Chapter 6

Demonstration of Federal Requirements for 2006 PM2.5 Standard

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TABLE OF CONTENTS

TABLE OF TABLES

6. DEMONSTRATION OF FEDERAL REQUIREMENTS FOR THE 2006 PM2.5 STANDARD: SERIOUS PLAN AND EXTENSION REQUEST

EPA's 2006 PM2.5 national ambient air quality standard (NAAQS, or standard) set the 24-hour average PM2.5 standard to 35 µg/m³ while retaining the annual average standard set in 1997.[1] Consistent with CAA Subpart 1, EPA finalized its implementation rule effective May 29, 2007 and designated the San Joaquin Valley as nonattainment for the standard effective December 2009.[2] The District adopted the *2012 PM2.5 Plan* to address the 2006 standard on December 20, 2012.[3] Just two weeks later, on January 4, 2013, the D.C. Circuit Court ruled that EPA erred by solely using Subpart 1 in establishing its PM2.5 implementation rule, without consideration of the PM-specific provisions in Subpart 4.[4]

Subpart 4 differs from Subpart 1 in required attainment plan deadlines, required levels of emissions controls, and requirements for addressing PM precursors. Another key difference is in the classification of nonattainment areas and corresponding attainment deadlines. Under Subpart 1, all areas were designated nonattainment without a corresponding classification. Under Subpart 4, nonattainment areas are initially classified as "Moderate," with six years from its initial nonattainment designation date to reach attainment (though two one-year extensions are available in certain circumstances). Areas can request reclassification to "Serious," with ten years from its initial attainment designation date to reach attainment. Subpart 4 allows for an additional extension of up to five years if the area demonstrates that the current attainment deadline is unfeasible, all requirements and commitments have been met, and SIP includes the most stringent measures (MSM) possible. If an area fails to attain an applicable attainment deadline, it must submit a SIP revision demonstrating expeditious attainment with PM or PM precursor emissions reduced by at least 5% per year until attainment.

Following the 2013 D.C. Circuit Court ruling, EPA began redirecting all PM2.5 implementation efforts to be consistent with Subpart 4, but with a truncated schedule as compared to what would have occurred had EPA initially designated nonattainment areas under Subpart 4 in 2009. In June 2014, EPA classified the Valley (and all other PM2.5 nonattainment areas) as Moderate nonattainment under Subpart 4, with no consideration to the level of pollution and air quality challenges in the Valley. This set the attainment deadline at December 2015. However, at the time of this classification and attainment deadline setting, it was already clear that attainment by December 2015 (based on 2013-2015 data) was impossible, in part due to the extreme drought,

[1] National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg, 200, pp. 61144-61233. (2006, October 17). (to be codified 40 CFR Part 50) http://www.gpo.gov/fdsys/pkg/FR-2006-10-17/pdf/06-8477.pdf
[2] Air Quality Designations for the 2006 24-Hour Fine Particle (PM2.5) National Ambient Air Quality Standards, 74 Fed. Reg. 218, pp. 58688-58781. (2009, November 13). (to be codified 40 CFR Part 81) https://www.gpo.gov/fdsys/pkg/FR-2009-11-13/pdf/E9-25711.pdf
[3] SJVPACD. PM2.5 Plan. (2012, December 20). Retrieved from http://www.valleyair.org/Air_Quality_Plans/PM25Plans2012.htm
[4] *Nat. Res. Def. Council v. E.P.A.*, 706 F.3d 428 (D.C. Cir. 2013)

stagnation, strong inversions, and historically dry conditions experienced over the winter of 2013-2014.

