

Staff Report

Review of the San Joaquin Valley 2018 Plan for the 1997, 2006, and 2012 PM_{2.5} Standards

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EXECUTIVE SUMMARY

This report presents the California Air Resources Board (CARB or Board) staff assessment of the *2018 Plan for the 1997, 2006, and 2012 PM_{2.5} Standards* (2018 PM_{2.5} Plan or Plan) developed by the San Joaquin Valley Air Pollution Control District (District). The Plan sets forth a comprehensive strategy to meet four National Ambient Air Quality Standards (NAAQS or standards) for fine particulate matter (PM_{2.5}) for which the San Joaquin Valley (Valley) is in nonattainment: the 1997 24-hour standard of 65 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), the 1997 annual standard of 15 $\mu\text{g}/\text{m}^3$, the 2006 24-hour standard of 35 $\mu\text{g}/\text{m}^3$, and the 2012 annual standard of 12 $\mu\text{g}/\text{m}^3$. Attainment deadlines for the 1997, 2006, and 2012 PM_{2.5} standards are 2020, 2024, and 2025, respectively.

CARB's commitment for the 2018 PM_{2.5} Plan to reduce emissions from mobile sources in the Valley is detailed in the *San Joaquin Valley Supplement to the 2016 State Strategy for the State Implementation Plan* (Valley State SIP Strategy), adopted by the Board in October 2018. The Valley State SIP Strategy builds on existing mobile source controls described in CARB's earlier *2016 State Strategy for the State Implementation Plan* (2016 State SIP Strategy) and includes new measures, both regulatory and incentive, to reduce emissions of oxides of nitrogen (NO_x) and directly emitted PM_{2.5}. Regulatory measures achieving new emissions reductions include lower opacity limits and amended warranty requirements for heavy-duty vehicles, a heavy-duty vehicle inspection and maintenance program, a California low-NO_x engine standard, and a low-emission diesel fuel requirement. Incentive measures achieving new emissions reductions include accelerated turnover of trucks, buses, agricultural equipment, and off-road equipment.

The District strategy to reduce emissions from stationary and area sources includes commitments to strengthen existing rules and to provide incentive funding to accelerate emissions reductions. New reductions of direct PM_{2.5} will come from tightened controls on residential wood-burning fireplaces and heaters and enhanced incentives to install control technology on commercial underfired charbroilers. Additionally, the District is pursuing strengthening a suite of measures to reduce emissions of NO_x from flares, internal combustion engines, and boilers, among other sources.

Taken together, reductions from these CARB and District measures, implemented for the 2018 PM_{2.5} Plan, will provide significant air quality benefits for the Valley, continuing trends in air quality improvement and providing for timely attainment. The District Governing Board adopted the 2018 PM_{2.5} Plan on November 15, 2018, and forwarded the Plan to CARB. In turn, the CARB Board will consider the Plan on January 24, 2019, and, if adopted, will forward it to the United States Environmental Protection Agency (U.S. EPA) as a revision to the California State Implementation Plan (SIP).

CARB staff has concluded that the Plan satisfies the SIP planning requirements of the federal Clean Air Act (Act) for each of the four standards, including attainment demonstration, best available control measure and most stringent measure demonstration, reasonable further progress demonstration, contingency measures, and transportation conformity budgets.

I. BACKGROUND

Fine particulate matter up to 2.5 micrometers in diameter—PM_{2.5}—is made up of many constituent particles and liquid droplets that vary in size and chemical composition. PM_{2.5} contains a diverse set of substances including elements such as carbon and metals, compounds such as nitrates, sulfates, and organic materials, and complex mixtures such as diesel exhaust and soil or dust.

Numerous health effects studies have linked exposure to PM_{2.5} to increased severity of asthma attacks, development of chronic bronchitis, decreased lung function in children, increased respiratory and cardiovascular hospitalizations, and even premature death in people with existing cardiac or respiratory disease. In addition, California has identified particulate exhaust from diesel engines as a toxic air contaminant suspected to cause cancer, other serious illnesses, and premature death. Those most sensitive to PM_{2.5} pollution include people with existing respiratory and cardiac problems, children, and older adults.

NAAQS establish the levels above which PM_{2.5} may cause adverse health effects. In 1997, U.S. EPA adopted the first set of PM_{2.5} standards, a 24-hour standard of 65 µg/m³ and an annual standard of 15 µg/m³. In 2006, the 24-hour standard was tightened to 35 µg/m³, and in 2012, the annual standard was lowered to 12 µg/m³.

The Act establishes planning requirements for areas that exceed health-based standards. These nonattainment areas must develop and implement SIPs that demonstrate how they will attain the standards by specified dates. Currently, the Valley is classified as a Serious nonattainment area for the 65 and 15 µg/m³ standards with an attainment deadline of 2020. The Valley is also classified as a Serious nonattainment area for the 35 µg/m³ standard, with an attainment deadline of 2024. The Valley is classified as a Moderate nonattainment area for the 12 µg/m³ standard, but the District has requested reclassification to a Serious nonattainment area, with an attainment deadline of 2025.

CARB and the District determined that a comprehensive SIP addressing all four PM_{2.5} standards was the most effective approach for achieving healthful air in the Valley, and developed the 2018 PM_{2.5} Plan to fulfill Act requirements for these standards. This Plan is unique because it addresses four PM_{2.5} standards in an integrated manner with a shared control strategy. Although the Plan is integrated, it must show that it meets Act SIP planning requirements for each of the PM_{2.5} standards individually. The PM_{2.5} standards addressed in the 2018 PM_{2.5} Plan are summarized in Table 1.

Table 1. Standards Addressed in the Plan

Standard			Serious Attainment Deadline	Classification
1997	24-hour	65 µg/m ³	2020	Serious
1997	Annual	15 µg/m ³	2020	Serious
2006	24-hour	35 µg/m ³	2024	Serious
2012	Annual	12 µg/m ³	2025	Moderate, with request for reclassification to Serious

2016 Moderate Plan Submission for the 12 µg/m³ Annual Standard

At the same time the Board considers the 2018 PM_{2.5} Plan, it will also consider the *2016 Moderate Area Plan for the 2012 PM_{2.5} Standard* (2016 Moderate Plan) for the San Joaquin Valley. Should both SIPs be adopted by the Board, CARB will submit them together as a California SIP revision package for U.S. EPA consideration.

The District Governing Board adopted the 2016 Moderate Plan on September 15, 2016, and the CARB Board considered it on October 20, 2016. While this plan satisfied the Moderate area requirements for the 12 µg/m³ annual PM_{2.5} standard, the Board determined that the public process and the strategy to clean the Valley's air could be further strengthened. Thus, the Board tabled the 2016 Moderate Plan and directed staff to work with the District to conduct a more thorough public process, explore opportunities for additional NOx and direct PM_{2.5} reductions from both mobile and stationary sources, and return to the Board with a path for attaining all PM_{2.5} standards in the Valley.

In response to this Board direction on the 2016 Moderate Plan development process, the 2018 PM_{2.5} Plan was developed with extensive input from stakeholders and the public, with CARB and the District hosting ten public meetings on the Plan between December 2016 and August 2018. Additionally, both agencies held Board meetings at many stages along the Plan development path with opportunities for public engagement and comment on the proposed Plan. The 2018 PM_{2.5} Plan includes commitments for new reductions of NOx and direct PM_{2.5} from a range of mobile, stationary, and area sources under CARB and District control that together provide for timely attainment.

