

TABLE OF CONTENTS

Executive Summary

Table of Contents

Acronyms

Chapter 1: Introduction	1-1
1.1 Ozone and Its Effects	1-1
1.1.1 Health Benefits of 2015 8-Hour Ozone Standard	1-2
1.1.2 Other Effects of Ozone	1-4
1.2 Addressing Ozone through Ambient Standards	1-5
1.2.1 EPA’s Ozone NAAQS	1-5
1.2.2 California Ambient Air Quality Standards (CAAQS)	1-8
1.3 Meeting Federal SIP Requirements	1-8
1.4 Guiding Principles	1-10
1.5 Public Process.....	1-11
Chapter 2: Air Quality in the Valley: Challenges and Progress	2-1
2.1 Ozone Life Cycle	2-1
2.2 Air Quality Challenges	2-3
2.2.1 Challenges of the Valley’s Natural Environment	2-3
2.2.2 Regional Challenges and Regulatory Limits	2-6
2.3 Ozone Air Quality Data and Progress	2-11
2.3.1 Ozone Monitoring Network	2-11
2.3.2 Air Quality Progress	2-13
2.4 Conclusion.....	2-18
Chapter 3: Attainment Strategy	3-1
3.1 Applicable Attainment Strategy Requirements	3-1
3.2 Overview of Sources and Control Options.....	3-3
3.3 District Control Strategy.....	3-4
3.3.1 Current Control Program.....	3-4
3.3.2 Summary of Control Measure Review Process	3-8
3.3.3 Conclusions for Regulatory Control Measure Analysis	3-9
3.3.4 Beyond Regulatory Control Measures	3-10
3.4 Metropolitan Planning Organizations (MPOs)	3-18
3.5 CARB Mobile Source Control Strategy.....	3-18
3.5.1 Current Control Strategy for Area Sources	3-18
3.5.2 CARB Commitments for the San Joaquin Valley	3-19
3.6 Other State Agencies	3-34
3.7 Federal Control Opportunities	3-34

Chapter 4: Mobile Source Advocacy and Leveraging New Opportunities	4-1
4.1 Importance of Funding.....	4-2
4.2 Need for Mobile Source Emissions Reductions.....	4-3
Chapter 5: Attainment Demonstration	5-1
5.1 Modeling Attainment Demonstration	5-1
5.2 Modeling.....	5-2
5.3 Reasonably Available Control Measures (RACM) Demonstration.....	5-6
5.3.1 District RACM Demonstration	5-6
5.3.2 CARB RACM Demonstration	5-6
5.3.3 Metropolitan Planning Organizations (MPOs) RACM Demonstration	5-19
5.3.4 RACM Demonstration Conclusion	5-19
Chapter 6: Incremental Progress	6-1
6.1 Reasonable Further Progress (RFP).....	6-1
6.2 Contingency for Attainment	6-4
6.2.1 What is a contingency measure?	6-4
6.2.2 Background.....	6-6
6.2.3 CARB's Opportunities for Contingency Measures	6-9
6.2.4 San Joaquin Valley's Opportunities for Contingency Measures.....	6-12
6.2.5 Summary	6-14

Appendices

Appendix A: Ambient Air Quality Data	A-1
A.1 Ambient Air Quality Data.....	A-1
A.2 Trend and Spatial Variations.....	A-8
A.2.1 Number of Days Above the 8-hour Ozone NAAQS.....	A-8
A.2.2 Monthly Assessment of Days Above the 8-hour Ozone NAAQS	A-9
A.3 Difference Between Urban and Rural Ozone Response	A-13
A.4 Wildfire Impacts.....	A-15
Appendix B: Emissions Inventory	B-1
B.1 Introduction	B-1
B.2 Emissions Inventory Tables	B-3
B.3 Emission Statements	B-14
B.4 Emissions Inventory Documentation for the San Joaquin Valley 2022 70 ppb 8- hour Ozone State Implementation Plan	B-15
B.4.1 Emissions Inventory Background.....	B-15
B.4.2 Emissions Inventory Overview	B-15
B.4.3 Emission Inventory Components	B-18
Appendix C: Stationary Control Measures	C-1
Control Measure Evaluation Methodology.....	C-2
Rule Development Process.....	C-6
C.1 Rule 4103 Open Burning	C-7
C.2 Rule 4104 Reduction of Animal Matter	C-12
C.3 Rule 4106 Prescribed Burning and Hazard Reduction Burning	C-16
C.4 Rule 4301 Fuel Burning Equipment.....	C-24
C.5 Rule 4302 Incinerator Burning.....	C-26
C.6 Rule 4306 and Rule 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	C-30
C.7 Rule 4307 Boilers, Steam Generators and Process Heaters—2.0 MMBtu/hr to 5.0 MMBtu/hr.....	C-44
C.8 Rule 4308 Boilers, Steam Generators and Process Heaters—0.075 MMBtu/hr to less than 2.0 MMBtu/hr.....	C-56
C.9 Rule 4309 Dryers, Dehydrators, and Ovens.....	C-65
C.10 Rule 4311 Flares	C-71
C.11 Rule 4313 Lime Kilns.....	C-78
C.12 Rule 4352 Solid Fuel Fired Boilers, Steam Generators, and Process Heaters	C-80
C.13 Rule 4354 Glass Melting Furnaces.....	C-85
C.14 Rule 4401 Steam-Enhanced Crude Oil Production Wells.....	C-90
C.15 Rule 4402 Crude Oil Production Sumps.....	C-95
C.16 Rule 4404 Heavy Oil Test Station —Kern County	C-99
C.17 Rule 4407 In-Situ Combustion Well Vents.....	C-101
C.18 Rule 4408 Glycol Dehydration Systems	C-103