In September 2014, the District submitted supplemental documentation to EPA with a request for reclassification to Serious nonattainment for the 2006 PM2.5 standard. The Valley was reclassified to Serious nonattainment effective February 19, 2016[5] with an attainment deadline of December 31, 2019. With this reclassification, EPA directed the District to submit a SIP revision meeting Serious area requirements. EPA approved the majority of the *2012 PM2.5 Plan* as meeting Moderate area requirements effective September 30, 2016.[6]

Unfortunately, despite the significant progress and stringent regulations on stationary and mobile sources, attainment by the current deadline of 2019 is not physically possible, and extensive modeling demonstrates that the Valley will need enormous additional emission reductions to meet the 2006 PM2.5 standard (Appendix K). CARB truck, bus, and off-road engine regulations, critical to attainment for the Valley, will not be fully implemented until 2023.

Through this Serious Plan, the District is formally requesting an attainment deadline extension of the attainment deadline from 2019 to 2024 for the 2006 PM2.5 standard pursuant to Clean Air Act §188(e). The statute also includes factors that EPA may consider in determining whether to grant the extension and the length of the extension, including "the nature and extent of nonattainment, the types and numbers of sources or other emitting activities in the area (including the influence of uncontrollable natural sources and transboundary emissions from foreign countries), the population exposed to concentrations in excess of the standard, the presence and concentrations of potentially toxic substances in the mix of particulate emissions in the area, and the technological and economic feasibility of various control measures."

This attainment Plan satisfies statutory requirements for a Serious nonattainment area SIP submission and attainment extension request.[7]

[5] Designation of Areas for Air Quality Planning Purposes; California; San Joaquin Valley; Reclassification as Serious Nonattainment for the 2006 PM2.5 NAAQS; Final Rule. 81. Fed. Reg. 12, pp. 2993-3001. (2016, January 1). (to be codified at 40 CFR Parts 52 and 81). https://www.gpo.gov/fdsys/pkg/FR-2016-01-20/pdf/2016-00739.pdf
[6] 81 Fed. Reg. 59877 (Aug. 31, 2016). https://www.gpo.gov/fdsys/pkg/FR-2016-08-31/pdf/2016-20413.pdf
[7] See also 81 Fed. Reg. 58074-58097 (Aug. 24, 2016)

Table 6-1 Summary of Serious Nonattainment Area Plan Requirements

Serious Plan and Extension Request Elements	Source of Requirement	Location of Plan Where Element Satisfied
Current attainment Date is Impracticable	40 CFR §51.1005(b)(1)(i)	Section 6.1 Appendix K
Compliance with Applicable SIP Commitments	40 CFR §51.1005(b)(1)(ii)	Section 6.2
Base Year and Attainment Projected Emissions Inventory	40 CFR §§51.1003(b), 51.1005(b)(2)(i) and 51.1008(b)	Appendix B
Identify Pollutants to be Addressed	CAA §189(e)	Appendices G and K
Most Stringent Measures (MSM) and Best Available Control Measures (BACM)	40 CFR §§ 51.1003(b), 51.1005(b)(1)(iii), and 51.1005(b)(2)(ii)	Section 6.3 and Appendices C and D
Attainment Demonstration and Modeling	40 CFR §§51.1005(b)(2)(iii) and 51.1011	Section 6.4 Appendices J, K, and L
Reasonable Further Progress	40 CFR §§ 51.1005(b)(2)(iv) and 51.1012	Section 6.5 Appendix H
Quantitative Milestones	40 CFR §§51.1005(b)(2)(v) and 51.1013	Section 6.6 Appendix H
Contingency Measures	40 CFR §§51.1005(b)(2)(vi) and 51.1014	Section 6.7 Appendix H
Nonattainment New Source Review Plan Requirements	40 CFR §51.1005(b)(2)(vii) and 51.165	Section 6.8
Transportation Conformity	40 CFR §51.1003(b and d)	Section 6.9 and Appendix D

6.1 Demonstration of Impracticability

An impracticability demonstration uses modeling to show that the implementation of all BACM/BACT will not bring the area into attainment by the statutory Serious area attainment date.[8] Modeling for this Plan (see Appendix K) demonstrates that the Valley cannot practicably attain the 2006 PM2.5 standard before the statutory deadline of December 31, 2019.