The 2016 Moderate Plan satisfied requirements for an area classified as *Moderate*, demonstrating that attaining the 12 µg/m³ standard by the Moderate deadline was impracticable, and contained a request that the San Joaquin Valley be reclassified as Serious nonattainment; the 2018 PM_{2.5} Plan satisfies *Serious* area requirements for this standard, including demonstrating attainment as expeditiously as practicable. U.S. EPA must consider these two plans in turn, reviewing first the 2016 Moderate Plan and then the portions of the 2018 PM_{2.5} Plan which pertain to the 12 µg/m³ standard Serious area requirements. As such, CARB must submit these two plans to fully address the 12 µg/m³ annual standard Act requirements.

II. NATURE AND EXTENT OF PM_{2.5} PROBLEM AND PROGRESS

PM_{2.5} is a complex mixture of many chemical species generated from a wide array of sources. Some PM_{2.5} (primary PM_{2.5}) is emitted directly into the air in the form of soot, smoke, or dust, while other PM_{2.5} (secondary PM_{2.5}) can form in the atmosphere from the reactions of precursor gases, forming compounds such as ammonium nitrate and ammonium sulfate. The relative mixture of these primary and secondary constituents in a region drives the nature of the needed control strategy.

To support the planning process, CARB and the District operate a comprehensive monitoring network that provides ongoing measurement of PM_{2.5} concentrations and chemical composition. In addition, numerous special studies have been conducted in the Valley. The largest of these, the California Regional Particulate Air Quality Study (CRPAQS), occurred in 1999 through 2001. The study included monitoring at over 100 locations, with results published in peer-reviewed publications and presented at national and international conferences. CRPAQS findings continue to provide a strong scientific foundation for planning efforts. The Valley also continues to be a focus of intensive study, with more recent efforts including CalNex 2010 and the DISCOVER-AQ study in 2013.

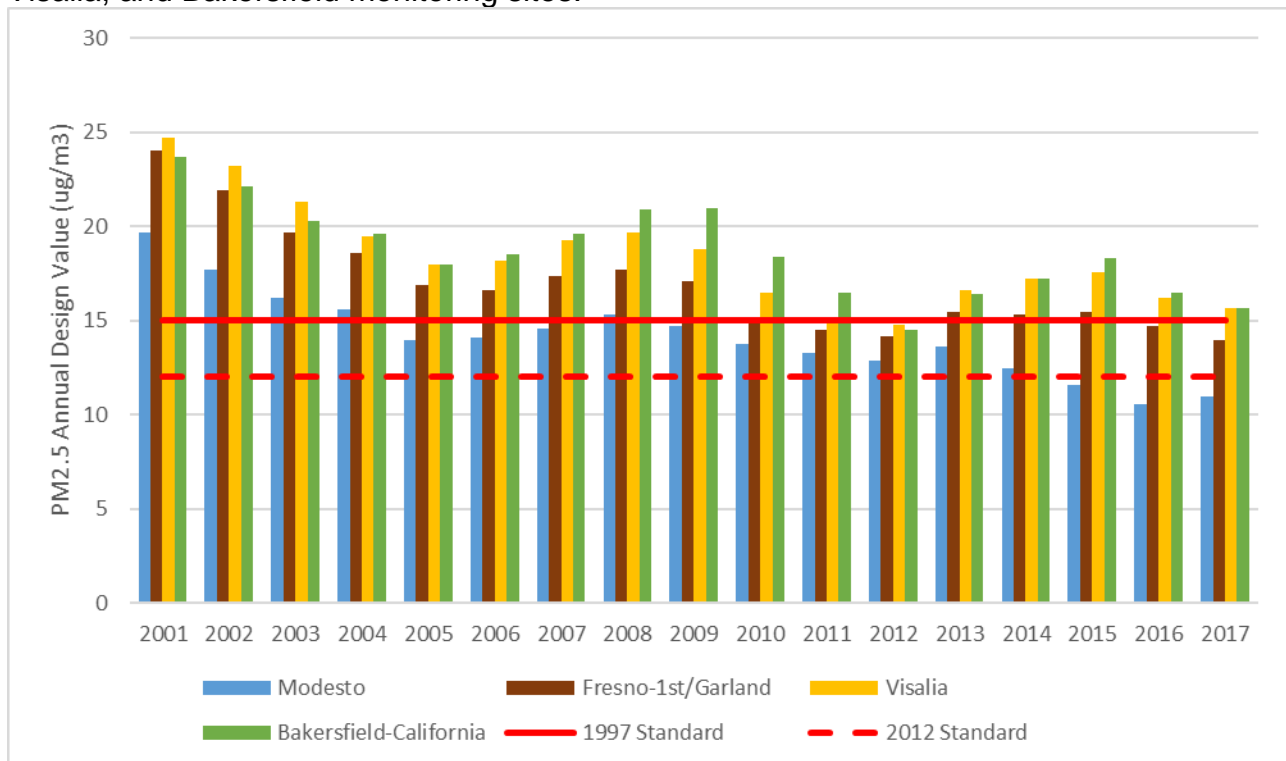
These and other studies have indicated that ammonium nitrate is an important contributor to PM_{2.5} pollution in the Valley on both an annual and a 24-hour basis. Although both NO_x and ammonia play a role in ammonium nitrate formation, modeled sensitivity analysis demonstrates that NO_x controls are most effective at reducing PM_{2.5} levels in the Valley. This is because ammonium nitrate formation in the Valley is limited by the availability of nitric acid instead of by ammonia, so ammonia reductions are less effective than NO_x reductions in reducing ammonium nitrate concentrations. This is consistent with previous modeling studies. Thus, programs aimed at reducing emissions of NO_x—the limiting precursor for ammonium nitrate formation—are vital to reducing nitrate concentrations and, consequently, overall PM_{2.5} concentrations in the Valley.

Additionally, seasonal patterns point to the importance of reducing direct emissions of PM_{2.5} in the winter. PM_{2.5} concentrations in the Valley exhibit a strong seasonal pattern, with concentrations over the 35 µg/m³ 24-hour standard occurring primarily during the winter months. Cold temperatures, fog, stagnant airflow, and extended periods without rainfall result in episodes of elevated PM_{2.5} that can persist for a week or more. Episodic activities such as seasonal wood burning also add to the pollution burden during the winter. PM_{2.5} concentrations are generally higher in the central and southern portions of the Valley, with highest levels recorded in the urban areas of Fresno and Bakersfield.

To determine attainment for the annual and 24-hour PM_{2.5} standards, the corresponding design value at each monitoring site must be calculated following U.S. EPA protocol. A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS.