C.19	Rule 4409 Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities	C-105
C.20	Rule 4453 Refinery Vacuum Producing Devices or Systems	C-109
C.21	Rule 4454 Refinery Process Unit Turnaround	C-112
C.22	Rule 4455 Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants.....	C-122
C.23	Rule 4565 Biosolids, Animal Manure, and Poultry Litter Operations	C-131
C.24	Rule 4566 Organic Material Composting Operations	C-133
C.25	Rule 4570 Confined Animal Facilities	C-137
C.26	Rule 4601 Architectural Coatings	C-144
C.27	Rule 4602 Motor Vehicle Assembly Coatings.....	C-151
C.28	Rule 4603 Surface Coating of Metal Parts and Products, Plastic Parts and Products, and Pleasure Crafts.....	C-165
C.29	Rule 4604 Can and Coil Coating Operations.....	C-180
C.30	Rule 4605 Aerospace Assembly and Component Coating Operations	C-184
C.31	Rule 4606 Wood Products and Flat Wood Paneling Products Coating Operations.....	C-186
C.32	Rule 4607 Graphic Arts and Paper Film, Foil, and Fabric Coatings	C-189
C.33	Rule 4610 Glass Coating Operations	C-195
C.34	Rule 4612 Motor Vehicle and Mobile Equipment Coating Operations	C-197
C.35	Rule 4621 Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plants	C-203
C.36	Rule 4622 Gasoline Transfer Into Motor Vehicle Fuel Tanks	C-209
C.37	Rule 4623 Storage of Organic Liquids.....	C-215
C.38	Rule 4624 Transfer of Organic Liquid.....	C-224
C.39	Rule 4625 Wastewater Separators.....	C-233
C.40	Rule 4641 Cutback, Slow Cure, and Emulsified Asphalt, Paving, and Maintenance Operations	C-236
C.41	Rule 4642 Solid Waste Disposal Sites	C-239
C.42	Rule 4651 Soil Decontamination Operations.....	C-242
C.43	Rule 4652 Coatings and Ink Manufacturing.....	C-244
C.44	Rule 4653 Adhesives and Sealants.....	C-246
C.45	Rule 4661 Organic Solvents.....	C-255
C.46	Rule 4662 Organic Solvents Degreasing Operations	C-258
C.47	Rule 4663 Organic Solvent Cleaning, Storage, and Disposal	C-262
C.48	Rule 4672 Petroleum Solvent Dry Cleaning Operations.....	C-265
C.49	Rule 4681 Rubber Tire Manufacturing.....	C-268
C.50	Rule 4682 Polystyrene, Polyethylene, and Polypropylene Products Manufacturing.....	C-271
C.51	Rule 4684 Polyester Resin Operations.....	C-274
C.52	Rule 4691 Vegetable Oil Processing Operations.....	C-276
C.53	Rule 4692 Commercial Charbroilers.....	C-278
C.54	Rule 4693 Bakery Ovens.....	C-281
C.55	Rule 4694 Wine Fermentation and Storage Tanks.....	C-283
C.56	Rule 4695 Brandy Aging and Wine Aging Operations	C-286
C.57	Rule 4702 Internal Combustion Engines	C-289

C.58	Rule 4703 Stationary Gas Turbines.....	C-300
C.59	Rule 4902 Residential Water Heaters	C-314
C.60	Rule 4905 Natural Gas-Fired, Fan-Type Central Furnaces	C-319
C.61	Emission Inventory Codes	C-323

Appendix D: Mobile Source Control Measures..... D-1

D.1	Key Mobile Source Regulations and Programs Providing Emission Reductions..	D-1
D.1.1	Light-Duty Vehicles	D-2
D.1.2	Medium- and Heavy-Duty On-Road Trucks	D-8
D.1.3	Off-Road Sources	D-17
D.1.4	Conclusion	D-25
D.2	District Innovative Mobile Source Strategies.....	D-26
D.2.1	Rule 9510 Indirect Source Review.....	D-26
D.2.2	Rule 9410 Employer Based Trip Reduction	D-27
D.2.3	Clean Landscaping Equipment and Practices	D-28
D.3	Transportation Conformity	D-31
D.3.1	Introduction	D-31
D.3.2	Methodology	D-32
D.3.3	Motor Vehicle Emissions Budgets.....	D-33
D.3.4	Local Reasonably Available Control Measures (RACM).....	D-41
D.4	Vehicle Miles Traveled (VMT) Offsets.....	D-50
Attachment A: Local Transportation Control Measure Review and Reasonably Available Control Measure Analysis for the San Joaquin Valley 2022 Ozone State Implementation Plan		D-52

Appendix E: Incentives..... E-1

E.1	District Experience to Date in Administering and Implementing Incentive Programs..	E-1
E.2	SIP Creditability for Incentive-Based Emissions Reductions	E-2
E.3	Incentive Funding Sources	E-3
E.4	Incentive Strategy.....	E-3
E.4.1	Cost Effectiveness	E-4
E.4.2	Inventory of Available Projects.....	E-4
E.4.3	Required Expenditure Timeframes	E-4
E.4.4	Upcoming Regulatory Deadlines.....	E-4
E.4.5	Health Benefits.....	E-4
E.4.6	Environmental Justice.....	E-5
E.4.7	Community Involvement and Benefits.....	E-5
E.5	Statutory Constraints on Incentive Funding	E-5
E.6	District Incentive Programs.....	E-6
E.6.1	2021-2022 Incentive Spending Priorities	E-6
E.6.2	Heavy Duty Trucks.....	E-8
E.6.3	Agricultural Pumping Engines	E-9
E.6.4	Agricultural Equipment.....	E-10
E.6.5	Alternatives to Open Agricultural Burning Incentive Program	E-10
E.6.6	Locomotives.....	E-11