6.2 Compliance with the Applicable SIP

The District's current SIP for the 2006 standard is its *2012 PM2.5 Plan*, which EPA approved effective September 30, 2016.[9] Table 6-2 summarizes this Plan's commitments (see Table 5-3 of the *2012 PM2.5 Plan*) and the completion date of such commitment. Although the District has not yet amended Rule 4692, overall, the

[8] CAA § 189(b)(1)(A)

[9] Approval and Promulgation of Air Quality State Implementation Plans; California; San Joaquin Valley; Moderate Area Plan for the 2006 PM2.5 NAAQS; Final Rule. 81 Fed. Reg. 169, pp. 59876-59901. (2016, August 31). (to be codified at 40 CFR Part 52). https://www.gpo.gov/fdsys/pkg/FR-2016-08-31/pdf/2016-20413.pdf

District's adopted control strategies achieve emissions reductions in excess of the PM2.5 emission reduction commitment included in the *2012 PM2.5 Plan* (Table 6-2).

Table 6-2 Summary of Commitments in District *2012 PM2.5 Plan*

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

Rule 4308 Boilers, Steam Generators, and Process Heaters 0.075 to <2 MMBtu/hr

Analysis for the *2012 PM2.5 Plan* indicated that lowering the NOx emission limit for instantaneous water heaters in the size range of 0.075–0.4 MMBtu/hr is technologically feasible and cost-effective. The District committed to amend Rule 4308 in 2013 to lower the NOx emission limit for instantaneous water heaters in the size range of 0.075–0.4 MMBtu/hr from the current level of 55 ppmv to 20 ppmv with an anticipated compliance date of 2015. The District adopted no specific emission reduction commitment.

The District Governing Board adopted amendments to Rule 4308 on November 14, 2013. Amendments lowered the NOx emission limit for instantaneous units from 55 ppmv to 20 ppmv effective January 1, 2015. Since Rule 4308 is a point-of-sale rule, emission reductions of approximately 1.82 tpy will be realized over a 20 year period from 2015 through 2034, reflecting a 62% reduction from baseline emissions from this source category.

Rule 4692 Commercial Charbroiling

Existing Rule 4692 achieves significant emissions reductions from chain-driven charbroilers. Analysis for the *2012 PM2.5 Plan* indicated that extending the applicability of the rule to include underfired units could further reduce directly emitted PM2.5 emissions by 20% (0.4 tons per day (tpd)) from the baseline inventory. Research and demonstration projects to evaluate emission control technologies for underfired charbroilers were already underway when the *2012 PM2.5 Plan* was adopted. As such,

the District committed to amend Rule 4692 in 2016 to add requirements for underfired charbroilers, with an anticipated compliance date of 2017. The control technology for underfired units has continued to be developed, tested, and studied over the past few years, in part through the District, SCAQMD, and EPA technology demonstration efforts.

The District Governing Board authorized $500,000 of funding for the Charbroiler Incentive Program (ChIP) to advance development of underfired charbroiler emissions control technologies. The ChIP was open for 18 months, and was advertised by the District to potential participants, however, the program did not receive any applications. Since 2009, the District partnered with South Coast AQMD, Bay Area AQMD, and EPA to further the research and evaluation of emission control technologies for underfired charbroilers. Through this effort, underfired charbroiler technology assessments have been conducted at UC Riverside College of Engineering's Center for Environmental Research and Technology (CE-CERT). The District provided in-kind technical support and research was funded with over $500,000 in contributions provided by South Coast AQMD, Bay Area AQMD, and EPA. The initial task under this effort was to review commercially available, prototype, and experimental charbroiler control technologies. The evaluation identified three technologies to be tested by CE-CERT. The three technologies represented a cross-section of control options, including a rooftop ventilation system design, a dedicated hood design, and a process design.