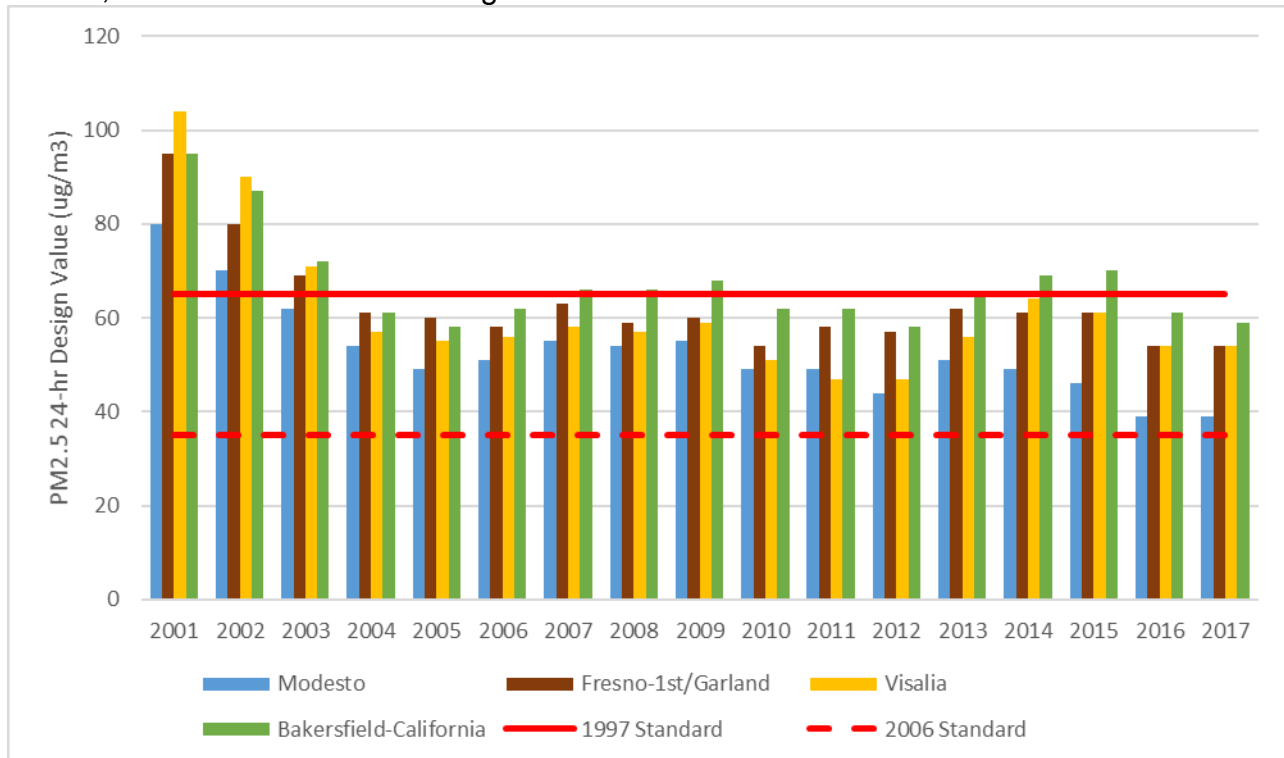
On an annual average basis, PM_{2.5} air quality in the Valley has improved over the last two decades. Between 2001 and 2017, annual design values declined between 24 and 44 percent at sites throughout the Valley. Approximately 70 percent of sites in the Valley attain the 15 µg/m³ standard in 2017 with around 25 percent attaining the 12 µg/m³ standard. The highest remaining levels are in the central and southern regions, where design values are about 9 to 31 percent over the 12 µg/m³ standard. Figure 1 shows annual design value trends at sites in Modesto, Fresno, Visalia, and Bakersfield. These sites are considered representative in their respective regions and include chemical speciation monitoring.

Figure 1. Trend in annual PM_{2.5} design values (2001-2017) at the Modesto, Fresno, Visalia, and Bakersfield monitoring sites.



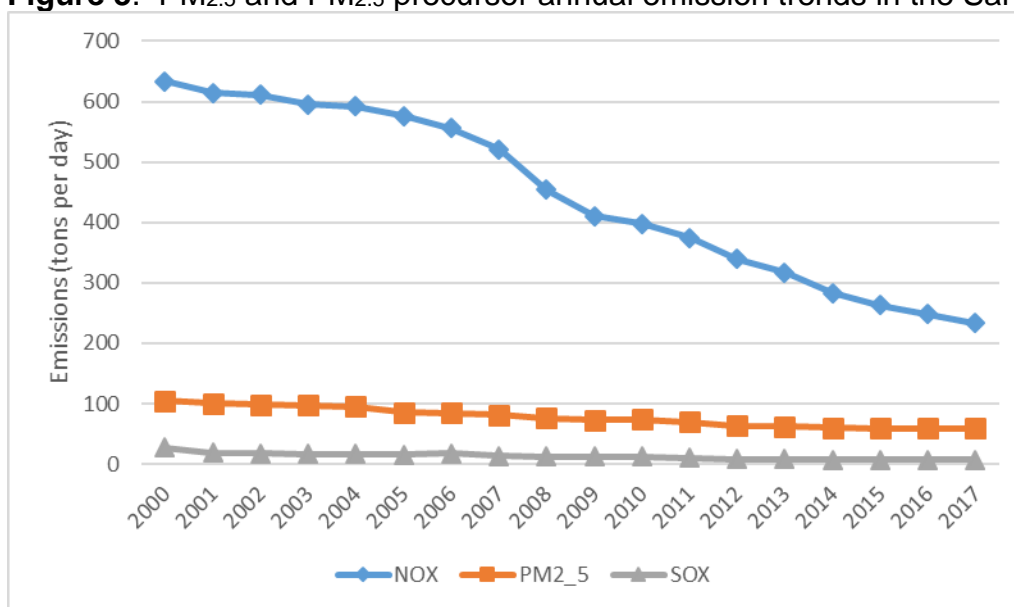
24-hour PM_{2.5} design values also show a downward trend. Between 2001 and 2017, the 24-hour PM_{2.5} design values have decreased by 30 to almost 50 percent at sites throughout the Valley. In 2017, all sites in the Valley, with the exception of Corcoran, attained the 65 µg/m³ standard and are well on the way to attaining the 35 µg/m³ standard. Figure 2 shows representative 24-hour design value trends at sites in Modesto, Fresno, Visalia, and Bakersfield.

Figure 2. Trend in 24-hour PM_{2.5} design values (2001-2017) at the Modesto, Fresno, Visalia, and Bakersfield monitoring sites.



Reductions in direct PM_{2.5}, NO_x, and oxides of sulfur (SO_x) emissions are key to effectively reducing PM_{2.5} concentrations. Figure 3 illustrates annual emission trends in the San Joaquin Valley Air Basin from 2000 through 2017 for PM_{2.5} and the two key precursors, NO_x and SO_x.

Figure 3. PM_{2.5} and PM_{2.5} precursor annual emission trends in the San Joaquin Valley.



Since 2000, NO_x emissions have decreased by 400 tons per day (tpd) or 63 percent. Major reductions occurred in emissions from heavy-duty diesel trucks, stationary combustion sources, and other mobile sources (e.g., farm and off-road equipment and trains). On-road mobile emissions constitute over half of all NO_x emissions in 2017, and have remained the dominant source category over this inventory period, down from 62 percent of NO_x emissions in 2000. Emissions from both on-road mobile and stationary sources have declined over this period due to aggressive control programs by CARB and the District, respectively.

Direct PM_{2.5} emissions decreased by 46 tpd or about 44 percent. Major reductions occurred in emissions from residential wood combustion, mobile sources, such as heavy-duty diesel trucks and off-road equipment, and entrained dust. The most significant decline occurred in on-road mobile sources with a 68 percent reduction. The largest contribution of PM_{2.5} emissions is made by areawide sources, which have been reduced by 44 percent from 2000 levels.

SO_x decreased by 20 tpd or about 72 percent. Major reductions occurred in emissions from stationary fuel combustion sources and industrial processes, driven by reductions in the allowable sulfur content of mobile and stationary source fuel streams.

The combined downward trends in PM_{2.5} components and emissions of PM_{2.5}, NO_x, and SO_x indicate that the ongoing control programs have had substantial benefits improving air quality in the Valley and that further emission reductions in the future are expected to provide continuing progress towards attaining the PM_{2.5} standards.