E.6.7	Electric School Bus Replacement	E-12
E.6.8	Alternative Fuel Infrastructure	E-12
E.7	Community Based Incentives	E-14
E.7.1	Drive Clean in the San Joaquin (Repair and Replace).....	E-14
E.7.2	Clean Green Yard Machine	E-14
E.7.3	Drive Clean! Rebate Program	E-15
E.7.4	Public Benefit Grants Program.....	E-15
E.7.5	REduce MOtor Vehicle Emissions (REMOVE)	E-16
E.7.6	Vanpool Voucher Incentive Program	E-16
E.7.7	Charge Up! Program.....	E-16
E.8	Technology Advancement	E-16

Appendix F: Modeling Protocol and Attainment Demonstration **F-1**

F.1	Introduction	F-1
F.2	Methodology	F-4
F.2.1	Meteorological Modeling.....	F-9
F.2.2	Emissions	F-13
F.2.3	Air Quality Modeling	F-16
F.3	Results	F-18
F.3.1	Meteorological Model Evaluation.....	F-18
F.3.2	Phenomenological Evaluation	F-28
F.3.3	Air Quality Model Evaluation	F-34
F.3.4	Air Quality Model Diagnostic Evaluation.....	F-41
F.3.5	Future Design Values	F-46
F.3.6	NOx/VOC Sensitivity Analysis for Reasonable Further Progress (RFP)	F-51
F.3.7	Unmonitored Area Analysis	F-53
F.4	References.....	F-58
F.5	Supplemental Materials.....	F-64

Appendix G: Modeling Emission Inventory..... **G-1**

G.1	Development of Ozone Emissions Inventories.....	G-1
G.1.1	Inventory Coordination	G-1
G.1.2	Background	G-1
G.1.3	Inventory Years	G-2
G.1.4	Spatial Extent of Emission Inventories	G-3
G.2	Estimation of Base Year Modeling Inventory	G-6
G.2.1	Terminology	G-6
G.2.2	Emissions Inventory	G-7
G.2.3	Temporal Distribution of Emissions	G-7
G.2.4	Spatial Allocation.....	G-15
G.2.5	Speciation Profiles	G-17
G.3	Methodology for Developing Base Case, Baseline, and Future Projected Emissions Inventories.....	G-19
G.3.1	Estimation of Gridded Area and Point sources.....	G-19
G.3.2	Estimation of On-road Motor Vehicle Emissions	G-20
G.3.3	Estimation of Gridded Biogenic Emissions.....	G-26

G.3.4	Aircraft Emissions	G-26
G.3.5	Estimation of Ocean-going Vessel (OGV) Emissions.....	G-27
G.3.6	Estimation of Other Day-specific Sources.....	G-27
G.3.7	Northern Mexico Emissions.....	G-30
G.3.8	Western States Emissions	G-34
G.3.9	Application of Control Measure Reduction Factors	G-35
G.3.10	Application of Emission Reduction Credits	G-35
G.4	Quality Assurance of Modeling Inventories	G-35
G.4.1	Area and Point Sources	G-35
G.4.2	On-road Emissions.....	G-38
G.4.3	Aircraft Emissions	G-38
G.4.4	Day-specific Sources	G-38
G.4.5	Additional Quality Assurance	G-39
G.4.6	Model-ready Files Quality Assurance.....	G-42
G.5	References.....	G-44
G.6	Appendix A: Day-of-week Redistribution Factors by Vehicle Type and County .	G-46
G.7	Appendix B: Hour-of-day Profiles by Vehicle Type and County	G-66
G.8	Appendix C: Additional Temporal Profiles.....	G-89
G.9	Appendix D: Spatial Surrogate Assignments	G-91
Appendix H: Weight of Evidence		H-1
H.1	Introduction	H-1
H.1.1	Elements Commonly Included in an Attainment Demonstration.....	H-1
H.1.2	Physical Context.....	H-1
H.1.3	Recent Air Quality	H-5
H.2	Assessment of Valley-Wide Air Quality Progress.....	H-6
H.3	Recent Trends (2000-2020)	H-8
H.3.1	Basin-Wide Perspective	H-8
H.3.2	Regional Trends	H-9
H.4	Wildfires	H-23
H.4.1	Wildfire Information	H-23
H.4.2	Summary of Event.....	H-28
H.4.3	PM _{2.5}	H-31
H.4.4	Adjusted Design Values	H-35
H.5	Meteorology and Air Quality Trends.....	H-45
H.5.1	Suitability of 2018 as a Base Year for Modeling	H-45
H.5.2	Meteorology-Adjusted Ozone Trends – Seasonal Averages by Region	H-54
H.6	Trends in Precursor Emissions	H-57
H.7	Trends for Ozone Precursor Concentrations.....	H-61
H.7.1	Analysis of PAMS Data	H-62
H.7.2	Analysis of Routine Ambient NO _x Data.....	H-63
H.8	Weekend Effect in the San Joaquin Valley	H-66
H.9	Preliminary Look: 2021 Ozone Data	H-71
H.10	Summary	H-74

Appendix I: Emission Reduction Credits..... I-1
I.1 Introduction..... I-1
 I.1.1 Pre-Baseline Emission Reduction Credits I-1

Appendix J: Triennial Progress Report for State Standards J-1
J.1 Introduction J-2
J.2 Meeting State Requirements for Plan Revisions J-3
J.3 Attainment by the Earliest Practicable Date J-3
J.4 Air Quality Improvements J-4
 J.4.1 Designation Values for the Valley J-4
 J.4.2 Population Exposure J-4
J.5 Emission Reductions..... J-4
J.6 Control Strategy and Cost-Effectiveness Ranking J-5
J.7 Emissions Trends..... J-6

