggressive and successful efforts to reduce in-use emissions and accelerate fleet turnover to cleaner engines. ARB's significant investment in incentive programs provides an additional mechanism to achieve maximum emission reductions from this source sector.

Off-Road Vehicles and Engines

The off-road equipment category is composed of off-road compression ignition (diesel) engines and equipment, small spark ignition off-road engines and equipment less than 25 hp (including lawn and garden equipment, and small industrial equipment), off-road large spark ignition (gasoline and liquefied petroleum gas) engines and equipment 25 hp and greater (including industrial equipment, forklifts, and portable generators), and airport ground support equipment. Requirements for the cargo handling equipment (CHE) subcategory are discussed separately. The off-road mobile source category is considered a significant BACM category (Table 9).

Table 9
Emissions from Off-Road Equipment in SJV

Vehicle Category	NOx Emissions (tpd)	Direct PM2.5 Emissions (tpd)
Off-Road Equipment excluding CHE	19.2	1.1
Total	19.2	1.1

Appendix B, 2015 Plan for the 1997 PM2.5 Standards

Similar to the on-road sectors, California has a comprehensive program for reducing emissions from off-road equipment that goes well beyond current requirements in place elsewhere in the nation. Regulations for off-road equipment include not only increasingly stringent standards for new off-road diesel engines, but also in-use requirements and idling restrictions. These in-use requirements are designed to accelerate the penetration of the cleanest equipment into California fleets beyond rates achieved elsewhere in the nation through new vehicle standards alone. Substantial investments in incentive programs are also facilitating additional turnover to cleaner engines to further maximize emission reductions.

New engine standard requirements vary according to the power rating of engines. Table 10 shows the schedule for phasing in tiered requirements for new off-road engines with a power rating between 175 and 300 hp. Beginning in 2014, new Tier 4 construction equipment with the power rating shown below must emit about 96 percent less NOx and PM than new Tier 1 equipment sold in the year 2000.

Table 10
Phase-in of Off-Road Engine Standards

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

*Reflects combined limit for non-methane hydrocarbons and NOx

U.S. EPA adopted the Tier 4 standards in May 2004. California's current standards were also adopted in 2004, and are equal in stringency to current federal standards.

However, large diesel off-road equipment typically remains in use for long periods of time. As with heavy-duty trucks, this long life means that newer, lower-emitting engines would be introduced into fleets relatively slowly. To address this, the Cleaner In-use Off-Road Equipment Regulation (Off-Road Regulation) was adopted in 2007, with amendments in 2010. U.S. EPA provided their authorization for this regulation in 2013.

Affected off-road equipment is used in construction, manufacturing, the rental industry, road maintenance, airport ground support, and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation is an extensive program designed to accelerate the penetration of the cleanest equipment into California's fleets. This regulation will significantly reduce emissions of diesel PM and NOx from the over 150,000 in-use off-road diesel vehicles that operate in California by requiring their owners to modernize their fleets and install exhaust retrofits. In 2015, this extensive program will have affected 10,447 vehicles used in 838 fleets by requiring owners to modernize their fleets

by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls.

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

Funding from incentive programs such as Carl Moyer also provides an additional mechanism to achieve emission reductions from off-road sources. The Moyer Off-Road Voucher Incentive Program provides a streamlined approach to reduce emissions by replacing existing, high polluting equipment with newer, lower-emission equipment. The Moyer Program also provides incentives for off-road compression-ignition equipment, off-road large-spark equipment, and off-road equipment replacement.

The District funds the replacement and retrofit of forklifts through its Large Spark-Ignited (LSI) forklift retrofit program and its Electric Forklift New-Purchase program. Because emission standards for new engines in this source category have only been in effect for the past few years, a significant number of high-emitting units are still in operation and available for retrofit.

Finally, the Act allows other states to adopt ARB's regulations for off-road engine or off-road vehicles provided that such standards are identical to the ARB standards for which an authorization has been obtained. Other states are considering, but have not yet adopted, rules equivalent to the California off-road regulation.

The ARB first approved exhaust and evaporative emission standards for small off-road engines in 1990. This category includes handheld and nonhandheld lawn and garden and industrial equipment such as string trimmers, leaf blowers, walk-behind lawn mowers, generators, and lawn tractors. The 1990 regulations were implemented in two stages, with first tier standards taking effect in 1995 and second tier standards being implemented in 1999. In September 2003, ARB Board approved more stringent exhaust and evaporative standards for small off-road engines and also directed staff to evaluate the potential for the use of more zero-emissions equipment in this category.

In summary, California's off-road program goes beyond emission standards for new engines through comprehensive in-use requirements for legacy fleets. These in-use control measures are national models for aggressive and successful efforts to reduce in-use emissions and accelerate fleet turnover to cleaner engines. Similar to the on-road emission categories, incentive program funding provides an additional mechanism that achieves further emission reductions. Together, these approaches provide for the most stringent and comprehensive suite of emission reductions.

Farm Equipment

The farm equipment category is composed of agricultural equipment that includes tractors, harvesting equipment, and sprayers and is considered a significant BACM category (Table 11).

Table 11
Emissions from Farm Equipment in SJV

Vehicle Category	NOx Emissions (tpd)	Direct PM2.5 Emissions (tpd)
Farm Equipment	50.4	2.9
Total	50.4	2.9

Appendix B, 2015 Plan for the 1997 PM2.5 Standards

As noted above, in 2004, U.S. EPA and California adopted equivalent standards that require additional reductions from off-road engines, including engines used in mobile agricultural equipment. These new engine standards will achieve substantial reductions in PM2.5 and NOx as new farm equipment is introduced into the fleet. Tier 4 engine technologies will not be introduced for all mobile agricultural equipment applications until about the 2020 timeframe. Therefore, to achieve maximum PM2.5 and NOx reduction benefits now, a significant investment in incentive funds is encouraging the mobile agricultural fleet in the San Joaquin Valley to upgrade to Tier 3 equipment, which will be further enhanced upon full introduction of Tier 4 engines. Since 2008, this effort has provided over $100 million in incentive funding for agricultural equipment from the Carl Moyer Program, District funding, and the USDA Natural Resources Conservation Service, contributing to the replacement of over 3000 pieces of equipment.

Cargo Handling Equipment

As a subcategory of the off-road equipment category, cargo handling equipment (CHE) is used to transfer goods or perform maintenance and repair activities and includes equipment such as yard trucks (hostlers), rubber-tired gantry cranes, top handlers, side handlers, forklifts, and loaders at ports and intermodal rail yards. This category represents a small portion of the inventory and is not considered significant for BACM purposes (Table 12).

Table 12
Emissions from Cargo Handling Equipment in SJV

Vehicle Category	NOx Emissions (tpd)	Direct PM2.5 Emissions (tpd)
Cargo Handling Equipment	0.1	0.0
Total	0.1	0.0

Appendix B, 2015 Plan for the 1997 PM2.5 Standards

California's CHE regulation was adopted in 2005 and amended in 2011. ARB obtained authorization for the 2005 version of the regulation in 2012. ARB's CHE regulations set performance standards for engines in newly acquired, as well as in-use, mobile CHE at ports or intermodal rail yards in California. Prop 1B also funds cleaner port-related cargo handling equipment.

Other Mobile Sources

The other mobile source category is composed of motorcycles, recreational boats, off-road recreational vehicles, and commercial harbor craft. This group of sources represents a small portion of the inventory and is not considered significant for BACM purposes (Table 13).

Table 13
Emissions from Other Mobile Sources in SJV

Vehicle Category	NOx Emissions (tpd)	Direct PM2.5 Emissions (tpd)
Motorcycles	1.0	0.0
Recreational Boats	1.6	0.4
Off-Road Recreational Vehicles	0.1	0.0
Commercial Harbor Craft	0.7	0.0
Total	3.4	0.5

Appendix B, 2015 Plan for the 1997 PM2.5 Standards

While representing a smaller share of the inventory, ARB has taken a comprehensive regulatory approach to provide ongoing emission reductions from sources in this sector. These efforts have focused on adoption of stringent new engine standards and ensuring that cleaner engines are introduced into the fleet at an accelerated pace.

Motorcycles for the most part are on-road two-wheeled, self-powered vehicles with engine displacements of 50 cubic centimeters (cc) or greater. First adopted in 1975, California's motorcycle regulation obtained its first waiver of preemption from U.S. EPA in 1976. ARB then obtained a waiver of preemption in 2006 for 1998 amendments. The 1975 regulation set emission standards for all motorcycles with engine displacements of at least 50 cc. The 1998 amendments affected only Class 3 motorcycles (280 cc or greater) and set a Tier I and Tier II standard for 2004 and 2008 model years, respectively. While ARB has the same emission standard as the federal standard, the California standard applies to engines starting in 2008 rather than 2010 under the federal requirement.

The recreational boat (marine) engine program is another important element in ARB's efforts to address emissions from all mobile source sectors. In 1998, ARB approved exhaust emission regulations for spark-ignition marine engines that accelerated implementation of the federal standards for 2006 engines for personal watercraft (PWC) and outboard (OB) marine engines in California to 2001. In 2001, ARB adopted Tier I and Tier II emission standards for inboard and stern-drive marine engines. In 2007,

U.S. EPA granted California authorization to enforce ARB's regulations for OB/PWC engines and Tier I of the California inboard and stern-drive marine engine emissions standards. In 2011, U.S. EPA granted California authorization to enforce ARB's Tier II exhaust emission standards for spark ignited inboard and stern-drive marine engines. While ARB has the same exhaust emission standard as the federal standard, the California standard applies to engines starting in 2008 rather than 2010 under the federal requirement. In February 2015, ARB Board approved more stringent evaporative emission control design standards than those set forth by the U.S. EPA's 2008 rule for gasoline-fueled spark-ignition marine watercraft configured with engines greater than 30 kilowatts.

There are several types of commercial harbor craft (CHC) used in California, including crew and supply boats, charter fishing vessels, commercial fishing vessels, ferry/excursion vessels, pilot vessels, towboats or push boats, tug boats, and work boats. The CHC regulation pertains to the reduction of diesel PM and NOx. The Board adopted the first CHC regulation in 2007 that implemented in-use limits and upgraded engine requirements. For this regulation, ARB obtained an authorization of preemption in 2011 from U.S. EPA. In addition, the Board approved an amended CHC regulation in 2010, which extended the in-use engine requirements to other types of CHC, deleting certain exemptions, defining swing engines, clarifying certain in-use requirements, adding replacement engine exemptions, expanding compliance extension options, and allowing continued use of existing engines in certain circumstances. On November 24, 2014, U.S. EPA issued a notice of rulemaking for these amendments. Prop 1B also funds cleaner commercial harbor craft.

Off-road recreation vehicles or off-highway recreational vehicles (OHRV) primarily include off-highway motorcycles, all-terrain vehicles, and utility-terrain vehicles. In 1994, ARB adopted exhaust emission standards for OHRVs. At that time, there were no equivalent federal standards regulating exhaust emissions from the vehicles and engines covered by California's OHRV regulations. U.S. EPA granted authorization for ARB's 1994 OHRV regulations in 1996. ARB subsequently adopted three rounds of amendments to these regulations, the first in 1999, the second in 2003, and the third in 2006. All three amendments were granted authorization concurrently by U.S. EPA in 2014. In July 2013, ARB Board approved evaporative emission control standards for green sticker OHRVs.

The emission limits established for these other mobile source categories, coupled with U.S. EPA waivers and authorization of preemption establish that California's programs for motorcycles, recreational boats, off-road recreational vehicles, and commercial harbor craft sources meet the requirements for BACM and MSM and represent the most stringent and comprehensive approach for achieving ongoing emission reductions from these categories.

Summary

California's long history of comprehensive and innovative emissions control has resulted in the strongest mobile source control program in the nation. U.S. EPA has acknowledged the strength of these programs in their approval of ARB's regulations and through the waiver process. In addition, U.S. EPA has provided past determinations that ARB's mobile source control programs meet BACM and MSM requirements as part of their 2004 approval of the Valley's 2003 PM10 Plan:

> "We believe that the State's control programs constitute BACM at this time for the mobile source and fuels categories, since the State's measures reflect the most stringent emission control programs currently available, taking into account economic and technological feasibility."

Since then, ARB has continued to substantially enhance and accelerate reductions from our mobile source control programs through the implementation of more stringent engine emissions standards, in-use requirements, incentive funding, and other policies and initiatives as described in the preceding sections. These efforts not only ensure that all source sectors continue to achieve maximum emission reductions through implementation of the cleanest current technologies, but also promote the ongoing development of more advanced zero and near-zero technologies. As a result, California's mobile source control programs reflect the most stringent and feasible level of emissions control in the nation and fully meet the requirements for BACM and MSM.

Air Resources Board Control Measures, 1985 - 2015

Board Action	Hearing Date
Proposed Regulation for the Commercialization of Alternative Diesel Fuels (1 of 2): proposed regulation governing the introduction of alternative diesel fuels into the California commercial market, including special provisions for biodiesel. This is the first of two hearings on the item, and the Board will not take action to approve the proposed regulation.	2/19/15
Evaporative Emission Control Requirements for Spark-Ignition Marine Watercraft: proposed regulation for controlling evaporative emissions from spark-ignition marine watercraft. The proposed regulation will harmonize, to the extent feasible, with similar federal requirements, while adding specific provisions needed to support California's air quality needs.	2/19/15
2015 Low Carbon Fuel Standard (LCFS) Amendments (1 of 2): proposed regulation for a Low Carbon Fuel Standard that includes re-adoption of the existing Low Carbon Fuel Standard with updates and revisions. This is the first of two hearings on the item, and the Board will not take action to approve the proposed regulation.	2/19/15
CA Cap on GHG Emissions and Market-Based Compliance Mechanisms to Add the Rice Cultivation Projects and Updated U.S. Forest Projects Protocols (1 of 2): updates to the Cap and Trade Regulation to include a new Rice Cultivation Compliance Offset Protocol and an update to the United States Forest Compliance Offset Protocol that would include project eligibility in parts of Alaska	12/18/14
2014 Amendments to ZEV Regulation: additional compliance flexibility to ZEV manufacturers working to bring advanced technologies to market	10/23/14
LEV III Criteria Pollutant Requirements for Light- and Medium-Duty Vehicles the Hybrid Electric Vehicle Test Procedures, and the HD Otto-Cycle and HD Diesel Test Procedures: applies to the 2017 and subsequent model years	10/23/14
Amendments to Mandatory Reporting Regulation for Greenhouse Gases: further align reporting methods with USEPA methods and factors, and modify reporting requirements to fully support implementation of California's Cap and Trade program	9/19/14
Amendments to the California Cap on Greenhouse Gas Emissions and Market Based Compliance Mechanisms Technical revisions to Mandatory Reporting of Greenhouse Gas Emissions Regulation to further align reporting methods with U.S.EPA update methods and factors, and modify reporting requirements to fully support implementation of California's Cap and Trade program.	9/18/14
Amendments to the AB 32 Cost of Implementation Fee Regulation: proposed amendments to the regulation to make it consistent with the revised mandatory reporting regulation, to add potential reporting requirements, and to incorporate requirements within the mandatory reporting regulation to streamline reporting.	9/18/14
Low Carbon Fuel Standard 2014 Update: As a result of a California Court of Appeal decision, ARB will revisit the LCFS rulemaking process to meet certain procedural requirements of the APA and CEQA. Following incorporation of any modifications to the regulation, the Board will consider the proposed regulation for adoption at a second hearing held in the spring of 2015	7/24/14
Revisions to the Carl Moyer Memorial Air Quality Standards Attainment Program Guidelines for On-Road Heavy-Duty Trucks Revisions to 1) reduce surplus emission reduction period, 2) reduce minimum CA usage requirement, 3) prioritize on-road funding to small fleets, 4) include light HD vehicles 14000-19500 libs, and 5) clarify program specifications.	7/24/14
Amendments to Enhanced Fleet Modernization (Car Scrap) Program: amendments consistent with SB 459 which requires ARB to increase benefits for low-income California residents, promote cleaner replacement vehicles, and enhance emissions reductions.	6/26/14
Proposed Approval of Amendments to CA Cap on GHG Emissions and Market-Based Compliance Mechanisms - Second hearing of two, continued from October 2013	4/24/14
Truck and Bus Rule Update -- Amendments to the Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen, and Other Criteria Pollutants From In-Use On-Road Diesel-Fueled Vehicles: increasing low-use vehicle thresholds, allowing owners to newly opt-in to existing flexibility provisions, adjusting "NOx exempt" vehicle provisions, and granting additional time for fleets in certain areas to meet PM filter requirements.	4/24/14

Air Resources Board Control Measures, 1985 - 2015

Board Action	Hearing Date
Heavy-Duty GHG Phase I: On-Road Heavy-Duty GHG Emissions Rule, Tractor-Trailer Rule, Commercial Motor Vehicle Idling Rule, Optional Reduced Emission Standards, Heavy-Duty Hybrid-Electric Vehicles Certification Procedure New GHG standards for MD and HD engines and vehicles identical to those adopted by the USEPA in 2011 for MYs 2014-18.	12/12/13
Agricultural equipment SIP credit rule Incentive-funded projects must be implemented using Carl Moyer Program Guidelines; must be surplus, quantifiable, enforceable, and permanent, and result in emission reductions that are eligible for SIP credit	10/25/13
Mandatory Report of Greenhouse Gas Emissions Approved a regulation that establishes detailed specifications for emissions calculations, reporting, and verification of GHG emission estimates from significant sources	10/25/13
CA Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Technical revisions to the Mandatory Reporting of Greenhouse Gas Emissions Reg to further align reporting methods with U.S.EPA, update factors, and modify definitions to maintain consistency with the Cap and Trade program.	10/25/13
Zero emission vehicle test procedures: existing certification test procedures for plug-in hybrid vehicles need to be updated to reflect technology developments. The ZEV reg will require minor modifications to address clarity and implementation issues.	10/24/13
Consumer Products: Antiperspirants, Deodorants, Test Method 310, Aerosol Coatings, Proposed Repeal of Hairspray Credit) Amendments to require various consumer products to reformulate to reduce VOC or reactivity content to meet specified limits, and to clarify various regulatory provisions, improve enforcement, and add analytical procedures.	9/26/13
Alternative fuel certification procedures Amendments to current alternative fuel conversion certification procedures for motor vehicles and engines that will allow small volume conversion manufacturers to reduce the upfront demonstration requirements and allow systems to be sold sooner with lower certification costs than with the current process, beginning with MY 2018.	9/26/13
Vapor Recovery for Gasoline Dispensing Facilities Amendments to certification and test procedures for vapor recovery equipment used on cargo tanks and at gasoline dispensing facilities.	7/25/13
Off-highway recreational vehicle evaporative emission control Staff proposes to set evaporative emission standards to control hydrocarbon emissions from Off-Highway Recreational Vehicles. The running loss, hot soak, and diurnal performance standards can be met by using proven automobile type control technology	7/25/13
Gasoline and diesel fuel test standards Adopted amendments to add test standards for the measurement of prohibited oxygenates at trace levels specified in existing regulations	1/25/13
LEV III and ZEV Programs for Federal Compliance Option Adopted amendments to deem compliance with national GHG new vehicle standards in 2017-2025 as compliance with California GHG standards for the same model years	11/15/12 12/6/12 EO
Consumer products (automotive windshield washing fluid) Adopted amendments to add portions of 14 California counties to the list of areas with freezing temperatures where 25% VOC content windshield washing fluid could be sold	10/18/2012 EO 03/15/13
GHG mandatory reporting, Fee Regulation, and Cap and Trade 2012 Adopted amendments to eliminate emission verification for facilities emitting less than 25,000 MTCO2e and make minor changes in definitions and requirements	9/20/12 11/2/12 EO
Amendments to Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines Approved amendments to the verification procedure used to evaluate diesel retrofits through emissions, durability, and field testing. Amendments will lower costs associated with required in-use compliance testing, streamline the in-use compliance process, and will extend time allowed to complete verifications.	8/23/2012 EO 07/02/13
Amendments to On-Board Diagnostics (OBD I and II) Regulations Approved amendments to the light- and medium-duty vehicle and heavy-duty engine OBD regulations.	8/23/2012 EO 06/26/13

Air Resources Board Control Measures, 1985 - 2015

Board Action	Hearing Date
Cap and Trade: Amendments to CA Cap on GHG Emissions and Market-Based Compliance Mechanisms, and Amendments Allowing Use of Compliance Instruments Issued by Linked Jurisdictions Amends Cap-and-Trade and compliance mechanisms to add security to the market system and to aid staff in implementation. Amendments include first auction rules, offset registry, market monitoring provisions, and information gathering necessary for the financial services operator.	6/28/12 7/31/12 EO
Vapor recovery defect list Adopted amendments to add defects and verification procedures for equipment approved since 2004, and make minor changes to provide clarity	6/11/12 EO
Tractor-Trailer GHG Regulation: Emergency Amendment Adopted emergency amendment to correct a drafting error and delay the registration date for participation in the phased compliance option	2/29/2012 2/29/12 EO
Advanced Clean Cars (ACC) Regulation: Low-Emission Vehicles and GHG Adopted more stringent criteria emission standards for MY 2015-2025 light and medium duty vehicles (LEV III), amended GHG emission standards for model year 2017-2025 light and medium duty vehicles (LEV GHG), amended ZEV Regulation to ensure the successful market penetration of ZEVs in commercial volumes, amended hydrogen fueling infrastructure mandate of the Clean Fuels Outlet regulation, and amended cert fuel for light duty vehicles from an MTBE-containing fuel to an E10 certification fuel.	1/26/12
Zero Emission Vehicles (ZEV) Adopted amendments to increase compliance flexibility, add two new vehicle categories for use in creating credits, increase credits for 300 mile FCVs, increase requirements for ZEVs and TZEVs, eliminate credit for PZEVs and AT PZEVs, expand applicability to smaller manufacturers, base ZEV credits on range, and make other minor changes in credit requirements	1/26/12
Amendments to Low Carbon Fuel Standard Regulation The amendments address several aspects of the regulation, including: reporting requirements, credit trading, regulated parties, opt-in and opt-out provisions, definitions, and other clarifying language.	12/16/11 10/10/12 EO
Amendments to Small Off-Road Engine and Tier 4 Off-Road Compression-Ignition Engine Regulations And Test Procedures; also "Recreational Marine" Spark-Ignition Marine Engine Amendments (Recreational Boats) adopted. Aligns California test procedures with U.S. EPA test procedures and requires off-road CI engine manufacturers to conduct in-use testing of their entire product lines to confirm compliance with previously established Not-To-Exceed emission thresholds.	12/16/2011 10/25/12 EO
Regulations and Certification Procedures for Engine Packages used in Light-Duty Specially Constructed Vehicles (Kit Cars) Ensures that certified engine packages, when placed into any Kit Car, would meet new vehicle emission standards, and be able to meet Smog Check requirements.	11/17/11 9/21/12 EO
Amendments to the California Reformulated Gasoline Regulations Corrects drafting errors in the predictive model, deletes outdated regulatory provisions, updates the notification requirements, and changes the restrictions on blending CARBOB with other liquids.	10/21/11 8/24/12 EO
Amendments to the In-Use Diesel Transport Refrigeration Units (TRU) ATCM Mechanisms to improve compliance rates and enforceability.	10/21/11 8/31/12 EO
Amendments to the AB 32 Cost of Implementation Fee Regulation Clarifies requirements and regulatory language, revises definitions.	10/20/11 8/21/12 EO
Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Including Compliance Offset Protocols Greenhouse Gas Emissions Cap-and-Trade Program, including compliance offset protocols and multiple pathways for compliance.	10/21/11 8/21/12 EO
Amendments to the Regulation for Cargo Handling Equipment (CHE) at Ports and Intermodal Rail Yards (Port Yard Trucks Reg) Provides additional compliance flexibility, and maintains anticipated emissions reductions. As applicble to yard trucks and two-engine sweepers.	9/22/11 8/2/12 EO
Amendments to the Enhanced Vapor Recovery Regulation for Gasoline Dispensing Facilities New requirement for low permeation hoses at gasoline dispensing facilities.	9/22/11 7/26/12 EO
Amendments to Cleaner Main Ship Engines and Fuel for Ocean-Going Vessels Adjusts the offshore regulatory boundary. Aligns very low sulfur fuel implementation deadlines with new federal requirements.	6/23/11 9/13/12 EO
Particulate Matter Emissions Measurement Allowance For Heavy-Duty Diesel In-Use Compliance Regulation Emission measurement allowances provide for variability associated with the field testing required in the regulation.	6/23/11 10/12/11 EO

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Board Action	Hearing Date
Low Carbon Fuel Standard Carbon Intensity Lookup Table Amendments Adds new pathways for vegetation-based fuels	2/24/11 1/6/12 EO
Amendments to Cleaner In-Use Heavy-Duty On-Road Diesel Trucks and LSI Fleets Regulations Amends five regulations to provide relief to fleets adversely affected by the economy, and take into account the fact that emissions are lower than previously predicted.	12/16/10 9/19/11 EO
Tractor-Trailer GHG Regulation Amendment Enacts administrative changes to increase compliance flexibility and reduce costs	12/16/10 10/26/11 EO
Amendments to Cleaner In-Use Off-Road Diesel-Fueled Fleets Regulation Amendments provide relief to fleets adversely affected by the economy, and take into account the fact that emissions are lower than previously predicted.	12/16/10 10/28/11 EO
In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities Amendments add flexibility to fleets' compliance schedules, mitigate the use of noncompliant trucks outside port and rail properties, and provide transition to the Truck and Bus regulation.	12/16/10 9/19/11 EO
Amendments to the Regulation for Mandatory Reporting of Greenhouse Gas Emissions Changes requirements to align with federal greenhouse gas reporting requirements adopted by US EPA.	12/16/10 10/28/11 EO
Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation Establishes framework and requirements for Greenhouse Gas Emissions Cap-and-Trade Program, including compliance offset protocols.	12/16/10 10/26/11 EO
Amendments to the Consumer Products Regulation Amendments set new or lower VOC limits for some categories, prohibit certain toxic air contaminants, high GWP compounds, and surfactants toxic to aquatic species. Also changes Method 310, used to determine aromatic content of certain products.	11/18/10 9/29/11 EO
Amendment of the ATCM for Diesel Transportation Refrigeration Units (TRU) Amendments expand the compliance options and clarify the operational life of various types of TRUs.	11/18/10 2/2/11 EO
Amendments to the ATCM for Stationary Compression Ignition Engines Approved amendments to closely align the emission limits for new emergency standby engines in the ATCM with the emission standards required by the federal Standards of Performance.	10/21/10 3/25/11 EO
Diesel Vehicle Periodic Smoke Inspection Program Adopted amendments to exempt medium duty diesel vehicles from smoke inspection requirements if complying with Smog Check requirements	10/21/10 8/23/11 EO
Renewable Electricity Standard Regulation Approved a regulation that will require electricity providers to obtain at least 33% of their retail electricity sales from renewable energy resources by 2020.	9/23/10
Energy Efficiency at Industrial Facilities Adopted standards for the reporting of GHG emissions and the feasibility of emissions controls by the largest GHG-emitting stationary sources	7/22/10 5/9/11 EO
Amendments to Commercial Harbor Craft Regulation Approved amendments to require the use of cleaner engines in diesel-fueled crew and supply, barge, and dredge vessels.	6/24/10 4/11/11 EO
Accelerated Introduction of Cleaner Line-Haul Locomotives Agreement with railroads sets prescribed reductions in diesel risk and target years through 2020 at four major railyards	6/24/10
Amendments to New Passenger Motor Vehicle Greenhouse Gas Emission Standards Approved amendments deeming complinace with EPA's GHG standards as compliance with California's standards in 2012 through 2016 model years	2/25/2010 03/29/10
Sulfur Hexafluoride (SF6) Regulation Approved a regulation to reduce emissions of sulfur hexafluoride (SF6), a high-GWP GHG, from high-voltage gas-insulated electrical switchgear.	2/25/10 12/15/10 EO
Amendments to the Statewide Portable Equipment Registration Regulation and Portable Engine ATCM Approved amendments that extend the deadline for removal of certain uncertified portable engines for one year.	1/28/10 8/27/10 EO 12/8/10 EO
Diesel Engine Retrofit Control Verification, Warranty, and Compliance Regulation Amendments Approved amendments to require per-installation compability assessment, performance data collection, and reporting of additional information, and enhance enforceabiility	1/28/10 12/6/10 EO
Stationary Equipment High-GWP Refrigerant Regulation Approved a regulation to reduce emissions of high-GWP refrigerants from stationary non-residential equipment.	12/1/09 9/14/10 EO

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Board Action	Hearing Date
Amendments to Limit Ozone Emissions from Indoor Air Cleaning Devices Adopted amendments to delay the labeling compliance deadlines by one to two years and to make minor changes in testing protocols	12/9/09 7/30/10 EO
Emission Warranty Information Reporting Regulation Amendments Repealed the 2007 regulation and readopted the 1988 regulation with amendments to implement adverse court decision	11/19/09 9/27/10 EO
Amendments to Maximum Incremental Reactivity Tables Added many new compounds and modified reactivity values for many existing compounds in the tables to reflect new research data	11/3/09 7/23/10 EO
AB 32 Cost of Implementation Fee Regulation AB 32 authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions regulated pursuant to AB 32. ARB staff will propose a fee regulation to support the administrative costs of AB 32 implementation.	9/24/2009 05/06/10 EO
Passenger Motor Vehicle Greenhouse Gas Limits Amendments Approved amendments granting credits to manufacturers for compliant vehicles sold in other states that have adopted California regulations	9/24/09 2/22/10 EO
Consumer Products Amendments Approved amendments that set new VOC limits for multi-purpose solvent and paint thinner products and lower the existing VOC limit for double phase aerosol air fresheners.	9/24/09 8/6/10 EO
Amendments to In-Use Off-Road Diesel-Fueled Fleets Regulation Approved amendments to implement legislatively directed changes and provide additional incentives for early action.	7/23/09 12/2/09 EO 6/3/10 EO
Methane Emissions from Municipal Solid Waste Landfills Approved a regulation to require smaller and other uncontrolled landfills to install gas collection and control systems, and also requires existing and newly installed systems to operate optimally.	6/25/09 5/5/10 EO
Cool Car Standards Approved a regulation requiring the use of solar management window glass in vehicles up to 10,000 lb GVWR.	6/25/09
Enhanced Fleet Modernization (Car Scrap) Approved guidelines for a program to scrap up to 15,000 light duty vehicles statewide.	6/25/09 7/30/10 EO
Amendments to Heavy-Duty On-Board Diagnostics Regulations Approved amendments to the light and medium-duty vehicle and heavy duty engine OBD regulations.	5/28/2009 4/6/10 EO
Smog Check Improvements BAR adopted amendments to implement changes in state law and SIP commitments adopted by ARB between 1996 and 2007	5/7/09 by BAR 6/9/09 EO
AB 118 Air Quality Improvement Program Guidelines The Air Quality Improvement Program provides for up to $50 million per year for seven years beginning in 2009-10 for vehicle and equipment projects that reduce criteria pollutants, air quality research, and advanced technology workforce training. The AQIP Guidelines describe minimum administrative, reporting, and oversight requirements for the program, and provide general criteria for how the program shall be implemented.	04/23/09 08/28/09 EO
Pesticide Element Reduce volatile organic compound (VOC) emissions from the application of agricultural field fumigants in the South Coast, Southeast Desert, Ventura County, San Joaquin Valley, and Sacramento Metro federal ozone nonattainment areas.	4/20/09 10/12/09 EO (2) 8/2/11 EO
Low Carbon Fuel Standard Approved new standards to lower the carbon content of fuels.	4/20/09 11/25/09 EO
Pesticide Element for San Joaquin Valley DPR Director approved pesticide ROG emission limit of 18.1 tpd and committed to implement restrictions on non-fumigant pesticide use by 2014 in the San Joaquin Valley	4/7/09 DPR
Tire Pressure Inflation Regulation Approved a regulation requiring automotive service providers to perform tire pressure checks as part of every service.	3/26/09 2/4/10 EO
Sulfur Hexafluoride from Non-Utility and Non-Semiconductor Applications Approved a regulation to phase out use of Sulfur Hexafluoride over the next several years.	2/26/09 11/12/09 EO
Semiconductor Operations Approved a regulation to set standards to reduce fluorinated gas emissions from the semiconductor and related devices industry.	2/26/09 10/23/09 EO
Plug-In Hybrid Electric Vehicles Test Procedure Amendments Amends test procedures to address plug-in-hybrid electric vehicles	1/23/09 12/2/09 EO
In-Use Off-Road Diesel-Fueled Fleets Amendments Makes administrative changes to recognize delays in the supply of retrofit control devices	1/22/09
Small Containers of Automotive Refrigerant Approved a regulation to reduce leakage from small containers, adopt a container deposit and return program, and require additional container labeling and consumer education requirements.	1/22/09 1/5/10 EO