III. ATTAINMENT DEMONSTRATION

Demonstrating attainment is a cornerstone of the SIP. The Act requires the use of air quality modeling to relate PM_{2.5} air quality to emissions in a region and simulate future air quality based on changes in emissions. The modeled attainment demonstration in this Plan was prepared using photochemical dispersion and meteorological modeling tools developed in response to U.S. EPA modeling guidelines and recommendations from air quality modeling experts. The modeling uses emission inventories, with measurements of meteorology and air quality, to establish the relationship between emissions and air quality. The 2018 PM_{2.5} Plan demonstrates that the Valley will attain each of the four standards by the applicable deadline using photochemical modeling.

Results of the photochemical modeling are summarized below.

1997 24-hour 65 µg/m³ standard

In 2020, the Bakersfield-California Avenue site has the highest projected design value at 47.6 µg/m³, which is below the standard of 65 µg/m³.

1997 annual 15 µg/m³ standard

In 2020, the Bakersfield-Planz site has the highest projected design value at 14.6 µg/m³, which is below the standard of 15 µg/m³.

2006 24-hour 35 µg/m³ standard

In 2024, the Fresno-Hamilton & Winery site has the highest projected design value at 35.2 µg/m³, which is below the standard of 35 µg/m³ (based on the form of the standard which allows the design value to be as high as 35.4 µg/m³ and still be in attainment).

2012 annual 12 µg/m³ standard

In 2025, the Bakersfield-Planz and Madera sites have the highest projected design value at 12.0 µg/m³, which is below the standard of 12 µg/m³ (based on the form of the standard which allows the design value to be as high as 12.04 µg/m³ and still be in attainment).

In addition, a series of model sensitivity simulations were performed for the Plan, following U.S. EPA guidance, to evaluate the impact of reducing emissions of different PM_{2.5} precursors on PM_{2.5} levels in the Valley. This modeling shows that NO_x and directly emitted PM_{2.5} are significant precursors to PM_{2.5} in the Valley, while volatile organic compounds (VOCs), SO_x, and ammonia are not considered significant. Thus, the Plan control strategy focuses on achieving reductions in NO_x and direct PM_{2.5}.

For more details on the modeling inventory, full modeling results, and modeling protocol, see Appendices J, K, and L of the 2018 PM_{2.5} Plan.

U.S. EPA modeling guidance requires that modeled attainment demonstrations be accompanied by a Weight of Evidence (WOE) analysis to provide a set of complementary analyses. Examining an air quality problem in a variety of ways provides a more informed basis for the attainment strategy as well as better understanding of the overall problem and the level and mix of emissions controls needed for attainment. CARB staff prepared the WOE, presented in Appendix C of this Staff Report, which includes an assessment of PM_{2.5} air quality trends, PM_{2.5} precursor emission trends, meteorology impacts on PM_{2.5} air quality trends, and a summary of corroborating analyses. The WOE indicates that the San Joaquin Valley is on track to attain the four PM_{2.5} standards by the applicable attainment dates, which is consistent with design value projections derived from the regional photochemical modeling assessment.

IV. CONTROL STRATEGY

The proposed strategy to attain the PM_{2.5} standards builds on existing controls on mobile, stationary, and area sources and also includes commitments from CARB and the District to strengthen or add new measures. Commitments are in the form of both regulatory and incentive measures. Taken together, District and CARB measures implemented for the 2018 PM_{2.5} Plan will provide significant air quality benefits for the Valley and contribute to attainment of all 24-hour and annual PM_{2.5} standards.

A. CARB Measures

CARB is responsible principally for mobile sources. CARB's commitment to reduce emissions from mobile sources in the Valley is detailed in the *San Joaquin Valley Supplement to the 2016 State Strategy for the State Implementation Plan* (Valley State SIP Strategy), adopted by the Board in October 2018. The Valley State SIP Strategy builds on existing mobile source controls described in CARB's earlier *2016 State Strategy for the State Implementation Plan* (State SIP Strategy), adopted by the Board in March 2017, and includes new measures, both regulatory and incentive. The strategy will reduce NO_x emissions by 32 tpd and direct PM_{2.5} emissions by 1 tpd in 2024, beyond the emissions reductions achieved with the current control program (157 tpd NO_x and 4.6 tpd direct PM_{2.5} in 2024).

Regulatory measures achieving new emissions reductions include lower opacity limits and amended warranty requirements for heavy-duty vehicles (already adopted by the Board in May and June of 2018), a heavy-duty vehicle inspection and maintenance program, a California low-NO_x engine standard, and a low-emission diesel fuel requirement. Incentive measures achieving new emissions reductions include accelerated turnover of trucks, buses, agricultural equipment, and off-road equipment.

Table 2 shows the full list and schedule of State measures needed for attainment of federal PM_{2.5} standards in the Valley. CARB staff proposes to initiate the public process for all measures listed in Table 2 by holding a workshop supporting the measure that could include understanding emission inventory changes or releasing a draft document for public review. This development process will provide additional opportunity for public and stakeholder input, as well as ongoing technology review and assessment of costs and environmental impacts. CARB staff also proposes to bring to the Board or take action on the list of proposed State measures for the Valley shown in the bottom portion of Table 2 by the dates specified.

Table 2. State Measures and Schedule for the San Joaquin Valley

Measures	Agency	Public Process Begins	Action	Implementation Begins
2016 State SIP Strategy Measures				
Advanced Clean Cars 2 Reduced ZEV Brake and Tire Wear	CARB	2017	2020 – 2021	2026
Lower In-Use Emission Performance Level:	CARB	2016	2017 – 2020	2018 +
Lower Opacity Limits for Heavy-Duty Vehicles	CARB	2016	2018	2018 – 2024
Amended Warranty Requirements for Heavy-Duty Vehicles	CARB	2016	2018	2022
Heavy-Duty Vehicle Inspection and Maintenance Program	CARB	2019	2020	2022 +
Low-NOx Engine Standard – California Action	CARB	2016	2019	2023
Low-NOx Engine Standard – Federal Action	U.S. EPA	2016	2019	2024
Innovative Clean Transit	CARB	2015	2018 – 2019	2020
Advanced Clean Local Trucks (Last Mile Delivery)	CARB	2016	2019	2020
Zero-Emission Airport Shuttle Buses	CARB	2017	2018	2023
More Stringent National Locomotive Emission Standards	U.S. EPA	2017	2017	2023 +
Zero-Emission Off-Road Forklift Regulation Phase 1	CARB	2020	2020	2023
Zero-Emission Airport Ground Support Equipment	CARB	2018	2019	2023
Small Off-Road Engines	CARB	2016	2018 – 2020	2022
Transport Refrigeration Units Used for Cold Storage	CARB	2016	2018 – 2019	2020 +
Low-Emission Diesel Fuel Requirement	CARB	2019	2021	2023
Proposed State Measures for the Valley				
Accelerated Turnover of Trucks and Buses				
Incentive Projects	CARB / SJVAPCD	--	--	Ongoing
SIP-Creditable Measure*		2018	by 2021	
Accelerated Turnover of Agricultural Equipment				
Incentive Projects	CARB / SJVAPCD	--	--	Ongoing
SIP-Creditable Measure*		2018	by 2020	
Cleaner In-Use Agricultural Equipment	CARB	2019	2025	2030
Accelerated Turnover of Off-Road Equipment				
Incentive Projects	CARB / SJVAPCD	--	--	Ongoing
SIP-Creditable Measure*		2020	by 2021	

*A SIP-creditable measure will be developed to demonstrate that the emission reductions from incentive projects can be credited towards the aggregate commitment

Note: In Tables 2 and 3, “Action” indicates the date the Board will take action on the measure. “Implementation Begins” indicates the date CARB will begin implementing the adopted measure.