Appendix K: Summary of Comments and ResponsesK-1

TABLE OF FIGURES

Figure 1-1	Ozone Formation	1-2
Figure 1-2	Public Health Benefits of 70 ppb Ozone Standard in California	1-4
Figure 2-1	Ozone Life Cycle.....	2-2
Figure 2-2	San Joaquin Valley Air Basin	2-3
Figure 2-3	Effect of Temperature Inversion on Pollutant Dispersion	2-4
Figure 2-4	Drought Extent and Severity in California	2-5
Figure 2-5	2022 NOx Emissions Inventory Jurisdictional Authority	2-10
Figure 2-6	Ozone Monitoring Sites within the Valley Air Basin.....	2-11
Figure 2-7	NOx Emissions Reductions, 1980-2021.....	2-13
Figure 2-8	Improvement in 8-hour Ozone Design Values, 2000-2019	2-14
Figure 2-9	Basin Days Over the 1979 1-hour Ozone Standard.....	2-14
Figure 2-10	Basin Days Over the 2015 8-Hour Ozone Standard	2-16
Figure 2-11	Basin Maximum 8-Hour Average Ozone Concentrations.....	2-16
Figure 2-12	Decrease in Valley's 8-hr Ozone Design Values.....	2-17
Figure 3-1	Jurisdiction of Federal, State, and Local Agencies	3-4
Figure 4-1	Major Reductions in Air Pollution	4-2
Figure 4-2	Jurisdiction Comparison of Statewide Mobile Source Emissions	4-4
Figure 5-1	Reductions through Attainment Year	5-2
Figure 6-1	Contingency Measure Years.....	6-8
Figure 6-2	Governor Newsom Executive Order N-79-20.....	6-10
Figure A-1	Valley Maximum 8-hour Ozone Design Value Trend.....	A-6
Figure A-2	8-Hour Ozone Design Value (2020)	A-7
Figure A-3	Number of Days Valley Exceeded the 8-hour Ozone Standard.....	A-8
Figure A-4	Frequency of Days Valley Exceeded the 2015 8-hour Ozone Standard..	A-10
Figure A-5	Frequency of Days Valley Exceeded the 2008 8-hour Ozone Standard..	A-10
Figure A-6	Frequency of Days Valley Exceeded the 1997 8-hour Ozone Standard..	A-11
Figure A-7	Temporal Changes in Ozone Concentrations at Ash Mountain and Bakersfield-Municipal Airport on August 23, 2019.....	A-15
Figure C-1	Rule Development Process.....	C-6
Figure C-2	Smoke Management System Burn Allocation Zones	C-9
Figure D-1	Light-Duty Emission Standards	D-2
Figure D-2	Off-Road Vehicle and Equipment Control Programs	D-18
Figure F-1	Map of California (left) along with the location of San Joaquin Valley (SJV) in magenta. The shaded and gray line contours denote the gradients in topography (km). The outer box of the left panel is the California statewide 12 km modeling domain, while	

the inner box shows the 4 km modeling domain covering Central California. The insert on the right shows the zoomed-in view of the spatial extent (magenta line) and approximate regional boundary along with the location of sites in the Northern (red triangle markers), Central (red circle makers) and Southern (red square markers) sub regions in the Valley. (Figure adapted from Kulkarni et al., 2014)..... F-2

Figure F-2 Trend in summer emissions of NO_x and ROG (tons per day), Maximum Daily Average 8-hour Ozone Design Value (ppb) and 70 ppb 8-hour Ozone NAAQS exceedance days between 2000 and 2020 in the SJV. Anthropogenic Emissions estimates are from the California Emission Projection Model (CEPAM) 2019 Ozone SIP Baseline Projection Version 1.04 with 2017 base year. 2018 biogenic ROG emissions are from MEGAN 3.0 biogenic model calculations. F-3

Figure F-3 Example showing how the location of the MDA8 ozone for the top ten days in the reference and future years are chosen..... F-9

Figure F-4 WRF modeling domains (D01 36 km; D02 12 km; and D03 4 km). F-11

Figure F-5 Monthly average biogenic ROG emissions for 2018..... F-15

Figure F-6 Monthly average soil NO_x emissions for 2018..... F-16

Figure F-7 Meteorological monitoring sites in the San Joaquin Valley: red markers represent sites in the northern SJV; green markers represent sites in the central SJV, while blue markers represent sites in the southern SJV..... F-19

Figure F-8 Distribution of hourly mean bias (left) and mean error (right) for April-October 2018. Results are shown for wind speed (top), temperature (middle), and RH (bottom)..... F-25

Figure F-9 Spatial distribution of mean bias (left) and mean error (right) for April-October 2018. Results are shown for wind speed (top), temperature (middle), and RH (bottom)..... F-26

Figure F-10 Comparison of modeled and observed hourly wind speed (left column), 2-meter temperature (middle column), and relative humidity (right column). Results for the Northern SJV are shown in the top row, Central SJV in the middle row, and Southern SJV in the bottom row. F-27

Figure F-11 Surface wind field at 13:00 PST (top) and 20:00 PST (bottom) on July 31, 2018. Modeled wind field is shown with black wind vectors, while observations are shown in red..... F-29

Figure F-12 Average wind field at 14:00 PST (top) and 21:00 PST (bottom) for the top 10 observed ozone days at Edison monitoring site in 2018. Modeled wind field is shown with black wind vectors, while observations are shown in red..... F-31