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Board Action	Hearing Date
Aftermarket Critical Emission Parts on Highway Motorcycles Allows for the sale of certified critical emission parts by aftermarket manufacturers	1/22/09 6/19/09 EO
Heavy-Duty Tractor-Trailer Greenhouse Gas (GHG) Reduction Approved a regulation to reduce greenhouse gas emissions by improving long haul tractor and trailer efficiency through use of aerodynamic fairings and low rolling resistance tires.	12/11/08 10/23/09 EO
Cleaner In-Use Heavy-Duty Diesel Trucks (Truck and Bus Reg) Approved a regulation to reduce diesel particulate matter and oxides of nitrogen through fleet modernization and exhaust retrofits. Makes enforceability changes to public fleet, off-road equipment, and portable equipment regulations.	12/11/08 10/19/09 EO 10/23/09 EO
Large Spark-Ignition Engine Amendments Approved amendments to reduce evaporative, permeation, and exhaust emissions from large spark-ignition (LSI) engines equal to or below 1 liter in displacement.	11/1/08 3/12/09 EO
Small Off-Road Engine (SORE) Amendments Approved amendments to address the excessive accumulation of emission credits.	11/21/08 2/24/10 EO
Proposed AB 118 Air Quality Guidelines for the Air Quality Improvement Program and the Alternative and Renewable Fuel and Vehicle and Technology Program. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (AB 118) requires ARB to develop guidelines for both the Alternative and Renewable Fuel and Vehicle Technology Program and the Air Quality Improvement Program to ensure that both programs do not adversely impact air quality.	09/25/08 EO 05/20/09
Portable Outboard Marine Tanks and Components (part of Additional Evaporative Emission Standards) Approved a regulation that establishes permeation and emission standards for new portable outboard marine tanks and components.	9/25/08 7/20/09 EO
Cleaner Fuel in Ocean Going Vessels Approved a regulation that requires use of low sulfur fuel in ocean-going ship main engines, and auxiliary engines and boilers.	7/24/08 4/16/09 EO
Spark-Ignition Marine Engine and Boat Amendments Provides optional compliance path for > 500 hp sterndrive/inboard maring engines	7/24/08 6/5/09 EO
Consumer Products Amendments Approved amendments that add volatile organic compound (VOC) limits for seven additional categories and lower limits for twelve previously regulated categories.	6/26/08 5/5/09 EO
Zero emission vehicles Updated California's ZEV requirements to provide greater flexibility with respect to fuels, technologies, and simplifying compliance pathways. Amendments give manufacturers increased flexibility to comply with ZEV requirements by giving credit to plug-in hybrid electric vehicles and establishing additional ZEV categories in recognition of new developments in fuel cell vehicles and battery electric vehicles.	3/27/08 12/17/08 EO
Amendments to the Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines Adds verification requirements for control technologies that only reduce NOx emissions, new reduction classifications for NOx reducing technologies, new testing requirements, and conditional extensions for verified technologies	1/24/08 12/4/08 EO
Mandatory Report of Greenhouse Gas Emissions Approved a regulation that establishes detailed specifications for emissions calculations, reporting, and verification of GHG emission estimates from significant sources	12/6/07 10/12/08 EO
Gaseous Pollutant Measurement Allowances for In-Use Heavy-Duty Diesel Compliance Measurement accuracy margins are to be determined through an ongoing comprehensive testing program performed by an independent contractor. Amendments include these measurement accuracy margins into the regulation.	12/6/07 10/14/08 EO
Ocean-Going Vessels While at Berth (aka Ship Hotelling) - Auxiliary Engine Cold Ironing and Clean Technology Approved a regulation that reduces emissions from auxiliary engines on ocean-going ships while at-berth.	12/6/07 10/16/08 EO
In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities Approved a regulation that establishes emission standards for in-use, heavy-duty diesel-fueled vehicles that transport cargo to and from California's ports and intermodal rail facilities.	12/6/07 10/12/08 EO
Commercial Harbor Craft Approved a regulation that establishes in-use and new engine emission limits for both auxiliary and propulsion diesel engines on ferries, excursion vessels, tugboats, and towboats.	11/15/07 9/2/08 EO
Suggested Control Measure for Architectural Coatings Amendments Approved amendments to reduce the recommended VOC content of 19 categories of architectural coatings	10/26/07

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Board Action	Hearing Date
Aftermarket Catalytic Converter Requirements Approved amendments that establish more stringent emission performance and durability requirements for used and new aftermarket catalytic converters offered for sale in California	10/25/07 2/21/08 NOD
Limiting Ozone Emissions from Indoor Air Cleaning Devices Approved ozone emission limit of 0.050 ppm for portable indoor air cleaning devices in response to requirements of AB 2276 (2006)	9/27/07 8/7/08 EO
Pesticide Commitment for Ventura County in 1994 SIP Approved substitution of excess ROG emission reductions from state motor vehicle program for 1994 SIP reduction commitment from pesticide application in Ventura County	9/27/07 11/30/07 EO
In-Use Off-Road Diesel Equipment Approved a regulation that requires off-road diesel fleet owners to modernize their fleets and install exhaust retrofits.	7/26/07 4/4/08 EO
Emission Control and Environmental Performance Label Regulations Approved amendments to add a Global Index Label and modify the formal of the Smog Index Label on new cars	6/21/07 5/2/08 EO
Vapor Recovery from Aboveground Storage Tanks Approved a regulation to establish new performance standards and specifications for the vapor recovery systems and components used with aboveground storage tanks.	6/21/07 5/2/08 EO
CaRFG Phase 3 amendments Approved amendments to mitigate the increases in evaporative emissions from on-road motor vehicles resulting from the addition of ethanol to gasoline.	6/14/07 4/25/08 EO 8/7/08 EO
Formaldehyde from Composite Wood Products Approved an ATCM to limit formaldehyde emissions from hardwood plywood, particleboard, and medium density fiberboard to the maximum amount feasible	4/26/07 3/5/08 EO
Portable equipment registration program (PERP) and airborne toxic control measure for diesel-fueled portable engines Approved amendments to allow permitting of Tier 0 portable equipment engines used in emergency or low use duty and to extend permitting of certain Tier 1 and 2 "resident" engines to 1/1/10	3/22/07 7/31/07 EO
Perc Control Measure Amendments Approved amendments to the Perchloroethylene ATCM to prohibit new Perc dry cleaning machines beginning 2008 and phase out all Perc machines by 2023.	1/25/07 11/7/07 EO
Amendments to Emission Warranty Information Reporting & Recall Regulations Approved amendments that tighten the provisions for recalling vehicles for emissions-related failures, helping ensure that corrective action is taken to vehicles with defective emission control devices or systems.	12/7/06 3/22/07 10/17/07 EO
Voluntary accelerated vehicle retirement regulations Approved amendments that authorize the use of remote sensing to identify light-duty high emitters and that establish protocols for quantifying emissions reductions from high emitters proposed for retirement	12/7/06
Emergency regulation for portable equipment registration program (PERP), airborne toxic control measures for portable and stationary diesel-fueled engines	12/7/06
Amendments to the Hexavalent Chromium ATCM Approved amendments that require use of best available control technology on all chrome plating and anodizing facilities.	12/7/06
Consumer Products Regulation Amendments Approved amendments that set lower emission limits in 15 product categories.	11/17/06 9/25/07 EO
Requirements for Stationary Diesel In-Use Agricultural Engines Approved amendments to the stationary diesel engine ATCM which set emissions standards for in-use diesel agricultural engines.	11/16/06 7/3/07 NOD
Ships - Onboard Incineration Approved amendments to cruise ship incineration ATCM to include all oceangoing ships of 300 gross registered tons or more.	11/16/06 9/11/07 EO
Zero Emission Bus Approved amendments postponing the 15 percent purchase requirement three years for transit agencies in the diesel path and one to two years for transit agencies in the alternative fuel path, in order to keep pace with developments in zero emission bus technology, and adding an Advanced Demonstration requirement to offset emission losses.	10/19/06 8/27/07 EO
Distributed generation certification Approved amendments improving the emissions durability and testing requirements, addng waste gas emission standards, and eliminating a redundant PM standard in the current 2007 emission standards.	10/19/06 5/17/07 NOD

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Board Action	Hearing Date
Heavy-Duty Diesel In-Use Compliance Regulation Approved amendments to the heavy-duty diesel engine regulations and test procedures to create a new in-use compliance program conducted by engine manufacturers. The amendments would help ensure compliance with applicable certification standards throughout an engine's useful life.	9/28/06 7/19/07 NOD
Revisions to OBD II and the Emission Warranty Regulations Approved amendments to the OBD II regulation to provide for improved emission control monitoring including air-fuel cylinder imbalance monitoring, oxygen sensor monitoring, catalyst monitoring, permanent fault codes for gasoline vehicles and new thresholds for diesel vehicles.	9/28/06 8/9/07 EO
Off-Highway Recreational Vehicle Amendments Approved amendments to the Off-Highway Recreational Vehicle Regulations including harmonizing evaporative emission standards with federal regulations, expanding the definition of ATVs, modifying labeling requirements, and adjusting riding seasons.	7/20/06 6/1/07 EO
Portable Equipment Registration Program (PERP) Amendments Approved amendments to the Statewide Portable Equipment Registration program that include installation of hour meters on equipment, and revisions to recordkeeping, reporting, and fees.	6/22/06 11/13/06 NOD
Heavy Duty Vehicle Service Information Approved amendments to the Service Information Rule to require manufacturers to make available diagnostic equipment and information for sale to the aftermarket.	6/22/06 5/3/07 EO
LEV II technical amendments Approved amendments to evaporative emission test procedures, four-wheel drive dynamometer provisions, and vehicle label requirements	6/22/06 9/27/06 NOD
Dry Cleaning ATCM Amendments Approved amendments to the Dry Cleaning ATCM to limit siting of new dry cleaners, phase out use of Perc at co-residential facilities, phase out higher emitting Perc sources at other facilities, and require enhanced ventilation at existing and new Perc facilities	5/25/06
Forklifts and other Large Spark Ignition (LSI) Equipment Adopted a regulation to reduce emissions from forklifts and other off-road spark-ignition equipment by establishing more stringent standards for new equipment, and requiring retrofits or engine replacement on existing equipment. Adopts EPA's stamdards fpr 2007; adopts more stringent standards for 2010.	5/25/06 3/2/07 EO
Enhanced Vapor Recovery Amendments Approved amendments to the vapor recovery system regulation and adopted revised test procedures.	5/25/06
Diesel Retrofit Technology Verification Procedure Approved amendments to the Diesel Emission In-use Control Strategy Verification Procedure to substitute a 30% increase limit in NOx concentration for an 80% reduction requirement from PM retrofit devices	3/23/06 12/21/06 NOD
Heavy duty vehicle smoke inspection program amendments Approved amendments to impose a fine on trucks not displaying a current compliance certification sticker	1/26/06 12/4/06 EO
Ocean-going Ship Auxiliary Engine Fuel Approved a regulation to require ships to use cleaner marine gas oil or diesel to power auxiliary engines within 24 nautical miles of the California coast.	12/8/05 10/20/06 EO
Diesel Cargo Handling Equipment Approved a regulation to require new and in-use cargo handling equipment at ports and intermodal rail yards to reduce emissions by utilizing best available control technology.	12/8/05 6/2/06 EO
Public and Utility Diesel Truck Fleets Approved a regulation to reduce diesel particulate matter emissions from heavy duty diesel trucks in government and private utility fleets.	12/8/05 10/4/06 EO
Cruise ships – Onboard Incineration Adopted an Air Toxic Control Measure to prohibit cruise ships from conducting onboard incineration within three nautical miles of the California coast.	11/17/05 2/1/06 NOD
Inboard Marine Engine Rule Amendments Approved amendments to the 2001 regulation to include additional compliance options for manufacturers.	11/17/05 9/26/06 EO
Heavy-Duty Diesel Truck Idling Technology Approved a regulation to limit sleeper truck idling to 5 minutes. Allows alternate technologies to provide cab heating/cooling and power.	10/20/05 9/1/06 EO
Automotive Coating Suggested Control Measure Approved an SCM for automotive coatings for adoption by air districts. The measure will reduce the VOC content of 11 categories of surface protective coatings.	10/20/05
2007-09 Model-year heavy duty urban bus engines and the fleet rule for transit agencies Adopted amendments to align urban bus emission limits with on-road heavy duty truck emission limits and allow for the purchase of non-complying buses under the condition that bus turnover increase to offset NOx increases	10/20/05 10/27/05 7/28/06 EO
Portable fuel containers (part 2 of 2) Approved amendments to revise spout and automatic shutoff design	9/15/05 7/28/06 EO

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Board Action	Hearing Date
Portable Fuel Containers (part 1 of 2) Approved amendments to include kerosene containers in the definition of portable fuel containers	9/15/05 11/9/05 NOD
2007-09 Model-year heavy duty urban bus engines and the fleet rule for transit agencies Adopted amendments to require all transit agencies in SCAQMD to purchase only alternate fuel versions of new buses	Superceded by 10/20/05 and
Reid vapor pressure limit emergency rule Approved amendments to relax Reid vapor pressure limit to accelerate fuel production for Hurricane Katrina victims	9/8/05 Operative for September and October 2005 only
Heavy-Duty Truck OBD Approved a regulation to require on-board diagnostic (OBD) systems for new gas and diesel trucks, similar to the systems on passenger cars.	7/21/05 12/28/05 EO
Definition of Large Confined Animal Facility Adopted a regulation to define the size of a large CAF for the purposes of air quality permitting and reduction of ROG emissions to the extent feasible	6/23/05 4/13/06 EO
ATCM for stationary compIression ignition engines: Approved emergency amendments (3/17/05) and permanent amendments (5/26/05) to relax the diesel PM emission limits on new stationary diesel engines to current off-road engine standards to respond to the lack of availability of engines meeting the original ATCM standard.	3/17/05 5/26/05 7/29/05 EO
Transit Fleet Rule Approved amendments to add emission limits for non-urban bus transit agency vehicles, require lower bus and truck fleet-average NOx and PM emission limits, and clarify emission limits for CO, NMHC, and formaldehyde	2/24/05 10/19/05 NOD
Thermal Spraying ATCM Approved a regulation to reduce emissions of hexavalent chromium and nickel from thermal spraying operations	12/9/04 7/20/05 EO
Tier 4 Standards for Small Off-Road Diesel Engines (SORE) Approved new emission standards for off-road diesel engines to be phased in between 2008 and 2015	12/9/04 10/21/05 EO
Emergency Regulatory Amendment Delaying the January 1, 2005 Implementation Date for the Diesel Fuel Lubricity Standard Adopted an emergency regulation delaying the lubricity standard compliance deadline by five months to respond to fuel pipeline contamination problems	11/24/04 12/10/04 EO
Enhanced vapor recovery compliance extension Approved amendments to the EVR regulation to extend the compliance date for onboard refueling vapor recovery compatibility to the date of EVR compliance	11/18/04 2/11/05 EO
CaRFG Phase 3 amendments Approved amendments correcting errors and streamlining requirements for comliance and enforcement of CaRFG Phase 3 regulations adopted in 1999	11/18/04
Clean diesel fuel for harborcraft and intrastate locomotives Approved a regulation that required harborcraft and locomotives operating solely within California to use clean diesel fuel.	11/18/04 3/16/05 EO
Nonvehicular Source, Consumer Product, and Architectural Coating Fee Regulation Amendment Approved amendments to fee regulations to collect supplemental fees when authorized by the Legislature	11/18/04
Greenhouse gas limits for motor vehicles Approved a regulation that sets the first ever greenhouse gas emission standards on light and medium duty vehicles starting with the 2009 model year.	9/24/04 8/4/05 EO
Gasoline vapor recovery system equipment defects list Approved the addition of defects to the VRED list for use by compliance inspectors	8/24/04 6/22/05 EO
Unihose gasoline vapor recovery systems Approved an emergency regulation and an amendment to delay the compliance date for unihose installation to the date of dispenser replacement	7/22/04 11/24/04 EO
General Idling Limits for Diesel Trucks Approved a regulation that limits idling of heavy-duty diesel trucks operating in California to five minutes, with exceptions for sleeper cabs.	7/22/04
Consumer Products Approved a regulation to reduce ROG emissions from 15 consumer products categories, prohibit the use of 3 toxic compounds in consumer products, ban the use of PDCB in certain products, allow for the use of Alternative Control Plans, and revise Test Method 310	6/24/04 5/6/05 EO
Urban bus engines/fleet rule for transit agencies Approved amendments to allow for the purchase of hybrid diesel buses and revise the zero emission bus demonstration and purchase timelines	6/24/04
Engine Manufacturer Diagnostics Approved a regulation that would require model year 2007 and later heavy duty truck engines to be equipped with engine diagnostic systems to detect malfunctions of the emission control system.	5/20/04
Chip Reflash Approved a voluntary program and a backstop regulation to reduce heavy duty truck NOx emissions through the installation of new software in the engine's electronic control module.	3/25/04 3/21/05 EO

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Board Action	Hearing Date
Portable equipment registration program (PERP) Approved amendments to allow uncertified engines to be registered until December 31, 2005, to increase fees, and to modify administrative requirements	2/26/04 1/7/05 EO 6/21/05 EO
Portable Diesel Engine ATCM Adopted a regulation to reduce diesel PM emissions from portable engines through a series of emission standards that increase in stringency through 2020	2/26/04 1/4/05 EO
California motor vehicle service information rule Adopted amendments to allow for the purchase of heavy duty engine emission-related service information and diagnostic tools by independent service facilities and aftermarket parts manufacturers.	1/22/04 5/20/04
Transportation Refrigeration Unit ATCM Adopted a regulation to reduce diesel PM emissions from transport refrigeration units by establishing emission standards and facility reporting requirements to streamline inspections	12/11/03 2/26/04 11/10/04 EO
Diesel engine verification procedures Approved amendments that reduced warranty coverage to the engine only, delayed the NOx reduction compliance date to 2007, added requirements for proof-of-concept testing for new technology, and harmonized durability requirements with those of EPA	12/11/03 2/26/04 10/17/04
Chip Reflash Approved a voluntary program and a backstop regulation to reduce heavy duty truck NOx emissions through the installation of new software in the engine's electronic control module.	12/11/03 3/27/04 3/21/05 EO
Revised tables of maximum incremental reactivity values Approved the addition of 102 more chemicals with associated maximum incremental reactivity values to existing regulation allowing these chemicals to be used in aerosol coating formulations	12/3/03
Stationary Diesel Engines ATCM Adopted a regulation to reduce diesel PM emissions from stationary diesel engines through the use of clean fuel, lower emission standards, operational practices	11/20/03 12/11/03 2/26/2004 9/27/04 EO
Solid waste collection vehicles Adopted a regulation to reduce toxic diesel particulate emissions from solid waste collection vehicles by over 80 percent by 2010. This measure is part of ARB's plan to reduce the risk from a wide range of diesel engines throughout California.	9/25/03 5/17/04 EO
Small off-road engines (SORE) Adopted more stringent emission standards for the engines used in lawn and garden and industrial equipment, such as string trimmers, leaf blowers, walk-behind lawn mowers, generators, and lawn tractors.	9/25/03 7/26/04 EO
Off-highway recreational vehicles Changes to riding season restrictions	7/24/03
Clean diesel fuel Adopted a regulation to reduce sulfur levels and set a minimum lubricity standard in diesel fuel used in vehicles and off-road equipment in California, beginning in 2006.	7/24/03 5/28/04 EO
Ozone Transport Migitation Amendments Adopted amendments to require upwind districts to (1) have the same no-net-increase permitting thresholds as downwind districts, and (2) adopt "all feasible measures"	5/22/03 10/2/03 NOD
Zero emission vehicles Updated California's ZEV requirements to support the fuel cell car development and expand sales of advanced technology partial ZEVs (like gasoline-electric hybrids) in the near-term, while retaining a role for battery electric vehicles.	3/27/03 12/19/03 EO
Heavy duty gasoline truck standards Aligned its existing rules with new, lower federal emission standards for gasoline-powered heavy-duty vehicles starting in 2008.	12/12/02 9/23/03 EO
Low emission vehicles II Minor administrative changes	12/12/02 9/24/03 EO
Gasoline vapor recovery systems test procudures Approved amendments to add advanced vapor recovery technology certification and testing standards	12/12/02 7/1/03 EO 10/21/03 EO
CaRFG Phase 3 amendments Approved amendments to allow for small residual levels of MTBE in gasoline while MTBE is being phased out and replaced by ethanol	12/12/02 3/20/03 EO
School bus Idling Adopted a measure requiring school bus drivers to turn off the bus or vehicle engine upon arriving at a school and restart it no more that 30 seconds before departure in order to limit children's exposure to toxic diesel particulate exhaust.	12/12/02 5/15/03 EO
California Interim Certification Procedures for 2004 and Subsequent Model Year Hybrid-Electric Vehicles in the Urban Transit Bus and Heavy-Duty Vehicle Classes Regulation Amendment Adopted amendments to allow diesel-path transit agencies to purchase alternate fuel buses with higher NOx limits, establish certification procedures for hybrid buses, and require lower fleet-average PM emission limits	10/24/02 9/2/03 EO

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Board Action	Hearing Date
CaRFG Phase 3 amendments Approved amendments delaying removal of MTBE from gasoline by one year to 12/31/03	7/25/02 11/8/02 EO
Diesel retrofit verification procedures, warranty, and in-use compliance requirements Adopted regulations to specify test procedures, warranty, and in-use compliance of diesel engine PM retrofit control devices	5/16/02 3/28/03 EO
On-board diagnostics for cars Adopted changes to the On-Board Diagnostic Systems (OBD II) regulation to improve the effectiveness of OBD II systems in detecting motor vehicle emission-related problems.	4/25/02 3/7/03 EO
Voluntary accelerated light duty vehicle retirement regulations Establishes standards for a voluntary accelerated retirement program	2/21/02 11/18/02 EO
Residential burning Adopted a measure to reduce emissions of toxic air contaminants from outdoor residential waste burning by eliminating the use of burn barrels and the outdoor burning of residential waste materials other than natural vegetation	2/21/02 12/18/02 EO
California motor vehicle service information rule Adopted regulations to require light- and medium-duty vehicle manufacturers to offer for sale emission-related service information and diagnostic tools to independent service facilities and aftermarket parts manufacturers	12/13/01 7/31/02 EO
Vapor recovery regulation amendments Adopted amendments to expand the list of specified defects requiring equipment to be removed from service	11/15/01 9/27/02 EO
Distributed generation guidelines and regulations Adopted regulations requiring the permitting by ARB of distributed generation sources that are exempt from air district permitting and approved guidelines for use by air districts in permitting non-exempt units	11/15/01 7/23/02 EO
Low emission vehicle regulations (LEV II) Approved amendments to apply PM emission limits to all new gasoline vehicles, extend gasoline PZEV emission limits to all fuel types, and streamline the manufacturer certification process	11/15/01 8/6/02 EO
Gasoline vaport recovery systems test methods and compliance procedures Adopted amendments to add test methods for new technology components, streamline test methods for liquid removal equipment, and***	10/25/01 7/9/02 EO
Heavy-duty diesel trucks Adopted amendments to emissions standards to harmonize with EPA regulations for 2007 and subsequent model year new heavy-duty diesel engines	10/25/01
Automotive coatings Adopted Air Toxic Control Measure which prohibits the sale and use in California of automotive coatings that contain hexavalent chromium or cadmium.	9/20/01 9/2/02 EO
Inboard and sterndrive marine engines Lower emission standards for 2003 and subsequent model year inboard and sterndrive gasoline-powered engines in recreational marine vessels.	7/26/01 6/6/02 EO
Asbestos from construction, grading, quarrying, and surface mining Adopted an Airborne Toxic Control Measure for construction, grading, quarrying, and surface mining operations requiring dust mitigation for construction and grading operations, road construction and maintenance activities, and quarries and surface mines to minimize emissions of asbestos-laden dust	7/26/01 6/7/02 EO
Zero emission vehicle infrastructure and standardization of electric vehicle charging equipment Adopted amendments to the ZEV regulation to alter the method of quantifying production volumes at joint-owned facilities and to add specifications for standardized charging equipment	6/28/01 5/10/02 EO
Pollutant transport designation Adopted amendments to add two transport couples to the list of air basins in which upwind areas are required to adopt permitting thresholds no less stringent than those adopted in downwind areas	4/26/01
Zero emission vehicle regulation amendments Adopted amendments to reduct the numbers of ZEVs required in future years, add a PZEV category and grant partial ZEV credit, modify the ZEV range credit, allow hybrid-electric vehicles partial ZEV credit, grant ZEV credit to advanced technology vehicles, and grant partial ZEV credit for several other minor new programs	1/25/01 12/7/01 EO 4/12/02 EO
Heavy duty diesel engines supplemental test procedures Approved amendments to extend "Not-To-Exceed" and EURO III supplemental test procedure requirements through 2007 when federal requirements will included these tests	12/7/00
Light and medium duty low emission vehicle alignment with federal standards Approved amendments that require light and medium duty vehicles sold in California to meet the more restrictive of state or federal emission standards	12/7/00 12/27/00 EO
Exhaust emission standards for heavy duty gas engines Adopted amendments that establish 2005 emission limits for heavy duty gas engines that are equivalent to federal limits	12/7/00 12/27/00 EO
CaRFG Phase 3 amendments Approved amendments to regulate the replacement of MTBE in gasoline with ethanol	11/16/00 4/25/01 EO
CaRFG Phase 3 test methods Approved amendments to gasoline test procedures to quantify the olefin content and gasoline distillation temperatures	11/16/00 7/11/01 EO 8/28/01 EO

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Antiperspirant and deordorant regulations Adopted amendments to relax a 0% VOC limit to 40% VOC limit for aerosol antiperspirants	10/26/00
Diesel risk reduction plan Adopted plan to reduce toxic particulate from diesel engines through retrofits on existing engines, tighter standards for new engines, and cleaner diesel fuel.	9/28/00
Conditional rice straw burning regulations Adopted regulations to limit rice straw burning to fields with demonstrated disease rates reducing production by more than 5 percent	9/28/00
Asbestos from unpaved roads Tightened an existing Air Toxic Control Measure to prohibit the use of rock containing more than 0.25% asbestos on unsurfaced roads	7/20/00
Architectural coatings Approved amendments to replace mass-based VOC limits with reactivity-based limits, add a table of Maximum Incremental Reactivity values, add limits for polyolefin adhesion promoters, prohibit use of certain toxic solvents, and make other minor changes	6/22/00 5/1/01 EO
Consumer products aerosol adhesives Adopted amendments to delete a 25% VOC limit by 2002, add new VOC limits for six categories of adhesives, prohibit the use of toxic solvents, and add new labeling and reporting requirements	5/25/00 3/14/01 EO
Automotive care products Approved an Air Toxic Control Measure to eliminate use of perchloroethylene, methylene chloride, and trichloroethylene in automotive products such as brake cleaners and degreasers.	4/27/00 2/28/01 EO
Enhanced vapor recovery emergency regulation Adopted a four-year term for equipment certifications	5/22/01 EO
Enhanced vapor recovery Adopted amendments to require the addition of components to reduce spills and leakage, adapt to onboard varpor recovery systems, and continuously monitor system operation and report equipment leaks immediately	3/23/00 7/25/01 EO
Agricultural burning smoke management Adopted amendments to add marginal burn day designations, require day-specific burn authrorizations by districts, and smoke management plans for larger prescribed burn projects	3/23/00 1/22/01 EO
Urban transit buses Adopted a public transit bus fleet rule and emissions standards for new urban buses that mandates a lower fleet-average NOx emission limit, PM retrofits, lower sulfur fuel use, and purchase of specified percentages of zero emission buses in future years	1/27/00 2/24/00 11/22/00 EO 5/29/01 EO
Small Off-Road (diesel) Equipment (SORE) Adopted amendments to conform with new federal requirements for lower and engine power-specific emission limits, and for the averaging, banking, and trading of emissions among SORE manufacturers	1/28/00
CaRFG Phase 3 MTBE phase out Adopted regulations to enable refiners to produce gasoline without MTBE while preserving the emissions benefits of Phase 2 cleaner burning gasoline	12/9/99 6/16/00 EO
Consumer products – mid-term measures II Adopted a regulation which adds emission limits for 2 new categories and tightens emission limits for 15 categories of consumer products	10/28/99
Portable fuel cans Adopted a regulation requiring that new portable fuel containers, used to refuel lawn and garden equipment, motorcycles, and watercraft, be spill-proof beginning in 2001	9/23/99 7/6/00 EO
Clean fuels at service stations Adopted amendments rescinding requirements applicable to SCAB in 1994-1995, modifying the formula for triggering requirements, and allowing the Executive Officer to make adjustments to the numbers of service stations required to provide clean fuels	7/22/99
Gasoline vapor recovery Adopted amendments to certification and test methods	6/24/99
Reformulated gasoline oxygenate Adopted amendments rescinding the requirement for wintertime oxygenate in gasoline sold in the Lake Tahoe Air Basin and requiring the statewide labeling of pumps dispensing gasoline containing MTBE	6/24/99
Marine pleasurecraft Adopted regulations to control emissions from spark-ignition marine engines, specifically, outboard marine engines and personal watercraft	12/11/98 2/17/00 EO 6/14/00 EO
Voluntary accelerated light duty vehicle retirement Adopted regulation setting standards for voluntary accelerated retirement program	12/10/98 10/22/99 EO

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Board Action	Hearing Date
Off-highway recreational vehicles and engines Approved amendments to allow non-complying vehicles to operate in certain seasons and in certain ORV-designated areas	12/10/98 10/22/99 EO
On-road motorcycles Amended on-road motorcycle regulations, to lower the tailpipe emission standards for ROG and NOx	12/10/98
Portable equipment registration program (PERP) Approved amendments to exclude non-dredging equipment operating in OCS areas and equipment emitting hazardous pollutants, include NSPS Part OOO rock crushers, require SCR emission limits and onshore emission offsets from dredging equipment operating in OCS areas, set catalyst emission limits for gasoline engines, and relieve certain retrofitted engines from periodic source testing	12/10/98
Liquid petroleum gas motor fuel specifications Approved amendment rescinding 5% propene limit and extending 10% limit indefinitely	12/11/98
Reformulated gasoline Approved amendments to rescind the RVP exemption for fuel with 10% ethanol and allow for oxygen contents up to 3.7% if the Predictive Model weighted emissions to not exceed original standards	12/11/98
Consumer products Adopted amendments to add new VOC test mothods, to modify Method 310 to quantify low vapor pressure VOC (LVP-VOC) constituents, and to exempt LVP-VOC from VOC content limits	11/19/98
Consumer products Approved amendments to extend the 1999 VOC compliance deadline for several aerosol coatings, antiperspirants and deodorants, and other consumer products categories to 2002, to exempt methyl acetate from the VOC definition, and make other minor changes	11/19/98
Low-emission vehicle program (LEV II) Adopted regulations adding exhaust emission standards for most sport utility vehicles, pick-up trucks and mini-vans, lowering tailpipe standards for cars, further reducing evaporative emission standards, and providing additional means for generating zero-emission vehicle credits	11/5/98 9/17/99 EO
Off-road engine aftermarket parts Approved imiplementation of a new program to test and certify aftermarket parts in gasoline and diesel, light-duty through heavy duty, engines used in off-road vehicles and equipment	11/19/98 10/1/99 EO 7/18/00 EO
Off-road spark ignition engines Adopted new emission standards for small and large spark ignition engines for off-road equipment, a new engine certification program, an in-use compliance testing program, and a three-year phase-in for large LSI	10/22/98
Gasoline deposit control additives Adopted amendments to decertify pre-RFG additives, tighten the inlet valve deposit limits, add a combustion chamber deposit limit, and modify the test procedures to align with the characteristics of reformulated gasoline formulations	9/24/98 4/5/99 EO
Stationary source test methods Adopted amendments to stationary source test methods to align better with federal methods	8/27/98 7/2/99 EO
Locomotive MOA for South Coast Memorandum of agreement (MOA) signed by ARB, U.S. EPA, and major railroads to concentrate cleaner locomotives in the South Coast by 2010 and fulfill a 1994 ozone SIP commitment	7/2/98
Gasoline vapor recovery Adopted amendments to certification and test methods to add methods for onboard refueling vapor recovery, airport refuelers, and underground tank interconnections, and make minor changes to existing methods	5/21/98 8/27/98
Reformulated gasoline Approved amendments to rescind the wintertime oxygenate requirement, allow for sulfur content averaging, and make other minor technical amendments	8/27/98
Ethylene oxide sterilizers Adopted amendments to the ATCM to streamline source testing requirements, add EtO limits in water effluent from control devices, and make other minor changes	5/21/98
Chrome platers Adopted amendments to ATCM to harmonize with requirements of federal NESHAP standards for chrome plating and chromic acid anodizing facilities	5/21/98
On-road heavy-duty vehicles Approved amendments to align on-road heavy duty vehicle engine emission standards with EPA's 2004 standards and align certification, testing, maintenance, and durability requirements with those of EPA	4/23/98 2/26/99 EO
Small off-road engines (SORE) Approved amendments to grant a one-year delay in implementation, relaxation of emissions standards for non-handheld engines, emissions durability requirements, averaging/banking/trading, harmonization with the federal diesel engine regulation, and modifications to the production line testing requirements	3/26/98
Heavy duty vehicle smoke inspection program Adopted amendments to require annual smoke testing, set opacity limits, and exempt new vehicles from testing for the first four years	12/11/97 3/2/98 EO
Consumer products (hairspray credit program) Adopted standards for the granting of tradable emission reduction credits achieved by sales of hairspray products having VOC contents less than required limits	11/13/97

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Light-duty vehicle off-cycle emissions Adopted standards to control excess emissions from aggressive driving and air conditioner use in light duty vehicles and added two light duty vehicle test methods for certification of new vehicles under these standards	7/24/97 3/19/98 EO
Consumer products Adopted amendments to add VOC limits to 18 categories of consumer products used in residential and industrial cleaning, automobile maintenance, and commercial poisons	7/24/97
Enhanced evaporative emissions standards Adopted amendments extending the compliance date for ultra-small volume vehicle manufacturers by one year	5/22/97
Emission reduction credit program Adopted standards for District establishment of ERC programs including certification, banking, use limitation, and reporting requirements	5/22/97
Lead as a toxic air contaminant Adopted an amendment to designate inorganic lead as a toxic air contaminant	4/24/97
Consumer products (hair spray) Adopted amendments to (1) delay a January 1, 1998, compliance deadline to June 1, 1999, (2) require progress plans from manufacturers, and (3) authorize the Executive Officer to require VOC mitigation when granting variances from the June 1, 1999 deadline	3/27/97
Portable engine registration program (PERP) Adopted standards for (1) the permitting of portable engines by ARB and (2) District recognition and enforcement of permits	3/27/97
Liquefied petroleum gas Adopted amendments to extend the compliance deadline from January 1, 1997, to January 1, 1999, for the 5% propene limit in liquefied petroleum gas used in motor vehicles	3/27/97
Onboard diagnostics, phase II Adopted amendments to extend the phase-in of enhanced catalyst monitoring, modify misfire detection requirements, add PVC system and thermostat monitoring requirements, and require manufacturers to sell diagnostic tools and service information to repair shops	12/12/96
Consumer products Adopted amendments to delay 25% VOC compliance date for aerosol adhesives, clarify portions of the regulation, exempt perchloroethylene from VOC definition, extend the sell-through time to three years, and add perchloroethylene reporting requirements	11/21/96
Consumer products (test method) Adopted an amendment to add Method 310 for the testing of VOC content in consumer products	11/21/96
Pollutant transport designation Adopted amendments to modify transport couples from the Broader Sacramento area and add couples to the newly formed Mojave Desert and Salton Sea Air Basins	11/21/96
Diesel fuel certification test methods Approved amendments specifying the test methods used for quantifying the constituents of diesel fuel	10/24/96 6/4/97 EO
Wintertime requirements for utility engines & off-highway vehicles: optional hydrocarbon and NOx standards for snowthrowers and ice augers, raising CO standard for specialty vechiles under 25hp	9/26/96
Large off-road diesel Statement of Principles National agreement between ARB, U.S. EPA, and engine manufacturers to reduce emissions from heavy-duty off-road diesel equipment four years earlier than expected in the 1994 SIP for ozone	9/13/96
Regulatory improvement initiative Rescinded two regulations relating to fuel testing in response to Executive Order W-127-95	5/30/96
Zero emission vehicles Adopted amendments to eliminate zero emission vehicle quotas between 1998 and 2002, and approved MOUs with seven automobile manufacturers to accelerate release of lower emission "49 state" vehicles	3/28/96 7/24/96 EO
CaRFG variance requirements Approved amendments to add a per gallon fee on non-compliant gasoline covered by a variance and to made administrative changes in variance processing and extension	1/25/96 2/5/96 EO 4/2/96 EO
Utility and lawn and garden equipment engines Adopted an amendment to relax the CO standard from 300 to 350 ppm for Class I and II utility engines	1/25/96
National security exemption of military tactical vehicles: such vehicles would not be required to adhere to exhaust emission standards	12/14/95
CaRFG regulation amendments Approved amendments to allow for downstream addition of oxygenates and expansion of compliance options for gasoline formulation	12/14/95
Required additives in gasoline (deposit control additives): terms, definitions, reporting requirements, and tes procedures for compliance are to be clarified	11/16/95
CaRFG test method amendments Approved amendments to designate new test methods for benzene, aromatic hydrocarbon, olefin, and sulfur content of gasoline	10/26/95
Motor vehicle inspection and maintenance program: handled by BAR	10/19/95 by BAR