CARB staff proposes to achieve, in aggregate, 32 tpd of NO_x emission reductions and 1 tpd of PM_{2.5} emission reductions in 2024, with those same emission reduction commitments carried through to 2025. These measures, in conjunction with the existing control program, identify all of the reductions required from mobile sources for the Valley's PM_{2.5} attainment needs. These measures reflect a combination of State actions and petitions for federal action to establish the policy and regulatory mechanisms to bring the needed advanced technologies into the California vehicle and equipment fleet, while pairing these actions with incentive and other programs to strategically accelerate the penetration of the cleanest technologies in each sector.

CARB's aggregate emission reduction commitment may be achieved through a combination of actions including but not limited to: the implementation of control measures; the expenditure of local, State, or federal incentive funds; or the implementation of other enforceable measures. In some cases, actions by federal agencies will be needed. CARB will include these emission reductions in its aggregate commitment to ensure that reductions are achieved regardless of federal action. For example, if a federal heavy-duty low-NO_x engine standard is not established, CARB will achieve the necessary reductions from other source categories. In other cases, programmatic approaches must be developed and funding secured to achieve the reductions outlined.

While Table 3 includes estimates of the emission reductions from each of the individual measures, final measures as proposed by staff to the Board or adopted by the Board may provide more or less than the initial emission reduction estimates. CARB's overall commitment is to achieve the total emission reductions necessary to attain the federal air quality standards while reflecting the combined reductions from the existing control strategy and new measures. Therefore, if a particular measure does not get its expected emission reductions, the State is still committed to achieving the total aggregate emission reductions. If actual emission decreases occur that exceed the projections reflected in the current emissions inventory and the Valley State SIP Strategy, CARB will submit an updated emissions inventory to U.S. EPA as part of a SIP revision. The SIP revision would outline the changes that have occurred and provide appropriate tracking to demonstrate that aggregate emission reductions sufficient for attainment are being achieved through enforceable emission reduction measures.

Table 3. San Joaquin Valley Expected Emission Reductions from State Measures
Reductions shown in tons per day (tpd)

Measures	2024		2025	
	NOx (tpd)	PM2.5 (tpd)	NOx (tpd)	PM2.5 (tpd)
2016 State SIP Strategy Measures				
Advanced Clean Cars 2	--	--	--	--
Reduced ZEV Brake and Tire Wear	--	NYQ	--	NYQ
Lower In-Use Emission Performance Level:	6.8	<0.1	6.8	<0.1
Lower Opacity Limits for Heavy-Duty Vehicles				
Amended Warranty Requirements for Heavy-Duty Vehicles				
Heavy-Duty Vehicle Inspection and Maintenance Program				
Low-NOx Engine Standard – California Action	0.7	--	2	--
Low-NOx Engine Standard – Federal Action	0.7	--	2	--
Innovative Clean Transit	<0.1	<0.1	<0.1	<0.1
Advanced Clean Local Trucks (Last Mile Delivery)	<0.1	<0.1	<0.1	<0.1
Zero-Emission Airport Shuttle Buses	NYQ	NYQ	NYQ	NYQ
More Stringent National Locomotive Emission Standards	0.1	<0.1	0.3	<0.1
Zero-Emission Off-Road Forklift Regulation Phase 1	--	--	--	--
Zero-Emission Airport Ground Support Equipment	<0.1	<0.1	<0.1	<0.1
Small Off-Road Engines	0.1	<0.1	0.2	<0.1
Transport Refrigeration Units Used for Cold Storage	NYQ	NYQ	NYQ	NYQ
Low-Emission Diesel Fuel Requirement	0.8	0.1	1	0.1
Total Reductions from 2016 State SIP Strategy Measures	9	0.1	12	0.1
Proposed State Measures for the Valley				
Accelerated Turnover of Trucks and Buses	10	NYQ	8	NYQ
Existing Incentive Projects				
New Incentive Projects				
Accelerated Turnover of Agricultural Equipment				
Existing Incentive Projects	3	0.2	2	0.2
New Incentive Projects	8	0.6	8	0.6
Cleaner In-Use Agricultural Equipment	NYQ	NYQ	NYQ	NYQ
Accelerated Turnover of Off-Road Equipment				
New Incentive Projects	2	NYQ	1.5	NYQ
Total Reductions from Proposed State Measures for Valley	23	0.8	20	0.8
Aggregate Emission Reductions	32	1	32	1

"NYQ" denotes emission reductions are Not Yet Quantified

"--" denotes no anticipated reductions

The measures as proposed by staff to the Board or adopted by the Board may provide more or less reductions than the amount shown.

A summary of CARB's mobile source measures can be found in Chapter 4 of the 2018 PM_{2.5} Plan and a full detailed description of measures, emissions reductions, and implementation schedules can be found in the Valley State SIP Strategy, also included in the 2018 PM_{2.5} Plan as Attachment A.

B. District Measures

The District is responsible principally for stationary and area sources located within the Valley. The District strategy to reduce emissions from stationary and area sources includes commitments to strengthen existing rules and increase incentives in certain hot spot areas. The strategy achieves 1.88 tpd NOx reduction and 1.3 tpd direct PM_{2.5} reduction in 2024. New NOx reductions come from strengthening a suite of controls, including on flares, boilers, steam generators, and internal combustion engines used in agricultural operations. New direct PM_{2.5} reductions come from several sources including:

- Strengthening the District rule on residential wood burning and providing enhanced incentives to change out wood-burning fireplaces and heaters in Fresno, Kern, and Madera Counties;
- Providing enhanced incentives to install control technology on commercial underfired charbroilers in urban portions of Fresno, Kern, and Madera Counties; and
- Conducting additional research on enhanced conservation management practices.

Like CARB, the District commits in the Plan to achieving aggregate emission reductions. These emission reductions are shown in Table 4. While the table includes estimates of the emission reductions from each of the individual measures, final measures as proposed for adoption into the SIP may provide more or less than the initial emission reduction estimates.

Table 4. Emission Reductions from District Measures

2024/2025	PM2.5 (tpd)	NOx (tpd)
Flares	–	0.05
Boilers, Steam Generators, and Process Heaters - Phase 3	0.03	1.83
Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr		
Internal Combustion Engines used at Agricultural Operations		
Glass Plants		
Solid Fuel-Fired Boilers, Steam Generators And Process Heaters		
Conservation Management Practices	0.32	–
Commercial Charbroiling	0.53	–
Wood Burning Fireplaces and Wood Burning Heaters	0.42	–
Aggregate Emission Reductions Commitment	1.30	1.88

“–” denotes reductions have not been quantified

Note: Table 4 provided by the District. “2024/2025” indicates the timeframe the listed reductions will be realized.

The District also commits in the Plan to the implementation schedules for regulatory and incentive-based measures shown in Tables 5 and 6.

Table 5. Schedule for Proposed Regulatory Measures

Regulatory Measures	Public Process Begins	Action Date	Implementation Begins
Rule 4311 Flares	2018	2020	2023
Rule 4306 Boilers, Steam Generators, and Process Heaters – Phase 3 Rule 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	2019	2020	2023
Rule 4702 Internal Combustion Engines	2019	2020	2024
Rule 4354 Glass Melting Furnaces	2020	2021	2023
Rule 4352 Solid Fuel-Fired Boilers, Steam Generators And Process Heaters	2020	2021	2023
Rule 4550 Conservation Management Practices	2021	2022	2024
Rule 4692 Commercial Under-fired Charbroiling (Hot-spot Strategy)	2019	2020	2024
Rule 4901 Wood Burning Fireplaces and Wood Burning Heaters (Hot-spot Strategy)	2019	2019	2019

Note: Tables 5 and 6 provided by the District. “Public Process Begins” indicates the date the District will begin holding public workshops and other public meetings on the measure. “Action Date” indicates the date the District Governing Board will take action on the measure. “Implementation Begins” indicates the date the District will begin implementing the adopted measure.