Figure F-13 Modeled and observed 500 hPa geopotential height at 00:00 UTC (top) and 12:00 UTC (bottom) for the top 10 observed ozone days at the Edison monitoring site in 2018..... F-33

Figure F-14 Comparison of various statistical metrics from the attainment demonstration modeling to the range of statistics from the 69 peer-reviewed studies summarized in Simon et al (2012). (MDA denotes Maximum Daily Average). Red circular markers show statistics calculated from modeled ozone at the monitor location, while blue triangular markers show statistics calculate from the maximum ozone in the

3x3 array of grid cells surrounding the monitor. Statistics for hourly ozone were only calculated from data over 60 ppb.	F-40
Figure F-15 Average MDA8 ozone for the top 10 ozone days from the model simulations overlaid with observation data (marked as circle), where the top 10 days from the observations were chosen based on the Edison monitor.	F-41
Figure F-16 Illustration of a typical ozone isopleth plot, where each line represents ozone mixing ratio, in 10 ppb increments, as a function of initial NO _x and VOC (or ROG) mixing ratio (adapted from (Seinfeld and Pandis 1998), Figure 5.15). General chemical regimes for ozone formation are shown as NO _x -disbenefit (red circle), transitional (blue circle), and NO _x -limited (green circle).	F-42
Figure F-17 Site-specific average weekday and weekend maximum daily average 8-hour ozone for each year from 2000 to 2020 for the Northern SJV (top), Central SJV (middle), and Southern SJV (bottom). The colored circle markers denote observed values while the dark gray square and light gray triangle markers denote the simulated baseline 2018 and future 2037 values. Points falling below the 1:1 dashed line represent a NO _x -disbenefit regime, those on the 1:1 dashed line represent a transitional regime, and those above the 1:1 dashed line represent a NO _x -limited regime.	F-44
Figure F-18 Spatial distribution of the future 2037 DVs based on the unmonitored area analysis in the Valley (left), and the population distribution in the Valley (right) based on 2020 US census data.	F-55
Figure F-19 Spatially interpolated 2018 base year DVs with gradient adjustment based on the unmonitored area analysis (left), and the RRF calculated for each grid (right)	F-57
Figure F-20 Spatially interpolated 2018 base year DVs with gradient adjustment based on the unmonitored area analysis (left), and the spatial distribution of the future year 2037 DVs using modeling data of July – October (right).	F-57
Figure G-1 Spatial coverage of emissions grid with nonattainment area highlighted in yellow	G-4
Figure G-2 San Joaquin Valley Nonattainment area highlighted in Northern California with statewide 4km grid overlaid	G-5
Figure G-3 Workflow for spatial and temporal allocation of on-road emissions.....	G-25
Figure G-4 Outline of Mexico municipalities included in California air quality simulations. The grey box outlines the boundaries of the CAState_4km modeling domain	G-31
Figure G-5 Example of an ROG spatial plot by source category (Consumer Products)	G-37
Figure G-6 Comparison of inventories report	G-40
Figure G-7 Daily variation of NO _x emissions for sources in the San Joaquin Valley 2018	G-41
Figure G-8 Annual processed emissions example for 2018 San Joaquin Valley Nonattainment Area NO _x for area, on-road, and point sources	G-42
Figure G-9 Example timeseries plot for daily 2018 NO _x emissions from area, on-road, and point sources for San Joaquin Valley Nonattainment Area	G-43
Figure H-1 San Joaquin Valley Wind Pattern During the Ozone Season.....	H-3
Figure H-2 Active Ozone Monitoring Sites in San Joaquin Valley Air Basin.....	H-4

Figure H-3	Design Value Trend for the San Joaquin Valley Air Basin.....	H-7
Figure H-4	Ozone Trends (2000-2020) in the San Joaquin Valley Air Basin.....	H-8
Figure H-5	Reductions in Levels of Spatial Extent of Elevated Design Values in the San Joaquin Valley Air Basin.....	H-9
Figure H-6	Counties and Regions in the San Joaquin Valley.....	H-10
Figure H-7	Active Ozone Sites in the Northern San Joaquin Valley.....	H-11
Figure H-8	Ozone Trends for Turlock – S Minaret Street Monitoring Station (2000–2020).....	H-12
Figure H-9	Ozone Trends for Modesto -14 th Street Monitoring Station (2000–2020)	H-12
Figure H-10	Ozone Trends for Merced – Coffee Road Monitoring Station (2000–2020).....	H-13
Figure H-11	Ozone Trends for Tracy – Airport Monitoring Station (2008-2020).....	H-13
Figure H-12	Active Ozone Sites in the Central San Joaquin Valley.....	H-14
Figure H-13	Ozone Trends for Clovis – N Villa Avenue Monitoring Station (2000-2020).....	H-15
Figure H-14	Ozone Trends for Fresno – 1 st street and Garland Street Monitoring Station (2000-2020).....	H-15
Figure H-15	Ozone Trends for Parlier Street Monitoring Station (2000-2020).....	H-16
Figure H-16	Ozone Trends for Fresno - Drummond Monitoring Station (2000-2020).....	H-16
Figure H-17	Ozone Trends for Hanford – S Irwin Street Monitoring Station (2000-2020).....	H-17
Figure H-18	Active Ozone Sites in the Southern San Joaquin Valley.....	H-18
Figure H-19	Ozone Trends for Edison Monitoring Station (2000-2020).....	H-19
Figure H-20	Ozone Trends for Arvin – Di Giorgio Monitoring Station (2012-2020) ..	H-19
Figure H-21	Ozone Trends for Bakersfield – California Avenue Monitoring Station (2000-2020).....	H-20
Figure H-22	Ozone Trends for Maricopa Monitoring Station (2001-2020).....	H-20
Figure H-23	Ozone Trends for Bakersfield – Municipal Airport Monitoring Station (2014-2020).....	H-21
Figure H-24	Active Ozone Sites in Sequoia National Park.....	H-21
Figure H-25	Ozone Trends for Sequoia National Park – Ash Mountain Monitoring Station (2001-2020).....	H-22
Figure H-26	Ozone Trends for Sequoia National Park – Lower Kaweah Monitoring Station (2001-2020).....	H-23
Figure H-27	Daily PM2.5 Data for July 2016.....	H-31
Figure H-28	Daily PM2.5 Data for August 2016.....	H-32
Figure H-29	Daily PM2.5 Data for August and September 2017.....	H-32
Figure H-30	Daily PM2.5 Data for July and August 2018.....	H-33
Figure H-31	Daily PM2.5 Data for September 2018.....	H-33
Figure H-32	Daily PM2.5 Data for August and early September 2020.....	H-34
Figure H-33	Daily PM2.5 Data for mid-September and October 2020.....	H-34
Figure H-34	Official and Adjusted Design Value Trends for the San Joaquin Valley Air Basin.....	H-35
Figure H-35	2016-2020 Adjusted DV for Turlock – S Minaret Street Monitoring Station (2000–2020).....	H-37