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Antiperspirants and deordorants, consumer products, and aerosol coating products: ethanol exemption for all products, modifications to aerosol special requirements, modifications for regulatory language consistency, modifications to VOC definition.	9/28/95
Low emission vehicle (LEV III) standards: reactivity adjustment factors, introduction of medium-duty ULEVs, window labels, and certification requirements and test procedures for LEVs	9/28/95
Medium- and heavy-duty gasoline trucks Expedited introduction of ultra-low emission medium-duty vehicles and lower NOx emission standards for heavy-duty gasoline trucks to fulfill a 1994 ozone SIP commitment	9/1/95
Retrofit emission standards: all vehicle classes to be included in the alternate durability test plan, kit manufacturers to be allowed two years to validate dterioration factors under the test plan, update retrofit procedures allowing manufacturers to disable specific OBDs if justified by law.	7/27/95
Gasoline vapor recovery systems: adopts revised certification and test procedures	6/29/95
Onboard refueling vapor recovery standards: 1998 and subsequent MY engine cars, LD trucks, and MD trucks less then 8500 GVWR	6/29/1995 4/24/96 EO
Heavy duty vehicle exhaust emission standards for NOx: amendments to standards and test procedures for 1985 and subsequent MY HD engines, amendments to emission control labels, amendments to Useful Life definition and HD engines and in-use vehicle recalls	6/29/95
Aerosol coatings regulation Adopted regulation to meet California Clean Air Act requirements and a 1994 ozone SIP commitment	3/23/95
Periodic smoke inspection program: delays start of PSIP from 1995 to 1996	12/8/94
Onboard diagnostics phase II: amendments to clarify reg language, ensure maximum effectiveness, and address manufacturer concerns regarding implementation.	12/8/94
Alternative control plan (ACP) for consumer products: a voluntary, market-based VOC emissions cap upon a grouping of consumer products, flexible by manufacturer, that will minimize overall costs of emission reduction methods and programs.	9/22/94
Diesel fuel certification: new specifications for diesel engine certification fuel, amended oxygen specification for CNG certification fuel, and amended commercial motor vehicle liquefied petroleum gas regulations.	9/22/94
Utility and lawn and garden equipment (UGLE) engines: modification to emission test procedures, ECLs, defects warranty, quality-audit testing, and new engine compliance testing.	7/28/94
Evaporative emissions standards and test procuedures Adopted evaporative emissions standards for medium-duty vehicles	2/10/94
Off-road recreational vehicles Adopted emission control regulations for off-road motorcycles, all-terrain vehicles, go-karts, golf carts, and specialty vehicles	1/1/94
Perchloroethylene from dry cleaners Adopted measure to control perchloroethylene emissions from dry cleaning operations	10/1/93
Wintertime oxygenate program: amendments to the control time period for San Luis Obispo County, exemption for small retailers bordering Nevada, flexibility in gasoline delivery time, calibration of ethanol blending equipment, gasoline oxygen content test method	9/9/93
Onboard diagnostic phase II	7/9/93
Urban transit buses Amended regulation to tighten state NOx and particulate matter (PM) standards for urban transit buses beyond federal standards beginning in 1996	6/10/93
1-year implementation delay in emission standards for utility engines	4/8/93
Non-ferrous metal melting Adopted Air Toxic Control Measure for emissions of cadmium, arsenic, and nickel from non-ferrous metal melting operations	1/1/93
Certifications requirements for low emission passenger cars, light-duty trucks & medium duty vehicles	1/14/93
Airborne toxic control measure for emissions of toxic metals from non-ferrous metal melting	12/10/92
Periodic self-inspection program Implemented state law establishing a periodic smoke self-inspection program for fleets operating heavy-duty diesel-powered vehicles	12/10/92
Notice of general public interest for consumer products	11/30/92
Substitute fuel or clean fuel incorporated test procedures	11/12/92
New vehicle testing using CaRFG Phase 2 gasoline Approved amendments to require the use of CaRFG Phase 2 gasoline in the certification of exhaust emissions in new vehicle testing	8/13/92

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Standards and test procedures for alternative fuel retrofit systems	5/14/92
Alternative motor vehicle fuel certification fuel specification	3/12/92
Heavy-duty off-road diesel engines Adopted the first exhaust emission standards and test procedures for heavy-duty off-road diesel engines beginning in 1996	1/9/92
Consumer Products - Tier II Adopted Tier II of regulations to reduce emissions from consumer products	1/9/92
Wintertime oxygen content of gasoline Adopted regulation requiring the addition of oxygenates to gasoline during winter to satisfy federal Clean Air Act mandates for CO nonattainment areas	12/1/91
CaRFG Phase 2 Adopted CaRFGPphase 2 specifications including lowering vapor pressure, reducing the sulfur, olefin, aromatic, and benzene content, and requiring the year-round addition of oxygenates to achieve reductions in ROG, NOx, CO, oxides of sulfur (SOx) and toxics	11/1/91
Low emissions vehicles amendments revising reactivity adjust factor (RAF) provisions and adopting a RAF for M85 transitional low emission vehicles	11/14/91
Onboard diagnostic, phase II	11/12/91
Onboard diagnostics for light-duty trucks and light & medium-duty motor vehicles	9/12/91
Utility and lawn & garden equipment Adopted first off-road mobile source controls under the California Clean Air Act regulating utility, lawn and garden equipment	12/1/90
Control for abrasive blasting	11/8/90
Roadside smoke inspections of heavy-duty vehicles Adopted regulations implementing state law requiring a roadside smoke inspection program for heavy-duty vehicles	11/8/90
Consumer Products Tier I Adopted Tier I of standards to reduce emissions from consumer products	10/11/90
CaRFG Phase I Adopted CaRFG Phase I reformulated gasoline regulations to phase-out leaded gasoline, reduce vapor pressure, and require deposit control additives	9/1/90
Low-emission vehicle (LEV) and clean fuels Adopted the landmark LEV/clean fuel regulations which called for the gradual introduction of cleaner cars in California. The regulations also provided a mechanism to ensure the availability of alternative fuels when a certain number of alternative fuel vehicles are sold	9/1/90
Evaporative emissions from vehicles Modified test procedure to include high temperatures (up to 105 F) and ensure that evaporative emission control systems function properly on hot days	8/9/90
Dioxins from medical waste incinerators Adopted Airborne Toxic Control Measure to reduce dioxin emissions from medical waste incinerators	7/1/90
CA Clean Air Act guidance for permitting Approved California Clean Air Act permitting program guidance for new and modified stationary sources in nonattainment areas	7/1/90
Consumer products BAAQMD	6/14/90
Medium duty vehicle emission standards Adopted three new categories of low emission MDVs, required minimum percentages of production, and established production credit and trading	6/14/90
Medium-duty vehicles Amended test procedures for medium-duty vehicles to require whole-vehicle testing instead of engine testing. This modification allowed enforcement of medium-duty vehicle standards through testing and recall	6/14/90
Ethylene oxide sterilizers Adopted Airborne Toxic Control Measure to reduce ethylene oxide emissions from sterilizers and aerators	5/10/90
Asbestos in serpentine rock Adopted Airborne Toxic Control Measure for asbestos-containing serpentine rock in surfacing applications	4/1/90
Certification procedure for aftermarket parts	2/8/90
Antiperspirants and deodorants Adopted first consumer products regulation, setting standards for antiperspirants and deodorants	11/1/89
Residential woodstoves Approved suggested control measure for the control of emissions from residential wood combustion	11/1/89
On-Board Diagnostic Systems II Adopted regulations to implement the second phase of on-board diagnostic requirements which alert drivers of cars, light-trucks and medium-duty vehicles when the emission control system is not functioning properly	9/1/89
Cars and light-duty trucks Adopted regulations to reduce ROG and CO emissions from cars and light trucks by 35 percent	6/1/89
Architectural coatings Approved a suggested control measure to reduce ROG emissions from architectural coatings	5/1/89

Air Resources Board Control Measures, 1985 - 2015

Board Action	Hearing Date
Chrome from cooling towers Adopted Airborne Toxic Control Measure to reduce hexavalent chromium emissions from cooling towers	3/1/89
Reformulated Diesel Fuel Adopted regulations requiring the use of clean diesel fuel with lower sulfur and aromatic hydrocarbons beginning in 1993	11/1/88
Vehicle Recall Adopted regulations implementing a recall program which requires auto manufacturers to recall and fix vehicles with inadequate emission control systems (Vehicles are identified through in-use testing conducted by the ARB)	9/1/88
Suggested control measure for oil sumps Approved a suggested control measure to reduce emissions from sumps used in oil production operations	8/1/88
Chrome platers Adopted Airborne Toxic Control Measure to reduce emissions of hexavalent chromium emissions from chrome plating and chromic acid anodizing facilities	2/1/88
Suggested control measure for boilers Approved suggested control measure to reduce NOx emissions from industrial, institutional, and commercial boilers, steam generators and process heaters	9/1/87
Benzene from service stations Adopted Airborne Toxic Control Measure to reduce benzene emissions from retail gasoline service stations (Also known as Phase II vapor recovery)	7/1/87
Agricultural burning guidelines Amended existing guidelines to add provisions addressing wildland vegetation management	11/1/86
Heavy-duty vehicle certification Amended certification of heavy-duty diesel and gasoline-powered engines and vehicles to align with federal standards	4/1/86
Cars and light-duty trucks Adopted regulations reducing NOx emissions from passenger cars and light-duty trucks by 40 percent	4/1/86
Sulfur in diesel fuel Removed exemption for small volume diesel fuel refiners	6/1/85
On-Board Diagnostics I Adopted regulations requiring the use of on-board diagnostic systems on gasoline-powered vehicles to alert the driver when the emission control system is not functioning properly	4/1/85
Suggested control measure for wood coatings Approved a suggested control measure to reduce emissions from wood furniture and cabinet coating operations	3/1/85
Suggested control measure for resin manufacturing Approved a suggested control measure to reduce ROG emissions from resin manufacturing	1/1/85

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Appendix D

Mobile Source Control Strategy

2016 PLAN FOR THE 2008 8-HOUR OZONE STANDARD

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Appendix D: Mobile Source Control Strategy

Mobile sources—on-road and off-road combined—account for over 85% of the San Joaquin Valley's total NOx emissions. According to the emissions inventory in Appendix B, mobile source emissions will decrease by nearly 42% from the 2012 baseline year to the 2031 attainment deadline due to already-adopted regulations and associated engine, fuel, and fleet improvements. However, the Valley's total vehicle miles traveled (VMT) are predicted to increase about 36% over the 2012-2031 timeframe, as the Valley remains a fast growing region and continues to serve as one of the state's major goods movement corridors. Additionally, as EPA promulgates increasingly stringent standards, and the District has already reduced over 80% of stationary source emissions within its jurisdiction, coming into attainment will continue to be difficult. Considering all of this in conjunction with the magnitude of the Valley's attainment challenges, it is clear that mobile source emissions reductions must be a key component of the District's strategies to attain EPA's health-based air quality standards.

Despite the need for mobile source control measures, the District does not have the authority to directly regulate the mobile source engines themselves. As discussed in *Chapter 5: Attainment Strategy*, the District has adopted innovative regulations such as Indirect Source Review (ISR) and Employer-based Trip Reduction (eTRIP) to reduce emissions from mobile sources, but only the state of California and the federal government can directly regulate tailpipe emissions from mobile sources. Additionally, land use decisions, such as building new roads, are controlled by the individual cities and eight counties that make up the District, despite the fact that these decisions can affect VMT (and therefore emissions). As such, the Air Resources Board (ARB) and Metropolitan Planning Organizations (MPOs) have adopted a number of comprehensive regulations and programs that have helped the District meet Valley air quality challenges. This appendix, provided by the California Air Resources Board, discusses these key mobile source strategies and demonstrates that these programs will cause a decrease in emissions despite an increase in VMT.

D.1 Key Statewide Mobile Source Regulations and Programs Providing Emission Reductions

Given the severity of California's air quality challenges and the need for ongoing emission reductions, the ARB has implemented the most stringent mobile source emissions control program in the nation. ARB's comprehensive program relies on four fundamental approaches:

- Stringent emissions standards that minimize emissions from new vehicles and equipment;
- In-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- Cleaner fuels that minimize emissions during combustion; and,
- Incentive programs that remove older, dirtier vehicles and equipment and pay for early adoption of the cleanest available technologies.

This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and pre-date the federal *Clean Air Act Amendments (Act) of 1970*, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of ARB's efforts, the Act provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards under Section 209(b). This waiver provision preserves a pivotal role for California in the control of emissions from new motor vehicles, recognizing that California serves as a laboratory for setting motor vehicle emission standards. Since then, the ARB has consistently sought and obtained waivers and authorizations for its new motor vehicle regulations. ARB's history of progressively strengthening standards as technology advances, coupled with the waiver process requirements, ensures that California's regulations remain the most stringent in the nation. A list of regulatory actions ARB has taken since 1985 is provided in Attachment A to highlight the scope of ARB's actions to reduce mobile source emissions.

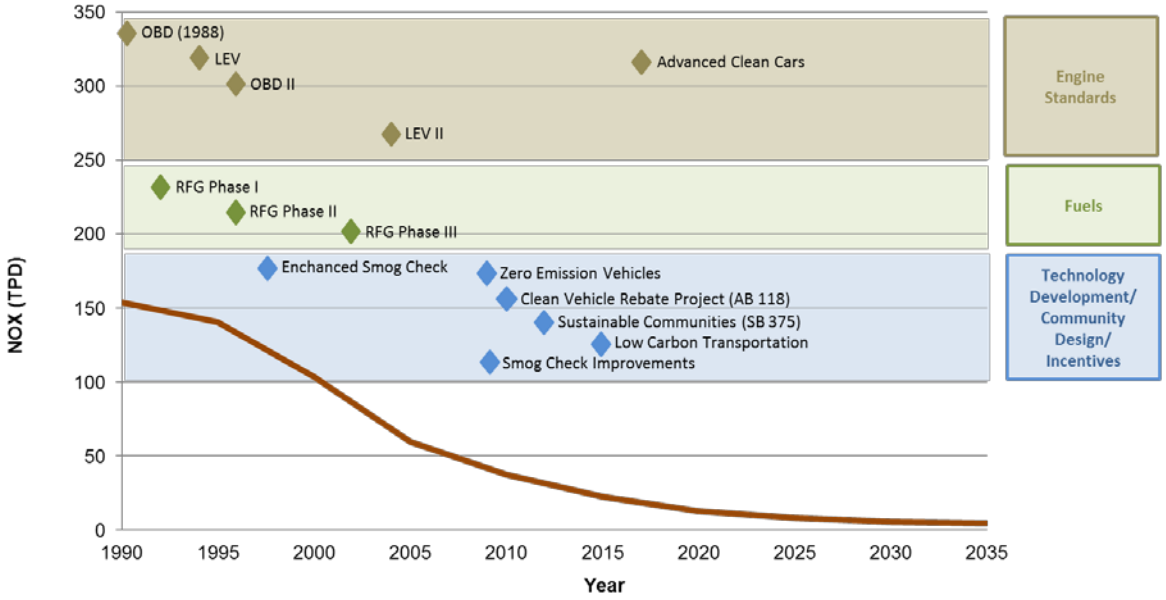
Recently, ARB adopted numerous regulations aimed at reducing exposure to diesel particulate matter and oxides of nitrogen, from freight transport sources like heavy duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will produce increasing emission reduction benefits from now until 2031 and beyond, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

Further, ARB and San Joaquin Valley district staff work closely on identifying and distributing incentive funds to accelerate cleanup of engines. Key incentive programs include: the Carl Moyer Program; the Goods Movement Program; the Lower-Emission School Bus Program; and the Air Quality Improvement Program (AQIP). These incentive-based programs work in tandem with regulations to accelerate deployment of cleaner technology.

D.1.1 Light-Duty Vehicles

Figure D-1 illustrates the trend in NOx emissions from light-duty vehicles and key programs contributing to those reductions. As a result of these efforts, light-duty vehicle emissions in the San Joaquin Valley have been reduced significantly since 1990 and will continue to go down through 2031 due to the benefits of ARB's longstanding light-duty mobile source program. From today, light-duty vehicle NOx emissions are reduced by 70 percent in 2031. Key light-duty programs include Advanced Clean Cars, On-Board Diagnostics, Reformulated Gasoline, Incentive Programs, and the Enhanced Smog Check Program.

Figure D - 1 Key Programs to Reduce Light-Duty NOx Emissions



Since setting the nation's first motor vehicle exhaust emission standards in 1966 that led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. Through ARB regulations, today's new cars pollute 99 percent less than their predecessors did thirty years ago. In 1970, ARB required auto manufacturers to meet the first standards to control NOx emissions along with hydrocarbon emissions. The simultaneous control of emissions from motor vehicles and fuels led to the use of cleaner-burning reformulated gasoline (RFG) that has removed the emissions equivalent of 3.5 million vehicles from California's roads. Since ARB first adopted it in 1990, the Low Emission Vehicle Program (LEV and LEV II) and Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of hundreds of thousands of zero-emission vehicles (ZEVs) in California.

D.1.1.1 Advanced Clean Cars

ARB's groundbreaking Advanced Clean Cars (ACC) program is now providing the next generation of emission reductions in California, and ushering in a new zero emission passenger transportation system. The success of these programs is evident: California is the world's largest market for Zero Emission Vehicles (ZEVs), with over 21 models available today, and a wide variety are now available at lower price points, attracting new consumers. As of January 2015, Californians drive 40 percent of all ZEVs on the road in the United States, while the U.S. makes up about half of the world market. This movement towards commercialization of advanced clean cars has occurred due to ARB's ZEV regulation, part of ACC, which affects passenger cars and light-duty trucks.

ARB's ACC Program, approved in January 2012, is a pioneering approach of a 'package' of regulations that, although separate in construction, are related in terms of the synergy developed to address both ambient air quality needs and climate change.

The ACC program combines the control of smog, soot causing pollutants and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. The program assures the development of environmentally superior cars that will continue to deliver the performance**,** utility, and safety vehicle owners have come to expect.

The ACC program approved by ARB in January 2012 also included amendments affecting the current ZEV regulation through the 2017 model year in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. These ZEV amendments are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions. The ACC Program benefits will increase over time as new cleaner cars enter the fleet displacing older and dirtier vehicles.

D.1.1.2 On Board Diagnostics

California's first OBD regulation required manufacturers to monitor some of the emission control components on vehicles starting with the 1988 model year. In 1989, ARB adopted OBD II, which required 1996 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines to be equipped with second generation OBD systems. OBD systems are designed to identify when a vehicle's emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer's specifications. ARB subsequently strengthened OBD II requirements and added OBD II specific enforcement requirements for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines.

D.1.1.3 Reformulated Gasoline

Since 1996, ARB has been regulating the formulation of gasoline resulting in California gasoline being the cleanest in the world. California's cleaner-burning gasoline regulation is one of the cornerstones of the State's efforts to reduce air pollution and cancer risk. Reformulated gasoline is fuel that meets specifications and requirements established by ARB. The specifications reduced motor vehicle toxics by about 40 percent and reactive organic gases by about 15 percent. The results from cleaning up fuel can have an immediate impact as soon as it is sold in the State. Vehicle manufacturers design low-emission emission vehicle to take full advantage of cleaner-burning gasoline properties.

D.1.1.4 Incentives

There are a number of different incentive programs focusing on light-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs work in two ways, encouraging the retirement of dirty older cars and encouraging the purchase of a cleaner vehicle.

Voluntary accelerated vehicle retirement or "car scrap" programs provide monetary incentives to vehicle owners to retire older, more polluting vehicles. The purpose of these programs is to reduce fleet emissions by accelerating the turnover of the existing fleet and subsequent replacement with newer, cleaner vehicles. Both State and local vehicle retirement programs are available.

California's voluntary vehicle retirement program is administered by the Bureau of Automotive Repair (BAR) and provides $1,000 per vehicle and $1,500 for low-income consumers for unwanted vehicles that have either failed or passed their last Smog Check Test and that meet certain eligibility guidelines. This program is referred to as the Consumer Assistance Program.

The Enhanced Fleet Modernization Program (EFMP) was approved by the AB 118 legislation to augment the State's existing vehicle retirement program. Approximately $30 million is available annually through 2015 to fund the EFMP via a $1 increase in vehicle registration fees. ARB developed the program in consultation with BAR. The program is jointly administered by both BAR for vehicle retirement, and local air districts for vehicle replacement.

Other programs, in addition to vehicle retirement programs, help to clean up the light-duty fleet. The AQIP, established by AB 118, is an ARB voluntary incentive program to fund clean vehicle and equipment projects. The Clean Vehicle Rebate Project (CVRP) is one of the current projects under AQIP. CVRP, started in 2009, is designed to accelerate widespread commercialization of zero-emission vehicles and plug-in hybrid electric vehicles by providing consumer rebates up to $2,500 to partially offset the higher cost of these advanced technologies. The CVRP is administered statewide by the California Center for Sustainable Energy. In Fiscal Years 2009-2012, $26.1 million, including $2 million provided by the California Energy Commission, funded approximately 8,000 rebates. In June 2012, the ARB allocated up to $15-21 million to the CVRP as outlined in the AQIP FY2012-2013 Funding Plan.

D.1.1.5 California Enhanced Smog Check Program

BAR is the state agency charged with administration and implementation of the Smog Check Program. The Smog Check Program is designed to reduce air pollution from California registered vehicles by requiring periodic inspections for emission-control system problems, and by requiring repairs for any problems found. In 1998, the Enhanced Smog Check program began in which Smog Check stations relied on the BAR-97 Emissions Inspection System (EIS) to test tailpipe emissions with either a Two-Speed Idle (TSI) or Acceleration Simulation Mode (ASM) test depending on where the vehicle was registered. For instance, vehicles registered in urbanized areas received an ASM test, while vehicles in rural areas or received a TSI test.

In 2009, the following requirements were added in to improve and enhance the Smog Check Program, making it more inclusive of motor vehicles and effective on smog reductions:

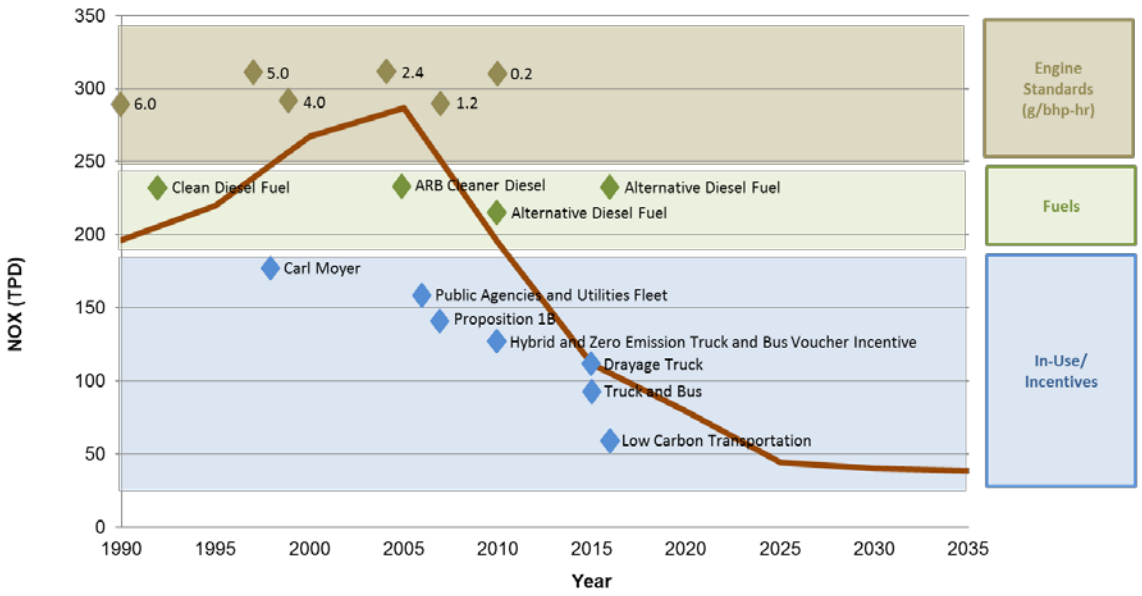
- Low pressure evaporative test;
- More stringent pass/fail cutpoints;
- Visible smoke test; and
- Inspection of light- and medium-duty diesel vehicles.

The next major change was due to AB 2289, adopted in October 2010, a new law restructuring California's Smog Check Program, streamlining and strengthening inspections, increasing penalties for misconduct, and reducing costs to motorists. This new law sponsored by ARB and BAR, promised faster and less expensive Smog Check inspections by talking advantage of OBD software installed on all vehicles since 2000. The new law also directs vehicles without this equipment to high-performing stations, helping to ensure that these cars comply with current emission standards. This program will reduce consumer costs by having stations take advantage of diagnostic software that monitors pollution-reduction components and tailpipe emissions. Beginning mid-2013, testing of passenger vehicles using OBD was required on all vehicles model years 2000 or newer.

D.1.2 Heavy-Duty Trucks

Figure D-2 illustrates the trend in NOx emissions from heavy-duty vehicles and key programs contributing to those reductions. As a result of these efforts, heavy-duty vehicle emissions in the San Joaquin Valley have been reduced significantly since 1990 and will continue to go down through 2031 due to the benefits of ARB's longstanding heavy-duty mobile source program. From today, heavy-duty NOx emissions are reduced by 60 percent in 2031. Key programs include Heavy-Duty Engine Standards, Clean Diesel Fuel, Truck and Bus Regulation and Incentive Programs.

Figure D - 2 Key Programs to Reduce Heavy-Duty Emissions



D.1.2.1 Heavy-Duty Engine Standards

Since 1990, heavy-duty engine NOx emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower-hour (g/bhp-hr) in 1990 down to the current 0.2 g/bhp-hr standard, which took effect in 2010. In addition to mandatory NOx standards, there have been several generations of optional lower NOx standards put in place over the past 15 years. Most recently in 2015, engine manufacturers can certify to three optional NOx emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard of 0.2 g/bhp-hr). The optional standards allow local air districts and ARB to preferentially provide incentive funding to buyers of cleaner trucks, to encourage the development of cleaner engines.

D.1.2.2 Clean Diesel Fuel

Since 1993, ARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter which is considered a toxic air contaminant. In 2006, ARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the ARB formulation.

D.1.2.3 Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)

The Truck and Bus Regulation was first adopted in December 2008. This rule represents a multi-year effort to turn over the legacy fleet of engines and replace them with the cleanest technology available. In December 2010, ARB revised specific provisions of the in-use heavy-duty truck rule, in recognition of the deep economic effects of the recession on businesses and the corresponding decline in emissions.

Starting in 2012, the Truck and Bus Regulation phases in requirements applicable to an increasingly larger percentage of the truck and bus fleet over time, so that by 2023 nearly all older vehicles would need to be upgraded to have exhaust emissions meeting 2010 model year engine emissions levels. The regulation applies to nearly all diesel-fueled trucks and buses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-state or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles. Approximately 170,000 businesses in nearly all industry sectors in California, and almost a million vehicles that operate on California roads each year are affected. Some common industry sectors that operate vehicles subject to the regulation include: for-hire transportation, construction, manufacturing, retail and wholesale trade, vehicle leasing and rental, bus lines, and agriculture.

ARB compliance assistance and outreach activities that are key in support of the Truck and Bus Regulation include:

- The Truck Regulations Upload and Compliance Reporting System, an online reporting tool developed and maintained by ARB staff;
- The Truck and Bus regulation's fleet calculator, a tool designed to assist fleet owners in evaluating various compliance strategies;
- ***Targeted training sessions all over the State; and***
- ***Out-of-state training sessions conducted by a contractor.***

ARB staff also develops regulatory assistance tools, conducts and coordinates compliance assistance and outreach activities, administers incentive programs, and actively enforces the entire suite of regulations. Accordingly, ARB's approach to ensuring compliance is based on a comprehensive outreach and education effort.

D.1.2.4 Incentive Programs

There are a number of different incentive programs focusing on heavy-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs encourage the purchase of a cleaner truck

.
Several State and local incentive funding pools have been used historically -- and remain available -- to fund the accelerated turnover of on-road heavy-duty vehicles. Since 1998, the Carl Moyer Program (Moyer Program) has provided funding for replacement, new purchase, repower and retrofit of trucks. Beginning in 2008, the Goods Movement Emission Reduction Program funded by Proposition 1B has funded cleaner trucks for the region's transportation corridors; the final increment of funds will implement projects in through 2018.

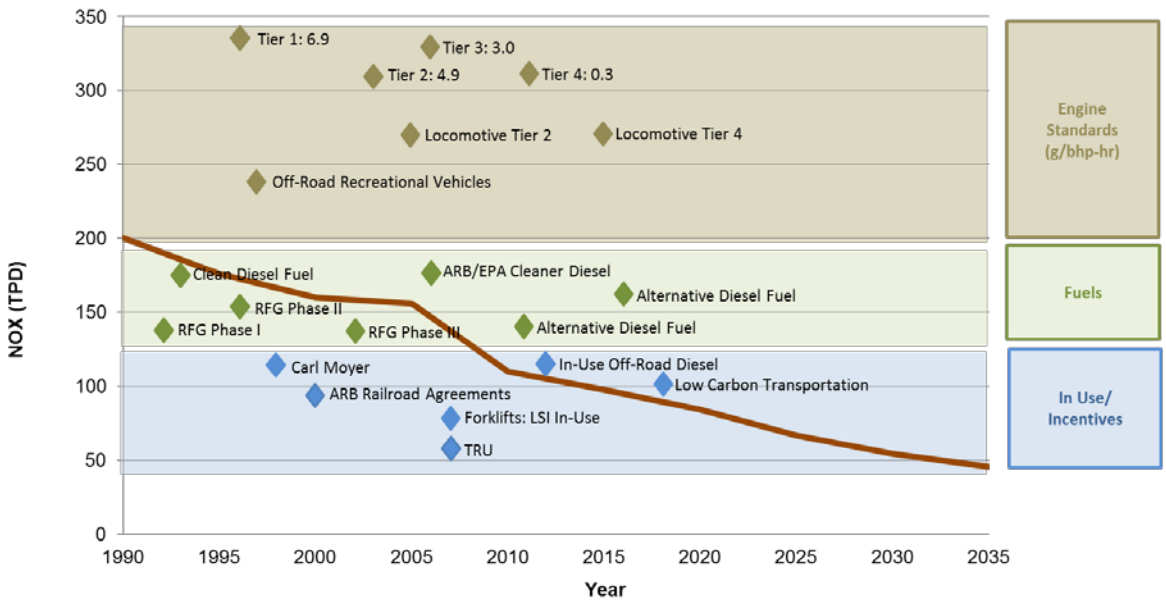
The Air Quality Improvement Program has funded the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) since 2010, and continued San Joaquin Valley participation is expected. ARB has also administered a Truck Loan Assistance Program since 2009.

D.1.3 Off-Road Sources

Off-road sources encompass equipment powered by an engine that does not operate on the road. Sources vary from ships to lawn and garden equipment and for example, include sources like locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment.

Figure D-3 illustrates the trend in NOx emissions from off-road equipment and key programs contributing to those reductions. As a result of these efforts, off-road emissions in the San Joaquin Valley have been reduced significantly since 1990 and will continue to go down through 2031 due to the benefits of ARB's and U.S. EPA longstanding programs. From today, off-road NOx emissions are reduced by 40 percent in 2031. Key programs include Off-Road Engine Standards, Locomotive Engine Standards, Clean Diesel Fuel, Cleaner In-Use Off-Road Regulation and In-Use LSI Fleet Regulation.

Figure D - 3 Key Programs to Reduce Off-Road Emissions



D.1.3.1 Off-Road Engine Standards

The Clean Air Act preempts states, including California, from adopting requirements for new off-road engines less than 175 HP used in farm or construction equipment. California may adopt emission standards for in-use off-road engines pursuant to Section 209(e)(2), but must receive authorization from U.S. EPA before it may enforce the adopted standards.

The Board first approved regulations to control exhaust emissions from small off-road engines (SORE) such as lawn and garden equipment in December 1990 with amendments in 1998 and 2003. These regulations were implemented through three tiers of progressively more stringent exhaust emission standards that were phased in between 1995 and 2008.

Manufacturers of forklift engines are subject to new engine standards for both diesel and Large Spark Ignition (LSI) engines. Off-road diesel engines were first subject to engine standards and durability requirements in 1996 while the most recent Tier 4 Final emission standards were phased in starting in 2013. Tier 4 emission standards are based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction. LSI engines have been subject to new engine standards that include both criteria pollutant and durability requirements since 2001 with the cleanest requirements phased-in starting in 2010.

D.1.3.2 Locomotive Engine Standards

The Clean Air Act and the U.S. EPA national locomotive regulations expressly preempt states and local governments from adopting or enforcing "any standard or other requirement relating to the control of emissions from new locomotives and new engines used in locomotives" (U.S. EPA interpreted new engines in locomotives to mean remanufactured engines, as well). U.S. EPA has approved two sets of national locomotive emission regulations (1998 and 2008). In 1998, U.S. EPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NOx reductions through Tier 0, 1, and 2 emission standards. Tier 2 NOx emission standards reduced older uncontrolled locomotive NOx emissions by up to 60 percent, from 13.2 to 5.5 g/bhphr.