While the testing methods used in this CE-CERT testing process were rigorously evaluated and determined to be highly accurate, the entire process was performed in CE-CERT's charbroiler test kitchen. The preparation and execution of the cooking process was highly controlled and precisely repeated for every test run for each control system so that the results are comparable for each device. Although the controlled nature of this test kitchen is able to effectively quantify the control efficiency of each control system, it does not allow for an appropriate assessment of the feasibility of installation or ongoing operation and maintenance. Although underfired charbroiler technology advancements have been made, the technologies had still been un-tested in real-life applications and needed further evaluation and demonstration at Valley restaurants.

During the summer of 2015, the District Governing Board approved $750,000 to fund the Restaurant Charbroiler Technology Partnership (RCTP) program to provide funding for restaurants to install particulate control systems for underfired charbroilers as demonstration projects to assess their feasibility and effectiveness. The District has been working with restaurants and control technology manufacturers to test and demonstrate control technologies. Based on the performance of the demonstration funded by the District and control devices that are currently deployed on underfired charbroilers at other restaurants, the implementation of particulate matter control technology on underfired charbroilers in the Valley may be feasible.

The District has not yet adopted rule requirements for underfired charbroilers in operation in the Valley. However, the Plan commitment to reduce 0.4 tpd of directly emitted PM2.5 by 2016 has been fulfilled through surplus PM2.5 reductions from the

amendments to the District's Wood Burning Fireplaces and Wood Burning Heaters rule (Rule 4901).

Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters

District Rule 4901 and the associated Check Before You Burn program reduce harmful species of PM2.5 when and where those reductions are most needed – in urbanized areas when the local weather conditions are forecast to inhibit PM dispersion. The District committed to amend Rule 4901 in 2016 and to reduce 1.5 tpd direct PM2.5 emissions. Commitments include the following:

1. Lower threshold level for wood-burning curtailments from 30 µg/m³ to ≥20 µg/m³
2. Review meteorological conditions that lead to elevated PM2.5
3. Consider expanding wood burning curtailment season to include October and/or March
4. Analyze feasibility of allowing use of cleanest certified wood burning devices at specified curtailment levels

In alignment with the District's Health Risk Reduction Strategy, the District Governing Board directed staff to develop the necessary amendments for implementation in the winter of 2014/2015, a two full years ahead of schedule in the *2012 PM2.5 Plan*. District staff was also directed to investigate the feasibility of enhanced financial incentives to encourage Valley residents to upgrade to cleaner devices.

During the rule evaluation process for rule amendments, District staff reviewed meteorological conditions leading to elevated PM2.5 and analyzed the feasibility of expanding the wood burning season to include October and/or March. The estimated number of increased No Burn days would have been in the range of less than one day up to six days and therefore would not significantly benefit air quality in the Valley. As such, the wood burning season was not amended to include the extra month(s).

Adopted amendments include the following:

- Significant amendments to District Rule 4901 are summarized as follows:
    - Lower the No Burn threshold for high polluting wood burning heaters and fireplaces from the current 30 µg/m^3 to 20 µg/m^3
    - Raising the No Burn threshold for cleaner certified wood burning devices to 65 µg/m^3
    - Create a registration program for wood burning heaters
    - Create a registration program for wood burning hearth professionals
    - Allow a free interim registration during the 2014-15 Winter Season
    - Clarifications to existing rule requirements
- Amendments to the District's Burn Cleaner Program, including:
    - Increased per-unit incentive amounts from $100-$500 to a maximum of $1,500 with an additional up to $500 for installation of gas-fired units
    - Increased per-unit incentive amounts for low-income qualified applicants from up to $1,500 to up to $2,500 with an additional up to $500 for installation of gas-fired units
    - Expanded low-income provisions to include property owners who rent to low-income qualified tenants

    - Worked with retailers to allow qualified low-income applicants to purchase devices through the Burn Cleaner program without requiring up-front payment
- Adopt new Rule 3901 (Fees for Registration of Wood Burning Heaters) to establish the fee required for the registration of a wood burning heater as defined in Rule 4901

Rule 4905 Natural Gas-Fired, Fan-Type Residential Central Furnaces

The District committed to amend Rule 4905 in 2014 to lower the NOx emission limits for residential furnaces and to examine the possibility of incorporating NOx limits for natural gas-fired, fan-type, commercial central furnaces into the rule, with an anticipated compliance date of 2015.