Figure H-36 2016-2020 Adjusted DV for Modesto -14 th Street Monitoring Station (2000–2020).....	H-38
Figure H-37 2016-2020 Adjusted DV for Clovis – N Villa Avenue Monitoring Station (2000-2020).....	H-39
Figure H-38 2016-2020 Adjusted DV for Fresno – 1 st street and Garland Street Monitoring Station (2000-2020).....	H-40
Figure H-39 2016-2020 Adjusted DV for Parlier Street Monitoring Station (2000-2020).....	H-40
Figure H-40 2016-2020 Adjusted DV for Fresno - Drummond Monitoring Station (2000-2020).....	H-41
Figure H-41 2016-2020 Adjusted DV for Hanford – S Irwin Street Monitoring Station (2000-2020).....	H-41
Figure H-42 2016-2020 Adjusted DV for Edison Monitoring Station (2000-2020)	H-42
Figure H-43 2016-2020 Adjusted DV for Arvin – Di Giorgio Monitoring Station (2012-2020).....	H-42
Figure H-44 2016-2020 Adjusted DV for Bakersfield – California Avenue Monitoring Station (2000-2020).....	H-43
Figure H-45 2016-2020 Adjusted DV for Maricopa Monitoring Station (2001-2020)	H-43
Figure H-46 2016-2020 Adjusted DV for Bakersfield – Municipal Airport Monitoring Station (2014-2020).....	H-44
Figure H-47 2016-2020 Adjusted DV for Sequoia National Park – Ash Mountain Monitoring Station (2001-2020).....	H-44
Figure H-48 OFP vs Observed Daily Max 8-Hour Ozone in Northern SJV.....	H-47
Figure H-49 OFP vs Observed Daily Max 8-Hour Ozone in Central SJV	H-47
Figure H-50 OFP vs Observed Daily Max 8-Hour Ozone in Southern SJV	H-48
Figure H-51 OFP in Northern SJV.....	H-49
Figure H-52 OFP in Central SJV	H-49
Figure H-53 OFP in Southern SJV	H-50
Figure H-54 Percentiles for Midday (10 a.m. to 4 p.m.) Average Temperature in the Northern SJV.....	H-51
Figure H-55 Percentiles for Midday (10 a.m. to 4 p.m.) Average Wind Speed in the Northern SJV.....	H-51
Figure H-56 Percentiles for Midday (10 a.m. to 4 p.m.) Average Temperature in the Central SJV	H-52
Figure H-57 Percentiles for Midday (10 a.m. to 4 p.m.) Average Wind Speed in the Central SJV	H-52
Figure H-58 Percentiles for Midday (10 a.m. to 4 p.m.) Average Temperature in the Southern SJV	H-53
Figure H-59 Percentiles for Midday (10 a.m. to 4 p.m.) Average Wind Speed in the Southern SJV	H-53
Figure H-60 Meteorology-adjusted Season Average of Daily Maximum 8-Hour Ozone Concentrations for Northern SJV	H-55
Figure H-61 Meteorology-adjusted Season Average of Daily Maximum 8-Hour Ozone Concentrations for Central SJV	H-56
Figure H-62 Meteorology-adjusted Season Average of Daily Maximum 8-Hour Ozone Concentrations for Southern SJV	H-56

Figure H-63 Overall Anthropogenic NO _x and ROG Emission Trends for the San Joaquin Valley	H-57
Figure H-64 Anthropogenic NO _x and ROG Emission Trends for the Northern San Joaquin Valley	H-58
Figure H-65 Anthropogenic NO _x and ROG Emission Trends for the Central San Joaquin Valley	H-59
Figure H-66 Anthropogenic NO _x and ROG Emission Trends for the Southern San Joaquin Valley	H-59
Figure H-67 Summer ROG Emissions by County in the San Joaquin Valley	H-60
Figure H-68 Summer NO _x Emissions by County in the San Joaquin Valley	H-61
Figure H-69 July – August Means at all San Joaquin Valley PAMS Stations (5-7 a.m./6-8 a.m.)*	H-62
Figure H-70 Northern San Joaquin Valley Trends for Ambient 24-hour NO _x from May – October	H-64
Figure H-71 Central San Joaquin Valley Trends for Ambient 24-hour NO _x from May – October	H-64
Figure H-72 Southern San Joaquin Valley Trends for Ambient 24-hour NO _x from May – October	H-65
Figure H-73 San Joaquin Valley Air Basin Trends for ambient NO _x from May – October	H-65
Figure H-74 Average Weekend Effect for the Northern Sub-Region of the SJV Basin	H-67
Figure H-75 Average Weekend Effect for the Central Sub-Region of the SJV Basin	H-68
Figure H-76 Average Weekend Effect for the Southern Sub-Region of the SJV Basin	H-69
Figure H-77 Average Weekend Effect for the whole SJV Basin	H-69
Figure H-78 Design Value Trend for the San Joaquin Valley Air Basin along with the 2037 Projected Design Value	H-75
Figure J-1 Ozone State Designation Values for the San Joaquin Valley	J-4