In 2008, U.S. EPA approved a second set of national locomotive regulations. Older locomotives upon remanufacture are required to meet more stringent particulate matter (PM) emission standards which are about 50 percent cleaner than Tier 0-2 PM emission standards. U.S. EPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhphr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new Tier 4 (2015 and later model years) locomotive NOx and PM emission standards. The U.S. EPA Tier 4 NOx and PM emission standards further reduced emissions by approximately 95 percent from uncontrolled levels.

D.1.3.3 Clean Diesel Fuel

Since 1993, ARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter which is considered a toxic air contaminant. In 2006, ARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the ARB formulation.

D.1.3.4 Cleaner In-Use Off-Road Equipment (Off-Road Regulation)

The Off-Road Regulation which was first approved in 2007 and subsequently amended in 2010 in light of the impacts of the economic recession. These off-road vehicles are used in construction, manufacturing, the rental industry, road maintenance, airport ground support and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation will significantly reduce emissions of diesel PM and NOx from the over 150,000 in-use off-road diesel vehicles that operate in California. The regulation affects dozens of vehicle types used in thousands of fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer,

cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls.

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

Fleets will be subject to increasingly stringent restrictions on adding older vehicles. The regulation also sets performance requirements. While the regulation has many specific provisions, in general by each compliance deadline, a fleet must demonstrate that it has either met the fleet average target for that year, or has completed the Best Available Control Technology requirements. The performance requirements of the Off-Road Regulation are phased in from January 1, 2014 through January 1, 2019.

Compliance assistance and outreach activities in support of the Off-Road Regulation include:

- The Diesel Off-road On-line Reporting System, an online reporting tool developed and maintained by ARB staff.
- The Diesel Hotline (866-6DIESEL), which provides the regulated public with questions about the regulations and access to ARB staff. Staff is able to respond to questions in English, Spanish and Punjabi.
- The Off-road Listserv, providing equipment owners and dealerships with timely announcement of regulatory changes, regulatory assistance documents, and reminders for deadlines.

D.1.3.5 LSI In-Use Fleet Regulation

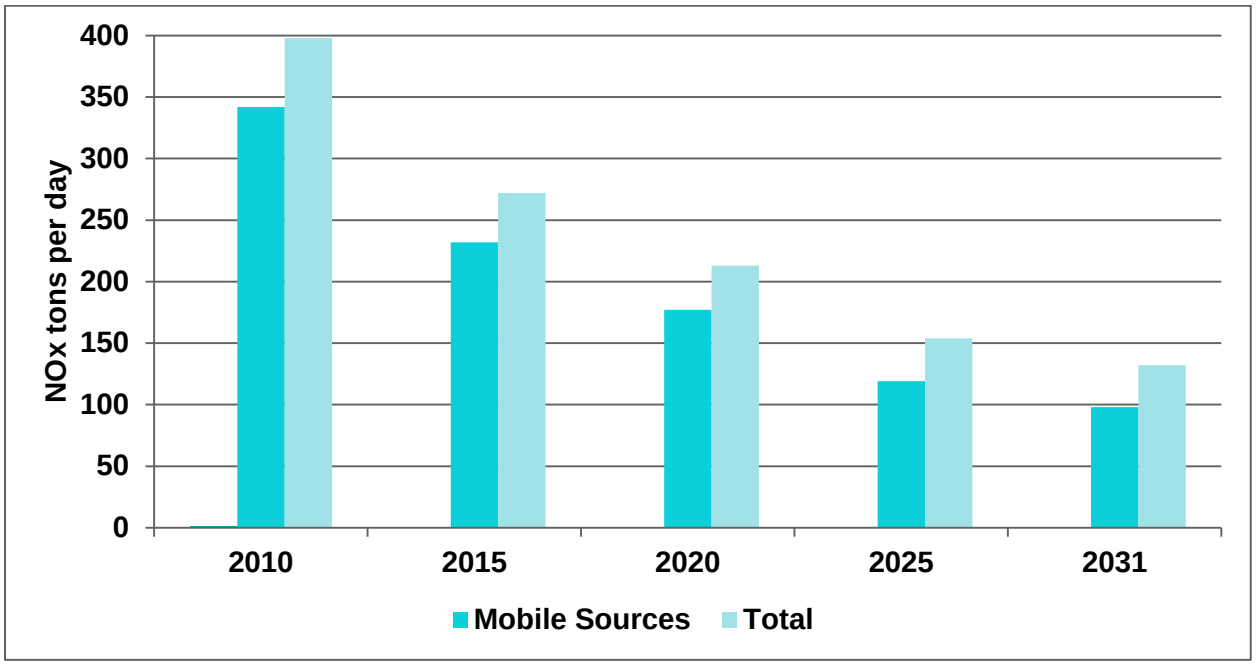
Forklift fleets can be subject to either the LSI fleet regulation, if fueled by gasoline or propane, or the off-road diesel fleet regulation. Both regulations require fleets to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards. The LSI fleet regulation was originally adopted in 2007 with requirements beginning in 2009. While the LSI fleet regulation applies to forklifts, tow tractors, sweeper/scrubbers, and airport ground support equipment, it maintains a separate fleet average requirement specifically for forklifts. The LSI fleet regulation requires fleets with four or more LSI forklifts to meet fleet average emission standards.

I. Emission Reduction Benefits of Existing Mobile Source Control Program

Air quality modeling has demonstrated that the substantial reductions from implementation of the existing mobile source control program will provide for attainment of both the 80 ppb ozone standard in 2023, and the 75 ppb ozone standard in 2031. As

shown in Figure D-4, these programs will reduce NOx emissions in the Valley by 140 tpd between 2015 and 2031.

Figure D - 4 San Joaquin Valley NOx Emission Reduction Trend



II. Air Resource Board Emission Reductions for the San Joaquin Valley

ARB staff has released the Proposed 2016 State Strategy for the State Implementation Plan (State SIP Strategy) to be considered by the Air Resources Board (Board) in September 2016. While the current control program provides the emission reductions necessary to meet the 75 ppb 8-hour ozone standard by 2031, the State SIP Strategy includes a discussion of the further NOx emission reduction benefits the proposed actions in the strategy would provide in the Valley in 2031. Those benefits include approximately 9 tpd of NOx emission reduction from measures under ARB's direct regulatory authority, which when coupled with strong action at the federal level, could achieve a total of 22 tpd of NOx reductions in 2031. After the State SIP Strategy is considered for approval by the Board later this year, ARB may propose an emissions reduction commitment for the San Joaquin Valley to the Board to be considered for approval for submittal to U.S. EPA.

D.2 TRANSPORTATION CONFORMITY

D.2.1 Transportation Conformity

Section 176(c) of the *Federal Clean Air Act* (CAA) establishes transportation conformity requirements which are intended to ensure that transportation activities do not interfere with air quality progress. The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals be consistent with, or *conform to* applicable state implementation plans (SIP) before being approved by a Metropolitan Planning Organization (MPO). Conformity to the SIP means that proposed transportation activities must not:

(1) Cause or contribute to any new violation of any standard,
(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.

A SIP analyzes the region's total emissions inventory from all sources necessary to demonstrate reasonable further progress (RFP), attainment, or maintenance of the National Ambient Air Quality Standards (NAAQS). The portion of the total emissions inventory from on-road highway and transit vehicles which provides RFP and attainment of the NAAQS in these analyses becomes the "motor vehicle emissions budget". [1] Motor vehicle emissions budgets are the mechanism for ensuring that transportation planning activities conform to the SIP. Budgets are set for each criteria pollutant or its precursors that the area does not attain and it is set for each RFP milestone year and the attainment year.

D.2.1.1 Requirements for Demonstrating Conformity

The eight metropolitan planning organizations (MPOs) in the Valley each prepare a long range regional transportation plan (RTP) at least every four years and a short range funding program, or regional transportation improvement program (RTIP) every two years. Content of both the RTP and RTIP are specified in federal transportation law found at Titles 23 and 49 of the federal code of regulations and applicable sections of state transportation planning law.

Before adopting the RTP/RTIP, the MPO prepares a regional emissions analysis using the proposed plan and program and compares those emissions to the emission budgets in the SIP. The MPO may determine RTP/RTIP conforms if the emissions from the proposed actions are less than the emissions budgets in the SIP. The conformity

[1] 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. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the EPA in the August 15, 1997 Federal Register.

determination also signifies that the MPO has met other transportation conformity requirements such as interagency consultation and financial constraint.

D.2.1.2 Conformity Budgets

The emissions budgets presented in Attachment B use EMFAC2014 with MPO modeled VMT and speed distributions. The VMT and speed distribution data for each MPO are from the most recently amended 2015 Federal Transportation Improvement Program (FTIP) as of March 22, 2016. Air Resources Board (ARB) staff released a revised emission rate program, EMFAC2014, which updates the emission rates and planning assumptions used in calculating conformity budgets. EMFAC2014 was approved for use in SIPs and transportation conformity by U.S. EPA on December 14, 2015.

Section 93.124(e) of the federal conformity rule provides that nonattainment areas with more than one Metropolitan Planning Organization (MPO) may establish motor vehicle emission budgets for each MPO in the nonattainment area. This plan establishes county-level emission budgets for each MPO for the Rate of Progress (RFP) years of 2018, 2021, 2024, 2027 and 2030, and the attainment year of 2031 in the San Joaquin Valley.

Calculation Methodology

The budgets have been constructed in consultation with the eight Valley MPOs using emissions for a summer average day consistent with the attainment and progress demonstrations in this plan, using the following method:

1) Calculate the on road motor vehicle emissions totals for ROG and NOx from EMFAC2014 for each of the eight Valley MPOs;
2) Round each of the eight county MPO totals up to the nearest tenth ton for ROG and NOx.

The total of the eight Valley MPO budgets for ROG and NOx differ slightly from the total emissions of ROG and NOx in the San Joaquin Valley used in the RFP and attainment demonstrations due to the round up methodology and slight differences in motor vehicle activity in the most recent Valley RTPs. These differences however are less than one half of one percent (0.5%) of the Valley total of ROG and NOx in all progress years and the attainment year.

Table D- 1 San Joaquin Valley Transportation Conformity Budgets[1]

County Subarea	2018		2021		2024		2027		2030		2031	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
Fresno	8.0	27.7	6.4	22.2	5.4	14.1	4.9	13.2	4.5	12.6	4.3	12.5
Kern (SJV)	6.6	25.4	5.5	20.4	4.8	12.6	4.5	11.7	4.2	10.9	4.1	10.8
Kings	1.3	5.1	1.1	4.2	0.9	2.6	0.9	2.5	0.8	2.3	0.8	2.3
Madera	1.9	5.1	1.5	4.1	1.2	2.6	1.1	2.3	0.9	2.0	0.9	2.0
Merced	2.5	9.4	2.0	7.8	1.6	4.8	1.5	4.4	1.3	4.2	1.3	4.1
San Joaquin	5.9	13.0	4.9	10.3	4.2	6.9	3.8	6.2	3.5	5.7	3.3	5.5
Stanislaus	3.8	10.5	3.0	8.3	2.6	5.6	2.3	5.1	2.1	4.7	2.0	4.7
Tulare	3.7	9.5	2.9	7.2	2.4	4.7	2.2	4.1	1.9	3.8	1.9	3.7

[1] All emissions are expressed as summer tons/ day and were calculated using EMFAC2014 (December 14, 2015). VMT and speed distribution data for each MPO are from the most recently amended 2015 Federal Transportation Improvement Program (FTIP) as of March 22, 2016.

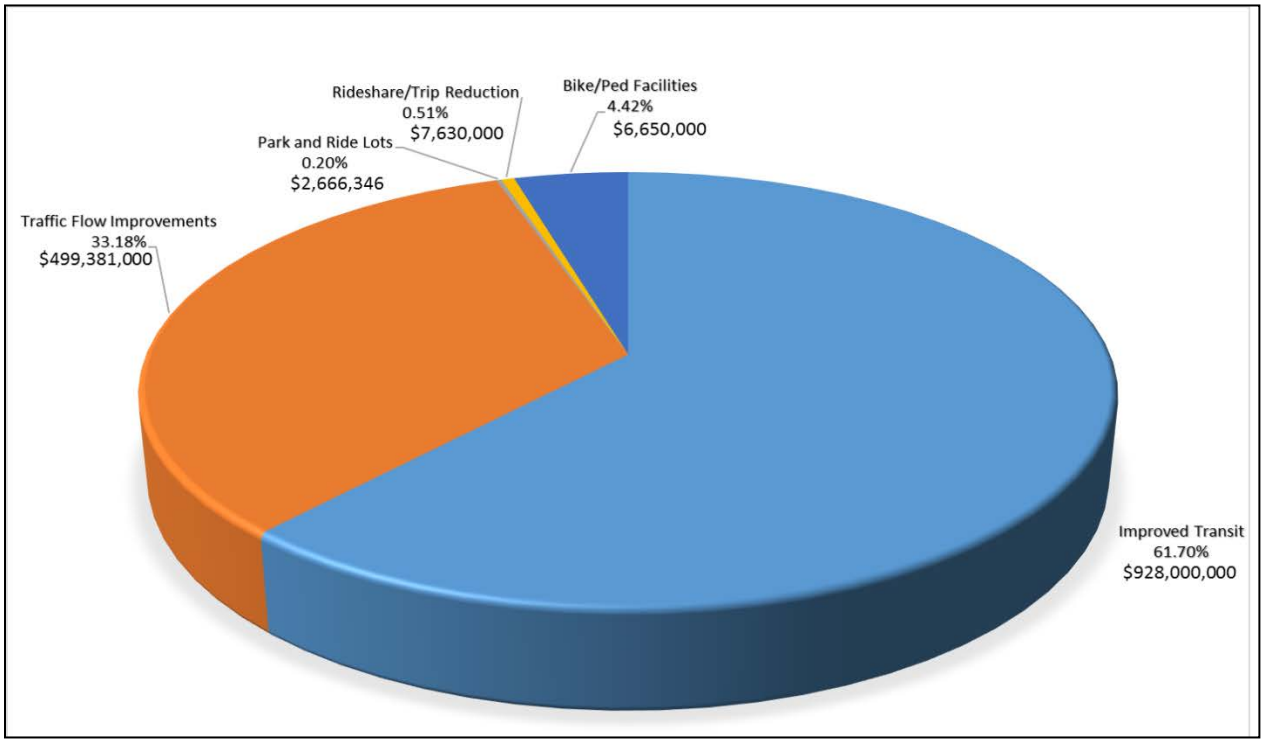
D.2.2 Local Reasonably Available Control Measures (RACM)

Transportation Control Measures (TCMs) in CAA §108(f) are currently being implemented by the Valley MPOs as part of the adopted Congestion Mitigation and Air Quality (CMAQ) cost effectiveness policy and in the development of each Regional Transportation Plan (RTP).

Valley MPOs continue to implement the adopted San Joaquin Valley CMAQ Policy, which was included in the District's *2007 Ozone Plan*, *2008 PM2.5 Plan, 2012 PM2.5 Plan*, *2015 PM2.5 Plan, and 2016 Ozone Plan*. The CMAQ policy includes a standardized process for distributing 20 percent of the CMAQ funds to projects that meet a minimum cost effectiveness beginning in fiscal year 2011. This policy focuses on achieving the most cost effective emissions reductions, while maintaining flexibility to meet local needs. The policy feasibility and minimum cost effectiveness standard was revisited in 2013 as part of the 2013 Federal Transportation Improvement Program (FTIP) development; the minimum cost effectiveness standard was also revisited in 2015 as part of the 2015 FTIP development.

Figure 6-2 provides an illustration of funding allocated valley-wide in the 2015 FTIPs for a sample of TCM categories: improved transit; high occupancy vehicle lanes; traffic flow improvements; park and ride lots; ridesharing/trip reduction programs; bicycle/pedestrian facilities. These tables demonstrate the eight SJV MPOs' commitment to the implementation of TCMs throughout the Valley. As the Valley MPOs implement TCMs through the current policies, all reasonable transportation control measures are being implemented.

Figure D - 5 Illustration of Valley MPO Funding for Sample TCM Categories



Each Valley MPO is required to update its RTP every four years. The RTP is a long-term regional transportation plan that provides a vision for transportation investments throughout the Valley. The 2014 RTPs integrate land use and transportation planning to achieve, where feasible, regional greenhouse gas (GHG) targets set by ARB pursuant to Senate Bill 375 (SB-375).

To further illustrate the eight SJV MPOs commitment to the implementation of TCMs throughout the Valley, the RTPs contains a host of improvements to every component of the regional multimodal transportation system including:

- ***Active transportation (non-motorized transportation, such as biking and walking)***
- ***Transportation demand management (TDM)***
- ***Transportation system management (TSM)***
- ***Transit***
- ***Passenger rail***
- ***Goods movement***
- ***Aviation and airport ground access***
- ***Highways***
- ***Arterials***
- ***Operations and maintenance***

Included within these transportation system improvements are TCM projects that reduce vehicle use or change traffic flow or congestion conditions. TCMs include the following categories of transportation improvement projects and programs:

- ***Improved Transit***
- ***High Occupancy Vehicle Lanes***
- ***Traffic Flow Improvements***
- ***Park and Ride Lots***
- ***Ridesharing/Trip Reduction Programs***
- ***Bicycle/Pedestrian Facilities***

As the San Joaquin Valley MPOs are implementing TCMs through the current policies, all reasonable transportation control measures are being implemented, as expressed in the *2016 Ozone Plan*, *2015 PM2.5 Plan, 2013 Plan for the Revoked 1-hour Ozone Standard,* and the *2012 PM2.5 Plan.* Therefore, there are no emissions reductions associated with unused regulatory control measures.

D.2.3 SB-375

The Sustainable Communities and Climate Protection Act of 2008 (Sustainable Communities, SB-375) enhances California's strategy to reduce GHG emissions through the coordination of transportation and land-use to reduce vehicle miles traveled per person through the development of a Sustainable Community Strategy. SB-375 identifies specific reduction goals for each of California's MPOs in 2020 and 2035 which the Sustainable Community Strategy must meet, if feasible. For the Valley, the SB-375 target reductions are a 5% per capita GHG emissions reductions from 2005 by 2020 and a 10% per capita GHG emissions reductions from 2005 by 2035. The strategies contained in the RTP/SCS produce benefits for the region far beyond simply reducing GHG emissions. The SCS integrates the transportation network and related strategies with an overall land use pattern that responds to projected growth, housing needs, changing demographics, and transportation demands. As a result, Sustainable Community Strategy development is anticipated to complement the reduction strategies outlined in the *2016 Ozone Plan*.

D.3 VMT OFFSETS

In 1979, U.S. EPA established a primary health-based national ambient air quality standard (NAAQS) for ozone at 0.12 parts per million (ppm) averaged over a 1-hour period. See 44 Fed.Reg. 8220 (February 9, 1979). The *Clean Air Act* (CAA), as amended in 1990, classified areas that had not yet attained the 1-hour standard, based on the severity of their ozone problem, ranging from Marginal to Extreme. Extreme areas were provided the most time to attain, until November 15, 2010, but were also subject to the most stringent requirements. In particular, Severe and Extreme areas were subject to CAA Section 182(d)(1)(A), which requires state implementation plans to adopt "specific enforceable transportation control strategies and transportation control measures to offset any growth in vehicle miles traveled or numbers of vehicle trips in such area…." U.S. EPA designated the San Joaquin Valley Air Basin as "Extreme" for the 1- hour standard on April 16, 2004 (69 Fed Reg 20550). Thus the San Joaquin Valley Air Basin was subject to this requirement under the 1-hour standard.

In 1997, U.S. EPA replaced the 1-hour ozone standard with an 8-hour standard of 0.08 ppm [62 Fed.Reg. 38856 (July 18, 1997)]. The U.S. EPA promulgated rules implementing the 8-hour standard with the "Phase 1" rule being was issued on April 30, 2004 (69 Fed.Reg. 23951), and the "Phase 2" rule, issued on November 29, 2005 (70 Fed. Reg. 71612). These implementation rules required that areas classified as Severe or Extreme under the 1997 8-hour standard would also be subject to the VMT offset requirement. U.S. EPA approved VMT offset demonstrations for the San Joaquin Valley for both the 1-hour and 8-hour ozone standards on April 5, 2015 (81 Fed Reg 19493).

D.3.1 2008 Ozone Standard

In 2008, U.S. EPA revised the 8-hour ozone NAAQS to a level of 0.075 parts per million. (73 Fed.Reg 16436, March 27, 2008). The San Joaquin Valley was subsequently designated non-attainment for the 2008 standard on May 21, 2012 and classified as an extreme non-attainment area (77 Fed.Reg 30087), making the San Joaquin Valley subject to the requirements of CAA Section 182(d)(1)(A) for the 2008 8-hour ozone NAAQS.

D.3.2 U.S. EPA Guidance on VMT Offset Requirement

In August 2012, U.S. EPA issued guidance titled "Implementing *Clean Air Act* Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Travelled". Among other things, U.S. EPA's guidance points out that subsequent court decisions regarding previous VMT offset demonstrations omitted any reference to "transportation control strategies" (TCS). TCSs, which are not defined in the CAA or U.S. EPA regulation, are eligible to offset growth in emissions due to growth in VMT. The U.S. EPA's new guidance indicates that technology improvements such as vehicle technology improvements, motor vehicle fuels, and other control strategies that are transportation-related could be used to offset increases in emissions due to VMT. U.S. EPA's revised

guidance sets forth a method of calculating the actual growth in emissions due to growth in VMT. Essentially, the state would compare projected attainment year emissions assuming no new control measures and no VMT growth with projected actual attainment year emissions (including new control measures and VMT growth). If the latter number is smaller than the former, no additional transportation control measures or strategies would be required. If additional transportation control measures and transportation control strategies are required, they should be clearly identified and distinguished from the measures included in the initial calculations for the base year and the three scenarios identified for the attainment year.

In addition, the guidance recommends that the base year used in the demonstration be the base year used in the attainment demonstration for the ozone standard. To address U.S. EPA's guidance, 2012 is used in this demonstration as the base year for the 2008 8-hour standard. Consistent with U.S. EPA guidance, emissions of VOC are used to determine compliance with the VMT offset requirement.

D.3.3 Transportation Control Strategies and Transportation Control Measures

By listing them separately, the *Clean Air Act* [CAA §182(d)(1)(A)] differentiates between transportation control strategies (TCS) and transportation control measures (TCM), and thus provides for a wide range of strategies and measures as options to offset growth in emissions from vehicle miles traveled (VMT) growth. In addition, the example TCMs listed in Section 108(f)(1)(A) of the CAA include measures that reduce emissions by reducing VMT, reducing tailpipe emissions, and removing dirtier vehicles from the fleet. California's motor vehicle control program includes a variety of strategies and measures including new engine standards and in-use programs (e.g., smog check, vehicle scrap, fleet rules, idling restrictions). TCMs developed by the eight San Joaquin Valley Metropolitan Planning Organizations (MPOs) provide additional reductions. In addition, the eight MPOs report every two years on the implementation status of TCMs in their jurisdiction.

Based on the provisions in Section 182(d)(1)(A) and the clarifications provided in the U.S. EPA guidance, any combination of transportation control strategies and TCMs may be used to meet the requirement to offset growth in emissions resulting from VMT growth. Since 1990 when this requirement was established, California has adopted more than sufficient enforceable transportation strategies and measures to meet the requirement to offset the growth in emissions from VMT growth. For the 2008 8-hour standard offset demonstration, 2012 controls are used as the base case control level since 2012 is the base year of the SIP

A list of the state's mobile source control program adopted since 1990 is provided in Attachment C. In addition, a list of TCMs implemented in the San Joaquin Valley Air Basin is provided in Attachment D.

D.3.4 Emissions Due To VMT Growth

As discussed above, U.S. EPA guidance does provide a recommended calculation methodology to determine if sufficient transportation control strategies and TCMs have been adopted and implemented to offset the growth in emissions due solely to growth in VMT. As such, any increase in emissions solely from VMT increases in the future attainment year from the base year (assuming that there are no further motor vehicle control programs implemented after the base year) would need to be offset. In addition, a calculation is needed to show the emissions levels if VMT had remained constant from the base year to the future attainment year. As discussed earlier, a comparison of the projected attainment year emissions assuming no new control measures and no VMT growth with projected actual attainment year emissions (including new control measures and VMT growth) would be made. If the latter number is smaller than the former, no additional transportation control measures or strategies would be required.

D.3.5 Methodology

The following calculations are based on the U.S. EPA guidance recommended calculation methodology. As shown for the 8-hour ozone standard, 2012 is the base year used for the attainment demonstration and 2031 is the attainment year.

Analysis Tool

This analysis uses California's approved motor vehicle emissions model, EMFAC. The EMFAC model estimates the emissions from two combustion processes: running exhaust and start exhaust, and four evaporative processes: hot soak, running losses, diurnal, and resting losses.

Emissions from running exhaust, start exhaust, hot soak, and running losses are a function of how much a vehicle is driven. Emissions from these processes are directly related to VMT, trips, and starts. These processes are included in the calculation of the emissions levels used in the VMT offset demonstration. Emissions from resting loss and diurnal loss processes are not related to VMT, trips or vehicle starts and are not included in the analysis because these emissions occur regardless if the vehicle makes a trip (i.e., a start) or not.

EMFAC combines trip-based VMT from the regional transportation planning agencies, starts data based on household travel surveys, and vehicle population data from the Department of Motor Vehicles with corresponding emission rates to calculate emissions. [1]

1 More information on data sources can be found in the EMFAC technical document which is located on the web at: http://www.arb.ca.gov/msei/emfac2011-technical-documentation-final-updated-0712-v03.pdf

With the EMFAC model, the calculation of emissions growth and whether it is offset is simplified to a comparison of future year emissions with "no growth" in VMT or new control strategies to future emissions with VMT growth and new control strategies. This follows U.S. EPA's 2012 guidance and is consistent with the court's interpretation of CAA section 182(d)(1)(A).

Analysis Using 2012 as the Base Year for the 2008 8-hour Ozone Standard with Attainment Year of 2031.

Step 1. Provide the emissions level for the base year.

Table D-2 shows the VOC emissions, VMT, starts, and vehicle population for calendar year 2012 from the EMFAC2014 model.

Table D-2 Summary of 2012 Baseline Year

	VMT (thousand miles/day)	Starts (thousands/day)	Vehicle Population (thousands)	VOC Emissions* (tons/day)
2012 Base Year	96,934	16,624	2,655	50

* Does not include diurnal or resting loss emissions.

Step 2. Calculate three emissions levels in the attainment year.

For the attainment year,

(1) Calculate emissions level with the motor vehicle control program frozen at 2012 levels and with projected VMT, starts, and vehicle population for the attainment year. This represents what the emissions in the attainment year would have been if transportation control strategies and TCMs had not been implemented after 2012;

(2) Calculate emissions level with the motor vehicle control program frozen at 2012 levels and assuming VMT, starts, and vehicle population do not increase from 2012 levels; and

(3) Calculate an emissions level that represents emissions with full implementation of all transportation control strategies and TCMs since 2002 and which represents the projected future year baseline emissions inventory using the VMT, starts, and vehicle population for the attainment year.

Calculation 1. ***Calculate the emissions in the attainment year assuming no new measures since the base year, and including growth in VMT, starts, and vehicle population.***

To perform this calculation, California Air Resources Board (CARB) staff identified the on-road motor vehicle control programs adopted since 2012 and adjusted EMFAC2014 to reflect the VOC emissions levels in 2031 without the benefits of the post-2012 control programs. The projected VOC emissions are 22 tons/day.

Calculation 2. Calculate the emissions with no growth in VMT, starts, or vehicle population.

In this calculation, the VOC emission levels in calendar year 2031 without benefit of the post 2012 control program are calculated. EMFAC2014 allows a user to input different VMT, starts, and vehicle population than default. For this calculation, EMFAC2014 was run without the benefit of the post 2012 control program for calendar year 2031 with the 2012 level of VMT of 96,934,216 miles per day, the 2012 level of starts at 16,623,711 per day, and the 2012 level of population at 2,665,304 vehicles. The VOC emissions associated with 2012 VMT, starts, and vehicle population in calendar year 2031 are 17 tons/day.

Calculation 3. Calculate emission reductions with full Implementation of Transportation Control Strategies & TCMs.

The VOC emission levels for 2031 assuming the benefits of the post-2012 motor vehicle control program and the projected VMT, starts, and vehicle population in 2031 are calculated using EMFAC2014. The projected VOC emissions level is 14 tons/day. VOC emissions for the three sets of calculations described above are summarized in table D-3.

Table D-3 Summary of 2031 Attainment Year Emissions Levels

	Description	VMT* (miles/day, thousands)	Starts (thousands/day)	Vehicle Population (thousands)	VOC Emissions** (tons/day)
(1)	**Emissions with Motor Vehicle Control Program Frozen at 2012 Levels.** (VMT, starts and vehicle population at 2031 levels.)	131,835	20,572	3,423	22
(2)	**Emissions with Motor Vehicle Control Program Frozen at 2012 Levels.** (VMT, starts, and vehicle population at 2012 levels)	96,934	16,624	2,655	17
(3)	**Emissions with Full Motor Vehicle Control Program in Place** (VMT, starts and vehicle population at 2031 levels)	131,835	20,572	3,423	14

* CY 2031 VMT based on 2015 FTIPs from the 8 San Joaquin Valley MPOs

** Does not include diurnal or resting loss emissions.

As provided in the U.S. EPA guidance, to determine compliance with the provisions of Section 182(d)(1)(A) of the federal *Clean Air Act*, the emissions levels calculated in Calculation 3 should be less than the emissions levels in Calculation 2:

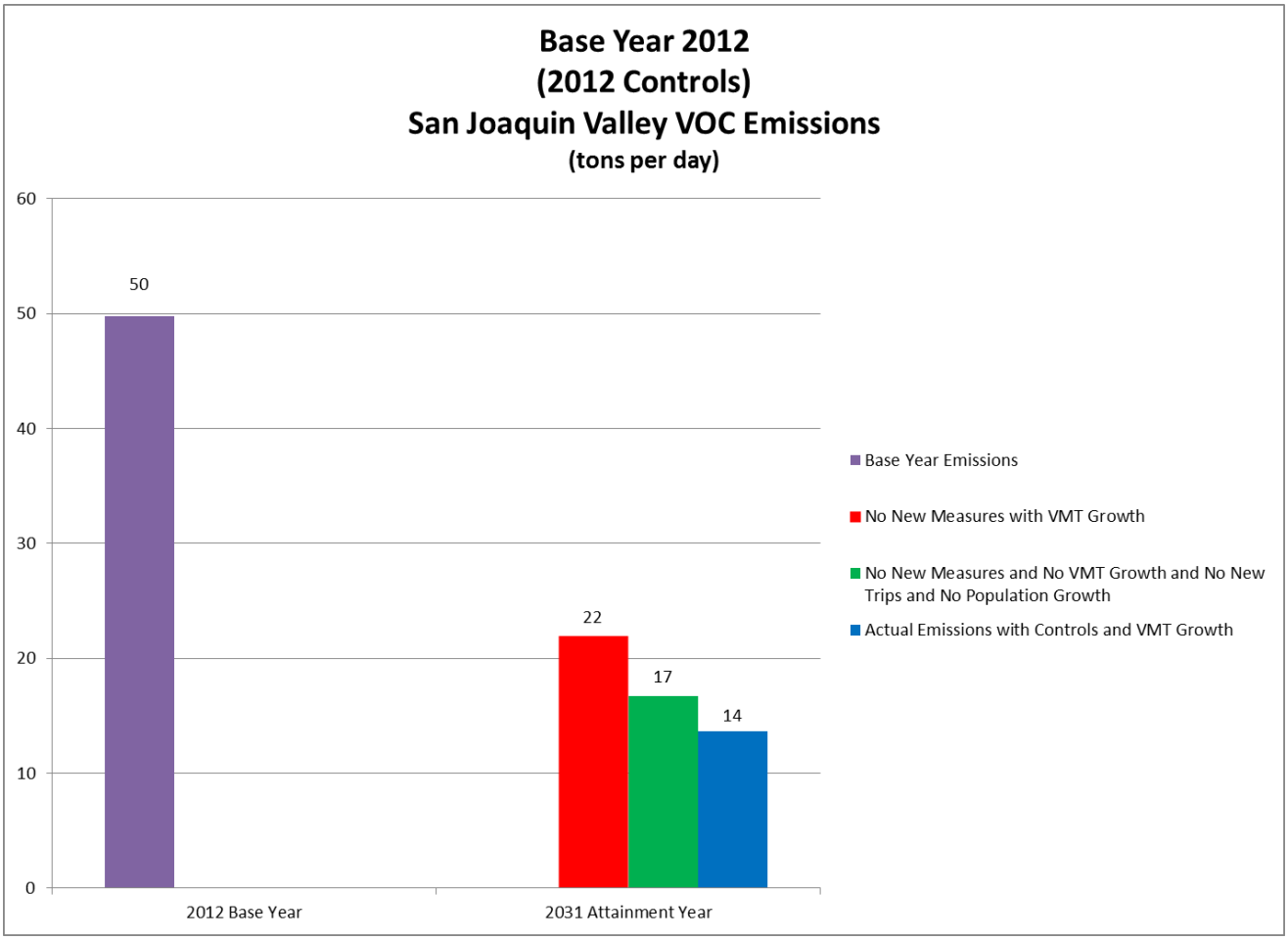
VOC: 14 < 17 tons/day

D.3.6 Summary

The previous sections provide an analysis to demonstrate compliance with the provisions of Section 182(d)(1)(A) of the federal Clean Air Act. To further illustrate the demonstration, Figure 1 below show graphically the emissions benefits of the motor vehicle control programs in offsetting VOC emissions due to increased VMT, starts, and vehicle population in the San Joaquin Valley Air Basin for the 2008 8-hour ozone standard (2012 base year). The left bar (in purple) shows the emissions in the base year with base year controls. The three bars on the right in each figure show the

emissions levels in the attainment year for the three calculations identified above: the red bar shows attainment year emissions with base year controls and attainment year VMT, starts, and vehicle population, the green bar shows attainment year emissions with base year controls, VMT, starts, and vehicle population, and the blue bar shows attainment year emissions with attainment year controls, VMT, starts, and vehicle population. Based on the U.S. EPA guidance, if the blue bar is lower than the green bar, then the identified transportation control strategies and TCMs are sufficient to offset the growth in emissions.