The District partnered with the South Coast AQMD and provided $50,000 to fund a $1.5 million technology assessment project to develop and test low-NOx furnace technologies that could meet more stringent limits. The assessment project was completed in early 2014 and resulted in the successful development and testing of compliant units. Amendments to Rule 4905 were adopted on January 22, 2015 with compliance dates starting in 2015. To provide manufacturers sufficient time to complete the commercialization process for the new technologies, and to provide for regulatory consistency in California, the compliance dates were set to be analogous with those in the South Coast AQMD furnace rule (Rule 1111).

The District went beyond Plan commitments when amending the rule. As this is a point-of-sale rule, emissions reductions will occur over the 20 year lifespan of existing units as they are replaced with new units. Amendments result in approximately 2.10 tpd NOx emissions reductions upon full turnover by 2036, reflecting greater than 50% reduction from projected emissions for this source category. Rule amendments included the following:

- Lower the NOx limit for residential units to 14 ng/J for condensing units, non-condensing units, and weatherized units.
- Expand applicability to include commercial units with a 14 ng/J NOx limit for condensing, non-condensing, and weatherized units
- Expand applicability to include units installed in manufactured homes with a 40 ng/J NOx limit in 2015, and lowered to 14 ng/J in 2018
- Allow the sale of non-compliant units during the initial implementation period in exchange for the payment of an emissions fee for each non-compliant unit sold
- Revise definitions to remove redundancy and improve clarity
- Expire exemptions for units installed in manufactured homes, units using fuel other than natural gas, and nonfan-type units
- Add labeling requirements to ensure compliance with new limits

6.3 MOST STRINGENT MEASURES

To qualify for any extension of a Serious area attainment date, CAA §188(e) requires a state to ‘‘demonstrate to the satisfaction of the Administrator that the Plan for the area includes the most stringent measures 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.'' In prior guidance, EPA interpreted the term "MSM" to mean the maximum degree of emission reduction that has been required or achieved from a source or source category in any other attainment Plans or in practice in any other states and that can feasibly be implemented in the area seeking the extension, such as what LAER represents for new or modified sources under the NNSR permit program.

The process for determining MSM includes the following: update emissions inventories (see Appendix B); identify potential MSM and compare to control measures already adopted (see Appendix C); and adopt and implement any technologically and economically feasible MSM that are more stringent than measures that are already approved into the SIP (see Chapter 4). The District's overall evaluation of emissions sources and emissions controls demonstrate that the most stringent measures, which includes all reasonably available emission reduction opportunities, best available control measures, and most stringent measures are in place in the Valley for NOx and directly emitted PM2.5 emissions. Refer to Appendices C and D for these demonstrations.

6.4 Attainment Demonstration and Modeling

The Serious area Plan must demonstrate attainment, using air quality modeling, by the most expeditious date practicable after the statutory Serious area attainment date.[10] Although the Valley has some of the most stringent regulations in the nation 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 state and federal jurisdiction, in order to meet this standard. As shown below, and discussed in detail in Appendix K, attainment is not possible by the mandated Serious nonattainment area deadline of 2019 (based on 2017-2019 data). Air quality modeling demonstrates expeditious attainment of the standard in 2024.

6.4.1 Summary of Modeling Results

[Section 6.4.1 provided by 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, Valley is designated as a serious nonattainment area for the 2006 24-hour $PM_{2.5}$ standard (35 µg/m^3) with an attainment deadline of 2024. Consistent with U.S. EPA guidance for model attainment demonstrations (U.S. EPA, 2014[11]), photochemical modeling was used to project $PM_{2.5}$ design values (DVs) to the future. 2024 24-hour $PM_{2.5}$ DVs at each monitor in the Valley demonstrate attainment of the 2006 24-hour $PM_{2.5}$ standard.