TABLE OF TABLES

Table 1-1	Federal Air Quality Standards and Valley Milestones for Ozone	1-6
Table 1-2	Summary of Federal Requirements	1-8
Table 1-3	2022 Ozone Plan Meetings	1-11
Table 2-1	Estimated Valley Population by County, 2020-2035	2-7
Table 2-2	Ozone Monitoring Site Types in 2020	2-12
Table 2-3	Sample Design Value Calculation (Clovis-Villa, 2020)	2-17
Table 3-1	Adopted District Rules Achieving Reductions from Stationary Sources in and After 2017	3-5
Table 3-2	Regulatory Control Measure Commitments	3-9
Table 3-3	Summary of Grant Expenditures and Results	3-10
Table 3-4	Stationary and Area Source Sectors for Further Study	3-11
Table 3-5	Adopted CARB Regulations – Area Sources	3-18
Table 3-6	Measures and Schedule	3-21
Table 3-7	Measures and Schedule	3-22
Table 3-8	Mobile Source Emissions under CARB and District Current Control Programs	3-23
Table 3-9	2016 State SIP Strategy Measures Still to be Adopted	3-24
Table 3-10	San Joaquin Valley NO _x Emission Reductions from CARB Programs ...	3-25
Table 3-11	San Joaquin Valley Expected NO _x Emissions Reductions from the 2022 State SIP Strategy	3-26
Table 5-1	SJV Summer Planning Emissions for 2018 and 2037 (tons/day)	5-4
Table 5-2	Summary of 2018 weighted average and future year 2037 ozone design value (DV) at SJV monitoring sites, where the 2037 DVs include the effects of CARB commitments but exclude federal clean truck and Tier 5 off-road commitments	5-5
Table 6-1	RFP demonstration for the San Joaquin Valley 70 ppb ozone standard	6-3
Table 6-2	Emissions Sources and Respective CARB Programs with a Zero-Emissions Requirement/Component	6-11
Table 6-3	Adopted District Rules Achieving Reductions from Stationary Sources in and After 2017	6-13
Table A-1	Fourth Highest 8-hr Average Ozone (ppm)	A-3
Table A-2	3-yr Average of the Annual Fourth-Highest Daily Maximum 8-hr	A-4
Table A-3	Current 8-hour Ozone Design Values and Attainment Status for the San Joaquin Valley Air Basin	A-5
Table A-4	Number of Days Above the 2015 8-Hour Ozone Standard	A-9
Table A-5	2015 8-hour Ozone Basin Exceedances by Month from 2000-2021	A-12
Table A-6	2008 8-hour Ozone Basin Exceedances by Month from 2000-2021	A-12
Table A-7	1997 8-hour Ozone Basin Exceedances by Month from 2000-2021	A-13

Table B-1 NO _x Emissions (Summer Daily Averages in Tons per Day)	B-3
Table B-2 VOC Emissions (Summer Daily Averages in Tons per Day).....	B-8
Table B-3 Valley-Wide Biogenic Emissions for 2018* in Tons per Day	B-14
Table B-4 Growth Surrogates for Point and Areawide Sources	B-35
Table B-5 District and CARB Control Rules and Regulations Included in the Inventory	B-37
Table B-6 External Adjustment IDs and Descriptions.....	B-41
Table C-1 Rule 4352 NO _x , CO, PM ₁₀ , and SO _x Emission Limits.....	C-81
Table C-2 San Joaquin Valley Petroleum Refining Operations	C-117
Table C-3 Confined Animal Facilities Applicability Thresholds.....	C-137
Table C-4 Comparison between CARB’s Suggested Control Measure for Architectural Coatings and SJVAPCD Rule 4601	C-145
Table C-5 VOC Content Limits for Two-Piece Can Coating Operations.....	C-180
Table C-6 VOC Content Limits for Three-Piece Can Coating Operations	C-181
Table C-7 VOC Content Limits for Drums, Pails and Lids Coating Operations	C-181
Table C-8 VOC Content Limits for Coil Coating Operations.....	C-181
Table C-9 VOC Content Limits for Organic Solvents.....	C-181
Table C-10 Applicability of CARB Certification Procedures.....	C-204
Table C-11 Applicability of CARB Certification Procedures.....	C-209
Table C-12 Brandy and Wine Aging Thresholds	C-286
Table C-13 Emission Inventory Codes	C-323
Table D-1 Summary MVEB for the 70 ppb Ozone Standard (Summer Season) for each MPO within the SJV Region (tons per day)	D-34
Table D-2 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2023	D-35
Table D-3 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2026	D-36
Table D-4 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2029	D-37
Table D-5 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2032	D-38
Table D-6 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2035	D-39
Table D-7 MVEB for the 70 ppb Ozone Standard (Summer Season) for 2037	D-40
Table E-1 Summary of Grant Expenditures and Results.....	E-1
Table E-2 Statutory Constraints on Incentive Funding	E-5
Table E-3 District Incentive Priorities (2022-2023 Budget).....	E-6
Table F-1 Data from each year that are utilized in the Design Value calculation for a specific year (DV Year), and the yearly weighting of data for the average Design Value calculation (or DVR).	F-5
Table F-2 Year-specific 8-hour ozone design values for 2018, 2019 and 2020, and the average baseline design value (represented as the average of three design values) for 2018 at the monitoring sites in SJV. 2020 DVs are the two-year averages of the 4th highest 8-hour O ₃ concentrations from 2018 and 2019.	F-6
Table F-3 WRF vertical layer structure.....	F-12
Table F-4 WRF Physics options.....	F-13
Table F-5 SJV Summer Planning Emissions for 2018, 2032, and 2037 (tons/day)...	F-14