Figure D - 6 VOC Emissions* from On-Road Mobile Sources in the San Joaquin Valley Air Basin (2012 Base Year)



* Does not include resting or diurnal loss emissions

ATTACHMENT A: ARB'S MOBILE SOURCE REGULATORY ACTIONS SINCE 1985

Board Action	Hearing Date
Amendments to the Portable Fuel Container Regulation Amendments to the Portable Fuel Container (PFC) regulation, which include requiring certification fuel to contain 10 percent ethanol, harmonizing aspects of the Board's PFC certification and test procedures with those of the U.S. EPA, revising the ARB's certification process, and streamlining, clarifying, and increasing the robustness of ARB's certification and test procedures.	2/18/16
Technical Status and Proposed Revisions to On-Board Diagnostic System Requirements and Associated Enforcement Provisions for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines (OBD II) Amendments to the OBD II regulations that update requirements to account for LEV III applications and monitoring requirements for gasoline and diesel vehicles, and clarify and improve the regulation; also, updates to the associated OBD II enforcement regulation to align it with the proposed amendments to the OBD II regulations and a minor amendment to the definition of "emissions-related part" in title 13, CCR section 1900.	9/25/15
2015 Low Carbon Fuel Standard (LCFS) Amendments (2 of 2) Re-adoption of the Low Carbon Fuel Standard, which includes updates and revisions to the regulation now in effect. The proposed regulation was first presented to the Board at its February 2015 public hearing, at which the Board directed staff to make modifications to the proposal.	9/24/15
Proposed Regulation on the Commercialization of Alternative Diesel Fuels (2 of 2) Regulation governing the introduction of alternative diesel fuels into the California commercial market, including special provisions for biodiesel.	9/24/15
CA Cap on GHG Emissions and Market-Based Compliance Mechanisms (2 of 2) Amendments to the Cap and Trade Regulation to include a new Rice Cultivation Compliance Offset Protocol and an update to the United States Forest Compliance Offset Protocol that would include project eligibility in parts of Alaska.	6/25/15
Intermediate Volume Manufacturer Amendments to the Zero Emission Vehicle Regulation (2 of 2) Amendments regarding intermediate volume manufacturer compliance obligations under the Zero Emission Vehicle regulation.	5/21/15
2015 Amendments to Certification Procedures for Vapor Recovery Systems at Gasoline Dispensing Facilities—Aboveground Storage Tanks and Enhanced Conventional Nozzles Amendments would establish new performance standards and specifications for nozzles used at fleet facilities that exclusively refuel vehicles equipped with onboard vapor recovery systems, would provide regulatory relief for owners of certain existing aboveground storage tanks, and would ensure that mass-produced vapor recovery equipment matches the specifications of equipment evaluated during the ARB certification process.	4/23/15
Proposed Regulation for the Commercialization of Alternative Diesel Fuels (1 of 2) Regulation governing the introduction of alternative diesel fuels into the California commercial market, including special provisions for biodiesel. This is the first of two hearings on the item, and the Board will not take action to approve the proposed regulation.	2/19/15
Evaporative Emission Control Requirements for Spark-Ignition Marine Watercraft Regulation for controlling evaporative emissions from spark-ignition marine watercraft. The proposed regulation will harmonize, to the extent feasible, with similar federal requirements, while adding specific provisions needed to support California's air quality needs.	2/19/15
2015 Low Carbon Fuel Standard (LCFS) Amendments (1 of 2) Regulation for a Low Carbon Fuel Standard that includes re- adoption of the existing Low Carbon Fuel Standard with updates and revisions. This is the first of two hearings on the item, and the Board will not take action to approve the proposed regulation.	2/19/15
CA Cap on GHG Emissions and Market-Based Compliance Mechanisms to Add the Rice Cultivation Projects and Updated U.S. Forest Projects Protocols (1 of 2) Updates to the Cap and Trade Regulation to include a new Rice Cultivation Compliance Offset Protocol and an update to the United States Forest Compliance Offset Protocol that would include project eligibility in parts of Alaska.	12/18/14
2014 Amendments to ZEV Regulation Additional compliance flexibility to ZEV manufacturers working to bring advanced technologies to market.	10/23/14
LEV III Criteria Pollutant Requirements for Light- and Medium-Duty Vehicles the Hybrid Electric Vehicle Test Procedures, and the HD Otto-Cycle and HD Diesel Test Procedures Applies to the 2017 and subsequent model years.	10/23/14
Amendments to Mandatory Reporting Regulation for Greenhouse Gases Further align reporting methods with USEPA methods and factors, and modify reporting requirements to fully support implementation of California's Cap and Trade program.	9/19/14

Board Action	Hearing Date
Amendments to the California Cap on Greenhouse Gas Emissions and Market Based Compliance Mechanisms Technical revisions to Mandatory Reporting of Greenhouse Gas Emissions Regulation to further align reporting methods with U.S.EPA update methods and factors, and modify reporting requirements to fully support implementation of California's Cap and Trade program.	9/18/14
Amendments to the AB 32 Cost of Implementation Fee Regulation Amendments to the regulation to make it consistent with the revised mandatory reporting regulation, to add potential reporting requirements, and to incorporate requirements within the mandatory reporting regulation to streamline reporting.	9/18/14
Low Carbon Fuel Standard 2014 Update As a result of a California Court of Appeal decision, ARB will revisit the LCFS rulemaking process to meet certain procedural requirements of the APA and CEQA. Following incorporation of any modifications to the regulation, the Board will consider the proposed regulation for adoption at a second hearing held in the spring of 2015.	7/24/14
Revisions to the Carl Moyer Memorial Air Quality Standards Attainment Program Guidelines for On-Road Heavy-Duty Trucks Revisions to 1) reduce surplus emission reduction period, 2) reduce minimum CA usage requirement, 3) prioritize on-road funding to small fleets, 4) include light HD vehicles 14000-19500 libs, and 5) clarify program specifications.	7/24/14
Amendments to Enhanced Fleet Modernization (Car Scrap) Program Amendments consistent with SB 459 which requires ARB to increase benefits for low-income California residents, promote cleaner replacement vehicles, and enhance emissions reductions.	6/26/14
Proposed Approval of Amendments to CA Cap on GHG Emissions and Market-Based Compliance Mechanisms Second hearing of two, continued from October 2013.	4/24/14
Truck and Bus Rule Update Amendments to the Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen, and Other Criteria Pollutants From In-Use On-Road Diesel-Fueled Vehicles: increasing low-use vehicle thresholds, allowing owners to newly opt-in to existing flexibility provisions, adjusting "NOx exempt" vehicle provisions, and granting additional time for fleets in certain areas to meet PM filter requirements.	4/24/14
Heavy-Duty GHG Phase I: On-Road Heavy-Duty GHG Emissions Rule, Tractor-Trailer Rule, Commercial Motor Vehicle Idling Rule, Optional Reduced Emission Standards, Heavy-Duty Hybrid-Electric Vehicles Certification Procedure New GHG standards for MD and HD engines and vehicles identical to those adopted by the USEPA in 2011 for MYs 2014-18.	12/12/13
Agricultural equipment SIP credit rule Incentive-funded projects must be implemented using Carl Moyer Program Guidelines; must be surplus, quantifiable, enforceable, and permanent, and result in emission reductions that are eligible for SIP credit.	10/25/13
Mandatory Report of Greenhouse Gas Emissions Approved a regulation that establishes detailed specifications for emissions calculations, reporting, and verification of GHG emission estimates from significant sources.	10/25/13
CA Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Technical revisions to the Mandatory Reporting of Greenhouse Gas Emissions Regulation to further align reporting methods with U.S.EPA, update factors, and modify definitions to maintain consistency with the Cap and Trade program.	10/25/13
Zero emission vehicle test procedures Existing certification test procedures for plug-in hybrid vehicles need to be updated to reflect technology developments. The ZEV regulation will require minor modifications to address clarity and implementation issues.	10/24/13
Consumer Products: Antiperspirants, Deodorants, Test Method 310, Aerosol Coatings, Proposed Repeal of Hairspray Credit) Amendments to require various consumer products to reformulate to reduce VOC or reactivity content to meet specified limits, and to clarify various regulatory provisions, improve enforcement, and add analytical procedures.	9/26/13
Alternative fuel certification procedures Amendments to current alternative fuel conversion certification procedures for motor vehicles and engines that will allow small volume conversion manufacturers to reduce the upfront demonstration requirements and allow systems to be sold sooner with lower certification costs than with the current process, beginning with MY 2018.	9/26/13

Board Action	Hearing Date
Vapor Recovery for Gasoline Dispensing Facilities Amendments to certification and test procedures for vapor recovery equipment used on cargo tanks and at gasoline dispensing facilities.	7/25/13
Off-highway recreational vehicle evaporative emission control Staff proposes to set evaporative emission standards to control hydrocarbon emissions from Off-Highway Recreational Vehicles. The running loss, hot soak, and diurnal performance standards can be met by using proven automobile type control technology.	7/25/13
Gasoline and diesel fuel test standards Adopted amendments to add test standards for the measurement of prohibited oxygenates at trace levels specified in existing regulations.	1/25/13
LEV III and ZEV Programs for Federal Compliance Option Adopted amendments to deem compliance with national GHG new vehicle standards in 2017-2025 as compliance with California GHG standards for the same model years.	11/15/12 12/6/12 EO
Consumer products (automotive windshield washing fluid) Adopted amendments to add portions of 14 California counties to the list of areas with freezing temperatures where 25% VOC content windshield washing fluid could be sold.	10/18/2012 EO 03/15/13
GHG mandatory reporting, Fee Regulation, and Cap and Trade 2012 Adopted amendments to eliminate emission verification for facilities emitting less than 25,000 MTCO2e and make minor changes in definitions and requirements.	9/20/12 11/2/12 EO
Amendments to Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines Approved amendments to the verification procedure used to evaluate diesel retrofits through emissions, durability, and field testing. Amendments will lower costs associated with required in-use compliance testing, streamline the in-use compliance process, and will extend time allowed to complete verifications.	8/23/2012 EO 07/02/13
Amendments to On-Board Diagnostics (OBD I and II) Regulations Approved amendments to the light- and medium-duty vehicle and heavy-duty engine OBD regulations.	8/23/2012 EO 06/26/13
Cap and Trade: Amendments to CA Cap on GHG Emissions and Market-Based Compliance Mechanisms, and Amendments Allowing Use of Compliance Instruments Issued by Linked Jurisdictions Amends Cap-and-Trade and compliance mechanisms to add security to the market system and to aid staff in implementation. Amendments include first auction rules, offset registry, market monitoring provisions, and information gathering necessary for the financial services operator.	6/28/12 7/31/12 EO
Vapor recovery defect list Adopted amendments to add defects and verification procedures for equipment approved since 2004, and make minor changes to provide clarity	6/11/12 EO
Tractor-Trailer GHG Regulation: Emergency Amendment Adopted emergency amendment to correct a drafting error and delay the registration date for participation in the phased compliance option	2/29/2012 2/29/12 EO
Advanced Clean Cars (ACC) Regulation: Low-Emission Vehicles and GHG Adopted more stringent criteria emission standards for MY 2015-2025 light and medium duty vehicles (LEV III), amended GHG emission standards for model year 2017-2025 light and medium duty vehicles (LEV GHG), amended ZEV Regulation to ensure the successful market penetration of ZEVs in commercial volumes, amended hydrogen fueling infrastructure mandate of the Clean Fuels Outlet regulation, and amended cert fuel for light duty vehicles from an MTBE-containing fuel to an E10 certification fuel.	1/26/12
Zero Emission Vehicle (ZEV) Adopted amendments to increase compliance flexibility, add two new vehicle categories for use in creating credits, increase credits for 300 mile FCVs, increase requirements for ZEVs and TZEVs, eliminate credit for PZEVs and AT PZEVs, expand applicability to smaller manufacturers, base ZEV credits on range, and make other minor changes in credit requirements	1/26/12
Amendments to Low Carbon Fuel Standard Regulation The amendments address several aspects of the regulation, including: reporting requirements, credit trading, regulated parties, opt-in and opt-out provisions, definitions, and other clarifying language.	12/16/11 10/10/12 EO

Board Action	Hearing Date
Amendments to Small Off-Road Engine and Tier 4 Off-Road Compression-Ignition Engine Regulations And Test Procedures; also "Recreational Marine" Spark-Ignition Marine Engine Amendments (Recreational Boats) adopted. Aligns California test procedures with U.S. EPA test procedures and requires off-road CI engine manufacturers to conduct in-use testing of their entire product lines to confirm compliance with previously established Not-To-Exceed emission thresholds.	12/16/2011 10/25/12 EO
Regulations and Certification Procedures for Engine Packages used in Light-Duty Specially Constructed Vehicles (Kit Cars) Ensures that certified engine packages, when placed into any Kit Car, would meet new vehicle emission standards, and be able to meet Smog Check requirements.	11/17/11 9/21/12 EO
Amendments to the California Reformulated Gasoline Regulations Corrects drafting errors in the predictive model, deletes outdated regulatory provisions, updates the notification requirements, and changes the restrictions on blending CARBOB with other liquids.	10/21/11 8/24/12 EO
Amendments to the In-Use Diesel Transport Refrigeration Units (TRU) ATCM Mechanisms to improve compliance rates and enforceability.	10/21/11 8/31/12 EO
Amendments to the AB 32 Cost of Implementation Fee Regulation Clarifies requirements and regulatory language, revises definitions.	10/20/11 8/21/12 EO
Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Including Compliance Offset Protocols Greenhouse Gas Emissions Cap-and-Trade Program, including compliance offset protocols and multiple pathways for compliance.	10/21/11 8/21/12 EO
Amendments to the Regulation for Cargo Handling Equipment (CHE) at Ports and Intermodal Rail Yards (Port Yard Trucks Regulation) Provides additional compliance flexibility, and maintains anticipated emissions reductions. As applicable to yard trucks and two-engine sweepers.	9/22/11 8/2/12 EO
Amendments to the Enhanced Vapor Recovery Regulation for Gasoline Dispensing Facilities New requirement for low permeation hoses at gasoline dispensing facilities.	9/22/11 7/26/12 EO
Amendments to Cleaner Main Ship Engines and Fuel for Ocean-Going Vessels Adjusts the offshore regulatory boundary. Aligns very low sulfur fuel implementation deadlines with new federal requirements.	6/23/11 9/13/12 EO
Particulate Matter Emissions Measurement Allowance For Heavy-Duty Diesel In-Use Compliance Regulation Emission measurement allowances provide for variability associated with the field testing required in the regulation.	6/23/11
Low Carbon Fuel Standard Carbon Intensity Lookup Table Amendments Adds new pathways for vegetation-based fuels	2/24/11
Amendments to Cleaner In-Use Heavy-Duty On-Road Diesel Trucks and LSI Fleets Regulations Amends five regulations to provide relief to fleets adversely affected by the economy, and take into account the fact that emissions are lower than previously predicted.	12/16/10 9/19/11 EO
Tractor-Trailer GHG Regulation Amendment Enacts administrative changes to increase compliance flexibility and reduce costs	12/16/10
Amendments to Cleaner In-Use Off-Road Diesel-Fueled Fleets Regulation Amendments provide relief to fleets adversely affected by the economy, and take into account the fact that emissions are lower than previously predicted.	12/16/10 10/28/11 EO
In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities Amendments add flexibility to fleets' compliance schedules, mitigate the use of noncompliant trucks outside port and rail properties, and provide transition to the Truck and Bus regulation.	12/16/10 9/19/11 EO
Amendments to the Regulation for Mandatory Reporting of Greenhouse Gas Emissions Changes requirements to align with federal greenhouse gas reporting requirements adopted by US EPA.	12/16/10 10/28/11 EO
Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation Establishes framework and requirements for Greenhouse Gas Emissions Cap-and-Trade Program, including compliance offset protocols.	12/16/10 10/26/11 EO
Amendments to the Consumer Products Regulation Amendments set new or lower VOC limits for some categories, prohibit certain toxic air contaminants, high GWP compounds, and surfactants toxic to aquatic species. Also changes Method 310, used to determine aromatic content of certain products.	11/18/10 9/29/11 EO
Amendment of the ATCM for Diesel Transportation Refrigeration Units (TRU) Amendments expand the compliance options and clarify the operational life of various types of TRUs.	11/18/10 2/2/11 EO
Amendments to the ATCM for Stationary Compression Ignition Engines Approved amendments to closely align the emission limits for new emergency standby engines in the ATCM with the emission standards required by the federal Standards of Performance.	10/21/10 3/25/11 EO

Board Action	Hearing Date
Diesel Vehicle Periodic Smoke Inspection Program Adopted amendments to exempt medium duty diesel vehicles from smoke inspection requirements if complying with Smog Check requirements.	10/21/10 8/23/11 EO
Renewable Electricity Standard Regulation Approved a regulation that will require electricity providers to obtain at least 33% of their retail electricity sales from renewable energy resources by 2020.	9/23/10
Energy Efficiency at Industrial Facilities Adopted standards for the reporting of GHG emissions and the feasibility of emissions controls by the largest GHG-emitting stationary sources.	7/22/10 5/9/11 EO
Accelerated Introduction of Cleaner Line-Haul Locomotives Agreement with railroads sets prescribed reductions in diesel risk and target years through 2020 at four major railyards.	6/24/10
Amendments to Commercial Harbor Craft Regulation Approved amendments to require the use of cleaner engines in diesel-fueled crew and supply, barge, and dredge vessels.	6/24/10 4/11/11 EO
Amendments to New Passenger Motor Vehicle Greenhouse Gas Emission Standards Approved amendments deeming compliance with EPA's GHG standards as compliance with California's standards in 2012 through 2016 model years.	2/25/2010 03/29/10
Sulfur Hexafluoride (SF6) Regulation Regulation to reduce emissions of sulfur hexafluoride (SF6), a high-GWP GHG, from high-voltage gas-insulated electrical switchgear.	2/25/10 12/15/10 EO
Amendments to the Statewide Portable Equipment Registration Regulation and Portable Engine ATCM Approved amendments that extend the deadline for removal of certain uncertified portable engines for one year.	1/28/10 8/27/10 EO 12/8/10 EO
Diesel Engine Retrofit Control Verification, Warranty, and Compliance Regulation Amendments Approved amendments to require per-installation compatibility assessment, performance data collection, and reporting of additional information, and enhance enforceability.	1/28/10 12/6/10 EO
Stationary Equipment High-GWP Refrigerant Regulation Approved a regulation to reduce emissions of high-GWP refrigerants from stationary non-residential equipment.	12/1/09 9/14/10 EO
Amendments to Limit Ozone Emissions from Indoor Air Cleaning Devices Adopted amendments to delay the labeling compliance deadlines by one to two years and to make minor changes in testing protocols.	12/9/09
Emission Warranty Information Reporting Regulation Amendments Repealed the 2007 regulation and readopted the 1988 regulation with amendments to implement adverse court decision.	11/19/09 9/27/10 EO
Amendments to Maximum Incremental Reactivity Tables Added many new compounds and modified reactivity values for many existing compounds in the tables to reflect new research data.	11/3/09 7/23/10 EO
AB 32 Cost of Implementation Fee Regulation AB 32 authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions regulated pursuant to AB 32. ARB staff will propose a fee regulation to support the administrative costs of AB 32 implementation.	9/24/2009 05/06/10 EO
Passenger Motor Vehicle Greenhouse Gas Limits Amendments Approved amendments granting credits to manufacturers for compliant vehicles sold in other states that have adopted California regulations.	9/24/09 2/22/10 EO
Consumer Products Amendments Approved amendments that set new VOC limits for multi-purpose solvent and paint thinner products and lower the existing VOC limit for double phase aerosol air fresheners.	9/24/09 8/6/10 EO
Amendments to In-Use Off-Road Diesel-Fueled Fleets Regulation Approved amendments to implement legislatively directed changes and provide additional incentives for early action.	7/23/09 12/2/09 EO 6/3/10 EO
Methane Emissions from Municipal Solid Waste Landfills Approved a regulation to require smaller and other uncontrolled landfills to install gas collection and control systems, and also requires existing and newly installed systems to operate optimally.	6/25/09 5/5/10 EO
Cool Car Standards Approved a regulation requiring the use of solar management window glass in vehicles up to 10,000 lb GVWR.	6/25/09

Board Action	Hearing Date
Enhanced Fleet Modernization (Car Scrap) Approved guidelines for a program to scrap up to 15,000 light duty vehicles statewide.	6/25/09 7/30/10 EO
Amendments to Heavy-Duty On-Board Diagnostics Regulations Approved amendments to the light and medium-duty vehicle and heavy duty engine OBD regulations.	5/28/2009 4/6/10 EO
Smog Check Improvements BAR adopted amendments to implement changes in state law and SIP commitments adopted by ARB between 1996 and 2007.	5/7/09 by BAR 6/9/09 EO
AB 118 Air Quality Improvement Program Guidelines The Air Quality Improvement Program provides for up to $50 million per year for seven years beginning in 2009-10 for vehicle and equipment projects that reduce criteria pollutants, air quality research, and advanced technology workforce training. The AQIP Guidelines describe minimum administrative, reporting, and oversight requirements for the program, and provide general criteria for how the program shall be implemented.	04/23/09 08/28/09 EO
Pesticide Element Reduce volatile organic compound (VOC) emissions from the application of agricultural field fumigants in the South Coast, Southeast Desert, Ventura County, San Joaquin Valley, and Sacramento Metro federal ozone nonattainment areas.	4/20/09 10/12/09 EO (2) 8/2/11 EO
Low Carbon Fuel Standard Approved new standards to lower the carbon content of fuels.	4/20/09 11/25/09 EO
Pesticide Element for San Joaquin Valley DPR Director approved pesticide ROG emission limit of 18.1 tpd and committed to implement restrictions on non-fumigant pesticide use by 2014 in the San Joaquin Valley.	4/7/09 DPR
Tire Pressure Inflation Regulation Approved a regulation requiring automotive service providers to perform tire pressure checks as part of every service.	3/26/09 2/4/10 EO
Sulfur Hexafluoride from Non-Utility and Non-Semiconductor Applications Approved a regulation to phase out use of Sulfur Hexafluoride over the next several years.	2/26/09 11/12/09 EO
Semiconductor Operations Approved a regulation to set standards to reduce fluorinated gas emissions from the semiconductor and related devices industry.	2/26/09 10/23/09 EO
Plug-In Hybrid Electric Vehicles Test Procedure Amendments Amends test procedures to address plug-in-hybrid electric vehicles.	1/23/09 12/2/09 EO
In-Use Off-Road Diesel-Fueled Fleets Amendments Makes administrative changes to recognize delays in the supply of retrofit control devices.	1/22/09
Small Containers of Automotive Refrigerant Approved a regulation to reduce leakage from small containers, adopt a container deposit and return program, and require additional container labeling and consumer education requirements.	1/22/09 1/5/10 EO
Aftermarket Critical Emission Parts on Highway Motorcycles Allows for the sale of certified critical emission parts by aftermarket manufacturers.	1/22/09 6/19/09 EO
Heavy-Duty Tractor-Trailer Greenhouse Gas (GHG) Reduction Approved a regulation to reduce greenhouse gas emissions by improving long haul tractor and trailer efficiency through use of aerodynamic fairings and low rolling resistance tires.	12/11/08 10/23/09 EO
Cleaner In-Use Heavy-Duty Diesel Trucks (Truck and Bus Regulation) Approved a regulation to reduce diesel particulate matter and oxides of nitrogen through fleet modernization and exhaust retrofits. Makes enforceability changes to public fleet, off-road equipment, and portable equipment regulations.	12/11/08 10/19/09 EO 10/23/09 EO
Large Spark-Ignition Engine Amendments Approved amendments to reduce evaporative, permeation, and exhaust emissions from large spark-ignition (LSI) engines equal to or below 1 liter in displacement.	11/1/08 3/12/09 EO
Small Off-Road Engine (SORE) Amendments Approved amendments to address the excessive accumulation of emission credits.	11/21/08 2/24/10 EO
Proposed AB 118 Air Quality Guidelines for the Air Quality Improvement Program and the Alternative and Renewable Fuel and Vehicle and Technology Program. The California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (AB 118) requires ARB to develop guidelines for both the Alternative and Renewable Fuel and Vehicle Technology Program and the Air Quality Improvement Program to ensure that both programs do not adversely impact air quality.	09/25/08 EO 05/20/09

Board Action	Hearing Date
Portable Outboard Marine Tanks and Components (part of Additional Evaporative Emission Standards) Approved a regulation that establishes permeation and emission standards for new portable outboard marine tanks and components.	9/25/08 7/20/09 EO
Cleaner Fuel in Ocean Going Vessels Approved a regulation that requires use of low sulfur fuel in ocean-going ship main engines, and auxiliary engines and boilers.	7/24/08 4/16/09 EO
Spark-Ignition Marine Engine and Boat Amendments Provides optional compliance path for > 500 hp sterndrive/inboard marine engines.	7/24/08 6/5/09 EO
Consumer Products Amendments Approved amendments that add volatile organic compound (VOC) limits for seven additional categories and lower limits for twelve previously regulated categories.	6/26/08 5/5/09 EO
Zero emission vehicles Updated California's ZEV requirements to provide greater flexibility with respect to fuels, technologies, and simplifying compliance pathways. Amendments give manufacturers increased flexibility to comply with ZEV requirements by giving credit to plug-in hybrid electric vehicles and establishing additional ZEV categories in recognition of new developments in fuel cell vehicles and battery electric vehicles.	3/27/08 12/17/08 EO
Amendments to the Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines Adds verification requirements for control technologies that only reduce NOx emissions, new reduction classifications for NOx reducing technologies, new testing requirements, and conditional extensions for verified technologies.	1/24/08 12/4/08 EO
Mandatory Report of Greenhouse Gas Emissions Approved a regulation that establishes detailed specifications for emissions calculations, reporting, and verification of GHG emission estimates from significant sources.	12/6/07 10/12/08 EO
Gaseous Pollutant Measurement Allowances for In-Use Heavy-Duty Diesel Compliance Measurement accuracy margins are to be determined through an ongoing comprehensive testing program performed by an independent contractor. Amendments include these measurement accuracy margins into the regulation.	12/6/07 10/14/08 EO
Ocean-Going Vessels While at Berth (aka Ship Hoteling) - Auxiliary Engine Cold Ironing and Clean Technology Approved a regulation that reduces emissions from auxiliary engines on ocean-going ships while at-berth.	12/6/07 10/16/08 EO
In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Rail Yard Facilities Approved a regulation that establishes emission standards for in-use, heavy-duty diesel-fueled vehicles that transport cargo to and from California's ports and intermodal rail facilities.	12/6/07 10/12/08 EO
Commercial Harbor Craft Approved a regulation that establishes in-use and new engine emission limits for both auxiliary and propulsion diesel engines on ferries, excursion vessels, tugboats, and towboats.	11/15/07 9/2/08 EO
Suggested Control Measure for Architectural Coatings Amendments Approved amendments to reduce the recommended VOC content of 19 categories of architectural coatings.	10/26/07
Aftermarket Catalytic Converter Requirements Approved amendments that establish more stringent emission performance and durability requirements for used and new aftermarket catalytic converters offered for sale in California.	10/25/07 2/21/08 NOD
Limiting Ozone Emissions from Indoor Air Cleaning Devices Approved ozone emission limit of 0.050 ppm for portable indoor air cleaning devices in response to requirements of AB 2276 (2006).	9/27/07 8/7/08 EO
Pesticide Commitment for Ventura County in 1994 SIP Approved substitution of excess ROG emission reductions from state motor vehicle program for 1994 SIP reduction commitment from pesticide application in Ventura County.	9/27/07 11/30/07 EO
In-Use Off-Road Diesel Equipment Approved a regulation that requires off-road diesel fleet owners to modernize their fleets and install exhaust retrofits.	7/26/07 4/4/08 EO
Emission Control and Environmental Performance Label Regulations Approved amendments to add a Global Index Label and modify the formal of the Smog Index Label on new cars.	6/21/07 5/2/08 EO
Vapor Recovery from Aboveground Storage Tanks Approved a regulation to establish new performance standards and specifications for the vapor recovery systems and components used with aboveground storage tanks.	6/21/07 5/2/08 EO

Board Action	Hearing Date
CaRFG Phase 3 amendments Approved amendments to mitigate the increases in evaporative emissions from on-road motor vehicles resulting from the addition of ethanol to gasoline.	6/14/07 4/25/08 EO 8/7/08 EO
Formaldehyde from Composite Wood Products Approved an ATCM to limit formaldehyde emissions from hardwood plywood, particleboard, and medium density fiberboard to the maximum amount feasible.	4/26/07 3/5/08 EO
Portable equipment registration program (PERP) and airborne toxic control measure for diesel-fueled portable engines Approved amendments to allow permitting of Tier 0 portable equipment engines used in emergency or low use duty and to extend permitting of certain Tier 1 and 2 "resident" engines to 1/1/10.	3/22/07 7/31/07 EO
Perchloroethylene Control Measure Amendments Approved amendments to the Perchloroethylene ATCM to prohibit new Perc dry cleaning machines beginning 2008 and phase out all Perc machines by 2023.	1/25/07 11/7/07 EO
Amendments to Emission Warranty Information Reporting & Recall Regulations Approved amendments that tighten the provisions for recalling vehicles for emissions-related failures, helping ensure that corrective action is taken to vehicles with defective emission control devices or systems.	12/7/06 3/22/07 10/17/07 EO
Voluntary accelerated vehicle retirement regulations Approved amendments that authorize the use of remote sensing to identify light-duty high emitters and that establish protocols for quantifying emissions reductions from high emitters proposed for retirement.	12/7/06
Emergency regulation for portable equipment registration program (PERP), airborne toxic control measures for portable and stationary diesel-fueled engines	12/7/06
Amendments to the Hexavalent Chromium ATCM Approved amendments that require use of best available control technology on all chrome plating and anodizing facilities.	12/7/06
Consumer Products Regulation Amendments Approved amendments that set lower emission limits in 15 product categories.	11/17/06 9/25/07 EO
Requirements for Stationary Diesel In-Use Agricultural Engines Approved amendments to the stationary diesel engine ATCM which set emissions standards for in-use diesel agricultural engines.	11/16/06 7/3/07 NOD
Ships - Onboard Incineration Approved amendments to cruise ship incineration ATCM to include all oceangoing ships of 300 gross registered tons or more.	11/16/06 9/11/07 EO
Zero Emission Bus Approved amendments postponing the 15 percent purchase requirement three years for transit agencies in the diesel path and one to two years for transit agencies in the alternative fuel path, in order to keep pace with developments in zero emission bus technology, and adding an Advanced Demonstration requirement to offset emission losses.	10/19/06 8/27/07 EO
Distributed generation certification Approved amendments improving the emissions durability and testing requirements, adding waste gas emission standards, and eliminating a redundant PM standard in the current 2007 emission standards.	10/19/06 5/17/07 NOD
Heavy-Duty Diesel In-Use Compliance Regulation Approved amendments to the heavy-duty diesel engine regulations and test procedures to create a new in-use compliance program conducted by engine manufacturers. The amendments would help ensure compliance with applicable certification standards throughout an engine's useful life.	9/28/06 7/19/07 NOD
Revisions to OBD II and the Emission Warranty Regulations Approved amendments to the OBD II regulation to provide for improved emission control monitoring including air-fuel cylinder imbalance monitoring, oxygen sensor monitoring, catalyst monitoring, permanent fault codes for gasoline vehicles and new thresholds for diesel vehicles.	9/28/06 8/9/07 EO
Off-Highway Recreational Vehicle Amendments Approved amendments to the Off-Highway Recreational Vehicle Regulations including harmonizing evaporative emission standards with federal regulations, expanding the definition of ATVs, modifying labeling requirements, and adjusting riding seasons.	7/20/06 6/1/07 EO
Portable Equipment Registration Program (PERP) Amendments Approved amendments to the Statewide Portable Equipment Registration program that include installation of hour meters on equipment, and revisions to recordkeeping, reporting, and fees.	6/22/06 11/13/06 NOD
Heavy Duty Vehicle Service Information Approved amendments to the Service Information Rule to require manufacturers to make available diagnostic equipment and information for sale to the aftermarket.	6/22/06 5/3/07 EO

Board Action	Hearing Date
LEV II technical amendments Approved amendments to evaporative emission test procedures, four-wheel drive dynamometer provisions, and vehicle label requirements.	6/22/06 9/27/06 NOD
Dry Cleaning ATCM Amendments Approved amendments to the Dry Cleaning ATCM to limit siting of new dry cleaners, phase out use of Perc at co-residential facilities, phase out higher emitting Perc sources at other facilities, and require enhanced ventilation at existing and new Perc facilities.	5/25/06
Forklifts and other Large Spark Ignition (LSI) Equipment Adopted a regulation to reduce emissions from forklifts and other off-road spark-ignition equipment by establishing more stringent standards for new equipment, and requiring retrofits or engine replacement on existing equipment. Adopts EPA's standards for 2007; adopts more stringent standards for 2010.	5/25/06 3/2/07 EO
Enhanced Vapor Recovery Amendments Approved amendments to the vapor recovery system regulation and adopted revised test procedures.	5/25/06
Diesel Retrofit Technology Verification Procedure Approved amendments to the Diesel Emission In-use Control Strategy Verification Procedure to substitute a 30% increase limit in NOx concentration for an 80% reduction requirement from PM retrofit devices.	3/23/06 12/21/06 NOD
Heavy duty vehicle smoke inspection program amendments Approved amendments to impose a fine on trucks not displaying a current compliance certification sticker.	1/26/06 12/4/06 EO
Ocean-going Ship Auxiliary Engine Fuel Approved a regulation to require ships to use cleaner marine gas oil or diesel to power auxiliary engines within 24 nautical miles of the California coast.	12/8/05 10/20/06 EO
Diesel Cargo Handling Equipment Approved a regulation to require new and in-use cargo handling equipment at ports and intermodal rail yards to reduce emissions by utilizing best available control technology.	12/8/05 6/2/06 EO
Public and Utility Diesel Truck Fleets Approved a regulation to reduce diesel particulate matter emissions from heavy duty diesel trucks in government and private utility fleets.	12/8/05 10/4/06 EO
Cruise ships – Onboard Incineration Adopted an Air Toxic Control Measure to prohibit cruise ships from conducting onboard incineration within three nautical miles of the California coast.	11/17/05 2/1/06 NOD
Inboard Marine Engine Rule Amendments Approved amendments to the 2001 regulation to include additional compliance options for manufacturers.	11/17/05 9/26/06 EO
Heavy-Duty Diesel Truck Idling Technology Approved a regulation to limit sleeper truck idling to 5 minutes. Allows alternate technologies to provide cab heating/cooling and power.	10/20/05 9/1/06 EO
Automotive Coating Suggested Control Measure Approved an SCM for automotive coatings for adoption by air districts. The measure will reduce the VOC content of 11 categories of surface protective coatings.	10/20/05
2007-09 Model-year heavy duty urban bus engines and the fleet rule for transit agencies Adopted amendments to align urban bus emission limits with on-road heavy duty truck emission limits and allow for the purchase of non- complying buses under the condition that bus turnover increase to offset NOx increases.	10/20/05 10/27/05 7/28/06 EO
Portable fuel containers (part 2 of 2) Approved amendments to revise spout and automatic shutoff design.	9/15/05 7/28/06 EO
Portable Fuel Containers (part 1 of 2) Approved amendments to include kerosene containers in the definition of portable fuel containers.	9/15/05 11/9/05 NOD
2007-09 Model-year heavy duty urban bus engines and the fleet rule for transit agencies Adopted amendments to require all transit agencies in SCAQMD to purchase only alternate fuel versions of new buses.	9/15/05 Superceded by 10/20/05
Reid vapor pressure limit emergency rule Approved amendments to relax Reid vapor pressure limit to accelerate fuel production for Hurricane Katrina victims.	9/8/05 Operative for September and October 2005 only