[10] Federal Clean Air Act §189(b)(1)(A)

[11] U.S. EPA, 2014, Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$ and Regional Haze, available at https://www.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

The findings from the model attainment demonstration are summarized below. A detailed description of the model inputs, modeling procedures, and attainment test can be found in the Modeling Attainment Demonstration and Modeling Protocol Appendices of this document.

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 at state and local regulatory agencies, and from participation in technical and policy groups in the region (See Photochemical Modeling Protocol Appendix for further details). 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 mechanism, initial and boundary conditions, and emission processing can be found in the Photochemical Modeling Protocol and Modeling Emissions Inventory Appendices.

The U.S. EPA modeling guidance (U.S. EPA, 2014[12]) 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. In particular, in 2013 SJV experienced one of the worst years for $PM_{2.5}$ pollution in the Valley within the last decade.

Specifying the baseline design value 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 modeling guidance recommends using the average 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. Here, the average DVs from 2012, 2013, and 2014 are used to calculate baseline DVs (see the table below for the baseline DVs utilized in the attainment demonstration modeling).

In order to use the modeling in a relative sense, five 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; and 3) future year simulations for 2024. These simulations were the same as the reference year simulation, except projected anthropogenic emissions for 2024 were used in lieu of the 2013 emissions.

The table below shows the 2013 and 2024 Valley annual anthropogenic emissions for the five $PM_{2.5}$ precursors calculated from the model-ready emissions inventory.

[12] U.S. EPA, 2014, Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$ and Regional Haze, available at https://www.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

Compared to 2013, anthropogenic emissions in the Valley in 2024 will drop by 63%, 9%, 12%, 6%, and 1% for NO_x, ROG, primary $PM_{2.5}$, SO_x, and ammonia, respectively. Among these five precursors, anthropogenic NO_x emissions show the largest relative reduction, dropping from 288.2 tons/day in 2013 to 107.6 tons/day in 2024. Note that the emission totals presented in the table were calculated from the modeling inventory based on CEPAM version 1.05.

Since the modeling inventory includes day-specific adjustments not included in the planning inventory, the planning and modeling inventories are expected to be comparable, but not identical. In addition, the 2024 emission totals in Table 6-3 are from the attainment inventory, and so include additional emission reductions beyond the future baseline inventory for the respective year. Details about these additional emission reductions can be found in the model attainment demonstration appendix, while the actual emission commitments are outlined in the SIP.

Table 6-3 Valley Model-Ready Annual Emissions for 2013 and 2024

Category	NO_x	ROG	$PM_{2.5}$	SO_x	NH_3
2013 (tons/day)					
Stationary	38.5	90.8	8.5	7.2	13.9
Area	8.1	153.3	40.2	0.3	310.0
On-road Mobile	154.6	45.1	5.7	0.6	4.4
Other Mobile	87.1	35.8	6.2	0.3	6.0
Total	288.2	325.0	60.5	8.4	334.3
2024 (tons/day)					
Stationary	26.1	99.2	8.5	6.7	16.2
Area	6.9	152.5	37.8	0.3	304.7
On-road Mobile	32.1	17.5	3.1	0.6	3.4
Other Mobile	42.5	25.9	3.8	0.3	6.0
Total	107.6	295.1	53.2	7.9	330.2
Total change from 2013 to 2024	-63%	-9%	-12%	-6%	-1%

In this relative approach, the fractional change (or ratio) in $PM_{2.5}$ concentration between the modeled future year (2024) and modeled baseline year (or reference year, 2013) are calculated. 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 were calculated for individual $PM_{2.5}$ species. In addition, because of potential seasonal differences in $PM_{2.5}$ formation mechanisms, RRFs for each species 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:

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

For the 24-hour $PM_{2.5}$ standard, $[C]_{j,\ future}$ is the mean concentration for component *j* (for the top 10 percent of modeled $PM_{2.5}$ days in a quarter) predicted at the single grid cell

which contains 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 (2006[13]) 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 for the annual standard calculation. For the 24-hour standard calculation, only the top 10% of measured $PM_{2.5}$ days from that quarter were utilized for percentage calculations.