Table F-6 CMAQ configuration and settings.	F-17
Table F-7 Meteorological site location and parameter measured.....	F-20
Table F-8 Hourly surface wind speed, temperature and relative humidity statistics by region for April-October 2018.	F-24
Table F-9 Maximum daily average 8-hour ozone performance statistics by modeling subregions and entire SJV region for the 2018 ozone season (April - October). Maximum daily average 8-hour ozone (>60ppb) with simulated data extracted at grid cell where the monitor is located.	F-36
Table F-10 Maximum daily average 8-hour ozone performance statistics by modeling subregions and entire SJV region for the 2018 ozone season (April - October). Maximum daily average 8-hour ozone (>60ppb) with simulated data extracted from the 3x3 grid cell array maximum centered at the monitor.....	F-36
Table F-11 Maximum daily average 1-hour ozone performance statistics by modeling subregions and entire SJV region for the 2018 ozone season (April - October). Maximum daily average 1-hour ozone (>60ppb) with simulated data extracted at grid cell where the monitor is located.	F-37
Table F-12 Maximum daily average 1-hour ozone performance statistics by modeling subregions and entire SJV region for the 2018 ozone season (April - October). Maximum daily average 1-hour ozone (>60ppb) with simulated data extracted from the 3x3 grid cell array maximum centered at the monitor.....	F-38
Table F-13 Hourly ozone performance statistics by modeling subregions and entire SJV region for the 2018 ozone season (April - October). Hourly ozone (>60ppb) with simulated data extracted at grid cell where the monitor is located. Note that only statistics for the grid cell in which the monitor is located were calculated for hourly ozone.	F-38
Table F-14 Summary of key parameters related to the future year 2037 ozone design value (DV) calculation, where the 2037 DVs include federal clean truck and Tier 5 off-road commitments.....	F-47
Table F-15 Summary of key parameters related to the future year 2037 ozone design value (DV) calculation excluding federal clean truck and Tier 5 off-road commitments	F-49
Table F-16 Summary of the ozone improvement from the 60% emissions reductions at the monitoring sites in SJV.....	F-51
Table G-1 Modeling domain parameters	G-5
Table G-2 Inventory terms for emission source types	G-7
Table G-3 Day of week variation factors	G-8
Table G-4 Daily variation factors	G-10
Table G-5 Network information for data sources used in current version of ITN	G-21
Table G-6 Registration Data Vehicle Type Classes.	G-22
Table G-7 Vehicle classification and type of adjustment	G-24
Table G-8 NOx Reductions (TPD) by Air Basin and Program for 2037	G-26
Table G-9 List indicating ERG developed spatial surrogates for the state of Baja California	G-32
Table G-10 List of EPA's Mexico surrogates as of May 2018	G-33
Table G-11 Day-of-week adjustment by vehicle class and county	G-46

Table G-12 Daily adjustment for Heavy Duty Trucks (HH) by county.....	G-49
Table G-13 Hour-of-day profiles for LD and LM vehicle types in counties Fresno, Kern, Kings, and Madera	G-67
Table G-14 Hour-of-day profiles for LD and LM vehicle types in counties Merced, San Joaquin, Stanislaus, and Tulare	G-74
Table G-15 Hour-of-day profiles (Sunday July 1 to Saturday July 8) for Heavy Heavy Duty vehicles by county.....	G-81
Table G-16 OGV Monthly Profiles.....	G-89
Table G-17 OGV Weekly Profiles.....	G-90
Table G-18 Primary surrogate assignment at the EICSUM level, description, and data source	G-91
Table H-1 Recent Design Values for Sites Currently Operating in the SJV (in ppb) ..	H-6
Table H-2 2016 Wildfires active in June through October	H-24
Table H-3 2017 Wildfires active in June through November	H-25
Table H-4 2018 Wildfires active in June through November	H-26
Table H-5 2019 Wildfires active in June through November	H-26
Table H-6 2020 Wildfires active in July through December.....	H-28
Table H-7 2016 through 2020 List of Dates and Sites Affected by Wildfires	H-29
Table H-8 Adjusted Design Values Compared to the Official Design Values for the High Sites Currently Operating in the SJV (in ppb).....	H-36
Table H-9 List of Observed variables used in Python sklearn Random Forest	H-45
Table H-10 Average Weekend Effect.....	H-70
Table H-11 2021 List of Dates and Sites Affected by Wildfires.	H-72
Table H-12 Preliminary Look: 2019-2021 Design Values (in ppb).....	H-73
Table I-1 Estimated NOx Growth, Control, and Estimated Offset Use	I-5
Table I-2 Estimated VOC Growth, Control, and Estimated Offset Use.....	I-7
Table I-3 List of Emission Reduction Credits NOx and VOC.....	I-9
Table J-1 CCAA Requirements for Triennial Plan Revisions.....	J-3
Table J-2 Adopted District Rules Achieving Reductions from Stationary Sources in and After 2018.....	J-5