Board Action	Hearing Date
Heavy-Duty Truck OBD Approved a regulation to require on-board diagnostic (OBD) systems for new gas and diesel trucks, similar to the systems on passenger cars.	7/21/05 12/28/05 EO
Definition of Large Confined Animal Facility Adopted a regulation to define the size of a large CAF for the purposes of air quality permitting and reduction of ROG emissions to the extent feasible.	6/23/05 4/13/06 EO
ATCM for stationary compression ignition engines Approved emergency amendments (3/17/05) and permanent amendments (5/26/05) to relax the diesel PM emission limits on new stationary diesel engines to current off-road engine standards to respond to the lack of availability of engines meeting the original ATCM standard.	3/17/05 5/26/05 7/29/05 EO
Transit Fleet Rule Approved amendments to add emission limits for non-urban bus transit agency vehicles, require lower bus and truck fleet-average NOx and PM emission limits, and clarify emission limits for CO, NMHC, and formaldehyde.	2/24/05 10/19/05 NOD
Thermal Spraying ATCM Approved a regulation to reduce emissions of hexavalent chromium and nickel from thermal spraying operations.	12/9/04 7/20/05 EO
Tier 4 Standards for Small Off-Road Diesel Engines (SORE) Approved new emission standards for off-road diesel engines to be phased in between 2008 and 2015.	12/9/04 10/21/05 EO
Emergency Regulatory Amendment Delaying the January 1, 2005 Implementation Date for the Diesel Fuel Lubricity Standard Adopted an emergency regulation delaying the lubricity standard compliance deadline by five months to respond to fuel pipeline contamination problems.	11/24/04 12/10/04 EO
Enhanced vapor recovery compliance extension Approved amendments to the EVR regulation to extend the compliance date for onboard refueling vapor recovery compatibility to the date of EVR compliance.	11/18/04 2/11/05 EO
CaRFG Phase 3 amendments Approved amendments correcting errors and streamlining requirements for compliance and enforcement of CaRFG Phase 3 regulations adopted in 1999.	11/18/04
Clean diesel fuel for harborcraft and intrastate locomotives Approved a regulation that required harborcraft and locomotives operating solely within California to use clean diesel fuel.	11/18/04 3/16/05 EO
Nonvehicular Source, Consumer Product, and Architectural Coating Fee Regulation Amendment Approved amendments to fee regulations to collect supplemental fees when authorized by the Legislature.	11/18/04
Greenhouse gas limits for motor vehicles Approved a regulation that sets the first ever greenhouse gas emission standards on light and medium duty vehicles starting with the 2009 model year.	9/24/04 8/4/05 EO
Gasoline vapor recovery system equipment defects list Approved the addition of defects to the VRED list for use by compliance inspectors.	8/24/04 6/22/05 EO
Unihose gasoline vapor recovery systems Approved an emergency regulation and an amendment to delay the compliance date for unihose installation to the date of dispenser replacement.	7/22/04 11/24/04 EO
General Idling Limits for Diesel Trucks Approved a regulation that limits idling of heavy-duty diesel trucks operating in California to five minutes, with exceptions for sleeper cabs.	7/22/04
Consumer Products Approved a regulation to reduce ROG emissions from 15 consumer products categories, prohibit the use of 3 toxic compounds in consumer products, ban the use of PDCB in certain products, allow for the use of Alternative Control Plans, and revise Test Method 310.	6/24/04 5/6/05 EO
Urban bus engines/fleet rule for transit agencies Approved amendments to allow for the purchase of hybrid diesel buses and revise the zero emission bus demonstration and purchase timelines.	6/24/04
Engine Manufacturer Diagnostics Approved a regulation that would require model year 2007 and later heavy duty truck engines to be equipped with engine diagnostic systems to detect malfunctions of the emission control system.	5/20/04

Board Action	Hearing Date
Chip Reflash Approved a voluntary program and a backstop regulation to reduce heavy duty truck NOx emissions through the installation of new software in the engine's electronic control module.	3/25/04 3/21/05 EO
Portable equipment registration program (PERP) Approved amendments to allow uncertified engines to be registered until December 31, 2005, to increase fees, and to modify administrative requirements.	2/26/04 1/7/05 EO 6/21/05 EO
Portable Diesel Engine ATCM Adopted a regulation to reduce diesel PM emissions from portable engines through a series of emission standards that increase in stringency through 2020.	2/26/04 1/4/05 EO
California motor vehicle service information rule Adopted amendments to allow for the purchase of heavy duty engine emission-related service information and diagnostic tools by independent service facilities and aftermarket parts manufacturers.	1/22/04 5/20/04
Transportation Refrigeration Unit ATCM Adopted a regulation to reduce diesel PM emissions from transport refrigeration units by establishing emission standards and facility reporting requirements to streamline inspections.	12/11/03 2/26/04 11/10/04 EO
Diesel engine verification procedures Approved amendments that reduced warranty coverage to the engine only, delayed the NOx reduction compliance date to 2007, added requirements for proof-of-concept testing for new technology, and harmonized durability requirements with those of U.S. EPA.	12/11/03 2/26/04 10/17/04
Chip Reflash Approved a voluntary program and a backstop regulation to reduce heavy duty truck NOx emissions through the installation of new software in the engine's electronic control module.	12/11/03 3/27/04 3/21/05 EO
Revised tables of maximum incremental reactivity values Approved the addition of 102 more chemicals with associated maximum incremental reactivity values to existing regulation allowing these chemicals to be used in aerosol coating formulations.	12/3/03
Stationary Diesel Engines ATCM Adopted a regulation to reduce diesel PM emissions from stationary diesel engines through the use of clean fuel, lower emission standards, operational practices.	11/20/03 12/11/03 2/26/2004 9/27/04 EO
Solid waste collection vehicles Adopted a regulation to reduce toxic diesel particulate emissions from solid waste collection vehicles by over 80 percent by 2010. This measure is part of ARB's plan to reduce the risk from a wide range of diesel engines throughout California.	9/25/03 5/17/04 EO
Small off-road engines (SORE) Adopted more stringent emission standards for the engines used in lawn and garden and industrial equipment, such as string trimmers, leaf blowers, walk-behind lawn mowers, generators, and lawn tractors.	9/25/03 7/26/04 EO
Off-highway recreational vehicles Changes to riding season restrictions.	7/24/03
Clean diesel fuel Adopted a regulation to reduce sulfur levels and set a minimum lubricity standard in diesel fuel used in vehicles and off-road equipment in California, beginning in 2006.	7/24/03 5/28/04 EO
Ozone Transport Mitigation Amendments Adopted amendments to require upwind districts to (1) have the same no-net-increase permitting thresholds as downwind districts, and (2) Adopt "all feasible measures."	5/22/03 10/2/03 NOD
Zero emission vehicles Updated California's ZEV requirements to support the fuel cell car development and expand sales of advanced technology partial ZEVs (like gasoline-electric hybrids) in the near-term, while retaining a role for battery electric vehicles.	3/27/03 12/19/03 EO
Heavy duty gasoline truck standards Aligned its existing rules with new, lower federal emission standards for gasoline-powered heavy-duty vehicles starting in 2008.	12/12/02 9/23/03 EO
Low emission vehicles II Minor administrative changes.	12/12/02 9/24/03 EO
Gasoline vapor recovery systems test procedures Approved amendments to add advanced vapor recovery technology certification and testing standards.	12/12/02 7/1/03 EO 10/21/03 EO
CaRFG Phase 3 amendments Approved amendments to allow for small residual levels of MTBE in gasoline while MTBE is being phased out and replaced by ethanol.	12/12/02 3/20/03 EO

Board Action	Hearing Date
School bus Idling Adopted a measure requiring school bus drivers to turn off the bus or vehicle engine upon arriving at a school and restart it no more than 30 seconds before departure in order to limit children's exposure to toxic diesel particulate exhaust.	12/12/02 5/15/03 EO
California Interim Certification Procedures for 2004 and Subsequent Model Year Hybrid-Electric Vehicles in the Urban Transit Bus and Heavy-Duty Vehicle Classes Regulation Amendment Adopted amendments to allow diesel-path transit agencies to purchase alternate fuel buses with higher NOx limits, establish certification procedures for hybrid buses, and require lower fleet-average PM emission limits.	10/24/02 9/2/03 EO
CaRFG Phase 3 amendments Approved amendments delaying removal of MTBE from gasoline by one year to 12/31/03.	7/25/02 11/8/02 EO
Diesel retrofit verification procedures, warranty, and in-use compliance requirements Adopted regulations to specify test procedures, warranty, and in-use compliance of diesel engine PM retrofit control devices.	5/16/02 3/28/03 EO
On-board diagnostics for cars Adopted changes to the On-Board Diagnostic Systems (OBD II) regulation to improve the effectiveness of OBD II systems in detecting motor vehicle emission-related problems.	4/25/02 3/7/03 EO
Voluntary accelerated light duty vehicle retirement regulations Establishes standards for a voluntary accelerated retirement program.	2/21/02 11/18/02 EO
Residential burning Adopted a measure to reduce emissions of toxic air contaminants from outdoor residential waste burning by eliminating the use of burn barrels and the outdoor burning of residential waste materials other than natural vegetation.	2/21/02 12/18/02 EO
California motor vehicle service information rule Adopted regulations to require light- and medium-duty vehicle manufacturers to offer for sale emission-related service information and diagnostic tools to independent service facilities and aftermarket parts manufacturers.	12/13/01 7/31/02 EO
Vapor recovery regulation amendments Adopted amendments to expand the list of specified defects requiring equipment to be removed from service.	11/15/01 9/27/02 EO
Distributed generation guidelines and regulations Adopted regulations requiring the permitting by ARB of distributed generation sources that are exempt from air district permitting and approved guidelines for use by air districts in permitting non-exempt units.	11/15/01 7/23/02 EO
Low emission vehicle regulations (LEV II) Approved amendments to apply PM emission limits to all new gasoline vehicles, extend gasoline PZEV emission limits to all fuel types, and streamline the manufacturer certification process.	11/15/01 8/6/02 EO
Gasoline vapor recovery systems test methods and compliance procedures Adopted amendments to add test methods for new technology components, streamline test methods for liquid removal equipment, and***.	10/25/01 7/9/02 EO
Heavy-duty diesel trucks Adopted amendments to emissions standards to harmonize with EPA regulations for 2007 and subsequent model year new heavy-duty diesel engines.	10/25/01
Automotive coatings Adopted Air Toxic Control Measure which prohibits the sale and use in California of automotive coatings that contain hexavalent chromium or cadmium.	9/20/01 9/2/02 EO
Inboard and sterndrive marine engines Lower emission standards for 2003 and subsequent model year inboard and sterndrive gasoline-powered engines in recreational marine vessels.	7/26/01 6/6/02 EO
Asbestos from construction, grading, quarrying, and surface mining Adopted an Airborne Toxic Control Measure for construction, grading, quarrying, and surface mining operations requiring dust mitigation for construction and grading operations, road construction and maintenance activities, and quarries and surface mines to minimize emissions of asbestos-laden dust.	7/26/01 6/7/02 EO
Zero emission vehicle infrastructure and standardization of electric vehicle charging equipment Adopted amendments to the ZEV regulation to alter the method of quantifying production volumes at joint-owned facilities and to add specifications for standardized charging equipment.	6/28/01 5/10/02 EO

Board Action	Hearing Date
Enhanced vapor recovery emergency regulation Adopted a four-year term for equipment certifications.	5/22/01 EO
Pollutant transport designation Adopted amendments to add two transport couples to the list of air basins in which upwind areas are required to adopt permitting thresholds no less stringent than those adopted in downwind areas.	4/26/01
Zero emission vehicle regulation amendments Adopted amendments to reduce the numbers of ZEVs required in future years, add a PZEV category and grant partial ZEV credit, modify the ZEV range credit, allow hybrid-electric vehicles partial ZEV credit, grant ZEV credit to advanced technology vehicles, and grant partial ZEV credit for several other minor new programs.	1/25/01 12/7/01 EO 4/12/02 EO
Heavy duty diesel engines supplemental test procedures Approved amendments to extend "Not-To-Exceed" and EURO III supplemental test procedure requirements through 2007 when federal requirements will include these tests.	12/7/00
Light and medium duty low emission vehicle alignment with federal standards Approved amendments that require light and medium duty vehicles sold in California to meet the more restrictive of state or federal emission standards.	12/7/00 12/27/00 EO
Exhaust emission standards for heavy duty gas engines Adopted amendments that establish 2005 emission limits for heavy duty gas engines that are equivalent to federal limits.	12/7/00 12/27/00 EO
CaRFG Phase 3 amendments Approved amendments to regulate the replacement of MTBE in gasoline with ethanol.	11/16/00 4/25/01 EO
CaRFG Phase 3 test methods Approved amendments to gasoline test procedures to quantify the olefin content and gasoline distillation temperatures.	11/16/00 7/11/01 EO 8/28/01 EO
Antiperspirant and deodorant regulations Adopted amendments to relax a 0% VOC limit to 40% VOC limit for aerosol antiperspirants.	10/26/00
Diesel risk reduction plan Adopted plan to reduce toxic particulate from diesel engines through retrofits on existing engines, tighter standards for new engines, and cleaner diesel fuel.	9/28/00
Conditional rice straw burning regulations Adopted regulations to limit rice straw burning to fields with demonstrated disease rates reducing production by more than 5 percent.	9/28/00
Asbestos from unpaved roads Tightened an existing Air Toxic Control Measure to prohibit the use of rock containing more than 0.25% asbestos on unsurfaced roads.	7/20/00
Aerosol Coatings Approved amendments to replace mass-based VOC limits with reactivity-based limits, add a table of Maximum Incremental Reactivity values, add limits for polyolefin adhesion promoters, prohibit use of certain toxic solvents, and make other minor changes.	6/22/00 5/1/01 EO
Consumer products aerosol adhesives Adopted amendments to delete a 25% VOC limit by 2002, add new VOC limits for six categories of adhesives, prohibit the use of toxic solvents, and add new labeling and reporting requirements.	5/25/00 3/14/01 EO
Automotive care products Approved an Air Toxic Control Measure to eliminate use of perchloroethylene, methylene chloride, and trichloroethylene in automotive products such as brake cleaners and degreasers.	4/27/00 2/28/01 EO
Enhanced vapor recovery Adopted amendments to require the addition of components to reduce spills and leakage, adapt to onboard vapor recovery systems, and continuously monitor system operation and report equipment leaks immediately.	3/23/00 7/25/01 EO
Agricultural burning smoke management Adopted amendments to add marginal burn day designations, require day-specific burn authorizations by districts, and smoke management plans for larger prescribed burn projects.	3/23/00 1/22/01 EO
Urban transit buses Adopted a public transit bus fleet rule and emissions standards for new urban buses that mandates a lower fleet-average NOx emission limit, PM retrofits, lower sulfur fuel use, and purchase of specified percentages of zero emission buses in future years.	1/27/00 2/24/00 11/22/00 EO 5/29/01 EO

Board Action	Hearing Date
Small Off-Road (diesel) Equipment (SORE) Adopted amendments to conform with new federal requirements for lower and engine power-specific emission limits, and for the averaging, banking, and trading of emissions among SORE manufacturers.	1/28/00
CaRFG Phase 3 MTBE phase out Adopted regulations to enable refiners to produce gasoline without MTBE while preserving the emissions benefits of Phase 2 cleaner burning gasoline.	12/9/99 6/16/00 EO
Consumer products – mid-term measures II Adopted a regulation which adds emission limits for 2 new categories and tightens emission limits for 15 categories of consumer products.	10/28/99
Portable fuel cans Adopted a regulation requiring that new portable fuel containers, used to refuel lawn and garden equipment, motorcycles, and watercraft, be spill-proof beginning in 2001.	9/23/99 7/6/00 EO
Clean fuels at service stations Adopted amendments rescinding requirements applicable to SCAB in 1994-1995, modifying the formula for triggering requirements, and allowing the Executive Officer to make adjustments to the numbers of service stations required to provide clean fuels.	7/22/99
Gasoline vapor recovery Adopted amendments to certification and test methods.	6/24/99
Reformulated gasoline oxygenate Adopted amendments rescinding the requirement for wintertime oxygenate in gasoline sold in the Lake Tahoe Air Basin and requiring the statewide labeling of pumps dispensing gasoline containing MTBE.	6/24/99
Marine pleasurecraft Adopted regulations to control emissions from spark-ignition marine engines, specifically, outboard marine engines and personal watercraft.	12/11/98 2/17/00 EO 6/14/00 EO
Voluntary accelerated light duty vehicle retirement Adopted regulation setting standards for voluntary accelerated retirement program.	12/10/98 10/22/99 EO
Off-highway recreational vehicles and engines Approved amendments to allow non-complying vehicles to operate in certain seasons and in certain ORV-designated areas.	12/10/98 10/22/99 EO
On-road motorcycles Amended on-road motorcycle regulations, to lower the tailpipe emission standards for ROG and NOx.	12/10/98
Portable equipment registration program (PERP) Approved amendments to exclude non-dredging equipment operating in OCS areas and equipment emitting hazardous pollutants, include NSPS Part OOO rock crushers, require SCR emission limits and onshore emission offsets from dredging equipment operating in OCS areas, set catalyst emission limits for gasoline engines, and relieve certain retrofitted engines from periodic source testing.	12/10/98
Liquid petroleum gas motor fuel specifications Approved amendment rescinding 5% propene limit and extending 10% limit indefinitely.	12/11/98
Reformulated gasoline Approved amendments to rescind the RVP exemption for fuel with 10% ethanol and allow for oxygen contents up to 3.7% if the Predictive Model weighted emissions to not exceed original standards.	12/11/98
Consumer products Adopted amendments to add new VOC test methods, to modify Method 310 to quantify low vapor pressure VOC (LVP-VOC) constituents, and to exempt LVP-VOC from VOC content limits	11/19/98
Consumer products Approved amendments to extend the 1999 VOC compliance deadline for several aerosol coatings, antiperspirants and deodorants, and other consumer products categories to 2002, to exempt methyl acetate from the VOC definition, and make other minor changes.	11/19/98
Low-emission vehicle program (LEV II) Adopted regulations adding exhaust emission standards for most sport utility vehicles, pick-up trucks and mini-vans, lowering tailpipe standards for cars, further reducing evaporative emission standards, and providing additional means for generating zero-emission vehicle credits.	11/5/98 9/17/99 EO
Off-road engine aftermarket parts Approved implementation of a new program to test and certify aftermarket parts in gasoline and diesel, light-duty through heavy duty, engines used in off-road vehicles and equipment.	11/19/98 10/1/99 EO 7/18/00 EO

Board Action	Hearing Date
Off-road spark ignition engines Adopted new emission standards for small and large spark ignition engines for off-road equipment, a new engine certification program, an in-use compliance testing program, and a three-year phase-in for large LSI.	10/22/98
Gasoline deposit control additives Adopted amendments to decertify pre-RFG additives, tighten the inlet valve deposit limits, add a combustion chamber deposit limit, and modify the test procedures to align with the characteristics of reformulated gasoline formulations.	9/24/98 4/5/99 EO
Stationary source test methods Adopted amendments to stationary source test methods to align better with federal methods.	8/27/98 7/2/99 EO
Locomotive MOA for South Coast Memorandum of agreement (MOA) signed by ARB, U.S. EPA and major railroads to concentrate cleaner locomotives in the South Coast by 2010 and fulfill 1994 ozone SIP commitment.	7/2/98
Reformulated gasoline Approved amendments to rescind the wintertime oxygenate requirement, allow for sulfur content averaging, and make other minor technical amendments.	8/27/98
Gasoline vapor recovery Adopted amendments to certification and test methods to add methods for onboard refueling vapor recovery, airport refuelers, and underground tank interconnections, and make minor changes to existing methods.	5/21/98 8/27/98
Ethylene oxide sterilizers Adopted amendments to the ATCM to streamline source testing requirements, add EtO limits in water effluent from control devices, and make other minor changes.	5/21/98
Chrome platers Adopted amendments to ATCM to harmonize with requirements of federal NESHAP standards for chrome plating and chromic acid anodizing facilities.	5/21/98
On-road heavy-duty vehicles Approved amendments to align on-road heavy duty vehicle engine emission standards with EPA's 2004 standards and align certification, testing, maintenance, and durability requirements with those of U.S. EPA.	4/23/98 2/26/99 EO
Small off-road engines (SORE) Approved amendments to grant a one-year delay in implementation, relaxation of emissions standards for non-handheld engines, emissions durability requirements, averaging/banking/trading, harmonization with the federal diesel engine regulation, and modifications to the production line testing requirements.	3/26/98
Heavy duty vehicle smoke inspection program Adopted amendments to require annual smoke testing, set opacity limits, and exempt new vehicles from testing for the first four years.	12/11/97 3/2/98 EO
Consumer products (hairspray credit program) Adopted standards for the granting of tradable emission reduction credits achieved by sales of hairspray products having VOC contents less than required limits.	11/13/97
Light-duty vehicle off-cycle emissions Adopted standards to control excess emissions from aggressive driving and air conditioner use in light duty vehicles and added two light duty vehicle test methods for certification of new vehicles under these standards.	7/24/97 3/19/98 EO
Consumer products Adopted amendments to add VOC limits to 18 categories of consumer products used in residential and industrial cleaning, automobile maintenance, and commercial poisons.	7/24/97
Enhanced evaporative emissions standards Adopted amendments extending the compliance date for ultra-small volume vehicle manufacturers by one year.	5/22/97
Emission reduction credit program Adopted standards for District establishment of ERC programs including certification, banking, use limitation, and reporting requirements.	5/22/97
Lead as a toxic air contaminant Adopted an amendment to designate inorganic lead as a toxic air contaminant.	4/24/97
Consumer products (hair spray) Adopted amendments to (1) delay a January 1, 1998, compliance deadline to June 1, 1999, (2) require progress plans from manufacturers, and (3) authorize the Executive Officer to require VOC mitigation when granting variances from the June 1, 1999 deadline.	3/27/97

Board Action	Hearing Date
Portable engine registration program (PERP) Adopted standards for (1) the permitting of portable engines by ARB and (2) District recognition and enforcement of permits.	3/27/97
Liquefied petroleum gas Adopted amendments to extend the compliance deadline from January 1, 1997, to January 1, 1999, for the 5% propene limit in liquefied petroleum gas used in motor vehicles.	3/27/97
Onboard diagnostics, phase II Adopted amendments to extend the phase-in of enhanced catalyst monitoring, modify misfire detection requirements, add PVC system and thermostat monitoring requirements, and require manufacturers to sell diagnostic tools and service information to repair shops.	12/12/96
Consumer products Adopted amendments to delay 25% VOC compliance date for aerosol adhesives, clarify portions of the regulation, exempt perchloroethylene from VOC definition, extend the sell-through time to three years, and add perchloroethylene reporting requirements.	11/21/96
Consumer products (test method) Adopted an amendment to add Method 310 for the testing of VOC content in consumer products.	11/21/96
Pollutant transport designation Adopted amendments to modify transport couples from the Broader Sacramento area and add couples to the newly formed Mojave Desert and Salton Sea Air Basins.	11/21/96
Diesel fuel certification test methods Approved amendments specifying the test methods used for quantifying the constituents of diesel fuel.	10/24/96 6/4/97 EO
Wintertime requirements for utility engines & off-highway vehicles Optional hydrocarbon and NOx standards for snow throwers and ice augers, raising CO standard for specialty vehicles under 25hp.	9/26/96
Large off-road diesel Statement of Principles National agreement between ARB, U.S. EPA, and engine manufacturers to reduce emissions from heavy-duty off-road diesel equipment four years earlier than expected in the 1994 SIP for ozone.	9/13/96
Regulatory improvement initiative Rescinded two regulations relating to fuel testing in response to Executive Order W-127-95.	5/30/96
Zero emission vehicles Adopted amendments to eliminate zero emission vehicle quotas between 1998 and 2002, and approved MOUs with seven automobile manufacturers to accelerate release of lower emission "49 state" vehicles.	3/28/96 7/24/96 EO
CaRFG variance requirements Approved amendments to add a per gallon fee on non-compliant gasoline covered by a variance and to made administrative changes in variance processing and extension.	1/25/96 2/5/96 EO 4/2/96 EO
Utility and lawn and garden equipment engines Adopted an amendment to relax the CO standard from 300 to 350 ppm for Class I and II utility engines.	1/25/96
National security exemption of military tactical vehicles Such vehicles would not be required to adhere to exhaust emission standards.	12/14/95
CaRFG regulation amendments Approved amendments to allow for downstream addition of oxygenates and expansion of compliance options for gasoline formulation.	12/14/95
Required additives in gasoline (deposit control additives) Terms, definitions, reporting requirements, and test procedures for compliance are to be clarified.	11/16/95
CaRFG test method amendments Approved amendments to designate new test methods for benzene, aromatic hydrocarbon, olefin, and sulfur content of gasoline.	10/26/95
Motor vehicle inspection and maintenance program Handled by BAR.	10/19/95 by BAR
Antiperspirants and deodorants, consumer products, and aerosol coating products Ethanol exemption for all products, modifications to aerosol special requirements, modifications for regulatory language consistency, modifications to VOC definition.	9/28/95
Low emission vehicle (LEV III) standards Reactivity adjustment factors, introduction of medium-duty ULEVs, window labels, and certification requirements and test procedures for LEVs.	9/28/95

Board Action	Hearing Date
Medium- and heavy-duty gasoline trucks Expedited introduction of ultra-low emission medium-duty vehicles and lower NOx emission standards for heavy-duty gasoline trucks to fulfill a 1994 ozone SIP commitment.	9/1/95
Retrofit emission standards: all vehicle classes to be included in the alternate durability test plan, kit manufacturers to be allowed two years to validate deterioration factors under the test plan, update retrofit procedures allowing manufacturers to disable specific OBDs if justified by law.	7/27/95
Gasoline vapor recovery systems Adopts revised certification and test procedures.	6/29/95
Onboard refueling vapor recovery standards 1998 and subsequent MY engine cars, LD trucks, and MD trucks less than 8500 GVWR.	6/29/1995 4/24/96 EO
Heavy duty vehicle exhaust emission standards for NOx Amendments to standards and test procedures for 1985 and subsequent MY HD engines, amendments to emission control labels, amendments to Useful Life definition and HD engines and in-use vehicle recalls.	6/29/95
Aerosol coatings regulation Adopted regulation to meet California Clean Air Act requirements and a 1994 ozone SIP commitment.	3/23/95
Periodic smoke inspection program Delays start of PSIP from 1995 to 1996.	12/8/94
Onboard diagnostics phase II Amendments to clarify regulation language, ensure maximum effectiveness, and address manufacturer concerns regarding implementation.	12/8/94
Alternative control plan (ACP) for consumer products A voluntary, market-based VOC emissions cap upon a grouping of consumer products, flexible by manufacturer that will minimize overall costs of emission reduction methods and programs.	9/22/94
Diesel fuel certification: new specifications for diesel engine certification fuel, amended oxygen specification for CNG certification fuel, and amended commercial motor vehicle liquefied petroleum gas regulations.	9/22/94
Utility and lawn and garden equipment (UGLE) engines Modification to emission test procedures, ECLs, defects warranty, quality-audit testing, and new engine compliance testing.	7/28/94
Evaporative emissions standards and test procedures Adopted evaporative emissions standards for medium-duty vehicles.	2/10/94
Off-road recreational vehicles Adopted emission control regulations for off-road motorcycles, all-terrain vehicles, go-karts, golf carts, and specialty vehicles.	1/1/94
Perchloroethylene from dry cleaners Adopted measure to control perchloroethylene emissions from dry cleaning operations.	10/1/93
Wintertime oxygenate program Amendments to the control time period for San Luis Obispo County, exemption for small retailers bordering Nevada, flexibility in gasoline delivery time, calibration of ethanol blending equipment, gasoline oxygen content test method.	9/9/93
Onboard diagnostic phase II	7/9/93
Urban transit buses Amended regulation to tighten state NOx and particulate matter (PM) standards for urban transit buses beyond federal standards beginning in 1996.	6/10/93
1-year implementation delay in emission standards for utility engines	4/8/93
Non-ferrous metal melting Adopted Air Toxic Control Measure for emissions of cadmium, arsenic, and nickel from non-ferrous metal melting operations.	1/1/93
Certifications requirements for low emission passenger cars, light-duty trucks & medium duty vehicles	1/14/93
Airborne toxic control measure for emissions of toxic metals from non-ferrous metal melting	12/10/92
Periodic self-inspection program Implemented state law establishing a periodic smoke self-inspection program for fleets operating heavy-duty diesel-powered vehicles.	12/10/92
Notice of general public interest for consumer products	11/30/92
Substitute fuel or clean fuel incorporated test procedures	11/12/92

Board Action	Hearing Date
New vehicle testing using CaRFG Phase 2 gasoline Approved amendments to require the use of CaRFG Phase 2 gasoline in the certification of exhaust emissions in new vehicle testing.	8/13/92
Standards and test procedures for alternative fuel retrofit systems	5/14/92
Alternative motor vehicle fuel certification fuel specification	3/12/92
Heavy-duty off-road diesel engines Adopted the first exhaust emission standards and test procedures for heavy-duty off-road diesel engines beginning in 1996.	1/9/92
Consumer Products - Tier II Adopted Tier II of regulations to reduce emissions from consumer products.	1/9/92
Wintertime oxygen content of gasoline Adopted regulation requiring the addition of oxygenates to gasoline during winter to satisfy federal Clean Air Act mandates for CO nonattainment areas.	12/1/91
CaRFG Phase 2 Adopted CaRFG phase 2 specifications including lowering vapor pressure, reducing the sulfur, olefin, aromatic, and benzene content, and requiring the year-round addition of oxygenates to achieve reductions in ROG, NOx, CO, oxides of sulfur (SOx) and toxics.	11/1/91
Low emissions vehicles amendments revising reactivity adjust factor (RAF) provisions and adopting a RAF for M85 transitional low emission vehicles	11/14/91
Onboard diagnostic, phase II	11/12/91
Onboard diagnostics for light-duty trucks and light & medium-duty motor vehicles	9/12/91
Utility and lawn & garden equipment Adopted first off-road mobile source controls under the California Clean Air Act regulating utility, lawn and garden equipment.	12/1/90
Control for abrasive blasting	11/8/90
Roadside smoke inspections of heavy-duty vehicles Adopted regulations implementing state law requiring a roadside smoke inspection program for heavy-duty vehicles.	11/8/90
Consumer Products Tier I Adopted Tier I of standards to reduce emissions from consumer products.	10/11/90
CaRFG Phase I Adopted CaRFG Phase I reformulated gasoline regulations to phase-out leaded gasoline, reduce vapor pressure, and require deposit control additives.	9/1/90
Low-emission vehicle (LEV) and clean fuels Adopted the landmark LEV/clean fuel regulations which called for the gradual introduction of cleaner cars in California. The regulations also provided a mechanism to ensure the availability of alternative fuels when a certain number of alternative fuel vehicles are sold.	9/1/90
Evaporative emissions from vehicles Modified test procedure to include high temperatures (up to 105 F) and ensure that evaporative emission control systems function properly on hot days.	8/9/90
Dioxins from medical waste incinerators Adopted Airborne Toxic Control Measure to reduce dioxin emissions from medical waste incinerators.	7/1/90
CA Clean Air Act guidance for permitting Approved California Clean Air Act permitting program guidance for new and modified stationary sources in nonattainment areas.	7/1/90
Consumer products BAAQMD	6/14/90
Medium duty vehicle emission standards Adopted three new categories of low emission MDVs, required minimum percentages of production, and established production credit and trading.	6/14/90
Medium-duty vehicles Amended test procedures for medium-duty vehicles to require whole-vehicle testing instead of engine testing. This modification allowed enforcement of medium-duty vehicle standards through testing and recall.	6/14/90
Ethylene oxide sterilizers Adopted Airborne Toxic Control Measure to reduce ethylene oxide emissions from sterilizers and aerators.	5/10/90
Asbestos in serpentine rock Adopted Airborne Toxic Control Measure for asbestos-containing serpentine rock in surfacing applications.	4/1/90

Board Action	Hearing Date
Certification procedure for aftermarket parts	2/8/90
Antiperspirants and deodorants Adopted first consumer products regulation, setting standards for antiperspirants and deodorants.	11/1/89
Residential woodstoves Approved suggested control measure for the control of emissions from residential wood combustion.	11/1/89
On-Board Diagnostic Systems II Adopted regulations to implement the second phase of on-board diagnostic requirements which alert drivers of cars, light-trucks and medium-duty vehicles when the emission control system is not functioning properly.	9/1/89
Cars and light-duty trucks Adopted regulations to reduce ROG and CO emissions from cars and light trucks by 35 percent.	6/1/89
Architectural coatings Approved a suggested control measure to reduce ROG emissions from architectural coatings.	5/1/89
Chrome from cooling towers Adopted Airborne Toxic Control Measure to reduce hexavalent chromium emissions from cooling towers.	3/1/89
Reformulated Diesel Fuel Adopted regulations requiring the use of clean diesel fuel with lower sulfur and aromatic hydrocarbons beginning in 1993.	11/1/88
Vehicle Recall Adopted regulations implementing a recall program which requires auto manufacturers to recall and fix vehicles with inadequate emission control systems (Vehicles are identified through in-use testing conducted by the ARB).	9/1/88
Suggested control measure for oil sumps Approved a suggested control measure to reduce emissions from sumps used in oil production operations.	8/1/88
Chrome platers Adopted Airborne Toxic Control Measure to reduce emissions of hexavalent chromium emissions from chrome plating and chromic acid anodizing facilities.	2/1/88
Suggested control measure for boilers Approved suggested control measure to reduce NOx emissions from industrial, institutional, and commercial boilers, steam generators and process heaters.	9/1/87
Benzene from service stations Adopted Airborne Toxic Control Measure to reduce benzene emissions from retail gasoline service stations (Also known as Phase II vapor recovery).	7/1/87
Agricultural burning guidelines Amended existing guidelines to add provisions addressing wildland vegetation management.	11/1/86
Heavy-duty vehicle certification Amended certification of heavy-duty diesel and gasoline-powered engines and vehicles to align with federal standards.	4/1/86
Cars and light-duty trucks Adopted regulations reducing NOx emissions from passenger cars and light-duty trucks by 40 percent.	4/1/86
Sulfur in diesel fuel Removed exemption for small volume diesel fuel refiners.	6/1/85
On-Board Diagnostics I Adopted regulations requiring the use of on-board diagnostic systems on gasoline-powered vehicles to alert the driver when the emission control system is not functioning properly.	4/1/85
Suggested control measure for wood coatings Approved a suggested control measure to reduce emissions from wood furniture and cabinet coating operations.	3/1/85
Suggested control measure for resin manufacturing Approved a suggested control measure to reduce ROG emissions from resin manufacturing.	1/1/85

ATTACHMENT B: SAN JOAQUIN VALLEY 8-HR OZONE MOTOR VEHICLE EMISSIONS BUDGETS

(Tons per summer average day, *established by conventional rounding)
Activity is the most recently amended 2015 FSTIP for each MPO as of March 22, 2016.