Table 6. Schedule for Proposed Incentive-Based Measures

Incentive-Based Measures	Public Process Begins	Action Date	Implementation Begins
Replacement of Internal Combustion Engines used at Agricultural Operations	2019	2020	ongoing
Installation of Commercial Under-fired Charbroiling Controls (Hot-spot Strategy)	2019	2020	ongoing
Replacement of Residential Wood Burning Devices (Valleywide and Hot-spot Strategy)	2019	2020	ongoing

A summary of the District’s stationary and area source measures can be found in Chapter 4 of the 2018 PM_{2.5} Plan.

V. OTHER CLEAN AIR ACT REQUIREMENTS

In addition to the attainment demonstration and control strategy, the Act requires the following elements be included in the 2018 PM_{2.5} Plan:

- A. An emissions inventory for manmade sources of PM_{2.5} air pollution in the nonattainment area;
- B. A demonstration that best available control measures (BACM) and most stringent measures (MSM) are in place;
- C. A demonstration of reasonable further progress (RFP) towards attainment;
- D. Contingency measures in the event the area fails to meet RFP or attainment;
and
- E. Transportation conformity emission budgets to ensure transportation plans and projects are consistent with the SIP.

The 2018 PM_{2.5} Plan contains each of these required elements, as discussed below, satisfying Act requirements.

A. Emissions Inventory

A SIP must include an emissions inventory consisting of base year inventories and future year forecasts for PM_{2.5} and PM_{2.5} precursors. An emissions inventory contains a systematic listing of the sources of air pollutants with an estimate of the amount of pollutants from each source or source category over a given period of time. The emissions inventory in the 2018 PM_{2.5} Plan includes emissions for the base year (2013), attainment years (2020, 2024, and 2025), and applicable milestone years to demonstrate RFP for all four standards. The inventory includes directly emitted PM_{2.5} as well as the PM_{2.5} precursors NO_x, SO_x, VOCs, and ammonia. Thus, the 2018 PM_{2.5} Plan contains an emissions inventory satisfying the Act requirements.

The emissions inventory, along with a description of the methodology used to create it, can be found in Appendix B of the 2018 PM_{2.5} Plan.

B. Best Available Control Measures and Most Stringent Measures Demonstration

For an area classified as Serious nonattainment, a SIP must show that BACM, including best available control technology (BACT), are in place for the control of direct PM_{2.5} and PM_{2.5} precursors. U.S. EPA defines a BACM level of control as the maximum degree of emissions reductions achievable from a source or source category considering energy, economic, and environmental impacts. Further, because the Valley has requested an attainment date extension for the 35 µg/m³ 24-hour standard and because it failed to attain the 15 µg/m³ annual and 65 µg/m³ 24-hour standards by the original attainment date, the SIP must demonstrate additional control measure stringency, going beyond BACM to satisfy MSM requirements.

U.S. EPA defines a MSM level of control as the maximum degree of emission reductions that has been required or achieved from a source or source category in any other attainment plan or in practice in any other state and that can feasibly be

implemented in the area. The 2018 PM_{2.5} Plan contains BACM/MSM analyses demonstrating that measures adopted by CARB and the District are BACM/MSM in compliance with the requirements of the Act.

The complete BACM/MSM assessment for District measures is provided in Appendix C of the 2018 PM_{2.5} Plan, and the BACM/MSM assessment for CARB measures is provided in Appendix D.

C. Reasonable Further Progress Demonstration

The purpose of the RFP demonstration required in the SIP is to ensure that a nonattainment area makes steady progress in reducing emissions during the years leading to attainment. Ongoing and early implementation of CARB and District measures will achieve reductions of NO_x and direct PM_{2.5} emissions to meet target emissions levels in RFP milestone years, satisfying Act requirements.

RFP demonstrations for NO_x and direct PM_{2.5} can be found in Appendix H of the 2018 PM_{2.5} Plan.

D. Contingency Measures

The Act and General Preamble of U.S. EPA guidance provide the basic requirements and framework for establishing contingency measures. In addition, a recent court case, *Bahr v. U.S. EPA (Bahr)*, has provided further interpretation of implementation requirements. U.S. EPA staff has interpreted the decision in *Bahr* to mean that contingency measures must include a future action triggered by a failure to attain or failure to make reasonable further progress. Contingency measures are required for all federal PM_{2.5} standards. For the 2018 PM_{2.5} Plan, the District and CARB have both developed contingency measures.

Additional NO_x emission reductions that are expected to occur due to ongoing State mobile source control programs, together with emission reductions from the CARB and District contingency measures, provide sufficient emissions reductions for attainment contingency, addressing the requirements of the Act as interpreted in *Bahr*. Assuming contingency is triggered, Table 7 below provides the emission reductions that occur after the attainment year for each applicable standard due to implementation of California's mobile source contingency measures.

Table 7. Mobile San Joaquin Valley Attainment Contingency Reductions

1997 65 µg/m ³ and 15 µg/m ³ standard (tpd, reductions calculated on annual planning inventory)	2020 Emissions	2021 Emissions	2020 to 2021 Emission Reductions
Mobile Source Direct PM _{2.5}	8.5	8.2	0.3
Mobile Source NO _x	166.8	154.7	12.1
2006 35 µg/m ³ standard (tpd, reductions calculated on winter planning inventory)	2024 Emissions	2025 Emissions	2024 to 2025 Emission Reductions
Mobile Source Direct PM _{2.5}	6.8	6.7	0.1
Mobile Source NO _x	101.6	97.4	4.2
2012 12 µg/m ³ standard (tpd, reductions calculated on annual planning inventory)	2025 Emissions	2026 Emissions	2025 to 2026 Emission Reductions
Mobile Source Direct PM _{2.5}	7.5	7.4	0.1
Mobile Source NO _x	108.6	104.5	4.1

Additional discussion of contingency measures is provided in Appendix H of the 2018 PM_{2.5} Plan.

E. Transportation Conformity Budgets

Under the Act, transportation activities that receive federal funding or approval must be fully consistent with the SIP. U.S. EPA’s transportation conformity rule details requirements for establishing motor vehicle emission budgets in SIPs for the purpose of ensuring that transportation plans conform with the SIP. In line with the rule, the 2018 PM_{2.5} Plan establishes county-level on-road motor vehicle emission budgets for NO_x and direct PM_{2.5} for each attainment and RFP milestone year, using CARB’s EMFAC2014 on-road emissions inventory model. These emission budgets fulfill the requirements of the Act and U.S. EPA regulations to ensure that transportation projects will not interfere with progress and attainment of the PM_{2.5} standards.

Additional details on the on-road motor vehicle emission budgets can be found in Appendix D of the 2018 PM_{2.5} Plan.