Projected 2024 24-hour $PM_{2.5}$ DVs for each monitor are given in the table below. The Fresno -Hamilton & Winery site has the highest projected DV at 35.2 $\mu g/m^3$, which meets the 2006 24-hour $PM_{2.5}$ standard at 35 $\mu g/m^3$ (technically, the form of the 24-hour $PM_{2.5}$ standard means that a DV needs to be less than 35.5 $\mu g/m^3$ to demonstrate attainment). The reduction in future year DVs are primarily attributed to significant reductions projected for ammonium nitrate and EC, with modest reductions in OM. Because of the large reduction in NO_x emissions from 2013 to 2024, significant reduction is projected for ammonium nitrate. Reductions in EC and OM are primarily due to emission reductions associated with primary $PM_{2.5}$ emission sources such as residential wood combustion and commercial cooking.

To evaluate the impact of reducing emissions of different $PM_{2.5}$ precursors to $PM_{2.5}$ DVs, a series of model sensitivity simulations were performed, for which anthropogenic emissions within the SJV were reduced by a certain percentage from the baseline emissions. Following U.S. EPA precursor demonstration guidance[14] as well as considering SJV's control strategies, sensitivity runs involving 30% emission reductions were performed for NO_x and direct $PM_{2.5}$. For other precursors (i.e., ammonia, VOCs,

[13] 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.

[14] U.S. EPA, 2016, PM2.5 Precursor Demonstration Guidance, available at https://www.epa.gov/sites/production/files/2016-11/documents/transmittal_memo_and_draft_pm25_precursor_demo_guidance_11_17_16.pdf

and SO_x), both 30% and 70% emission reductions were performed. In addition, sensitivity simulations were performed for the years 2013, 2020, and 2024. The key conclusion from the sensitivity runs is that in 2024, reductions of direct $PM_{2.5}$ and NO_x emissions will continue to have a significant impact on annual and 24-hour $PM_{2.5}$ DVs, while reductions of ammonia, ROG, and SO_x have a much smaller impact compared to that of direct $PM_{2.5}$ and NO_x.

Table 6-4 Projected Future Year 2024 24-hour PM2.5 DVs at Each Monitor

Site AQS ID	Name	Base DV (µg/m^3)	2024 24-hr DV (µg/m^3)
60290014	Bakersfield - California	64.1	33.5
60190011	Fresno-Garland	60.0	32.9
60311004	Hanford	60.0	30.3
60195025	Fresno – Hamilton & Winery	59.3	35.2
60195001	Clovis	55.8	30.8
61072002	Visalia	55.5	31.3
60290016	Bakersfield – Planz	55.5	30.1
60392010	Madera	51.0	30.3
60990006	Turlock	50.7	30.2
60990005	Modesto	47.9	29.1
60472510	Merced - M. Street	46.9	27.5
60771002	Stockton	42.0	28.6
60470003	Merced - S Coffee	41.1	24.3
60772010	Manteca	36.9	25.8
60192009	Tranquility	29.5	16.2

6.4.2 ATTAINMENT DEMONSTRATION

Attaining federal health-based air quality standards is an important milestone for improving public health. As detailed in Appendix K, this Plan demonstrates that the Valley will attain the federal 2006 PM2.5 standard as expeditiously as practicable, with all feasible measures and strategies being implemented to accomplish this goal.

Given the significant contribution of ammonium nitrate to the Valley's PM2.5 concentrations, reductions in NOx emissions are particularly important. To achieve the NOx reductions critical for reaching attainment in the Valley, CARB has adopted regulations that will significantly reduce NOx emissions from various mobile sources. Achieving this level of emissions reductions requires adequate time and carries a tremendous cost.