Table D- 4 2018 Motor Vehicle Emissions Budget

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare		Valley Air Basin	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
EMFAC2014 V1.0.7	7.95	27.64	6.50	25.39	1.29	5.09	1.80	5.08	2.42	9.35	5.87	12.97	3.76	10.49	3.67	9.40		
Total	7.95	27.64	6.50	25.39	1.29	5.09	1.80	5.08	2.42	9.35	5.87	12.97	3.76	10.49	3.67	9.40	33.26	105.42
Rounded Total	8.000	27.700	6.600	25.400	1.300	5.100	1.900	5.100	2.500	9.400	5.900	13.000	3.800	10.500	3.700	9.500		
Budget*	8.0	27.7	6.6	25.4	1.3	5.1	1.9	5.1	2.5	9.4	5.9	13.0	3.8	10.5	3.7	9.5	33.7	105.7

Table D- 5 2021 Motor Vehicle Emissions Budgets

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare		Valley Air Basin	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
EMFAC2014 V1.0.7	6.38	22.13	5.41	20.33	1.06	4.19	1.44	4.06	1.94	7.70	4.80	10.22	2.98	8.23	2.86	7.20		
Total	6.38	22.13	5.41	20.33	1.06	4.19	1.44	4.06	1.94	7.70	4.80	10.22	2.98	8.23	2.86	7.20	26.88	84.06
Rounded Total	6.400	22.200	5.500	20.400	1.100	4.200	1.500	4.100	2.000	7.800	4.900	10.300	3.000	8.300	2.900	7.200		
Budget*	6.4	22.2	5.5	20.4	1.1	4.2	1.5	4.1	2.0	7.8	4.9	10.3	3.0	8.3	2.9	7.2	27.3	84.5

Table D- 6 2024 Motor Vehicle Emissions Budgets

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare		Valley Air Basin	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
EMFAC2014 V1.0.7	5.34	14.06	4.75	12.54	0.90	2.59	1.17	2.53	1.58	4.79	4.12	6.88	2.50	5.51	2.37	4.65		
Total	5.34	14.06	4.75	12.54	0.90	2.59	1.17	2.53	1.58	4.79	4.12	6.88	2.50	5.51	2.37	4.65	22.73	53.55
Rounded Total	5.400	14.100	4.800	12.600	0.900	2.600	1.200	2.600	1.600	4.800	4.200	6.900	2.600	5.600	2.400	4.700		
Budget*	**5.4**	**14.1**	**4.8**	**12.6**	**0.9**	**2.6**	**1.2**	**2.6**	**1.6**	**4.8**	**4.2**	**6.9**	**2.6**	**5.6**	**2.4**	**4.7**	**23.1**	**53.9**

Table D- 7 2027 Motor Vehicle Emissions Budgets

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare		Valley Air Basin	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
EMFAC2014 V1.0.7	4.84	13.12	4.47	11.61	0.83	2.41	1.03	2.22	1.41	4.37	3.73	6.12	2.26	5.05	2.10	4.09		
Total	4.84	13.12	4.47	11.61	0.83	2.41	1.03	2.22	1.41	4.37	3.73	6.12	2.26	5.05	2.10	4.09	20.67	48.98
Rounded Total	4.900	13.200	4.500	11.700	0.900	2.500	1.100	2.300	1.500	4.400	3.800	6.200	2.300	5.100	2.200	4.100		
Budget*	**4.9**	**13.2**	**4.5**	**11.7**	**0.9**	**2.5**	**1.1**	**2.3**	**1.5**	**4.4**	**3.8**	**6.2**	**2.3**	**5.1**	**2.2**	**4.1**	**21.2**	**49.5**

Table D- 8 2030 Motor Vehicle Emissions Budgets

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare		Valley Air Basin	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
EMFAC2014 V1.0.7	4.42	12.52	4.18	10.89	0.76	2.28	0.89	1.98	1.27	4.11	3.40	5.60	2.03	4.68	1.90	3.73		
Total	4.42	12.52	4.18	10.89	0.76	2.28	0.89	1.98	1.27	4.11	3.40	5.60	2.03	4.68	1.90	3.73	18.85	45.78
Rounded Total	**4.500**	**12.600**	**4.200**	**10.900**	**0.800**	**2.300**	**0.900**	**2.000**	**1.300**	**4.200**	**3.500**	**5.700**	**2.100**	**4.700**	**1.900**	**3.800**		
Budget*	**4.5**	**12.6**	**4.2**	**10.9**	**0.8**	**2.3**	**0.9**	**2.0**	**1.3**	**4.2**	**3.5**	**5.7**	**2.1**	**4.7**	**1.9**	**3.8**	**19.2**	**46.2**

Table D- 9 2031 Motor Vehicle Emissions Budgets

County	Fresno		Kern		Kings		Madera		Merced		San Joaquin		Stanislaus		Tulare		Valley Air Basin	
	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx	ROG	NOx
EMFAC2014 V1.0.7	4.28	12.40	4.10	10.76	0.73	2.24	0.85	1.92	1.22	4.05	3.29	5.47	1.95	4.60	1.82	3.62		
Total	4.28	12.40	4.10	10.76	0.73	2.24	0.85	1.92	1.22	4.05	3.29	5.47	1.95	4.60	1.82	3.62	18.24	45.07
Rounded Total	**4.300**	**12.500**	**4.100**	**10.800**	**0.800**	**2.300**	**0.900**	**2.000**	**1.300**	**4.100**	**3.300**	**5.500**	**2.000**	**4.700**	**1.900**	**3.700**		
Budget*	**4.3**	**12.5**	**4.1**	**10.8**	**0.8**	**2.3**	**0.9**	**2.0**	**1.3**	**4.1**	**3.3**	**5.5**	**2.0**	**4.7**	**1.9**	**3.7**	**18.6**	**45.6**

ATTACHMENT C: STATE OF CALIFORNIA MOTOR VEHICLE CONTROL PROGRAM (1990-PRESENT) TRANSPORTATION CONTROL STRATEGIES ADOPTED BY THE CALIFORNIA AIR RESOURCES BOARD SINCE 1990

Measure	Hearing Date	Category
Emission Control System Warranty. T 13, CCR, 2035-2041, 1977	12/14/89	On-road
Certification Procedure for Aftermarket Parts. VC 27156 & 38391	02/08/90	On-road
Emission Standards for Medium Duty Vehicles. T 13, CCR, 1900, 1956.8, 1960.1, 1968.1, 2061, 2112, 2139	06/14/90	On-road
Wintertime Limits for Sulfur in Diesel Fuel. T 13, CCR, 2255	06/21/90	Fuels
Evaporative Emission Standards. T 13, CCR, 1976	08/09/90	On-road
California Reformulated Gasoline (CaRFG), Phase I. T 13, CCR, 2251.5	09/27/90	Fuels
Low Emission Vehicles and Clean Fuels. T 13, CCR, 1900, 1904, 1956.8, 1960.1, 1960.1.5, 1960.5 and 2111, 2112, 2125, and 2139, 2061.	09/28/90	On-road
Heavy Duty Diesel Smoke Emission Testing. T 13, CCR, 2180-2187	11/08/90	On-road
Limit on Aromatic Content of Diesel Fuel. T 13, CCR, 2256	12/13/90	Fuels
Onboard Diagnostics for Light-Duty Trucks and Light & Medium-Duty Motor Vehicles. T 13, CCR, 1977, 1968.1	09/12/91	On-road
Onboard Diagnostic, Phase II. T 13, CCR, 1968.1, 1977	11/12/91	On-road
Low Emission Vehicles amendments revising reactivity adjustment factor (RAF) provisions and adopting a RAF for M85 transitional low emission vehicles. T 13, CCR, 1960.1	11/14/91	On-road
California Reformulated Gasoline, Phase II. T 13, CCR, 2250, 2255.1, 2252, 2260 - 2272, 2295	11/21/91	Fuels
Wintertime Gasoline Program. T 13, CCR, 2258, 2298, 2251.5, 2296	11/21/91	Fuels
Specifications for Alternative Motor Vehicle Fuel. T 13, & 26, CCR, 2290, 2291, 2292.1, 2292.2, 2292.3, 2292.5, 2292.6, 2292.7, 1960.1(k), 1956.8(b), 1956.8(d)	12/12/91	Fuels
Specifications for Alternative Motor Vehicle Fuels. T 13, & 26, CCR, 2290-2292.7, 1960.1(k), 1956.8(b), 1956.8(d)	03/12/92	On-road
Standards and Test Procedures for Alternative Fuel Retrofit Systems. T 13, CCR, 2030, 2031	05/14/92	On-road
Phase 2 RFG certification fuel specifications. T 13, CCR, 1960.1, 1956.8(d)	08/13/92	On-road
Substitute Fuel or Clean Fuel Incorporated Test Procedures. T 13, CCR, 1960.1(k), 2317	11/12/92	On-road
Smoke Self Inspection Program for Heavy Duty Diesel & Gasoline Engines. T 13, CCR, 21902194, 2180-2187, 1956.8(b)	12/10/92	On-road

Measure	Hearing Date	Category
Certification Requirements for Low Emission Passenger Cars, Light-Duty Trucks & Medium Duty Vehicles. T 13, CCR, 1960.1, 1976, 2061, 1900	01/14/93	On-road
Urban Transit Buses. T 13, CCR, 1956.8, 1965, 2112	06/10/93	On-road
Onboard Diagnostic, Phase II. T 13, CCR, 1968.1	07/09/93	On-road
Wintertime Oxygenate Program. T 13, CCR, 2258, 2251.5, 2263(b), 2267, 2298, 2259, 2283, 2293.5	09/09/93	Fuels
Diesel Fuel Regulations -Emergency. T 13, CCR, 2281(h), 2282(1)	10/15/93	Fuels
Evaporative Emission Standards and Test Procedures. T 13, CCR, 1976	02/10/94	On-road
Predictive Model for Phase II CaRFG. T 13, CCR, 2261, 2262-2270	06/09/94	Fuels
Small Refiner Diesel. T 13, CCR, 2282(e)(1)	07/24/94	Fuels
Diesel Fuel Certification. T 13, CCR, 1956.8(b)&(d), 1960.1(k), 2292.6	09/22/94	Fuels
Self-Inspection Program for Heavy Duty Diesel & Gasoline Engines. T 13, CCR, 2190-2194, 21802187, 1956.8(b)	11/09/94	On-road
Onboard Diagnostics, Phase II. T 13, CCR,1963.1, & Certification Procedures	12/08/94	On-road
Periodic Smoke Inspection Program. T 13, CCR, 2190	12/08/94	On-road
Specification for Alternative Motor Vehicle Fuels (M100). T 13 CCR, 2292.1	12/08/94	Fuels
Heavy Duty Vehicle Exhaust Emission Standards. T 13, CCR, 1956.8 and incorporate test procedures.	06/29/95	On-road
Onboard Refueling Vapor Recovery Standards. T 13, CCR, 1976, 1978 and incorporate test procedures	06/29/95	On-road
Test Method for Oxygen in Gasoline. T 13, CCR, 2251.5(c), 2258(c), 2263(b)	06/29/95	Fuels
Retrofit Emission Standards. T 13, CCR, 1956.9, 2030, 2031, and incorporate test procedures	07/27/95	On-road
Low Emission Vehicle Standards 3 (LEV 3). T 13, CCR, 1956.8, 1960.1, 1965, 2101, 2061, 2062, and incorporate test procedures	09/28/95	On-road
Test Methods for CaRFG 13, CCR, 2263(b)	10/26/95	Fuels
Required Additives in Gasoline (Deposit Control Additives). T 13, CCR, 2257 and incorporates testing procedures.	11/16/95	Fuels
CaRFG Housekeeping & CARBOB. T 13, CCR, 2263.7, 2266.5, 2260, 2262.5, 2264, 2265, 2272	12/14/95	Fuels
Exemption of Military Tactical Vehicles. T 13, CCR, 1905, 2400, 2420	12/14/95	On Road/Off Road
CaRFG Variance Requirements. T 13, CCR, 2271 (Emergency)	01/25/96	Fuels
Postpone Zero Emission Vehicle Requirements. T 13, CCR, 1900, 1960.1, 1976	03/28/96	On-road

Measure	Hearing Date	Category
Regulation Improvements and Repeals (fuel additives). T 13, CCR, 2201, 2202	05/30/96	Fuels
Diesel Fuel Certification Test Methods . T 13, CCR, 1956.8(b), 1960.1(k), 2281(c), 2282(b), (c) and (g)	10/24/96	Fuels
Diesel Fuel Test Methods. T 13, CCR, 1956.8(b), 1960.1(k), 2281(c), 2282(b), (c) and (g)	10/24/96	Fuels
Onboard Diagnostics, Phase II, Technical Status. T 13, CCR, 1968.1, 2030, 2031	12/12/96	On-road
Liquefied Petroleum Gas Propane Limit Specification Delay. T 13, CCR, 2292.6	03/27/97	Fuels
Postpone Enhanced Evaporative Emission Requirements for Ultra-Small Volume Vehicle Manufacturers. T 13, CCR, 1976 and incorporate test procedures	05/22/97	On-road
Off-Cycle Emissions Supplemental Federal Test Procedures (SFTPs). T 13, CCR, 1960.1, 2101 and incorporate test procedures	07/24/97	On-road
Heavy Duty Vehicle Smoke Inspection Program/Periodic Smoke Inspection Program. T 13, CCR, 2180-2188 and 2190-2194	12/11/97	On-road
Heavy Duty Vehicle Regulations: 2004 Standards. T 13, CCR, 1956.8, 1965, 2036, 2112 and test procedures	04/23/98	On-road
Cleaner Burning Gasoline Model Flexibility. T 13, CCR, Sections 2260, 2262.1, 2262.3, 2262.4, 2262.5, 2262.6, 2262.7 and 2265	08/27/98	Fuels
Gasoline Vapor Recovery Systems. T 17, CCR, 94010-94015 and 94150, 94156, 94157, 94158, 94159, 94160, 94162	08/27/98	Vapor Recovery
Gasoline Deposit Control Additive Regulation. T 13, CCR, 2257, and incorporating test procedures	09/24/98	Fuels
Low Emission Vehicles Standards (LEV 2) and Compliance Assurance Program (CAP 2000). T 13, CCR,1961 & 1962 (both new); 1900, 1960.1, 1965, 1968.1, 1976, 1978, 2037, 2038, 2062, 2101, 2106, 2107, 2110, 2112, 2114, 2119, 2130, 2137-2140, 2143-2148	11/05/98	On-road
Exhaust Standards for (On-Road) Motorcycles. T 13, CCR, 1958	12/10/98	On-road
Voluntary Accelerated Light Duty Vehicle Retirement Regulations. T 13, CCR, 2600-2610	12/10/98	On-road
Cleaner Burning Gasoline (Increasing the Oxygen Content). T 13, CCR, sections 2262.5(b) and 2265(a)(2)	12/11/98	Fuels
Specifications for Liquid Petroleum Gas Used as a Motor Vehicle Fuel. T 13, CCR, 2292.6	12/11/98	Fuels
Cleaner Burning Gasoline, Oxygen Requirement for Wintertime In Lake Tahoe Area/Gas Pump Labeling for MTBE. T 13, CCR, 2262.5, and 2273	06/24/99	Fuels
Clean Fuels Regulation Requirements. T 13, CCR, sections 2300-2317, and 2303.5, 2311.5	07/22/99	On-road

Measure	Hearing Date	Category
CaRFG Phase 3 Amendments (Phase out of MTBE, standards, predictive model). T 13, CCR, 2260, 2261, 2262.1, 2262.5, 2263, 2264, 2264.2, 2265, 2266 etc…	12/09/99	Fuels
Transit Bus Standards. T 13, CCR, 1956.1, 1956.2, 1956.3, 1956.4, 1956.8, 1965	02/24/00	On-road
CaRFG Phase 3 Follow-up Amendments. T 13, CCR, sections 2260, 2261, 2262.3, 2262.5, 2263, 2264, 2265, 2266, 2266.5, 2270, 2272, 2273, 2282, 2296, 2297, 2262.9 and incorporated test procedures	11/16/00	Fuels
CaRFG Phase 3 Test Methods. T 13, CCR, sections 2263(b)	11/16/00	Fuels
Heavy Duty Diesel Engines "Not-to-Exceed (NTE)" Test Procedures. T 13 CCR, 1956.8, 2065	12/07/00	On-road
Light-and Medium Duty Low Emission Vehicle Alignment with Federal Standards. Exhaust Emission Standards for Heavy Duty Gas Engines. T 13, CCR, 1956.8 &1961	12/07/00	On-road
Zero Emission Vehicle Regulation Update. T 13, CCR, 1900, 1960.1(k), 1961, 1962 & incorporated Test Procedure	01/25/01	On-road
Zero Emission Vehicle Infrastructure and Standardization of Electric Vehicle Charging Equipment. T 13, CCR, 1900(b), 1962(b) 1962.1	06/28/01	On-road
Heavy Duty Diesel Engine Standards for 2007 and Later. T 13, CCR, 1956.8 and incorporated test procedures	10/25/01	On-road
Low Emission Vehicle Regulations. T 13, CCR, 1960.1,1960.5, 1961, 1962 and incorporate test procedures and guidelines	11/15/01	On-road
California Motor Vehicle Service Information Rule. T 13&17, CCR, 1969 & 60060.1 -60060.7	12/13/01	On-road
Voluntary Accelerated Light Duty Vehicle Retirement Regulations. T 13, CCR, 2601-2605, 2606 & appendices C & D, and 2607-2610	02/21/02	On-road
On-Board Diagnostic II Review Amendments. T 13, CCR, 1968.1, 1968.2, 1968.5	04/25/02	On-road
Diesel Retrofit Verification Procedure, Warranty and In-Use Compliance Requirements. T 13, CCR, 2700-2710	05/16/02	On-road
Revision to Transit Bus Regulations Amendments. T 13, CCR, 1956.1, 1956.2, 1956.4,1956.8, and 2112, & documents incorporated by reference	10/24/02	On-road
Airborne Toxic Control Measure for Diesel Particulate from School Bus Idling. T13, CCR, 2480	12/12/02	On-road
Low Emission Vehicles II. Align Heavy Duty Gas Engine Standards with Federal Standards; minor administrative changes. T 13, CCR, 1961, 1965, 1956.8, 1956.1, 1978, 2065 and documents incorporated by reference	12/12/02	On-road
Zero Emission Vehicle Amendments for 2003. T 13, CCR, 1960.1(k), 1961(a) and (d), 1900, 1962, and documents incorporated by reference	03/25/03	On-road

Measure	Hearing Date	Category
Solid Waste Collection Vehicles. T 13, CCR, 2020, 2021, 2021.1, 2021.2	09/24/03	On-road
Airborne Toxic Control Measure for Diesel Particulate for Transport Refrigeration Units. T 13, CCR, 2022 & 2477	12/11/03	On-road
Diesel Retrofit Verification Procedure, Warranty and In-Use Compliance Requirements (Amendments). T 13, CCR, 2701-2707 & 2709	12/11/03	On-road
CA Motor Vehicle Service Information Rule. T 13, CCR, 1969	01/22/04	On-road
Heavy Duty Diesel Engine-Chip Reflash. T 13, CCR, 2011, 2180.1, 2181, 2184, 2185, 2186, 2192, and 2194	03/27/04	On-road
Engine Manufacturer Diagnostic System Requirements for 2007 and Subsequent Model Heavy Duty Engines. T 13, CCR, 1971	05/20/04	On-road
Urban Bus Engines/Fleet Rule for Transit Agencies. T 13, CCR, 1956.1, 1956.2, 1956.3, and 1956.4,	06/24/04	On-road
Airborne Toxic Control Measure for Diesel Particulate from Diesel Fueled Commercial Vehicle Idling. T 13, CCR, 2485	07/22/04	On-road
Greenhouse Gas. T 13, CCR, 1961.1, 1900, 1961 and Incorporated Test Procedures	09/23/04	On-road
California Reformulated Gasoline, Phase 3. T 13, CCR, 2260, 2262, 2262.4, 2262.5, 2262.6, 2262.9, 2263, 2265 (and the incorporated "California Procedures"), and 2266.5	11/18/04	Fuels
Diesel Fuel Standards for Harborcraft & Locomotives. T 13, CCR, 2299, 2281, 2282, and 2284, and T 17, CCR, 93117	11/18/04	Fuels
Emergency Regulation for Temporary Delay of Diesel Fuel Lubricity Standard. T 13, CCR, 2284	11/24/04	Fuels
Transit Fleet Rule. T 13, CCR, 2023, 2023.1, 2023.2, 2023.3, 2023.4, 1956.1, 2020, 2021, repeal 1956.2, 1956.3, 1956.4	02/24/05	On-road
On-Board Diagnostic System Requirements for 2010 and Subsequent Model-Year Heavy-Duty Engines (HD OBD). T 13, CCR, 1971.1	07/21/05	On-road
2007-2009 Model-Year Heavy Duty Urban Bus Engines and the Fleet Rule for Transit Agencies. T 13, CCR, 1956.1, 1956.2, and 1956.8	09/15/05	On-road
Requirements to Reduce Idling Emissions from New and In-Use Trucks, Beginning in 2008. T 13, CCR section1956.8 and the incorporated document	10/20/05	On-road
Diesel Particulate Matter Control Measure for On-Road Heavy-Duty Diesel-Fueled Vehicles Owned or Operated by Public Agencies and Utilities. T 13, CCR, 2022 and 2022.1	12/08/05	On-road
AB1009 Heavy-Duty Vehicle Smoke Inspection Program. T 13, CCR, 2180, 2180.1, 2181, 2182, 2183, 2184, 2185, 2186, 2187, and 2188, 2189	01/26/06	On-road
Diesel Verification Procedure, Warranty & In-Use. T 13, CCR, 2702, 2703, 2704, 2706, 2707, and 2709.	03/23/06	On-road

Measure	Hearing Date	Category
Technical Amendments to Evaporative Exhaust and Evaporative Emissions Test Procedures. T 13, CCR, 1961,1976 and 1978.	05/25/06	On-road
California Motor Vehicle Service Information Rule. T 13, CCR, 1969 and incorporated documents	06/22/06	On-road
Heavy-Duty In-Use Compliance Regulation. T 13, CCR, 1956.1, 1956.8, and documents incorporated by reference	09/28/06	On-road
On-Board Diagnostic II. T 13, CCR, 1968.2, 1968.5, 2035, 2037 and 2038	09/28/06	On-road
Zero Emission Bus Regulation. T13, CCR, 2023.1, 2023.3, & 2023.4	10/19/06	On-road
Voluntary Accelerated Retirement Regulation. T 13, CCR, 2601-2610 and appendices A-D	12/07/06	On-road
Phase 3 Reformulated Gasoline (Ethanol Permeation) T 13, CCR, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2270, 2271, and 2273	06/14/07	On-road
Aftermarket Catalytic Converters and Used Catalytic Converters T 13, CCR, 2222	10/25/07	On-road
Port Truck Modernization T 13, CCR, 2027	12/07/07	On-road
Cleaner In-Use Heavy-Duty Trucks T 13, CCR, 2025	12/11/08	On-road
Enhanced Fleet Modernization Program (formerly “Expanded Vehicle Retirement Program”) T 13, CCR, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, and 2630	06/26/09	On-road
Vapor Recovery Equipment Defects List T 17, CCR, 94006	06/15/11	Vapor Recovery
Advanced Clean Cars T 13, CCR, 1900, 1956, 1960, 1961, 1962, 1965, 1968, 1976, 1978, 2037, 2038, 2062, 2112, 2139, 2140, 2145, 2147, 2235, 2300, 2302, 2303, 2304, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, and 2318	01/26/12	On-road
Zero Emission Vehicle Standards for 2009 through 2017 T 13, CCR, 1962.1, 1962.2, 1962.3	01/26/12	On-road
Emergency Regulatory Amendments to the Tractor-Trailer Greenhouse Gas Regulation T 17, CCR, 95307	02/29/12	On-Road
Amendments to On-Board Diagnostics (OBD I and II) Regulations T 13, CCR, 1968.2, 1971.1	08/23/12	On-road
Amendments to Verification Procedures, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines T13, CCR, 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2707, 2708, 2709, 2710, 2711	08/23/12	On-road
Low Emission Vehicle III Greenhouse Gas and Zero Emission Vehicle Regulation Amendments for Federal Compliance Option T 13, CCR, 1900, 1956.8, 1960.1, 1961, 1961.2, 1961.3, 1962.1, 1962.2, 1976	11/15/12	On-road
Gasoline and Diesel Fuel Test Methods T13, CCR, 2262.9, 2263, 2282	01/25/13	Fuel
Off-Highway Recreational Vehicle Evaporative Emission Control T 13, CCR 2416, 2417, 2418, 2419, 2419.1, 2419.2, 2419.3, 2419.4	07/25/13	Vapor Recovery

Measure	Hearing Date	Category
Amendments to Vapor Recovery for Gasoline Dispensing Facilities T 17, CCR, 94014, 94016	07/25/13	Vapor Recovery
Alternative Fuel Certification Procedures T13, CCR, 2030, 2031	09/26/13	Fuel
Minor Modifications to the Zero Emission Vehicle Regulation T 13, CCR, 1962.1, 1962.2	10/24/13	On-road
Heavy-Duty Greenhouse Gas Phase 1: On-Road Heavy Duty Greenhouse Gas Emissions Rule, Tractor-Trailer Rule, Commercial Motor Vehicle Idling Rule, Optional Emission Standards, Heavy-Duty Hybrid-Electric Vehicle Certification Procedure T 13, CCR, 1900, 1956.8, 2036, 2037, 2112, 2139, 2140, 2147, 2485, T 17, CCR, 95300, 95301, 95302, 95303, 95305, 95660, 95661, 95662, 95663, 95664	12/12/13	On-road
Truck and Bus Rule Update T 13, CCR, 2025	04/24/14 11/20/14	On-road
Amendments to the Enhanced Fleet Modernization Program Regulation T13, CCR, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629	06/26/14	On-road
2014 Amendments to Zero Emission Vehicle Regulation T 13, CCR, 1962.1, 1962.2	10/23/14 05/21/15	On-road
Amendments to Low Emission Vehicle III Criteria Pollutant Requirements for Light-and Medium-Duty Vehicles the Hybrid Electric Vehicle Test Procedures, and the Heavy-Duty Otto-Cycle and Heavy-Duty Diesel Test Procedures T 13, CCR, 1900, 1956.8, 1961.2, 1962.2, 1965, 1976, 1978	10/23/14	On-road
2015 Low Carbon Fuel Standard Amendments T 17, CCR, 95480, 95481, 95482, 95483, 95483.1, 95483.2, 95484, 95485, 95486, 95487, 95488, 95489, 95491, 95492, 95493, 95494, 95495, 95496, 95497	02/19/15 09/24/15	Fuel
Evaporative Emission Control Requirements for Spark-Ignition Marine Watercraft T13, CCR, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869	02/19/15	Vapor Recovery
Commercialization of Alternative Diesel Fuels Regulation T13, CCR, 2290, 2291, 2293, 2293.1, 2293.2, 2293.3, 2293.4, 2293.5, 2293.6, 2293.7, 2293.8, 2293.9	02/19/15 09/24/15	Fuel
Amendments to Certification Procedures for Vapor Recovery Systems at Gasoline Dispensing Facilities: Aboveground Storage Tanks and Enhanced Conventional Nozzles T 17, CCR, 94010, 94011, 94016, 94017	04/23/15	Vapor Recovery
Revisions to On-Board Diagnostics System Requirements T 13, CCR, 1968.2, 1968.5, 1900	09/24/15	On-Road
Amendments to the Portable Fuel Container Regulation T 13, CCR, 2467, 2467.1, 2467.2, 2467.3, 2467.4, 2467.5, 2467.6,2467.7, 2467.8, 2467.9,	02/18/16	Vapor Recovery

ATTACHMENT D: ADOPTED TRANSPORTATION CONTROL MEASURES

The following tables represent each county's RACM commitment to implement TCMs as submitted for the *2002 Severe Area Ozone Plan* and approved by EPA.