VI. ANNUAL REPORTING ON SIP IMPLEMENTATION

CARB analysis shows the Valley will attain PM_{2.5} standards by the applicable deadlines based on the control strategy summarized above. SIP implementation from both CARB and the District is critical to successful attainment of the standards. To keep CARB and the District on track, and at the request of the Board during the October 2018 hearing, CARB staff will report annually to the Board on the status of 2018 PM_{2.5} Plan implementation. The purpose of this annual report is to provide an opportunity for staff and the Board to evaluate in a transparent manner whether we are progressing as expected towards meeting the Valley's clean air goals and, if not, allow for needed course corrections.

Staff proposes the annual report include updates on:

- A. Air quality trends
- B. Emissions trends
- C. Enforcement activities
- D. Latest relevant research and science
- E. Regulatory actions
- F. Status of incentive programs

Staff proposes the annual report addressing these six topics follow the framework laid out below. A greater level of detail is given for the incentives portion of the report. To address Board member requests for additional specificity and transparency on how CARB and the District will meet our incentive-based SIP commitments, the proposed framework includes benchmarks for tracking incentive funding.

A. Air Quality Trends

CARB will report on how PM_{2.5} air quality in the Valley changed in the past year. This could include not only regional trends but potentially also a discussion of whether air quality in the hot spot areas identified in the District's control strategy is improving as expected. Additionally, this section of the report might discuss whether the non-hot spot areas in the rest of the Valley are seeing air quality benefits moving them towards expeditious attainment and whether expanding the hot spot areas to include certain additional areas would be beneficial.

B. Emissions Trends

CARB will report on whether emissions of direct PM_{2.5}, NO_x, and other precursors are declining in the Valley at the needed pace. Together, CARB and District control strategies should result in measurable emissions reductions. Annually evaluating emissions trends will show whether the reductions both agencies committed to are in fact occurring.

C. Enforcement Activities

CARB will report on what the State and the District are doing to enforce our respective regulations and rules in the Valley. This could include an update on CARB's roadside inspections for heavy-duty trucks and implementation of the District's wintertime residential wood-burning curtailment program, Check Before You Burn.

D. Latest Relevant Research and Science

CARB will report on any new studies or research results released in the past year about PM_{2.5} formation in the Valley and the implications for the SIP control strategy. CARB has a number of studies and research efforts currently underway that are relevant to the Valley, including on ammonia from dairies, NO_x from soils, and species-resolved PM_{2.5} monitoring in Fresno. This section of the report could provide preliminary findings from these or other projects.

E. Regulatory Actions

CARB will report on whether the State and the District are on track with meeting our respective regulatory and rulemaking commitments. CARB's commitments are laid out in the Valley State SIP Strategy adopted by the Board in October 2018 (see Tables 2 and 3 above), and the District's are set forth in the 2018 PM_{2.5} Plan (see Tables 4, 5, and 6 above). The annual report could include an update on the status of the rule development process, such as workshops already held or scheduled and the date of scheduled CARB or District Governing Board action. Staff could report, for example, on CARB's progress towards developing the *Low-NO_x Engine Standard – California Action* measure, and on the District's progress amending its residential wood-burning rule. Additionally, staff could report on any emissions reductions achieved in the past year due to ongoing implementation of various adopted regulations or rules.

F. Status of Incentive Programs

CARB will report on whether the State and the District are on track in obtaining the funding needed for incentive programs and our progress in using those funds to turn over equipment to cleaner technologies. While regulatory actions account for almost 90 percent of the emission reductions in the 2018 PM_{2.5} Plan, emission reductions from incentive programs are needed for the last increment to reach attainment. The 2018 PM_{2.5} Plan estimates that about \$5 billion in incentives will be needed in the Valley through 2024 to successfully implement programs to achieve reductions from mobile, stationary, and area sources. Estimates for the amount of incentive funds needed for the various incentive-based programs rely on assumptions about the total cost of the equipment being replaced or retrofitted and what fraction of that total cost must be provided by incentives to enable and encourage participation from farmers, fleet owners, restaurants, and residents.

As shown below in Table 8, nearly all of the estimated total incentive funds needed—over 97 percent—are for incentivizing accelerated turnover of heavy-duty trucks and buses, agricultural equipment, and off-road equipment. The Plan estimates that about

33,000 trucks and 12,000 pieces of agricultural equipment will need to be repowered or replaced with cleaner equipment with the assistance of incentives to achieve the emissions reductions needed for attainment. In addition, incentives are an essential element of the District’s strategy to reduce direct PM_{2.5} emissions from residential wood combustion, commercial underfired charbroiling, and NOx emissions from internal combustion engines used at agricultural operations (e.g. ag pumps).

Table 8. Estimated Incentive Funding Needed through 2024 by Measure

Incentive Measures	Incentive Funding Needed
Mobile Source	\$4.87 billion
Accelerated Turnover of Trucks and Buses	\$3.3 billion
Accelerated Turnover of Agricultural Equipment	\$1.4 billion
Accelerated Turnover of Off-Road Equipment	\$170 million
Stationary and Area Source	\$134 million
Commercial Underfired Charbroiling Controls	\$45 million
Replacement of Residential Wood Burning Devices	\$75 million
Replacement of Internal Combustion Engines used at Agricultural Operations	\$14 million
Total	\$5 billion

Funding for incentive programs comes from a variety of State, federal, and local sources. Important State sources of funding include the Carl Moyer program, the Assembly Bill (AB) 617 Community Air Protection Program, the Funding Agricultural Replacement Measures for Emissions Reductions (FARMER) program, the Low Carbon Transportation Program, the Air Quality Improvement Program (AQIP), and Proposition 1B. These programs are summarized in detail in the Valley State SIP Strategy. Federal sources include the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) program and the U.S. EPA Diesel Emission Reduction Act (DERA) and Targeted Airshed Grant programs. The District also provides matching funds for these federal grants. Beyond these State and federal sources, the District receives local funds from sources such as Department of Motor Vehicle (DMV) vehicle fees.

Some of these funding sources can be used to fund incentive programs for either mobile or stationary and area sources; others have more limited applicability. For instance, while the Targeted Airshed Grant has been used in the past by the District to fund both heavy-duty truck replacement and wood-burning devices, the FARMER program can only be used for agricultural equipment incentives.

The Valley State SIP Strategy which sets forth CARB’s mobile source commitments includes discussion of existing and anticipated sources of funding for incentive programs; however, neither the Valley State SIP Strategy nor the 2018 PM_{2.5} Plan sets forth benchmarks for the amount secured and needed annually. When staff presented the Valley State SIP Strategy to the Board in October 2018, the Board requested that staff provide additional specificity on the details of CARB’s plan to meet the overall incentive-based SIP commitments for the Valley. In response, Table 9 below sets forth

estimated funding benchmarks from 2018 through 2024. Figure 4 immediately following displays the same information on identified and anticipated funding as a chart.

These benchmarks reflect staff's best effort to plan for the next six to seven years, in consultation with the District and stakeholders, but both the total and annual funding targets are estimates, based on currently available information. Staff will make adjustments to these estimates in each annual report to reflect any new information or assumptions. The ultimate goal of the Plan is to achieve the emissions reductions needed to reach attainment, and incentive monies raised and equipment turned over are a critical part of this effort, but not in and of themselves precise targets that must be met. If we can meet our emissions reductions goals more efficiently, spending less incentive money and replacing less (but dirtier) equipment, thereby not meeting funding or equipment turnover benchmarks, the programs will still be successful. It is also important to note that almost 90 percent of the reductions needed to meet the PM_{2.5} standards in 2024 and 2025 will come from regulatory actions associated with ongoing implementation of the existing control program, combined with regulatory measures identified in the Valley State SIP Strategy. The incentive funding will be used to achieve the last increment of emissions reductions needed to attain the standards, with the bulk of reductions coming from regulatory programs.