Modeling performed by CARB and the District demonstrates the Valley will attain the 2006 PM2.5 standard by 2024. See above for the summary of modeling results and

Appendix K for the full discussion. This Plan also demonstrates the Valley will attain the standard as expeditiously as practicable as validated in Appendix H.

The attainment demonstration for this Plan includes the benefits of CARB and District control programs that provide ongoing emission reductions. The NOx reductions result from implementation of MSM, which includes the ongoing implementation of both new vehicle standards for passenger and heavy-duty diesel vehicles and equipment; and rules accelerating the turnover of legacy diesel fleets. Implementation of stringent requirements for new off-road engines and in-use off road equipment lead to further NOx reductions, along with District rules addressing stationary source NOx emissions.

6.5 Reasonable Further Progress (RFP)

Reasonable Further Progress (RFP) is the incremental emission reductions leading to the attainment date of a standard for an area. In its most recent Implementation Rule, EPA clarified that RFP requirements may be satisfied through generally linear progress, or through a stepwise demonstration. Stepwise emissions reductions would be slower than ‘‘generally linear’’ reductions for certain periods, and then would decline sharply (due to implementation of a new emission reduction program, or new operation of control technology on one or more stationary sources). See Appendix H for the full RFP discussion and demonstration.

6.6 Quantitative Milestones

CAA Subpart 4 §189(c)(1) requires Plans submitted to EPA to contain quantitative milestones which are to be achieved every three years until the area is re-designated attainment and which demonstrate reasonable further progress as defined in CAA §171. The quantitative milestones for the 2006 PM2.5 standard are 2017, 2020, 2023, and 2026.[15] This Plan satisfies quantitative milestone requirements as discussed at length in Appendix H.

6.7 Contingency Measures

All PM2.5 attainment Plans must contain contingency measures that are consistent with CAA §172(c)(9) and 40 CFR § 51.1014. Contingency measures are additional control measures to be implemented in the event that EPA issues final rulemaking that the Valley failed to meet a regulatory requirement necessitating implementation of a contingency measure. See Appendix H for this demonstration.

6.8 Fulfillment of Serious Area Permitting Requirements

Pursuant to Subpart 4 §189(b)(3) the District must provide a revision to the nonattainment new source review (NNSR) program to lower the applicable “major stationary source” thresholds from 100 tons per year (tpy) to 70 tpy. The District’s New and Modified Stationary Source Review Rule (Rule 2201) identifies the major source emission thresholds for each pollutant. The District adopted amendments to Rule 2201

[15] 40 CFR 51.1013(a)(4)

on February 18, 2016, to meet requirements related to the District's reclassification from Moderate to Serious nonattainment for the 1997 and 2006 federal standards for PM2.5. Currently, through Rule 2201, the District identifies the major source emission threshold for NOx major sources at 10 tpy and PM2.5 at 70 tpy. However, the rule amendments have not been submitted to EPA for inclusion into the SIP because CARB and EPA requested changes to some of the new rule language. The District hosted a public workshop on the proposed amendments on July 26, 2016. District staff had planned on presenting the rule to the Governing Board for adoption in September of 2016. While these revisions do not change the District's interpretation or implementation of the rule, these amendments must be adopted by the District Governing Board before CARB can submit the rule to EPA for inclusion into the State Implementation Plan. However, in August of 2016, EPA released long-overdue regulations on implementing the PM2.5 standards in NSR rules that require an assessment of the significance of precursor pollutant emissions using a specific type of air quality modeling. Due to these new requirements, EPA will not be able to approve an NSR rule that does not address EPA's implementation regulation, so adoption has been delayed until such modeling can be completed. The District anticipates taking rule amendments to the District's Governing Board in 2018.

6.9 TRANSPORTATION CONFORMITY

This Plan must address all Serious area SIP requirements, including transportation conformity budgets for the attainment year pursuant to 40 CFR §1003(d).[16] See Appendix D for more information.

[16] See also 81 Reg. Reg. 58103.

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