Table D- 10 San Joaquin Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	SJCOG	Escalon	Lathrop	Lodi	Manteca	Ripon	Stockton	Tracy	County of San Joaquin	San Joaquin Regional Transit District
	Resolution Adopting Local Government Control Measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
											✓
SJC1.1	Regional Express Bus Program										✓
SJC1.2	Transit Access to Airports										✓
SJC1.3	Study Benefits of Bus Retrofit Program								✓		✓
SJC1.4	Mass Transit Alternatives										✓
SJC1.5	Expansion of Public Transportation Systems								✓		✓
SJC1.6	Transit Service Improvements in Combination with Park-and-Ride Lots and Parking Management								✓		✓
SJC1.7	Free (to the public) transit during special events								✓		✓
SJC1.9	Increase parking at transit centers or stops								✓		
SJC3.1	Commute Solutions	✓									
SJC3.2	Parking Cash-Out	✓									
SJC3.3	Employer Rideshare Program Incentives	✓									
SJC3.5	Preferential Parking for Carpools and Vanpools	✓									
SJC3.8	Purchase vans for vanpools	✓									
SJC3.9	Encourage merchants and employers to subsidize the cost of transit for employees	✓			✓				✓		
SJC13.16	Telecommuting	✓									
SJC5.1	Develop Intelligent Transportation Systems	✓							✓		
SJC5.2	Coordinate Traffic Signal Systems		✓	✓	✓	✓		✓	✓	✓	
SJC5.3	Reduce Traffic Congestion at Major Intersections		✓	✓	✓	✓		✓	✓	✓	

Table D- 10 San Joaquin Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	SJCOG	Escalon	Lathrop	Lodi	Manteca	Ripon	Stockton	Tracy	County of San Joaquin	San Joaquin Regional Transit District
SJC5.4	Site-Specific Transportation Control Measures		✓	✓	✓	✓		✓	✓	✓	
SJC5.6	Reversible Lanes				✓						
SJC5.7	One-Way Streets							✓	✓		
SJC5.8	On-Street Parking Restrictions			✓		✓		✓	✓	✓	
SJC5.9	Bus Pullouts in Curbs for Passenger Loading			✓				✓	✓		
SJC5.10	Additional Freeway Service Patrol										
SJC5.16	Adaptive traffic signals and signal timing		✓	✓	✓			✓	✓		
SJC5.17	Freeway bottleneck improvements (add lanes, construct shoulders, etc.)	✓									
SJC6.1	Park and Ride Lots	✓	✓						✓		
SJC6.2	Park and Ride lots serving perimeter counties	✓									
SJC7.3	Involve school districts to encourage walking/bicycling to school								✓		
SJC7.4	Adjust school hours so they do not coincide with peak traffic periods and Ozone seasons										
SJC7.11	Auto restricted zones								✓		
SJC8.1	Financial Incentives	✓									
SJC8.2	Internet ridematching services	✓									
SJC8.3	Preferential parking for carpoolers	✓									
SJC8.4	Credits and incentives for carpoolers	✓									
SJC8.5	Encourage employers to provide vehicles to carpoolers for running errands or emergencies	✓									
SJC8.6	Subscription Services										✓
SJC9.1	Establish Auto Free Zones and Pedestrian Malls		✓		✓			✓			
SJC9.2	Encouragement of Pedestrian Travel		✓	✓		✓		✓	✓	✓	
SJC9.3	Bicycle/Pedestrian Program		✓	✓	✓	✓		✓	✓	✓	
SJC9.4	Close certain roads for use by non-motorized traffic		✓	✓	✓	✓		✓	✓	✓	
SJC9.5	Encouragement of Bicycle Travel	✓	✓	✓					✓		

Table D- 10 San Joaquin Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	SJCOG	Escalon	Lathrop	Lodi	Manteca	Ripon	Stockton	Tracy	County of San Joaquin	San Joaquin Regional Transit District
SJC9.8	Close streets for special events for use by bikes and pedestrians when/where appropriate		✓	✓	✓	✓		✓	✓	✓	
SJC10.2	Bike Racks on Buses	✓							✓		✓
SJC10.4	Development of Bicycle Travel Facilities	✓	✓	✓	✓	✓		✓	✓	✓	
SJC13.1	Alternative Work Schedules	✓							✓		
SJC13.2	Modifications of Work Schedules	✓							✓		
SJC13.3	Telecommunications-Telecommuting	✓									
SJC13.4	Telecommunications-Teleconferencing	✓									
SJC14.3	Land Use/Development Alternatives		✓	✓	✓	✓		✓		✓	
SJC14.6	Transportation for Livable Communities (TLC)/Housing Incentive Program	✓							✓		
SJC15.1	Encouragement of Pedestrian Travel	✓							✓		
SJC15.2	Pedestrian and Bicycle Overpasses Where Safety Dictates		✓	✓	✓	✓		✓			
SJC17.1	Enforcement of Traffic, Parking, and Air Pollution Regulations		✓			✓		✓			
SJC17.6	Satellite campuses										
TCM1	Traffic Flow Improvements				✓	✓		✓	✓	✓	
TCM2	Public Transit								✓		✓
TCM3	Rideshare Programs	✓									
TCM4	Bicycle Programs	✓	✓	✓	✓	✓		✓	✓	✓	
TCM5	Alternative Fuels Program				✓			✓	✓	✓	
EPA	Commute Benefits	✓									
District	Heavy Duty Engine Emission Reduction Incentive Program										

Table D- 11 Stanislaus Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	StanCOG	Ceres	Hughson	Modesto	Newman	Oakdale	Patterson	Riverbank	Turlock	Waterford	Stanislaus County
	Resolution Adopting Local Government Control Measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ST1.1	Regional Express Bus Program				✓							
ST1.2	Transit Access to Airports				✓							
ST1.4	Mass Transit Alternatives		✓				✓		✓	✓		
ST1.5	Expansion of Public Transportation Systems		✓		✓					✓		✓
ST1.7	Free transit during special events		✓		✓			✓				✓
ST3.1	Commute Solutions	✓										
ST3.5	Preferential Parking for Carpools and Vanpools				✓					✓		
ST3.9	Encourage merchants and employers to subsidize the cost of transit for employees						✓					
ST13.16	Telecommuting										✓	
ST5.1	Develop Intelligent Transportation Systems		✓		✓				✓			
ST5.2	Coordinate Traffic Signal Systems		✓		✓			✓		✓		
ST5.3	Reduce Traffic Congestion at Major Intersections		✓		✓		✓	✓		✓		✓
ST5.4	Site-Specific Transportation Control Measures		✓		✓					✓		
ST5.9	Bus Pullouts in Curbs for Passenger Loading		✓		✓		✓	✓	✓	✓		✓
ST5.13	Fewer stop signs		✓		✓			✓		✓		
ST5.15	Changeable lane assignments											
ST5.16	Adaptive traffic signals and signal timing											✓
ST7.14	Incentives for cities with good development practices											
ST7.15	Cash incentives to foster jobs/housing balance						✓	✓		✓		
ST7.16	Trip reduction oriented development				✓		✓			✓		
ST7.17	Transit oriented development						✓			✓		
ST7.18	Sustainable development				✓		✓			✓		
ST7.19	Establishment of Urban Growth Boundaries									✓		
ST8.1	Financial Incentives, Including Zero Bus Fares				✓							✓

Table D- 11 Stanislaus Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	StanCOG	Ceres	Hughson	Modesto	Newman	Oakdale	Patterson	Riverbank	Turlock	Waterford	Stanislaus County
ST8.2	Internet ride-matching services											
ST8.3	Preferential parking for carpoolers				✓					✓		
ST8.4	Credits and incentives for carpoolers				✓					✓		
ST9.2	Encouragement of Pedestrian Travel			✓			✓	✓		✓	✓	
ST9.3	Bicycle/Pedestrian Program	✓		✓			✓	✓	✓	✓	✓	✓
ST9.5	Encouragement of Bicycle Travel				✓	✓	✓	✓	✓	✓	✓	
ST9.11	Safe Routes to School		✓	✓	✓		✓	✓		✓		
ST10.2	Bike Racks on Buses				✓		✓		✓	✓		✓
ST11.8	Ban cruising during Ozone Alert Days				✓							
ST11.9	Discourage drive-thrus in new development				✓							
ST13.1	Alternative Work Schedules							✓	✓			
ST13.5	Internet commerce and education	✓		✓	✓	✓	✓	✓	✓	✓		✓
ST14.3	Land Use/Development Alternatives		✓		✓							
ST14.7	Incentives to increase density around transit centers											
ST14.8	Incentives for cities with good development practices											
ST15.1	Encouragement of Pedestrian Travel			✓			✓	✓			✓	
ST15.2	Pedestrian and Bicycle Overpasses Where Safety Dictates				✓		✓		✓	✓		
ST17.15	Encourage the purchase and use of alternative, cleaner vehicles								✓	✓		
STTCM1	Traffic Flow Improvements											
STTCM2	Public Transit											
STTCM3	Rideshare Programs											
STTCM4	Bicycle Programs											
STTCM5	Alternative Fuels Program											
ARB	Parking Cash-Out											

Table D- 11 Stanislaus Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	StanCOG	Ceres	Hughson	Modesto	Newman	Oakdale	Patterson	Riverbank	Turlock	Waterford	Stanislaus County
EPA	Commute Benefits											
District	Heavy Duty Engine Emission Reduction Incentive Program											
	ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST											
10.1	Region-wide Mandatory Bile Racks at Work Sites		✓									

Table D-12 Merced County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	MCAG	Atwater	Dos Palos	Gustine	Livingston	Los Banos	Merced	County of Merced	Transit Joint Powers Authority for Merced County
	Resolution Adopting Local Government Control Measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓
ME1.5	Expansion of Public Transportation Systems									✓
ME1.10	Particulate Trap Retrofit									
ME3.1	Commute Solutions	✓								
ME3.3	Employer Rideshare Program Incentives									
ME3.9	Encourage merchants and employers to subsidize the cost of transit for employees									✓
ME5.3	Reduce Traffic Congestion at Major Intersections		✓	✓	✓	✓	✓	✓	✓	
ME5.7	One-Way Streets							✓		
ME5.9	Bus Pullouts in Curbs for Passenger Loading									✓
ME5.19	Internet provided road and route information									
ME8.2	Internet ride-matching services	✓								
ME9.2	Encouragement of Pedestrian Travel									
ME9.3	Bicycle/Pedestrian Program									
ME9.4	Close certain roads for use by non-motorized traffic		✓	✓	✓	✓	✓	✓	✓	
ME9.5	Encouragement of Bicycle Travel									
ME10.2	Bike Racks on Buses									
ME14.3	Land Use/Development Alternatives		✓	✓	✓	✓	✓	✓	✓	
ME14.5	Evaluation of the Air Quality Impacts of New development and Mitigation of Adverse Impacts		✓	✓	✓	✓	✓	✓	✓	
ME15.1	Encouragement of Pedestrian Travel									

Table D-12 Merced County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	MCAG	Atwater	Dos Palos	Gustine	Livingston	Los Banos	Merced	County of Merced	Transit Joint Powers Authority for Merced County
ME17.12	Use scout troops, churches, public figures to carry message of air pollution problems									
TCM1	Traffic Flow Improvements		✓	✓	✓	✓	✓		✓	
TCM2	Public Transit							✓		
TCM3	Rideshare Programs	✓								
TCM4	Bicycle Programs									

Table D-13 Madera County Transportation Commission Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	MCTC	Chowchilla	Madera County	Madera
	Resolution Adopting Local Government Control Measures for the Sever Area Ozone Plan	✓	✓	✓	✓
MA1.5	Expansion of Public Transportation Systems		✓	✓	✓
MA1.7	Free transit during special events				✓
MA3.1	Commute Solutions	✓			
MA3.5	Preferential Parking for Carpools and Vanpools	✓			
MA3.9	Encourage merchants and employers to subsidize the cost of transit for employees	✓			
MA5.1	Develop Intelligent Transportation Systems		✓	✓	✓
MA5.2	Coordinate Traffic Signal Systems				✓
MA5.3	Reduce Traffic Congestion at Major Intersections			✓	✓
MA5.5	Removal of On-Street Parking				
MA5.9	Bus Pullouts in Curbs for Passenger Loading				✓
MA5.19	Internet provided road and route information		✓	✓	✓
MA7.3	Involve school districts to encourage walking to school				
MA9.2	Encouragement of Pedestrian Travel				
MA9.3	Bicycle/Pedestrian Program		✓	✓	✓
MA9.5	Encouragement of Bicycle Travel				
MA9.8	Close streets for special events for use by bikes and pedestrians			✓	✓
MA10.2	Bike Racks on Buses				
MA11.2	Encourage Limitations on Vehicle Idling	✓			
MA11.6	Promote use of Pony engines	✓			
MA13.3	Telecommunications-Telecommuting	✓			
MA13.4	Telecommunications-Teleconferencing	✓	✓	✓	✓
MA14.1	Area wide Public Awareness Programs	✓			

Table D-13 Madera County Transportation Commission Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	MCTC	Chowchilla	Madera County	Madera
MA14.5	Evaluation of the Air Quality Impacts of New development and Mitigation of Adverse Impacts		✓	✓	✓
MA15.1	Encouragement of Pedestrian Travel				
MA17.12	Use scout troops, churches, public figures to carry message of air pollution problems				
TCM1	Traffic Flow Improvements		✓	✓	✓
TCM2	Public Transit		✓	✓	✓
TCM3	Rideshare Programs	✓			
TCM4	Bicycle Programs				
TCM5	Alternative Fuels Program			✓	✓
EPA	Commute Benefits	*			
* MCTC has indicated that implementation of this measure is included in Measure 3.1 Commute Solutions, but was inadvertently omitted from the resolution package.					

Table D-14 Fresno Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	Fresno COG	Clovis/Clovis Transit	Coa-linga	Fire-baugh	Fowler	Fresno/Fresno Area Express	Huron	Kerman	Kings-burg	Men-dota	Orange Cove	Parlier	Reedley	Sanger	San Joaquin	Selma	Fresno County	Fresno County Rural Transit Agency
	Resolution Adopting Local Government Control Measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR1.1	Regional Express Bus Program		✓				✓												✓
FR1.2	Transit Access to Airports		✓				✓												
FR1.3	Study Benefits of Bus Retrofit Program		✓				✓												
FR1.4	Mass Transit Alternatives		✓				✓												✓
FR1.5	Expansion of Public Transportation Systems		✓				✓												✓
FR1.6	Transit Service Improvements in Combination with Park-and-Ride Lots and Parking Management																		
FR1.7	Free transit during special events		✓				✓												
FR1.9	Increase parking at transit centers or stops						✓												
FR2.3	Fixed Lanes for Buses and Carpools on Arterials																		
FR3.1	Commute Solutions	✓																	
FR3.2	Parking Cash-Out	✓																	
FR3.3	Employer Rideshare Program Incentives																		
FR3.5	Preferential Parking for Carpools and Vanpools	✓																	
FR3.6	Employee Parking Fees	✓																	
FR3.8	Purchase vans for vanpools																		
FR3.9	Encourage merchants and employers to subsidize the cost of transit for employees	✓																	
FR13.16	Telecommuting																		
FR5.1	Develop Intelligent Transportation Systems		✓				✓												
FR5.2	Coordinate Traffic Signal Systems		✓				✓	✓	✓				✓	✓	✓		✓	✓	
FR5.3	Reduce Traffic Congestion at Major Intersections		✓	✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	
FR5.4	Site-Specific Transportation Control Measures		✓	✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	

Table D-14 Fresno Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	Fresno COG	Clovis/Clovis Transit	Coa-linga	Fire-baugh	Fowler	Fresno/Fresno Area Express	Huron	Kerman	Kings-burg	Men-dota	Orange Cove	Parlier	Reedley	Sanger	San Joaquin	Selma	Fresno County	Fresno County Rural Transit Agency
FR5.5	Removal of On-Street Parking		✓	✓			✓	✓		✓		✓		✓	✓		✓	✓	
FR5.6	Reversible Lanes																		
FR5.7	One-Way Streets																✓		
FR5.8	On-Street Parking Restrictions		✓				✓											✓	
FR5.9	Bus Pullouts in Curbs for Passenger Loading		✓				✓											✓	
FR5.10	Additional Freeway Service Patrol	✓																	
FR5.11	Consider coordinating scheduling of arterial and highway maintenance to exclude ozone action days if the maintenance activities require lane reductions on heavily utilized arterials and highways		✓				✓											✓	
FR5.13	Fewer stop signs, remove unwarranted and "political" stop signs and signals		✓		✓		✓			✓				✓			✓	✓	
FR5.14	Ban left turns		✓				✓												
FR5.15	Changeable lane assignments																		
FR5.16	Adaptive traffic signals and signal timing		✓				✓											✓	
FR5.18	Minimize impact of construction on traveling public. Have contractors pay when lanes are closed as an incentive to keep lanes open		✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR6.1	Park and Ride Lots					✓		✓	✓	✓			✓	✓		✓	✓		
FR6.2	Park and Ride lots serving perimeter counties					✓		✓	✓	✓			✓	✓		✓	✓		
FR7.12	Incentives to increase density around transit centers		✓				✓												
FR8.1	Financial Incentives, Including Zero Bus Fares																		
FR8.2	Internet ride-matching services	✓																	
FR8.3	Preferential parking for carpoolers	✓																	
FR8.4	Credits and incentives for carpoolers	✓																	
FR8.5	Employers provide vehicles to carpoolers for running errands or emergencies	✓																	
FR8.6	Subscription Services																		✓

Table D-14 Fresno Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	Fresno COG	Clovis/Clovis Transit	Coa-linga	Fire-baugh	Fowler	Fresno/Fresno Area Express	Huron	Kerman	Kings-burg	Men-dota	Orange Cove	Parlier	Reedley	Sanger	San Joaquin	Selma	Fresno County	Fresno County Rural Transit Agency
FR9.1	Establish Auto Free Zones and Pedestrian Malls			✓			✓			✓									
FR9.2	Encouragement of Pedestrian Travel		✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			
FR9.3	Bicycle/Pedestrian Program		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
FR9.4	Close certain roads for use by non-motorized traffic		✓	✓			✓			✓		✓		✓	✓		✓	✓	
FR9.5	Encouragement of Bicycle Travel		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR9.7	Cash Rebates for Bikes																		
FR9.8	Close streets for special events for use by bikes and pedestrians		✓	✓			✓			✓		✓		✓	✓		✓	✓	
FR9.10	Provide funding so volunteers do not have to pay the cost of trail creation and maintenance		✓		✓		✓							✓				✓	
FR10.2	Bike Racks on Buses		✓				✓												
FR10.4	Development of Bicycle Travel Facilities		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR10.5	Expedite Bicycle Projects from RTP		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
FR10.6	Provide Bike/Pedestrian facilities safety patrols		✓		✓		✓	✓			✓			✓			✓		
FR10.7	Require inclusion of bicycle lanes on state or federally funded thoroughfare projects.		✓	✓		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓		
FR11.3	Turn off engines while stalled in traffic																		
FR13.1	Alternative Work Schedules	✓																	
FR13.2	Modifications of Work Schedules	✓																	
FR13.3	Telecommunications-Telecommuting	✓																	
FR13.4	Telecommunications-Teleconferencing	✓																	
FR14.3	Land Use/Development Alternatives		✓			✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	
FR14.5	Evaluation of the Air Quality Impacts of New Development and Mitigation of Adverse Impacts		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR14.7	Incentives to increase density around transit centers		✓				✓												
FR15.1	Encouragement of Pedestrian Travel	✓																	
FR15.2	Pedestrian and Bicycle Overpasses Where Safety Dictates		✓				✓											✓	

Table D-14 Fresno Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	Fresno COG	Clovis/Clovis Transit	Coa-linga	Fire-baugh	Fowler	Fresno/Fresno Area Express	Huron	Kerman	Kings-burg	Men-dota	Orange Cove	Parlier	Reedley	Sanger	San Joaquin	Selma	Fresno County	Fresno County Rural Transit Agency
FR17.1	Enforcement of Traffic, Parking, and Air Pollution Regulations		✓	✓	✓		✓	✓		✓					✓		✓		
FR17.6	Satellite campuses																		
FR-TCM1	Traffic Flow Improvements		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR-TCM2	Improved Public Transit						✓						✓						✓
FR-TCM3	Voluntary Rideshare Program and Employer Incentive Program	✓																	
FR-TCM4	Bicycle Lanes and Facilities		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR-TCM5	Alternative Fuels Program		✓		✓	✓	✓				✓			✓				✓	
FR-TCM6	Park and Ride Fringe Parking					✓		✓	✓	✓			✓	✓		✓	✓		
ARB	Parking Cash-Out	✓																	
EPA	Commute Benefits	✓																	
District	Heavy Duty Engine Emission Reduction Incentive Program																		
FR19.1	Regional Express Bus Program		✓				✓												✓
FR19.2	Expansion of Public Transportation Systems		✓				✓												✓
FR19.3	Consolidation of Public Transit Operators						✓												
FR19.4	Increase Parking at Transit Centers or Stops						✓			✓				✓					
FR19.5	Transit Stop Improvements		✓				✓												✓
FR19.6	Productivity Improvements		✓				✓												✓
FR19.7	Ridership Targets						✓												
FR19.18	Pedestrian facilities		✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
FR19.25	Optimize traffic signal timing		✓				✓	✓	✓				✓	✓	✓		✓	✓	
FR19.26	Encourage employers to provide money to employees for home computer purchase so employees can work from home.	✓																	

Table D-14 Fresno Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	Fresno COG	Clovis/Clovis Transit	Coa-linga	Fire-baugh	Fowler	Fresno/Fresno Area Express	Huron	Kerman	Kings-burg	Men-dota	Orange Cove	Parlier	Reedley	Sanger	San Joaquin	Selma	Fresno County	Fresno County Rural Transit Agency
	ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST																		
10.7A	Require Inclusion of Paved Shoulders Adequate for Bicycle Use on State or Federally Funded Reconstruction or Widening of Federal Major Collectors or Greater																	✓	

Table D-15 Tulare County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	TCAG	Dinuba	Exeter	Farmersville	Lindsay	Porterville	Tulare	Woodlake	Visalia	County of Tulare
	Resolution Adopting Local Government Control Measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TU1.1	Regional Express Bus Program							✓			✓
TU1.2	Transit Access to Airports						✓	✓		✓	
TU1.5	Expansion of Public Transportation Systems		✓	✓	✓	✓		✓	✓	✓	✓
TU1.6	Transit Service Improvements in Combination with Park-and-Ride Lots and Parking Management					✓	✓	✓			
TU1.7	Free transit during special events					✓	✓	✓		✓	
TU1.9	Increase parking at transit centers or stops						✓	✓			
											✓
TU3.1	Commute Solutions			✓	✓		✓	✓	✓		
TU3.2	Parking Cash-Out			✓			✓	✓	✓		✓
TU3.3	Employer Rideshare Program Incentives	✓					✓	✓		✓	
TU3.5	Preferential Parking for Carpools and Vanpools			✓	✓	✓	✓	✓	✓	✓	✓
TU3.8	Purchase vans for vanpools	✓									
TU3.9	Encourage merchants and employers to subsidize the cost of transit for employees	✓					✓	✓		✓	
TU5.1	Develop Intelligent Transportation Systems	✓				✓	✓	✓		✓	
TU5.2	Coordinate Traffic Signal Systems	✓					✓	✓		✓	
TU5.3	Reduce Traffic Congestion at Major Intersections	✓				✓	✓	✓		✓	
TU5.4	Site-Specific Transportation Control Measures	✓		✓	✓	✓	✓	✓	✓	✓	
TU5.5	Removal of On-Street Parking				✓	✓	✓	✓	✓	✓	✓
TU5.8	On-Street Parking Restrictions				✓	✓		✓	✓	✓	
TU5.9	Bus Pullouts in Curbs for Passenger Loading				✓		✓	✓	✓	✓	
TU5.16	Adaptive traffic signals and signal timing			✓	✓		✓	✓		✓	
TU5.19	Internet provided road and route information		✓	✓		✓		✓	✓	✓	
TU5.20	Regional route marking systems to encourage underutilized capacity	✓				✓		✓		✓	
TU6.1	Park and Ride Lots					✓	✓	✓			

Table D-15 Tulare County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	TCAG	Dinuba	Exeter	Farmersville	Lindsay	Porterville	Tulare	Woodlake	Visalia	County of Tulare
TU7.3	Involve school districts to encourage walking to school		✓	✓	✓	✓	✓	✓	✓	✓	
TU7.12	Incentives to increase density around transit centers	✓					✓	✓			
TU7.13	Land use/air quality guidelines		✓	✓	✓	✓	✓	✓	✓	✓	
TU7.14	Incentives for cities with good development practices			✓	✓	✓	✓		✓		
TU7.17	Transit oriented development						✓	✓			
TU8.1	Financial Incentives, Including Zero Bus Fares										
TU8.2	Internet ride matching services										
TU8.3	Preferential parking for carpoolers		✓	✓	✓				✓	✓	✓
TU8.4	Credits and incentives for carpoolers		✓							✓	
TU8.5	Employers provide vehicles to carpoolers for running errands or emergencies	✓				✓					
TU8.6	Subscription Services										
TU9.1	Establish Auto Free Zones and Pedestrian Malls					✓		✓			
TU9.2	Encouragement of Pedestrian Travel					✓	✓	✓			
TU9.3	Bicycle/Pedestrian Program	✓				✓	✓	✓		✓	
TU9.4	Close certain roads for use by non-motorized traffic							✓			
TU9.5	Encouragement of Bicycle Travel	✓		✓		✓	✓	✓		✓	
TU9.8	Close streets for special events for use by bikes and pedestrians					✓	✓	✓			
TU9.9	Use condemned dirt roads for bike trails							✓			
TU10.1	Region-wide mandatory bike racks at work sites	✓						✓		✓	
TU10.2	Bike Racks on Buses						✓	✓	✓	✓	✓
TU11.6	Promote use of Pony engines	✓						✓			
TU13.1	Alternative Work Schedules	✓						✓			
TU13.2	Modifications of Work Schedules	✓						✓			
TU13.3	Telecommunications-Telecommuting	✓				✓					
TU13.4	Telecommunications-Teleconferencing	✓				✓		✓		✓	

Table D-15 Tulare County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	TCAG	Dinuba	Exeter	Farmersville	Lindsay	Porterville	Tulare	Woodlake	Visalia	County of Tulare
TU14.1	Area-wide Public Awareness Programs		✓					✓			
TU14.2	Special Event Controls			✓	✓		✓		✓		
TU14.3	Land Use/Development Alternatives		✓	✓	✓	✓	✓	✓	✓	✓	✓
TU14.4	Voluntary No Drive Day Programs		✓					✓			
TU14.5	Evaluation of the Air Quality Impacts of New development and Mitigation of Adverse Impacts		✓	✓	✓	✓	✓	✓	✓	✓	✓
TU14.6	Transportation for Livable Communities (TLC)/Housing Incentive Program		✓	✓	✓	✓			✓		
TU14.7	Incentives to increase density around transit centers						✓	✓			
TU14.8	Incentives for cities with good development practices			✓	✓		✓		✓		
TU15.1	Encouragement of Pedestrian Travel									✓	
TU15.2	Pedestrian and Bicycle Overpasses Where Safety Dictates							✓			
TU17.6	Satellite campuses					✓					
TU17.12	Use scout troops, churches, public figures to carry message of air pollution problems	✓	✓	✓	✓		✓	✓	✓	✓	✓
TU17.14	Cool cities approach to reduce heat build-up					✓	✓	✓			
TCM1	Traffic Flow Improvements			✓	✓		✓		✓	✓	✓
TCM2	Public Transit		✓	✓	✓		✓			✓	✓
TCM3	Rideshare Programs						✓				
TCM4	Bicycle Programs	✓				✓		✓	✓	✓	
TCM5	Alternative Fuels Program	✓	✓				✓	✓		✓	✓
ARB	Parking Cash-Out										
EPA	Commute Benefits										
District	Heavy Duty Engine Emission Reduction Incentive Program										
	ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST										
TU1.8	Require that government employees use transit for home to work trips, expand transit, and encourage large businesses to promote transit use							✓			
TU3.14	Mandatory compressed work weeks					✓					
TU5.6	Reversible Lanes					☐		✓			
TU5.7	One-Way Streets					☐		✓		✓	

Table D-15 Tulare County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	TCAG	Dinuba	Exeter	Farmersville	Lindsay	Porterville	Tulare	Woodlake	Visalia	County of Tulare
TU5.13	Fewer Stop Signs						✓	✓			
TU7.15	Cash incentives to foster jobs/housing balance					✓					
TU7.16	Trip reduction oriented development					✓		✓			
TU7.18	Sustainable development					✓		✓			
TU11.2	Encourage Limitations on Vehicle Idling					☐		✓			
TU17.1	Enforcement of Traffic, Parking, and Air Pollution Regulations					✓					
	Promote Use of Cleaner Lawn and Garden Equipment such as Lower-Emission Four-Stroke and Electric-Powered Equipment							✓			
	Defer Emissions Associated with Governmental Activities							✓			

Table D-16 Kings County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	KCAG	Avenal	Corcoran	Hanford	Lemoore	County of Kings	Kings County Area Public Transit Agency
	Resolution Adopting Local Government Control measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓
KI1.5	Expansion of Public Transportation Systems		✓	✓				✓
KI1.6	Transit Service Improvements in Combination with Park-and-Ride Lots and Parking Management		✓	✓	✓			✓
KI1.7	Free transit during special events		✓	✓	✓			✓
KI3.1	Commute Solutions							
KI3.3	Employer Rideshare Program Incentives					✓		
KI3.5	Preferential Parking for Carpools and Vanpools						✓	
KI3.8	Purchase vans for vanpools		✓					✓
KI3.9	Encourage merchants and employers to subsidize the cost of transit for employees		✓	✓		✓		
KI6.1	Park and Ride Lots		✓		✓			
KI6.2	Park and Ride lots serving perimeter counties		✓		✓			
KI8.2	Internet ride-matching services							
KI8.3	Preferential parking for carpoolers						✓	
KI8.5	Employers provide vehicles to carpoolers for running errands or emergencies							
KI8.6	Subscription Services							
KI9.2	Encouragement of Pedestrian Travel		✓	✓	✓	✓	✓	
KI9.3	Bicycle/Pedestrian Program				✓			
KI9.4	Close certain roads for use by non-motorized traffic		✓	✓	✓	✓	✓	
KI9.5	Encouragement of Bicycle Travel		✓	✓	✓			
KI9.8	Close streets for special events for use by bikes and pedestrians		✓	✓	✓	✓	✓	
KI10.1	Region-wide mandatory bike racks at work sites				✓			
KI10.2	Bike Racks on Buses		✓	✓				✓
KI11.6	Promote use of Pony engines							

Table D-16 Kings County Association of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	KCAG	Avenal	Corcoran	Hanford	Lemoore	County of Kings	Kings County Area Public Transit Agency
KI13.1	Alternative Work Schedules				✓		✓	
KI13.2	Modifications of Work Schedules				✓	✓	✓	
KI13.4	Telecommunications-Teleconferencing		✓	✓	✓	✓	✓	
KI14.1	Area-wide Public Awareness Programs				✓			
KI14.3	Land Use/Development Alternatives				✓	✓	✓	
KI14.4	Voluntary No Drive Day Programs							
KI15.1	Encouragement of Pedestrian Travel		✓	✓	✓	✓	✓	
TCM1	Traffic Flow Improvements		✓	✓	✓		✓	
TCM2	Public Transit		✓	✓				✓
TCM3	Rideshare Programs	✓						
TCM4	Bicycle Programs		✓	✓	✓			
TCM5	Alternative Fuels Program				✓		✓	
EPA	Commute Benefits		✓	✓				
	ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST							
5.1	Develop Intelligent Transportation Systems				✓			
5.3	Reduce Traffic Congestion at Major Intersections		✓	✓	✓	✓	✓	
5.4	Site-Specific Transportation Control Measures		✓	✓	✓	✓	✓	
5.5	Removal of On-Street Parking		✓	✓	✓	✓	✓	
5.8	On-Street Parking Restrictions				✓		✓	
5.9	Bus Pullouts In Curbs for Passenger Loading				✓		✓	
5.22	Use Dynamic Message Signs to Direct/Smooth Speeds During Incidents						✓	
7.3	Involve School Districts to Encourage Walking to School				✓			
7.13	Land Use/Air Quality Guidelines				✓			
7.14	Incentives for Cities with Good Development Practices				✓			
17.6	Satellite Campuses				✓			

Table D-17 Kern Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	KCOG	Arvin	Bakersfield	California City*	County of Kern	Delano	Golden Empire Transit	Maricopa	McFarland	Ridgecrest*	Shafter	Taft	Tehachapi*	Wasco
	Resolution Adopting Local Government Control Measures for the Severe Area Ozone Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
KE1.1	Regional Express Bus Program		✓			✓									
KE1.2	Transit Access to Airports														
KE1.4	Mass Transit Alternatives														
KE1.5	Expansion of Public Transportation Systems		✓			✓	✓					✓	✓	☐	
KE1.7	Free transit during special events					✓	✓					✓			✓
KE1.11	Make small dial-a-ride systems free														
KE1.12	Regional Express across county lines														
KE3.1	Commute Solutions														
KE3.2	Parking Cash-Out														
KE3.5	Preferential Parking for Carpools and Vanpools	✓													
KE3.9	Encourage merchants and employers to subsidize the cost of transit for employees						✓					✓			✓
KE3.15	Extend parking cash-out rule to more employers	**													
KE3.17	Promote Employer Rideshare Program Incentives														
KE3.18	Promote compressed work weeks														
KE3.19	Promote voluntary business closures on ozone action days														
KE5.1	Develop Intelligent Transportation Systems			✓									✓	☐	
KE5.2	Coordinate Traffic Signal Systems			✓		✓									
KE5.3	Reduce Traffic Congestion at Major Intersections			✓		✓								✓	✓
KE5.4	Site-Specific Transportation Control Measures			✓		✓									
KE5.5	Removal of On-Street Parking			✓	✓	✓					✓				✓
KE5.8	On-Street Parking Restrictions				✓										
KE5.9	Bus Pullouts in Curbs for Passenger Loading														
KE5.11	Consider coordinating scheduling of arterial and highway maintenance to exclude ozone			✓		✓									

Table D-17 Kern Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	KCOG	Arvin	Bakersfield	California City*	County of Kern	Delano	Golden Empire Transit	Maricopa	McFarland	Ridgecrest*	Shafter	Taft	Tehachapi*	Wasco
	action days if the maintenance activities require lane reductions on heavily utilized arterials and highways														
KE5.16	Adaptive traffic signals and signal timing			✓											
KE5.18	Minimize impact of construction on traveling public. Have contractors pay when lanes are closed as an incentive to keep lanes open			✓		✓									
KE5.19	Internet provided road and route information			✓		✓	✓					✓			
KE5.20	Regional route marking systems to encourage underutilized capacity			✓		✓	✓					✓			
KE5.22	Use dynamic message signs to direct/smooth speeds during incidents			✓											
KE5.27	Place vehicle sensors further away from intersections														
KE6.1	Park and Ride Lots														
KE7.3	Involve school districts to encourage walking to school														
KE7.4	Adjust school hours so they do not coincide with peak traffic periods and Ozone seasons														
KE7.12	Incentives to increase density around transit centers	✓		✓		✓									
KE7.13	Land use/air quality guidelines			✓		✓									
KE7.14	Incentives for cities with good development practices														
KE7.16	Trip reduction oriented development			✓		✓									
KE7.17	Transit oriented development		✓	✓		✓									✓
KE7.18	Sustainable development			✓		✓									
KE7.19	Shortened government work days during ozone alerts														
KE7.20	Distribute special parking passes for carpoolers														
KE7.21	Outreach program encouraging reduced trips during warmest part of the day														
KE8.2	Internet ride-matching services														
KE9.1	Establish Auto Free Zones and Pedestrian			✓		✓									✓

Table D-17 Kern Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	KCOG	Arvin	Bakersfield	California City*	County of Kern	Delano	Golden Empire Transit	Maricopa	McFarland	Ridgecrest*	Shafter	Taft	Tehachapi*	Wasco
	Malls														
KE9.2	Encouragement of Pedestrian Travel	✓				✓	✓					✓	✓	✓	
KE9.3	Bicycle/Pedestrian Program		✓			✓	✓				✓	✓	✓	☐	✓
KE9.5	Encouragement of Bicycle Travel	✓		✓	✓	✓	✓					✓	✓	✓	✓
KE9.8	Close streets for special events for use by bikes and pedestrians			✓			✓					✓			✓
KE9.10	Provide funding so volunteers do not have to pay the cost of trail creation and maintenance														
KE10.1	Region-wide mandatory bike racks at work sites			✓		✓	✓					✓			
KE10.2	Bike Racks on Buses		✓			✓	✓								
KE10.3	Regional Bike Parking Ordinance for all new construction			✓		✓							✓	☐	
KE13.2	Modifications of Work Schedules														
KE14.1	Area-wide Public Awareness Programs	✓													
KE14.2	Special Event Controls			✓		✓									
KE14.3	Land Use/Development Alternatives			✓		✓								✓	
KE14.4	Voluntary No Drive Day Programs	✓				✓									
KE14.5	Evaluation of the Air Quality Impacts of New development and Mitigation of Adverse Impacts						✓					✓		✓	✓
KE14.7	Incentives to increase density around transit centers	✓													
KE14.11	COG comments on land use planning decisions that affect transportation and air quality issues														
	Promote Telecommunications-Telecommuting														
	Promote Telecommunications-Teleconferencing														
	Promote voluntary business closures on ozone action days														
KE15.1	Encouragement of Pedestrian Travel	✓													

Table D-17 Kern Council of Governments Summary of Commitments - 2002 Severe Area Ozone Plan

Number	Measure Title	KCOG	Arvin	Bakersfield	California City*	County of Kern	Delano	Golden Empire Transit	Maricopa	McFarland	Ridgecrest*	Shafter	Taft	Tehachapi*	Wasco
KE15.2	Pedestrian and Bicycle Overpasses Where Safety Dictates			✓		✓									
KE17.6	Satellite campuses														
KE17.7	Charge more for higher emission fuels														
KE17.12	Use scout troops, churches, public figures to carry message of air pollution problems	✓													
KE17.14	Cool cities approach to reduce heat build-up														
KE17.16	Contact other areas that have been subject to EPA sanctions to determine best ways to implement new air quality measures														
KE17.17	Alternative fuel outreach program														
TCM1	Traffic Flow Improvements														
TCM2	Public Transit														
TCM3	Rideshare Programs														
TCM4	Bicycle Programs														
TCM5	Alternative Fuels Program	✓				✓									✓
ARB	Parking Cash-Out														
EPA	Commute Benefits	***													
District	Heavy Duty Engine Emission Reduction Incentive Program														
	ADDITIONAL COMMITMENTS FOR MEASURES NOT ON THE SUGGESTED LIST														
8.5	Shared LEV Vehicles at Work Sites			✓	✓										
14.9	Business, Industry and Governmental Outreach Program	✓													
14.1	Public Education Program	✓													
Local	Develop Programs that Encourage Good Movements by Rail											✓			
Local	Purchase Low Emission Vehicles (LEV) for Government Fleet Purposes													✓	

* These jurisdictions are located in the Mohave air basin, not the San Joaquin Valley air basin.
** KCOG has indicated that this measure is financially infeasible, but was inadvertently omitted from the reasoned justification documentation.
*** KCOG has indicated that implementation of this measure is included in Measure 14.9, but was inadvertently omitted from the resolution package.

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