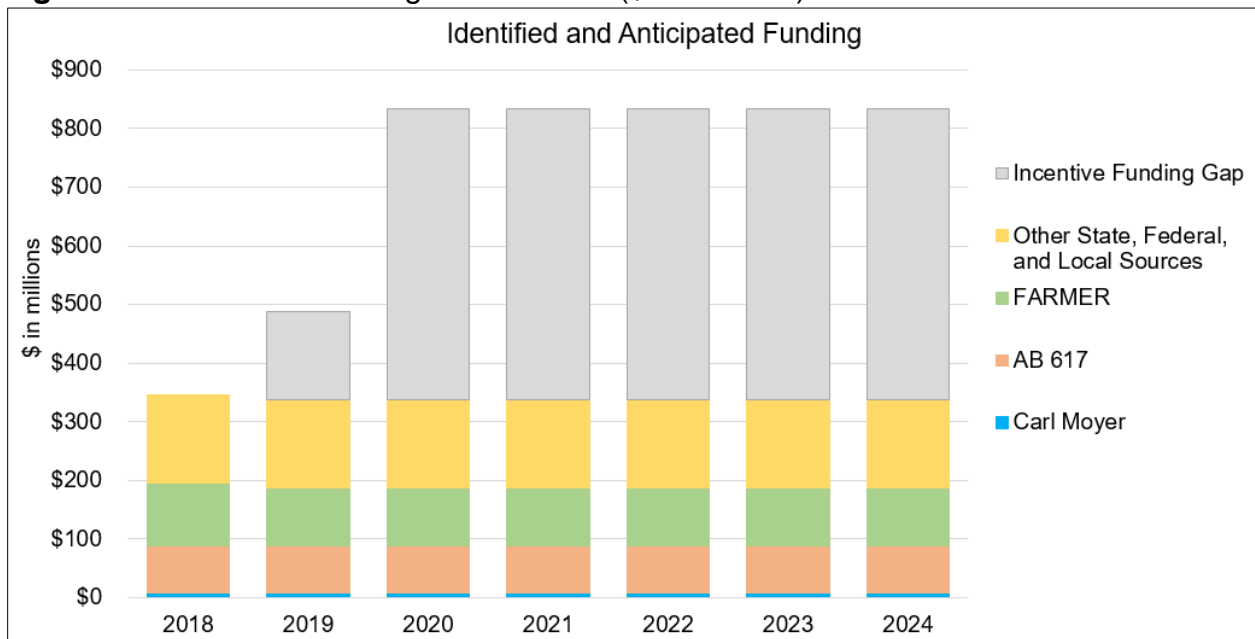
For 2018, the District has already received funds from the sources listed above to administer a variety of incentive programs. For 2019, a number of funding sources have been identified, with allocations to the San Joaquin Valley yet to be determined. Funding sources and amounts for 2018 and 2019 where known are summarized in the Valley State SIP Strategy. Funding for future years is uncertain for many critical programs such as FARMER and the AB 617 Community Air Protection Program, which do not have a dedicated funding source but instead receive appropriations annually at the discretion of the Legislature. CARB is committed to collaborating closely with the District and with stakeholders to secure sustained funding for the incentive programs described.

Valley stakeholders and Board members alike have expressed concerns about the reliance of the 2018 PM_{2.5} Plan on uncertain future sources of incentive funding to provide needed emissions reductions. While CARB and the District are committed to securing the needed incentive funding, CARB will identify alternative options for achieving emissions reductions if anticipated funding does not materialize.

Table 9. Estimated Funding Benchmarks (\$ in millions)

Funding Benchmarks	2018	2019	2020	2021	2022	2023	2024
Carl Moyer	\$8	\$8	\$8	\$8	\$8	\$8	\$8
AB 617	\$80	\$80	\$80	\$80	\$80	\$80	\$80
FARMER	\$108	\$100	\$100	\$100	\$100	\$100	\$100
Other State, Federal, and Local Sources , including Low Carbon Transportation Program, AQIP, Proposition 1B, NRCS, DERA, Targeted Airshed Grant Program, and District funding sources	Approx. \$150	Approx. \$150	Approx. \$150	Approx. \$150	Approx. \$150	Approx. \$150	Approx. \$150
Incentive funding identified or anticipated	\$346	\$338	\$338	\$338	\$338	\$338	\$338
Incentive funding needed: Approx. \$5 billion total		\$487	\$833	\$833	\$833	\$833	\$833
Incentive Funding Gap	\$0	\$149	\$495	\$495	\$495	\$495	\$495

Figure 4. Estimated Funding Benchmarks (\$ in millions)



VII. ENVIRONMENTAL IMPACTS

The District prepared a Negative Declaration for the 2018 PM_{2.5} Plan. The Negative Declaration demonstrated that the 2018 PM_{2.5} Plan would not have a significant adverse impact on air quality and would have a less than significant impact on the environment. The District approved and adopted the Negative Declaration on November 15, 2018.

CARB has determined that its review and approval of the 2018 PM_{2.5} Plan submitted by the District for inclusion in the SIP is a ministerial activity by CARB for purposes of CEQA (14 CCR § 15268). A “ministerial” decision is one that involves fixed standards or objective measurements, and the agency has no discretion to shape the activity in response to environmental concerns. (14 CCR § 15369; San Diego Navy Broadway Complex Coalition v. City of San Diego (2010) 185 Cal.App.4th 924, 934.)

CARB’s review of the 2018 PM_{2.5} Plan is limited to determining if it meets all the requirements of the Act. CARB is prohibited from not approving it or changing it unless CARB finds that it does not comply with the Act (HSC § 41650 and 41652). Since CARB’s review concludes that the Plan meets the requirements of the Act, CARB lacks authority to not adopt the plan, or modify it, in response to environmental concerns raised through the CEQA process. Therefore, CARB’s action on the plan is ministerial for purposes of CEQA.

VIII. STAFF RECOMMENDATION

CARB staff recommends that the Board:

1. Adopt the San Joaquin Valley *2018 Plan for the 1997, 2006, and 2012 PM_{2.5} Standards*, including the emission inventory, local control strategy, attainment demonstration, identification of PM_{2.5} attainment plan precursors, reasonable further progress plan, contingency measures, BACM/MSM demonstration, and transportation conformity emission budgets, as a revision to the California SIP.
2. Adopt the San Joaquin Valley *2016 Moderate Area Plan for the 2012 PM_{2.5} Standard*, including the emission inventory, local control strategy, impracticability demonstration, identification of PM_{2.5} attainment plan precursors, attainment deadline request, reasonable further progress plan, contingency measures, RACM/RACT demonstration, and transportation conformity emission budgets, as a revision to the California SIP.
3. Approve the District's request that the San Joaquin Valley be classified as a Serious PM_{2.5} nonattainment area for the 12 µg/m³ annual standard.
4. Direct the Executive Officer to submit the San Joaquin Valley *2018 Plan for the 1997, 2006, and 2012 PM_{2.5} Standards* to U.S. EPA for approval.
5. Direct the Executive Officer to submit the San Joaquin Valley *2016 Moderate Area Plan for the 2012 PM_{2.5} Standard* to U.S. EPA for approval.
6. Direct the Executive Officer to work with the District and U.S. EPA and take appropriate action to resolve any completeness or approvability issues that may arise regarding the SIP submission.
7. Authorize the Executive Officer to include in the SIP submittal any technical corrections, clarifications, or additions that may be necessary to secure U.S. EPA approval.

APPENDICES